# Health Shocks and permanent income loss: the Household Business channel

Draft – 09/2016

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**Abstract**

The monetary and time costs associated with illness may affect directly the household businesses that generate income for countless individuals around the developing world. This study uses an original Vietnamese panel data to provide strong evidence that health shocks affecting microenterprises operators and/or other household members have a negative impact on the business operations. Although intra-household labour reallocation mitigate the direct labour supply decrease, large out-of- pocket health expenditures have the potential of crowding out business-related expenditures, and to significantly decrease investment.

These results have important implications, among which the underestimation of the positive externalities of health insurance schemes.

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## 1. Introduction

Health impoverishment due to catastrophic spending is frequent in contexts where health insurance schemes are weak or non-existent. A large body of academic research identifies the effects of health shocks on households' (HH) consumption and coping strategies. Yet a piece is still missing for the full understanding of the income loss that may occur: what are their effects on the household businesses (HB) that are the main income source for many near-poor households? This study provides robust evidence that health shocks can have large negative effects on household businesses' level of activity and investment, and in turn, on the capacity of the household to generate income. The results of this chapter can thus be understood as shedding light upon a new channel of impoverishment in case of health shocks: a household business channel.

Discussing the effect of "health problems" involves gathering a set of heterogeneous events under a common terminology. A common and evident feature of these events is a diminished physical condition that can impact daily activity. In the case of (mainly informal) household businesses, this impact can directly translate into reduced income. As illustrated by the results of field interviews conducted in Ho Chi Minh City in the last quarter of 2013 among informal sector workers:

> "*I live from hand to mouth. When I'm sick, I don't get any money: I have to rest. Look: today, my legs hurt, so I can't go*" (A recyclable waste gatherer).

These illnesses or injuries have contrasted effects depending on their nature, on their interactions with other pre-existing conditions, and on the context in which they occur. First, different forms of illness or injuries obviously result in different physical or mental conditions. Malaria, tuberculosis, hypertension or rheumatism: all reduce individuals' fettle; yet, they differ in terms of life threat, type and extent of abilities affected, psychological distress, treatment options, and associated financial burden (Lucas, Ding and Bloom, 2008). Second, a health problem can be more or less exogenous, depending on whether it is purely the result of a *shock,* or the manifestation of a chronic disease or poor health. A poorer health status generates more frequent illnesses, and illness (especially if not treated) might also engender complications, risky behaviours or other illnesses. Health problems are thus rarely exogenous, and interact with each other:

> "*I have rheumatism. [Mrs Cuc] doesn't want me to drink. But I have this leg problem: I drink to lie down and forget the pain*" (The same recyclable waste gatherer).

Third, different contexts contribute to the heterogeneity of effects of otherwise comparable health problems. The age, gender, and income of the individual; the characteristics of the household, such as size, age structure, and its financial and social resources; environmental or economic factors; the availability and characteristics of health facilities as well as the contingency of health insurances schemes: all these elements shape a different response to a similar health problem (*ibid.*). Income, in particular, will determine the probability and the efficiency of

treatment following a health problem, efficiency of which is not assured (Sepehri et al., 2008; de Walque et al.,2011).

> "*I don't go to the hospital; I only take medicines that people tell me to. My friend recommend me a brand, or I take Chinese and western medicines. But it's weak and I don't feel better*" (A sticky rice vendor).

Uncovering the consequences of such heterogeneous events thus requires particular care in the type of events considered (section 3.2), the endogeneity problems, and the factors controlled for (section 4). One can expect those consequences for HB to be of two types: time and money. Whether health problems are treated or not, time costs will be significant (Sauerborn, Nougtara, Hien & Diesfeld, 1996). Not only does the time available for normal activity (including work) diminishes, but other healthy household members might have to devote time to caregiving.

> "*My kids would take care of me. My son helps me with money, my daughter helps feeding me.*" (The same sticky rice vendor)

Time costs, in the case of medium or large enterprises, concern a small share of the labour input only. In the case of microenterprises, relying on a single workers in most cases, the decrease in labour input can be much more meaningful. Intra-household labour substitution, that is, the reallocation of tasks among HH members, can compensate for labour lost to illness. But complete compensation is not alwars possible. The ability to reallocate the tasks of the ill individual to other members depends on the household's size and composition, and on the degree of specialization of the task. Even for what is considered unskilled labour, replacement can be impossible:

> *"I deliver food and no one can do it for me. Even when I am sick, I have to go and deliver for the regular customers; then I can rest"* (A motorbike-taxi)

> *"If you are sick you cannot work. For someone to replace you he has to know the customers, or it's impossible. You don't get any help"* (A mobile ice vendor)

Monetary costs are the other expected channel of influence of health problems on household businesses. Both direct and indirect costs are prompted in the short run (McIntyre et al., 2006). First and foremost, the financial burden associated with the treatment can represent a large share of the household's budget. To the direct and immediate costs of the contingent consultations and treatment (which accounts for a variable share of the total cost of illness, from 30 to 60%; Asenso-Okyere, and Dzator, 1997) are added transportation costs to the health facility (Nahar and Costello, 1998; Attanayake et al., 2000), and other indirect expenditures such as specific food (Nguyen et al., 2012b). In countries where public health systems are underfunded, substantial "unofficial" payments or gifts may also augment indirect costs[1] (Balabanova and McKee, 2002; Nguyen et al., 2012a). Perhaps contrarily to intuition, inpatient treatments are not the sole item causing large expenditures: aggregated outpatients treatments and medicines can account for half

[1] It is notoriously the case in Vietnam. Even when accessing healthcare does not require immediate additional fees, they can rarely be avoided since they are then requested for "services" as simple as not sharing a bed with another patient.

of total health payments (Lieberman and Wagstaff, 2009). Health insurance coverage is a discriminating factor when it comes to facing these costs, but is often at embryonic stages in developing countries, especially as regards the coverage of the informal sector. Even when it exists and functions, indirect costs are generally not covered. Out-of-pocket payments (OOP) are thus the main financing source of health care over the developing world, especially in Asia (O'Donnell et al., 2008).

A key question is the extent to which these OOP payments affect the household, and more specifically the extent to which they might be considered *catastrophic* in relation with the household's budget. Above a certain level, health expenditures are "*likely to force households to cut their consumption of other minimum needs, trigger productive asset sales or high levels of debt, and lead to impoverishment*" (Russell, 2004). This share can be defined in percentage of the total household income, or as a share of its total –or non-essential- consumption. Most of the literature uses a cut-off point (Wyszewianski, 1986; Wagstaff and Van Doorslaer, 2003; Russell, 2004; Van Doorslaer et al., 2007). The definition of such threshold is somehow arbitrary (McIntyre, 2006), and lower expenditure levels than the often-used 10% threshold may also be catastrophic for poor households[2]. Furthermore, if the household receives supporting transfers from others, the burden of illness might be overestimated (Sauerborn, Adams and Hien, 1996). Convincing and robust evidences on the issue thus cannot make the economy of using a flexible threshold (cf. sub-section 3). Borrowing is common to meet these costs, and households resorting to loans can experience lasting effects on livelihoods: interest rates reach high levels[3], and HH remain in debt for a long time after the initial health event.

> *"I was so sick, I had to borrow 50 million, the interests are 40.000 per day. I had to mortgage the house"* (A recyclable waste gatherer).

Watermarked in these monetary and time costs is the idea that the whole household is affected when a member experiences a health problem. The monetary costs are often shared, and time costs can be of comparable amplitude for healthy and for ill members (*ibid.*); the former meet the demand for care giving of the latter (Beegle, 2005; Yamano and Jayne, 2004). Negative impacts can further be amplified by spillovers within the household (d'Adda et al., 2009), noticeably between children and parents. The following analysis thus considers not only health problems of the HB owner, but also those of other household members.

Using an original panel dataset of HBs, constructed from a large and nationally representative Vietnamese Household surveys, I am able to relate the Household business to a large set of individual and household-level characteristics. Two main questions are then addressed. First, what is the overall effect of health shocks on HB (if the business operator is him/herself sick, or if another HH member is)? Second, what is the relative role of Out of Pocket (OOP) health expenditures, compared to the effect of a decreased labour supply? Both channels are investigated separately, considering a possible crowding out of business expenditures and a

[2] OOP payments may worsen inequalities by imposing a greater burden on poor families (McIntyre et al., 2006): the ratio of OOP payment's share in income for the poorest over the richest families ranges from one to ten (Pannarunothai & Mills, 1997).

[3] They were measured between 2.5 and 15% *per month* in Cambodia, where even relatively modest OOP health expenditures lead to poverty through indebtedness (Van Damme et al., 2004)

negative effect on investment. Acknowledging the endogenous nature of health problems, I combine flexible control groups with fixed-effects regressions, and control as much as possible by time-varying factors to obtain plausibly causal estimations.

I find that the occurrence of serious sickness has a strong negative impact on the income generated by the HB (most of which is allocated to the household's budget). The decrease in working time resulting from serious health shock has little effect on HB, which may result from labour substitution mechanisms within the household. However, catastrophic health expenditures do translate into liquidity constraints: they cause a strong decrease in business-related expenditures. More importantly perhaps, they have a significant negative impact on investment. To the extent health shocks could lead to impoverishment and permanent income loss by threatening the HH's capacity to generate income, I argue that the social cost of sickness is thus larger than what is currently measured.

The remainder of the study is organised as follows. In the next sub-section, I review the literature on the effects of health shocks on households' economic activities. Sub-section 3 describes the surveys and the methodology used to build a Household Business panel, as well as the outcome and health shock variables. The identification strategy is explained in section 4, and the results are provided in section 5.

## 2. Literature review: health and household's economic activities

Much has been written on how the cost of health and the resulting coping strategies can cause impoverishment. As households borrow money, sell assets and reduce consumption, they might enter a vicious circle and fall into poverty. In Vietnam, as much as 60% of poor households in the rural north carry debt, and about 33% of them refer to health care costs as the major reason (Whitehead et al., 2001; Nguyen et al., 2002; Sepehri et al., 2003; Nguyen et al., 2012a). When selling asset rather than (or in addition to) borrowing, households can be deprived from a source of income (Eswaran and Kotwal, 1989; Tibaijuka, 1997; Van Damme et al., 2004; Russell and Gilson, 2006). It is noticeably the case for land or cattle in the case of agricultural HH. When consumption is affected despite the mobilization of additional cash, vulnerable households' food consumption might fall below the required level of calories intake, which could in turn reduce their ability to work. All groups are not equal; in Vietnam, urban (Wagstaff, 2007) and female-headed households are the least able to smooth their consumption after a health shock (Mitra et al., 2016).

In the literature on impoverishment, the theoretical oversight of current consumption largely frames the evaluations of the effects of illness in developing countries. Yet, the relevant concept of household resource constraint is permanent income (Okunade, Suraratdecha and Benson, 2010, pp. 366). As non-farm household business are an important (if not the main) income-generating source of many households, the effects of health shocks could have through this channel the largest consequences in the long run.

A first strand of literature deals with the effects of illness (or of health shocks) on wage labour. Even in developed countries where social safety nets exist, ill health determines selection into the

labour force, number of hours worked, and to a lesser extent, wages (Chirikos and Nestel, 1981, 1985; Cai, Mavromaras and Oguzoglu, 2014). In developing countries, where safety nets are weak or inexistent, health shocks limiting the ability to work have outsized impacts on productivity, and in turn on labour income (Schultz and Tansel, 1997 ; Strauss and Thomas, 1998; Dercon and Krishnan, 2000; Kochar, 2004; Thomas et al., 2006). It has also been showed that health shocks change the working behaviours of other household members when intra-household labour substitution exists: they may increase their labour contribution to domestic work, or seek additional income through other forms of employment. Indeed, activities are interweaved as several household members work together in farm or business activities (Benjamin, 1992; Dercon and Krishnan, 2000; Adhvaryu et al., 2013); the labour supply of healthy members can thus be affected by sickness as well. The deterioration of earnings is consequently found to be smaller at the household level as compared to the individual level (Genoni, 2012).

A second strand looked at the impact on agricultural activities (Yamano and Jayne, 2004; Beegle, 2005), which represent a source of livelihood for an often-dominant share of households over the developing world. For farmers, the effect of illness is more severe when it occurs during the peak agricultural season, and when the affected member is a working male (Kochar, 1995; Berhman et al., 1997), even though compensation through increased paid work is feasible during the other periods. Conversely, an improvement in health condition may have direct positive effects on agricultural productivity, on the cultivation of other crops and on the extension of activities (Audibert and Etard, 2003)

When it comes to the effects on non-agricultural businesses, there is a surprising shortage of literature on the effects of health shocks or illness. In the context of a highly developed country (South Korea), Kim and Yang (2011) compared the business earnings of sick and healthy HH with cross-sectional data, and found the former to be significantly lower. Using Indonesian data, Sparrow et al (2014) showed that income from self-employment is negatively affected by ill health. However, the result is only true for the non-poor and the formal sector; they thus likely capture skilled self-employed labour rather than the whole non-farm household business sector. Long-term effects, although mentioned, are not considered, and there is no distinction between lasting conditions and health shocks. Finally, Adhvaryuy and Nyshadhamz (2014) point out the fact that household enterprises can serve as coping mechanisms in case of sickness under the form of small and ephemeral businesses. Prolonged illness or slow recovery from a health shock both cause household members to switch from farm to enterprises activities, and the cost of treatment seems to reduce the value of business assets.

Against this backdrop, this study focuses on existing HB and assesses the impact of health shock on HB spending, income and investment. Both of the above-mentioned channels (money and time) are investigated. First, considering that (1) the households are budget-constrained, and (2) the household and the HBs' budgets are often mingled, the primary expected channel is that large OOP spending might crowd out expenses in the household business. In other words, large and unexpected health expenditures are likely to result in a cut in the amount of money allocated to the HB, and thus limit its operation (if not threaten its existence). Second, the time lost to an episode of illness reduces the available time for work. The time spent for recovering or caregiving by HH members contributing to the business equals to a decrease in labour input. Both effects

could affect in turn the performance of the business, and beyond, its growths potential in the long run -especially in case the health expenditures also crowd out investment.

## 3. Data and descriptive statistics: building a HB panel and measuring health shocks.

This study uses the Vietnamese Household Living Standard Survey (VHLSS), which is conducted in its current form every two years. It has a rotating panel component, whereby 50% of the sample from year *n* is kept in the following survey in year *n+2*. Each wave's renewed sample is drawn from the updated census listings using a three-stage stratified design, and representative at the national level. 45,000 households are included in the full sample each year, from which a sub-sample of 9,189 households answers the full questionnaire. This questionnaire includes on the one hand detailed information on health. It records with a 12 months reference period all ill health events, outpatient and inpatient visits at the individual level, as well as detailed health expenditures. On the other hand, it includes a specific module on non-farm business, which records businesses' characteristics, income and expenditures. This module allows identifying who among the household members manages the business.

The core of this study relies on a dataset constructed from the VHLSS by taking these non-farm HBs as observation units. From the 2006 and 2008 surveys, a unique HB identifier was built using individual identifiers and activity numbers, which allowed matching units between years.[4] Household and individual characteristics, especially information on health, were then matched though information on the individual in charge of the HB. The resulting dataset includes 8,090 HB (respectively 4,161 and 3,929 HB in 2006 and 2008). This approach allows accounting for multiple HB by households: in the initial year, the 4, 161 HB belong to 3,980 individuals from 3,185 unique households. Most of the observations (80.74%) are yet primary activities and only the remaining 19.26% are secondary HB.

The balanced panel includes 1,908 HB (954 per year). This might seem to result from a high attrition, but recalling that only about 50% of households are to be resurveyed (the renewal rate is applied to the whole sample, not only to households operating a HB) and that 50% of the 2008 HBs belong to newly surveyed households, the resurvey rate is actually high. The core of the analysis focuses on the balanced panel, while the effect of health shocks on HB survival (defined as households resurveyed, but whose businesses stopped operating) is investigated separately.

### i. Outcomes

The very first objective of this study is to take household businesses as observation units to investigate how vulnerable they are to health shocks. If health shocks affect households' ability to generate income through their HB, they might have unaccounted long-term effects. Hence, I use the total income generated during the last 12 months by the household business as the first outcome variable, that is, the total revenue (sales) to which is added the value of exchanged goods and services, self-consumption, and the value of by-products. Including all destinations of production rather than the purely commercial income gives a better measure of the overall business activity. I then turn to a set of intermediate variables to provide more details on the mechanisms through which the businesses are affected. Total expenditures in the HB, expenditures on material, and total intermediate consumption are used as secondary outcomes.

[4] A similar approach is used in Nguyen and Nordman (2014) with the 2004-2006 surveys, and yields a sample of HB of comparable size.

These variables are built from a list of expenditures recalled over the past 12 months, including self-supplied, purchased, bartered, and recuperated items.

The third outcome is the purchase of fixed assets by the household in the past period, which is used as a proxy for investment in the business. Intuitively, illness could be associated to a more risky environment, and thus discourage investment. When considering the resulting financial burden rather than illness itself, it might be that OOP payments for health crowd out investment; health shocks could then threaten the businesses' capacity to grow. The second outcome is accordingly the probability to invest in the past period, measured as a binary variable of non-zero spending on purchased fixed assets at the household level.

### ii. Health shock, time and monetary costs indicators

The literature relies on different indicators. Numerous studies focusing on the occurrence of a specific disease rely on self-reported *health status* (Gunasekara, 2010), measurement error of which is a known problem (Schultz and Tansel, 1997). Others use changes in physiological indexes (Wagstaff 2007, Gertler and Gruber, 2002) such as the Body Mass Index, or measures of Ability to perform activities of Daily Living (ADLs). Arguably capturing better severe health events when compared with other self-reported health measures, these variables nevertheless overweight the disabilities associated with ageing. Another strand of literature focuses on health shocks. Two conditions are required to narrow the general notion of health problem down to the one of health shock. First, the event must be a severe illness or injury, that is, an ill event with a potential to have a significant influence on the individual and/or the household's living conditions. Second, it should be as much as possible a *shock*, that is, an unexpected (and thus exogenous) event. Ill events of little consequences, or anticipated (as manifestations of chronic diseases or poor health) are consequently not strictly speaking health shocks. Commonly used variables to measure health shocks and their severity include the number of missed days at work, inpatient spells (used per se or with various thresholds), or days in bed (Mitra et al., 2016). Although narrowing to potentially influential health problems, these variables do not guarantee the unexpected nature of the shock. Furthermore, they suffer from the unobserved influence of heterogeneous individual choices. Missing days at work does not represent the same cost for everyone (as mentioned in the introduction, and in Strauss and Thomas, 1998; Genoni, 2012).

The "health shock" variable used in this study is accordingly constructed as a binary indication of (1) the individual reporting "illness or injury" in the reference period and (2) this illness resulting in the individual being "absent from work or unable to carry regular activity" for more than one day. I further restrict to individuals who were not sick or injured in the initial period (see section 4) to ensure that these health problems are "new". It might be of concern that the long recall period could result in measurement error. However, we can assume that only the sufficiently rare and memorable ill events will be reported given the length of the recall period, and those are the ones of interest. Another potential source of bias lies in potential differences in reporting illness given the declarative nature of the variable. Income may increase, for instance, the propensity to seek treatment (and thus the reporting) for what would be otherwise considered minor diseases. Finally, as mentioned above, the opportunity cost of resting varies with the type of activity and the income level. These two potential biases would lead to underestimate the effect of illness on the poorest. Indeed, if the lowest income quantiles underreport illnesses or injuries, and tend to

stop working less often while ill or injured, their diminished outcomes will be wrongly categorized as "unaffected" observations and all estimations will yield conservative estimates.

The relevant unit of observation in case of health shock is the whole household. Even if sickness of the HB operator is expected to have the highest influence, solidarity within the household implies sharing the monetary costs as well as devoting time to sick members. Thus, an indication of other household members being seriously sick (notwithstanding the status of the HB operator) is constructed following a similar method.

The other aim of this study is to investigate separately the two channels of influence: monetary and time costs. I use for the former the total out-of-pocket health expenditures at the household level. As mentioned in section 2, a narrow understanding of the cost of treatment would lead to a severe underestimation of the cost of health shocks. The expenditure level variable hence sums all OOP expenditures related to outpatient and inpatient visits, prescribed and non-prescribed medicines, travel and parking costs, medical tools, health insurance, and bonus for doctors. In line with the literature, I use a threshold of "catastrophic" health expenditures. The observation unit being production units rather than households or individuals, I relate the OOP health expenditures to the income of the PU rather than to the total income of the household. The aim is to capture the size of health expenditure at the household level compared with the size of the business. I rely on the often used threshold of 10% in the core of the analysis, but other levels and a continuous measure are used as robustness tests. Variability in the OOP budget is large across households in a given country (Van Doorslaer et al., 2007), which has been interpreted as an indication of the unpredictability of catastrophic health payments; using OOP indicators thus capture health *shocks* affecting the household as a whole, bearing in mind two noticeable limits. First, it will mechanically exclude sick individuals who choose not to utilize health care –or cannot afford to do so; in which case the impact of health shock will be underestimated. Second, when rich households are included[5], large payments can be classified as health-related while they fall within aesthetic or comfort expenditures (Kim and Yang, 2011). Finally, the time costs are measured using the total number of days absent from work –again, both at the individual and the household level.

Health shocks thereby defined are closer to the notion of unexpected and serious events than when considering all illnesses and injuries. They are nonetheless still linked with the income level of the household business: poorer individuals, operating more precarious HB, experience more frequent health shocks (see below). Their incidence also depends from individual behaviours that can impact business performance, such as risk-taking or education attainment. Grimm and Treibich (2016) showed for instance that risk-adverse individuals are more likely to wear a helmet when driving, which might result in less frequent (road) injuries. Higher education levels can also lead to both performing businesses, and to less risky behaviours; as showed by de Walque (2010). Health shocks, despite being restrictively defined, are accordingly treated as occurring endogenously in this study (see section 4).

[5] It is not the case in this study where the population of interest is restricted to small-scale household business owners.

**Sample description: incidence of health shocks and HB characteristics**

Matching household businesses between the 2006 and 2008 surveys, and adding individual- and household-level variables, we obtain a sample of very small production units: the average size is 1.65 workers. This figure is coherent with representative data on the Vietnamese informal sector (Cling et al., 2010). Two thirds of the HBs are made of a single own-account worker, while the remaining units employ on average less than two workers in addition to the head of the business. 76% of these HB are informal, in the sense that they have no Business Registration Certificate.

Among the 954 HB of the balanced panel, 281 experienced a health shock in 2006 and 297 in 2008. 673 had no health shock before the initial survey in 2006, among which 156 experienced a health shock between the two years, which is the sub-sample used in the first part of the analysis. Affected individuals missed on average 12 days of work because of these illnesses or injuries. At the same time, the households to which these HB belong had on average 1.4 sick members in addition to the HB owner (with a maximum of 11 individuals simultaneously sick), who missed 16 to 20 days of work (or "normal activity" for the inactive). Health expenditures of households with a sick member amount to nearly 2 million dongs (around 100 USD), which represent 24% of the total income generated by the HB.

**Table 1.** Sample description: incidence of health shocks, HB characteristics and geographic repartition

| | 2006 | | 2008 | | | 2006 | | 2008 | |
|---|---|---|---|---|---|---|---|---|---|
| | HB head w/ health shock | No HS | HB head w/ health shock | No HS | | HB head w/ health shock | No HS | HB head w/ health shock | No HS |
| Nr. of HB | 281 | 673 | 297 | 657 | Business size | 1.58 | 1,65 | 1.651 | 1.672 |
| Outcomes | | | | | P(size>1) | 0.33 | 0,358 | 0.353 | 0.354 |
| HB income | 26,892** | 34,905 | 52,764 | 59,352 | Ethnic minority | 0.06 | 0,038 | 0.048 | 0.048 |
| P(invested) | 0.12 | 0.15 | 0.14 | 0.11 | Urban | 0.33 | 0,378 | 0.325** | 0.392 |
| Amount invested | 1,741 | 2,937 | 2,843 | 2,839 | Informal (no BRC) | 0.82* | 0,757 | 0.772 | 0.732 |
| Expenditures dedicated to the HB | | | | | Premise | | | | |
| Total exp. on HB | 14,025* | 19,139 | 32,084 | 34,707 | Non-permanent premise | 0.14 | 0.125 | 0.145 | 0.100 |
| Material | 7,887 | 10,867 | 22,679 | 21,941 | At home | 0.54 | 0.577 | 0.568 | 0.582 |
| Intermediate Cons. | 3,438 | 4,482 | 4,793 | 7,125 | Permanent place | 0.32 | 0.298 | 0.287 | 0.319 |
| Health shocks | | | | | Household size | 4.12*** | 4.408 | 3.965*** | 4.380 |
| Illness | 1*** | 0.38 | 1 | 0.402 | Region | | | | |
| #days of work missed | 12.32*** | 0 | 11.721*** | 0 | Red river delta | 0.27 | 0.227 | 0.260 | 0.232 |
| health shock | 1*** | 0 | 1*** | 0 | North East | 0.09 | 0.089 | 0.121** | 0.074 |
| # other HH members ill | 1.359*** | 1.019 | 1.401*** | 1.093 | North West | 0.03* | 0.012 | 0.031** | 0.011 |
| #days of work missed in the HH | 20.103*** | 1.712 | 16.424*** | 3.673 | North Central | 0.11 | 0.113 | 0.111 | 0.112 |
| health shock in the HH | 0.585*** | 0.089 | 0.598*** | .085 | South Central | 0.12 | 0.115 | 0.076*** | 0.135 |
| Catastrophic OOP | 0.363*** | 0.208 | 0.337*** | 0.215 | Central Highlands | 0.05 | 0.045 | 0.073** | 0.035 |
| Total HH health expenditure | 1,628* | 1,111 | 2,437* | 1,880 | South East | 0.10 | 0.166 | 0.125 | 0.160 |
| Proportion: HH health exp. /HB income | 0.236*** | 0.084 | 0.247*** | 0.122 | Mekong Delta | 0.23 | 0.233 | 0.204 | 0.240 |

All monetary variables (HB income, amount invested, expenditures, HH health expenditures) expressed in 1,000 VND.
Significance levels are indicated for t-tests between years. *** p<0.01, ** p<0.05, * p<0.1

Table 1 provides descriptive statistics by year, and additional comparisons between household businesses whose operators experienced –or not- health shocks during the past 12 months. We compare means in the outcome variables and health indicators, as well as the household and HB characteristics later used as control variables. It should be stressed that the sample is split for this description according to the health status of the HBs' operators only: it is thus possible that other HH members are affected by illness while the operator of the considered HB is not.

First, HB whose head is sick are generating significantly less income. Whilst this relationship is all but causal at this point, it is still an indication of a common evolution. They overall report inferior expenditures dedicated to the HB, which is confirmed by t-tests for the total expenditures in 2006. Second, illness of members within the same household is apparently not independent: the number of other sick members as well as the total number of days unable to work is significantly higher in the households where the businesses' operators are sick or injured. Third, health shock affecting HB head is a discriminating factor when comparing household expenditures for health and the incidence of catastrophic spending, defined in this case with respect to the HB income. Finally, HB whose operator is affected are more often informal businesses, vulnerability of which is higher in other aspects.

## 4. Identification

The following section describes the identification strategy adopted to obtain plausibly causal estimates of the influence of health shocks on HBs. The panel dataset consist in two years of observations of a sample of household businesses, of which some operators reported health shocks (and/or health shocks within the same household).

Beyond a preliminary estimation of the effect of health shocks on the probability to keep operating a household business, the objective of the analysis is to evaluate the overall effect of experiencing serious (and new) illness or injury on the HB income. While informative, this global picture somehow combines the two possible channels of influence: monetary and time costs. The second objective is thus to investigate them separately. The effects of out-of-pocket health expenditure (at the household level) on HB activity are determined first. In order to grasp the mechanisms at stake, the effect of these costs are then estimated on the set of variables related to expenditures in the business to show the magnitude of the substitution at stake. Potential long-term influence of health shocks could occur through reduced investment in the business, which is taken as the third outcome. Finally, the effects of time costs are isolated on all available outcomes.

Health shocks are not exogenous: even when restricting the variable of illness and injuries to new and serious ill events, it is necessary to overcome several identification challenges. First, in line with the definition of health shocks as newly occurring events, and to ensure that relevant comparison group are used for each question of interest (the overall effect of HS, the monetary costs, and the time costs), I use flexible control groups. In other words, I investigate the three main questions of interest on sub-samples of HB that did not experience those events in the first period. Second, endogeneity remains a concern: omitted factors might drive both the occurrence of a health problem and the HB's level of operations. Household businesses fixed effects are used in all specification to remove unvarying unobserved factors at the individual, the household or the business level that might drive the results. In order to control for time-varying factors, I also control for a large set of time-varying variables arguably unaffected by health and having an influence on the outcomes. I further introduce differentiated time trends by region, and test various interactions for heterogeneous effects. Third, reverse causality could be a problem as a reduced activity level of the HB may perhaps influence the health status of its operator, especially among the poor and the households with limited sources of income; the specifications and the time period considered however rule out such possibility.

### i. Flexible control groups

The questions of interest are (1) the overall effect of health shocks on HB income; (2) the specific effect of the monetary costs at the household level (as catastrophic OOP health expenditures) on HB income, HB spending, and HB investment; and (3) the specific effect of labour supply decrease (as number of days at work lost to health problems), and the extent to which labour substitution can offset them.

Given the objective of evaluating separately each of these questions for newly occurring events, the identification strategy involves restricting the sample to a relevant control group for each

question. Each phenomenon is evaluated on the sub-population of HB that did not experience it initially. First, the effect of health shock experienced by the HB owners (interacted with those affecting other household members) is evaluated on the HB population whose owners were healthy in the initial period (2006). Second, the effect of catastrophic OOP health expenditures (in proportion to the business size) is evaluated on HB income, inputs and investment on the sub-sample of households that did not have to cope with such spending in the initial period. The sample is further restricted to the HB not knowing catastrophic OOP **and** whose owner does not miss working days because of sickness, in order to obtain the specific impact of catastrophic spending and take out the influence of reduced labour inputs Similarly, HB that experienced a labour supply decrease following a health shock are compared only to HB not experiencing catastrophic OPP and whose head operator initially worked full-time. The health shocks are thereby restricted as much as possible to the unexpected, and arguably exogenous, events, and the time costs effects are isolated.

### ii. Unobserved heterogeneity

The possibility remains that unobserved factors might drive both the probability of health shock and affect HB operations. Old age, bad shape, or other physiological factors associated with a low income may affect the probability to be ill, and at the same time correlate with a variety of HB-related variables. A pre-existent chronic illness could for instance have no declared influence in the first period and turn out to have consequences on both health and business in the second. It is also the case for individual attitudes toward risk, with might drive business performance as well as the incidence of injuries. It is worth mentioning that in both cases, the unobserved factors would lead to underestimate the effects of health shocks.

In order to obtain plausibly causal estimates, all specifications nevertheless use household businesses fixed effects to remove unvarying heterogeneity. By using the difference across time for the same HB, all regressions eliminate the influence of observed and unobserved time invariant factors. Observations being matched at the individual-household level, all factors at the individual, HH or HB level will be differentiated out. Individual characteristics, family background, individuals' health endowment, as well as fixed HB characteristics (such as industry, owner's ability, etc.) will thus be controlled for. Standard errors are further clustered at the household level, where shocks and responses are expected to be comparable. Overall, it is the effect of health shocks on the evolution of the household business activity that is evaluated.

Fixed effects are only solving part of the identification problem. These specifications do not handle biases associated with time-varying factors. All time-varying observables such as household size, HB operating conditions (type of premise) and informality status are further included as controls. As health insurance is expected to have an influence, especially on the cost of illness, we include indications of health insurance status of the head, as well as the number of other household members having health insurance.

An additional concern is that the potential divergent economic situations by geographic area might explain a different evolution of income and yield biased estimates. If, for instance, some remote rural areas were lagging behind in terms of economic growth, an undifferentiated estimation of the prevalence of health shocks might overstate their influence on those units. All

models include a time trend, which is allowed to vary by region; common changes at the regional level that may be correlated with illness, such as changes in infrastructures, are thereby included.

### iii. Reverse causality

At the aggregate level, higher income often translates into a better health in developing countries (Strauss and Thomas, 1998). At the individual level, the work status is known to influence the likelihood of experiencing health shocks: health can deteriorate with employment –or lack thereof- and labour market history (Kerkhofs and Lindeboom, 1997). Yet, the association between changes in income and changes in (self-rated) health in the short run is small and "probably reduced to the null" (Gunasekara, 2011).

It is still possible, although unlikely, that when considering a population of HB a decrease in income might render individuals who rely on the business more vulnerable to health problem, noticeably for those HH where the HB is the main source of income. This reverse causality is yet likely to occur, if any, in the medium to long run only: it would take at least several months for individuals' health to suffer from a decreased HB activity through reduced calories intake. It is thus worth stressing that the identification applied in this study rules out reverse causality concerns. The difference of HB activity between the two periods could not plausibly affect individual health (*a fortiori* not health shocks incidence) in the past 12 months. A final check that HB income had no effect on health shocks incidence was nevertheless conducted and no significant influence was found. Finally, it is still possible that health shocks occurred in 2007, in which case they will be reported only if they still had an influence in the past 12 months.

Inference with observational panel data is rarely exempt from limitations, and the shortcomings of this identification strategy should be acknowledged. Even when carefully defining health shocks, removing unvarying heterogeneity, controlling for time-varying observed heterogeneity and differentiated trends, the possibility remains that time-varying unobservable factors introduce some bias in the results.

## 5. Estimation results

The core of the analysis focuses on the balanced panel. A key preliminary question is however to determine to what extent health shocks influence business survival. Restricting the sample to households surveyed both years, which eliminates "pure" sampling attrition, it is possible to identify the households that initially had a non-farm business and stopped operating it in the second period. Regressing with OLS the probability to keep operating a household business (among balanced households) on the indicators of health shocks, I find that catastrophic health expenditures at the household level do have a significant influence at 5%. Households that did not have to meet such catastrophic expenditures are on average 5.9% more likely to keep operating their business. Integrating this preliminary impact of health shocks on business survival in the following results could be achieved by reweighting observations using the survival probability. The choice made in the remainder of the analysis is however to estimate all effects without correcting for business survival. Indeed, as this effect is only estimated on those households that were re-surveyed in 2008, it is not possible to integrate the "full" effect of health shock on attrition (i.e. on households completely disappearing from the sample), and the corrected estimates would thus introduce a further bias. All of the following results are thus conservative estimates in this regard, as integrating business survival would lead to increase the impact of health shocks.

### i. On the overall exposure of HB to health shocks

The first question concerns the overall effect of health shocks on the HB activity. Table 2 provides the results of the fixed-effects panel estimates, which regress the log of total HB income on the dummy indicating health shock experienced by the business operator, interacted with a similar dummy for other members within the same household. Time-varying characteristics plausibly unaffected by sickness are included: household size to account for changing economies of scale (Okunade, Suraratdecha and Benson, 2010), type of premises, and informality since formalization is a proven determinant of performance (Rand and Torm, 2012; Demenet et al., 2016). Health insurance status of the HB owner and/or other HH members is also a varying factor that should influence the severity and costs of health problems.

All models include HB fixed effects, time trends and regional interactions. The sub-sample of interest is the group of 684 household businesses whose operator was not sick in the initial period (2006), among which 157 were affected by a health shock before the second period. Among those experiencing a health shock, some 95 observations report an additional household member being sick.

Sickness of the HB operator does reduce significantly the income generated by the business. The HB whose operator was seriously sick underperformed by nearly 28%,[6] compared with those whose operator was not sick (knowing that all were initially healthy). Sickness among other HH members has no specific effect, and neither does the simultaneous occurrence of both.

The time trend is also interacted with three characteristics on the basis of their potential divergent evolution (see sect.2): urban/rural area, ethnicity of the head, and initial size of the HB.

[6] As the outcome variable is log transformed.

These interaction terms are an additional guarantee that the possible correlation between unobserved time-varying characteristics inherent to the variables included and the error term is controlled for.

**Table 2.** Effects of health shocks on Household Business income

| | Whole sample | | Whole sample Including trend tests | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Health shock, HB head | -0.243* | -0.244* | -0.248* | -0.252* |
| | (0.146) | (0.147) | (0.145) | (0.147) |
| Health shock, other HH members | 0.110 | 0.083 | 0.113 | 0.085 |
| | (0.099) | (0.096) | (0.101) | (0.097) |
| HS(head)*HS(HH) | 0.066 | 0.101 | 0.067 | 0.106 |
| | (0.197) | (0.197) | (0.198) | (0.198) |
| Time | 0.376 | 0.394 | 0.454 | 0.454 |
| | (0.458) | (0.430) | (0.416) | (0.401) |
| Premise (home) | | 0.112 | | 0.112 |
| | | (0.133) | | (0.133) |
| Premise (permanent) | | 0.099 | | 0.100 |
| | | (0.104) | | (0.104) |
| HH size | | 0.095* | | 0.091* |
| | | (0.053) | | (0.053) |
| Informal (Bus. License) | | -0.169** | | -0.169** |
| | | (0.081) | | (0.080) |
| Health Insurance of HB head | | 0.100 | | 0.096 |
| | | (0.089) | | (0.090) |
| # other HH members having HI | | 0.005 | | 0.006 |
| | | (0.007) | | (0.007) |
| Time*Ethnicity | | | -0.217 | -0.161 |
| | | | (0.192) | (0.189) |
| Time*Urban | | | 0.017 | 0.003 |
| | | | (0.074) | (0.074) |
| Constant | 9.775*** | 9.336*** | 9.775*** | 9.345*** |
| | (0.021) | (0.226) | (0.021) | (0.227) |
| Observations | 1,368 | 1,368 | 1,368 | 1,368 |
| R-squared | 0.168 | 0.187 | 0.170 | 0.188 |
| Number of id(hb) | 684 | 684 | 684 | 684 |
| Regions*time | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All models use the log of total income generated by the Household Business as outcome variable. All include HB fixed effects. Col. 1 includes health shocks only, while col.2 includes time-varying cofounders. Col. 3 and 4 include the time-trend interactions.

These overall effects account for both the "income shock" effect, and the effect of a reduced labour supply, which are disentangled below.

### ii. Catastrophic health expenditures

Health shocks have a large negative impact on HB income. Two underlying mechanisms can be at stake. First and foremost, large OOP health expenditures can severely constraint the household's –and in turn the businesses'- liquidity. The results on HB income and intermediate consumption, and the potential long-term effects through reduced investment are presented below. All results use a 10% threshold in the core of the study to define catastrophic health expenditures; other specifications are used as robustness tests.

#### a. How household health expenditures crowd out business expenditures

Table 3 provides the estimation results related to the effects of catastrophic health expenditures within the household on the household business. Specifically, the sample is restricted to households that did not have to face catastrophic payments in the initial period, and the income of businesses whose HH was affected by a health shock resulting in a catastrophic payment is compared with the still unaffected ones. Fixed-effects regressions show a significant and large effect; the affected businesses' income decreased by nearly half in the first specification. Column 2 further restricts the comparison group to the businesses (1) not affected by catastrophic OOP payments and (2) whose operator was not sick. This let capturing the specific effect of large monetary expenditures for serious sickness of other household members. The effect is still significant and large: the monetary consequences of health shocks decrease total HB income by more than a third.

Table 3 Effects of catastrophic health expenditures on

| Outcome: | HB income | HB income | Total expenditures in the HB | Expenditures: material | Total intermediate consumption |
|---|---|---|---|---|---|
| Catastrophic health exp. (HH) | -0.460*** | -0.350*** | -0.571*** | -0.824*** | -0.336*** |
| | (0.090) | (0.119) | (0.151) | (0.240) | (0.122) |
| Time | 0.455*** | 0.544** | 0.343 | -0.372 | 0.283 |
| | (0.159) | (0.220) | (0.212) | (0.739) | (0.269) |
| Premise (home) | 0.129 | 0.118 | 0.133 | 0.619 | -0.052 |
| | (0.121) | (0.148) | (0.220) | (0.393) | (0.169) |
| Premise (permanent) | 0.220* | 0.130 | 0.281 | 0.933** | 0.099 |
| | (0.112) | (0.132) | (0.198) | (0.474) | (0.170) |
| HH size | 0.093** | 0.139* | 0.066 | -0.090 | 0.072 |
| | (0.045) | (0.079) | (0.062) | (0.103) | (0.054) |
| Informality | -0.101 | -0.109 | -0.097 | 0.414** | -0.134 |
| | (0.084) | (0.104) | (0.130) | (0.194) | (0.114) |
| Health Insurance of HB head | 0.064 | 0.067 | 0.063 | -0.207 | -0.070 |
| | (0.079) | (0.099) | (0.127) | (0.162) | (0.125) |
| # other HH members having HI | -0.002 | 0.003 | -0.001 | 0.012 | 0.005 |
| | (0.006) | (0.009) | (0.010) | (0.019) | (0.010) |
| Constant | 9.501*** | 9.346*** | 8.348*** | 8.209*** | 7.264*** |
| | (0.207) | (0.339) | (0.314) | (0.600) | (0.275) |
| Observations | 1,446 | 850 | 1,446 | 705 | 1,435 |
| R-squared | 0.164 | 0.193 | 0.070 | 0.109 | 0.046 |
| Number of id(hb) | 723 | 425 | 723 | 423 | 722 |
| Regions*time | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In order to confirm the liquidity constraint, the model was re-estimated using HB total expenditures. The results show that having to face large health payments indeed affects the money put in the business: expenditures on material and total intermediate consumption all significantly decrease, and total expenditures in the HB are reduced by two thirds. Columns 3, 4 and 5 use the log of expenditures in the HB as outcome variables: total expenditures in the business (col. 3), expenditures on material (col.4, which only concerns part of the HB), and total intermediate consumption (col.5). This finding is coherent with the one of Fafchamps, McKenzie, Quinn and Woodruff (2014) who suggest a "*flypaper effect*" among microenterprises whereby cash does not stick in the business.

### b. The Costs of uncertainty: health shocks and investment

The current operations of HB are therefore strongly affected by health shocks, in particular by the large and unexpected expenditures. This effect implies an income loss by itself. Another angle of interest is the growth potential of HBs, which can be proxied by measuring the impact of health shocks on investment. Table 4 provides the results of linear probability models regressing the effect of catastrophic health expenditures on the binary variable indicating expenditures for fixed assets by the household. This variable is potentially more accurate than the often-used replacement cost of invested capital –which might be difficult to evaluate and could include parasite spending. Consistently with the above results, the control group in the first two models is the set of households not experiencing catastrophic spending. It is further restricted to the non-sick operators in columns 3 and 4.

**Table 4.** Effect of catastrophic health OOP on investment

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Catastrophic OOP health expenditures | -0.164*** | -0.163*** | -0.129* | -0.122* |
| | (0.048) | (0.048) | (0.067) | (0.068) |
| Time | 0.123 | 0.140* | -0.186 | -0.027 |
| | (0.086) | (0.083) | (0.201) | (0.096) |
| Premise (home) | | -0.017 | | -0.038 |
| | | (0.064) | | (0.098) |
| Premise (permanent) | | 0.045 | | 0.027 |
| | | (0.059) | | (0.089) |
| HH size | | 0.036* | | 0.021 |
| | | (0.021) | | (0.029) |
| Informality | | -0.036 | | -0.019 |
| | | (0.046) | | (0.058) |
| Health Insurance of HB head | | -0.026 | | -0.045 |
| | | (0.041) | | (0.046) |
| # other HH members having HI | | 0.002 | | -0.002 |
| | | (0.004) | | (0.005) |
| Constant | 0.140*** | 0.004 | 0.153*** | 0.112 |
| | (0.010) | (0.105) | (0.012) | (0.145) |
| Observations | 1,446 | 1,446 | 850 | 850 |
| R-squared | 0.028 | 0.038 | 0.022 | 0.028 |
| Number of HB | 723 | 723 | 425 | 425 |
| Regions*time | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As above, columns 1 and 2 restrict the control group to the population of HB whose HH did not have to meet catastrophic health payments. The control group in columns 3 and 4 is further restricted to the HB whose head was not sick. The difference between models 1-2 and 3-4 lies in the inclusion of time-varying controls.

Investment is significantly lower among affected households: it decreases by 16.4 per cent in the first two specifications, and from 12 to 13 per cent in the last two models. It is worth noting that borrowing increased at the same time (results not reported) to meet catastrophic health expenditures: all in all, a health shock deprives the household from the needed liquidities for investments, and reduces the HH's future borrowing capacity. Shortfalls in HB investment could severely endanger their growth potential, and the overall ability of the HB sector to benefit from economic growth.

### iii. Labour supply effects and intra-household labour substitution

Health shocks when measured by the decrease in labour supply have a much weaker influence on HB activity. Using comparable fixed effects specification and restricting the sample to HB (1) initially not losing labour input to health shocks, and further (2) whose households are not coping with catastrophic OOP health expenditures, I find a very small -or unsignificant- association with all outcomes.

Table 5 provides the results of regressing HB income on a continuous variable measuring the number of days absent from work of the HB owner, the total number of days that other household members spent in bed (excluding HB owners), and the interaction between both terms. All time-varying controls are included as in previous models, as well as regional trends. In line with the identification strategy, all models reported are restricted to health events not existent in 2006. This measures the effect by comparing with HB owners initially missing a small (less than 10) number of days (column 1), or no days at all (column 2). In order to separate the labour supply decrease from the monetary effect, a further restriction is made to households not experiencing catastrophic health expenditures (column 3).

If HB owners are expected to meet time costs upon taking care of other household members, the total number of days spent in bed within the household should have a direct negative influence on HB income. Symmetrically, if other household members are able to substitute for the HB owner when he/she cannot work, the direct labour supply decrease should have a lesser impact on HB activity. All models infirm the former, and confirm the latter hypothesis. Both days away from work and days in bed of HH members have a consistently small and/or unsignificant impact on HB income. Similar regressions (not reported) also failed to show any significant effect on investment or on expenditures in the HB.

This result can be understood in several ways. First, a major difference with the monetary channel is that time costs may be retrievable. HB owners can make up for missed days upon returning to work, which is not possible when meeting large OOP health expenditures. Second, intra-household labour-substitution is likely to compensate for part of the decrease in labour input (Sauerborn, Nougtara, Hien & Diesfeld, 1996). There is no direct measure of working time of other household members in the HB, which makes a direct test of this effect impossible. It is yet worth noting that even when time costs have no direct impact, labour substitution can have adverse consequences by itself. Getting other HH members to work might have negative effect such as attending schools and looking after the children (Mutangadura, Mukurazita, & Jackson, 1999).

**Table 5.** Labour supply decrease and HB income

| | Initially missed <10days | Initially missed no days | <10days & no catastrophic OOP |
|---|---|---|---|
| # Days being absent from work | -0.010** | -0.010** | -0.005 |
| | (0.005) | (0.004) | (0.005) |
| # Days in bed of other HH members | -0.002* | 0.000 | -0.001 |
| | (0.001) | (0.002) | (0.008) |
| Interaction days(head)*days(HH members) | 0.001* | 0.000** | 0.001 |
| | (0.000) | (0.000) | (0.001) |
| Time | 0.351 | 0.402 | 0.453** |
| | (0.413) | (0.271) | (0.177) |
| Premise (home) | 0.120 | 0.096 | 0.109 |
| | (0.128) | (0.123) | (0.126) |
| Premise (permanent) | 0.107 | 0.094 | 0.258** |
| | (0.099) | (0.096) | (0.112) |
| HH size | 0.097* | 0.084** | 0.067 |
| | (0.053) | (0.041) | (0.057) |
| Informality | -0.206** | -0.196** | -0.119 |
| | (0.084) | (0.076) | (0.098) |
| Health Insurance of HB head | 0.110 | 0.053 | 0.063 |
| | (0.087) | (0.073) | (0.081) |
| # other HH members having HI | 0.005 | 0.001 | -0.000 |
| | (0.007) | (0.006) | (0.007) |
| Constant | 9.344*** | 9.404*** | 9.757*** |
| | (0.230) | (0.182) | (0.258) |
| Observations | 1,368 | 1,780 | 1,108 |
| R-squared | 0.193 | 0.203 | 0.217 |
| Number of HB | 684 | 890 | 554 |
| Regions*time | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All models explain the log of HB total income. Columns 1 restrict the control group to the population of HB owners who missed less than 10 days of work in the initial period. Column 2 does so on HB owners who missed no day at work in 2006. Column 3 further restricts to households not coping with catastrophic OOP health expenditures.

## 6. Robustness

All results went through several types of robustness checks. First, an alternative outcome variable is used to redo the whole analysis. As total HB income and decrease in HB expenditure could compensate one another, it is necessary to check the effects of health shocks (overall and though the different channels) on net profits of the HB. Table 6 provides the results of all preferred specifications regressing HB income on health shocks, catastrophic OOP health expenditures and time costs, using net profits of the HB. Columns 1 and 2 use health shocks indicators affecting HB owners and/or other family members (as in columns 1 and 2 in table 2). Columns 3 and 4 use indicators of catastrophic health expenditures as done in the first two columns of table 3. Finally, continuous measures of time costs (number of days absent from work) are used in models 5 and 6, and are interacted with total days in bed of other HH members. All results strongly resemble to the core analysis in direction, significance levels and magnitude.

**Table 6.** Effect of health shocks on HB net profits.

| | (1) Health shocks | (2) Health shocks | (3) Catastrophic OOP exp. | (4) Catastrophic OOP exp. | (5) Labour supply | (6) Labour supply |
|---|---|---|---|---|---|---|
| Health shock, HB head | -0.222* | -0.223* | | | | |
| | (0.134) | (0.135) | | | | |
| Health shock, other HH members | -0.018 | -0.042 | | | | |
| | (0.074) | (0.074) | | | | |
| HS(head)*HS(HH) | 0.163 | 0.190 | | | | |
| | (0.172) | (0.171) | | | | |
| Catastrophic OOP health exp. | | | -0.425*** | -0.336*** | | |
| | | | (0.085) | (0.116) | | |
| # Days absent from work | | | | | -0.008** | -0.008* |
| | | | | | (0.004) | (0.005) |
| # Days, other HH members | | | | | -0.002** | -0.006 |
| | | | | | (0.001) | (0.006) |
| Interaction: days | | | | | 0.000 | 0.001 |
| | | | | | (0.000) | (0.001) |
| Time-varying controls | No | Yes | Yes | Yes | Yes | Yes |
| Constant | Yes | Yes | Yes | Yes | Yes | Yes |
| Regions*time | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,368 | 1,368 | 1,446 | 850 | 1,368 | 1,108 |
| R-squared | 0.173 | 0.187 | 0.179 | 0.214 | 0.191 | 0.236 |
| Number of id | 684 | 684 | 723 | 425 | 684 | 554 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All models use the log of total profits as outcome variable. All include HB fixed effects. Col. 1 includes health shocks only, while col.2 includes time-varying cofounders Columns 3 and 4 use catastrophic health expenditures in the household. The control group in column 3 is the whole population of HB whose HH did not have to meet catastrophic health payments. The control group in column 4 is further restricted to the HB whose head was not sick or injured. Models 5 and 6 focus on time costs; column 5 restricts the control group to the population of HB owners who missed no days of work in the initial period. Column 6 further restricts to households not coping with catastrophic OOP health expenditures.

The literature on health commonly uses a 10% threshold for what is considered "catastrophic" health expenditures related to household income. While this might be empirically justified, this cut-off point certainly calls for alternative specifications, in our case to check the robustness of the monetary impact of health shocks. An alternative threshold of 20% for indicating

catastrophic health expenditure is thus used. In order to obtain an overall effect rather than binary indicators, I also use a continuous variable measuring the ratio of health expenditures at the household level divided by the business income. Results are reported in table 6. Coherently with the previous estimations the sample includes all households having no catastrophic OOP health expenditures in the first period. The first model uses a 20% threshold to define catastrophic OOP and finds a stronger effect on HB income than with the 10% one. All other models use the continuous variable indicating the amount that HH health expenditures represent when compared with the business income-generating capacity. The effect is estimated on all previously used outcomes, including expenditures in the business and investment. Both the crowd-out effect and the decreased investment are robust to this alternative specification.

**Table 7.** Alternative health expenditures variables and HB activity.

| | (1) HB income | (2) HB income | (3) Total expenditures in the HB | (4) Expenditures material | (5) Total intermediate consumption | (6) Investment |
|---|---|---|---|---|---|---|
| Catastrophic exp. (20%) | -0.564*** | | | | | |
| | (0.120) | | | | | |
| Proportion of health exp. | | -0.502*** | -0.549*** | -0.905*** | -0.337** | -0.106** |
| | | (0.126) | (0.181) | (0.263) | (0.157) | (0.050) |
| Constant | Yes | Yes | Yes | Yes | Yes | Yes |
| Time-varying controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,446 | 1,446 | 1,446 | 705 | 1,435 | 1,446 |
| R-squared | 0.164 | 0.182 | 0.074 | 0.113 | 0.049 | 0.029 |
| Number of idupi_d | 723 | 723 | 723 | 423 | 722 | 723 |
| Regions*time | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Two last types of robustness checks were conducted, results of which are not reported. First, as the health shock measure combining illness or injury and missing days at work could be considered not restrictive enough, a second variable using a higher threshold (missing more than 5 working days after a health shocks) is employed. Second, informal insurances may play a role at the commune level. Assistance between community members can partially offset the effects of illness, both time and monetary costs. The results were re-estimated using, on the one hand, standard errors clustered at the village level and, on the other hand, village-level fixed effects. All robustness checks yield converging results in terms of significance level and amplitude.

## 7. Discussion

The effects evidenced in this study are large. To answer concerns that they may in fact be too large, it should be recalled that they represent conservative estimates as regards several potentially remaining sources of bias, and that they are robust to various measures of health shocks and outcomes. Furthermore, the choice of dealing only with health shock rather than lasting conditions and/or chronic events is likely to further restrict its magnitude: chronic diseases could have an even larger effect, noticeably on business survival. But beyond technical considerations, one question raised by the magnitude of the effects is the extent of the "social cost of sickness" that they imply. In view of the size of the household business sector in Vietnam, the loss of income *not generated* by these production units because of the direct and indirect costs of health problems would yield impressive figures. The opportunity cost of the profits further not realised because these units were deprived of investment as a result of past illness episodes must be added to the total. The counterfactual case where sickness, being perfectly insured, would represent no direct cost for households bears by contrast large economic gains –even though this scenario implies increased social contributions.

At the household level, the severity of the income loss due the effects of health shocks on HB depends on two parameters. First, the importance of the HB in the income structure of the household. Most of the HB of our sample are operated as primary activity (81%), but this income can be a complement to other family members' wage or independent revenue. Second, the extent to which the impact has lasting effects on the HB: the decrease in income could indeed reflect a temporary loss. The translation into permanent income loss however likely stems primarily from the marked effect on business survival, and from the documented decrease in investment. Additional investigations on these two parameters would require a longer observation span, in order to verify (1) that the impact on the HB translates into a decrease in total household income in the next periods, and (2) the capacity of HB affected in the past to economically recover, and eventually compensate for underinvestment. The data limitations, both in terms of number of observations and time periods, do not allow testing these assumptions.

A possibly surprising finding is the total absence of mitigating effect of the health insurance variables. Insurance coverage should, by definition, reduce the OOP burden on households – even though at the time of these data, the inclusion of the informal sector into the voluntary schemes was still marginal. Yet, health shocks have comparable consequence on HB operators who are insured and on those who aren't. The insurance status of other household members does not have more influence. Two pieces can help solve this puzzle. First, despite recent progress of the health insurance system, the OOP share of total spending remains persistently high in Vietnam (World Bank, 2014). There is no cap on copayment expenditures, and as the Social Security's reimbursements do not cover fully the benefits, providers increase OOPs for patients. The second reason has to do with deficiencies of the social health insurance scheme. Most of the individuals in the sample who are insured are covered through social assistance programs, e.g. because of being officially classified poor households. The associated free health care was known to come with accessibility and quality problems, which could explain why in case of serious illness patients would still seek care outside the range of covered services. Palmer et al. (2015) found the social health insurance to have no significant impact on expenditures in the

period 2006-2010, although it increased the probability to seek treatment. Health insurance could nevertheless have a mitigating effect *via* two extra channels. First, if its positive effects on health outcomes are true, *via* increased inpatient and outpatient visits in case of sickness. Second, if health insurance decreases the perceived risk of facing catastrophic expenditures (even though it possibly has no real effect on actual OOP payments). This risk could indeed impact investment on its own, even though no health shock is concretised –and is explored in the third section.

Finally, the question of the external validity of these results can be raised. The specificities of Vietnam in terms of health care financing, and the resulting importance of out-of-pocket health expenditures in the households' budget probably explain a great deal of the impacts found. Health shocks possibly have bulky monetary costs in many other countries, but the specificities of each health system might shape a different response of the household business population. While the magnitude of effects could vary, the point made on the general vulnerability of HB to health problems is however fairly general.

## 8. Conclusion

Not only households, but also the businesses they operate, are vulnerable to health shocks. This study evidenced this significant and severe causal impact, building an innovative dataset from a nationally representative Household survey.

Catastrophic health payments within the household are the main driver of this effect, whereas labour substitution seems to mitigate the decrease in labour inputs. Whether or not the operator is him/herself sick, large and unexpected health expenditures strongly affect the HB income. Budget-constrained households substitute health payments to the expenditures dedicated to their business, resulting in a significant underperformance. More importantly perhaps, the propensity to invest is negatively affected and the growth capacity is undercut; transitory shocks could thus alter into permanent ones.

All in all, the monetary shock associated with ill health events undercuts the capacity of household businesses to generate income and grow. Health is a major, yet constantly underestimated, vulnerability factor for the countless microenterprises that operate in an already risky environment.

**Why are the consequences of health problems on household businesses a key problem in the developing world?**

The informal sector is the number one employer outside agriculture in many countries: hundreds of millions of individuals around the developing world generate income through non-farm microenterprises. Despite industrialization, the household business sector absorbed in Vietnam the majority of the labour force increment over the past years (Oudin et al., 2014). Survival activities coexist with top performing micro businesses reaching a sophisticated level of organization, but all operate in a risky environment. Considering their number and the fact that they are the main source of income for a large share of the poor and near-poor households, HBs are undoubtedly a key to promoting inclusive growth. The results of this study enlighten an underestimated –yet powerful- mechanism that adds up to their general vulnerability. Health care financing strategies that place considerable emphasis on out-of-pocket payments were upheld in LMICs since the late 1980s (McIntyre et al., 2006), and especially in Vietnam. By promoting user fees for public sector health services and increasing the role of the private for-profit sector, they are likely to have had adverse consequences in the light of the above results.

## References


Adhvaryu, A., & Nyshadham, A. (2014). Health, Enterprise, and Labor Complementarity in the Household. Working paper.

Adhvaryu, A., Kala, N., & Nyshadham, A. (2013). Booms, busts, and household enterprise: Evidence from coffee farmers in Tanzania. Technical report, mimeo.

Asenso-Okyere, W. K., & Dzator, J. A. (1997). Household cost of seeking malaria care. A retrospective study of two districts in Ghana. Social Science & Medicine, 45(5), 659–667.

Attanayake, N., Fox-Rushby, J., & Mills, A. (2000). Household costs of 'malaria' morbidity: A study in Matale district, Sri Lanka. Tropical Medicine and International Health, 5(9), 595–606.

Audibert, M. & Etard, J-F. (2003). Productive Benefits after Investment in Health in Mali. Economic Development and Cultural Change, 51(3), 769-782.

Balabanova, D., & McKee, M. (2002). Understanding informal payments for health care: The example of Bulgaria. Health Policy, 62, 243–273.

Beegle, K. (2005). Labor Effects of Adult Mortality in Tanzanian Households. Economic Development and Cultural Change, 53(3), 655-683.

Benjamin, D. (1992). Household composition, labor markets, and labor demand: testing for separation in agricultural household models. Econometrica, 60(2), 287–322.

Berhman, J.R., Foster, A.D., & Rosenzweig, M.R. (1997). The Dynamics of Agricultural Production and the Calorie-Income Relationship: Evidence from Pakistan. Journal of Econometrics, 77(1), 187–207.

Cai, L., Mavromaras, K., & Oguzoglu, U. (2014). The effects of health status and health shocks on hours worked. Health Economics, 23, 516–528.

Castel, P., La, Hai Anh, Tran, N.M. Tam. (2014). Social Protection Programs in Vietnam. Cash transfers, Social Insurance and Indirect Transfers. Hanoi, mimeo.

Castel P. and Gian T. C. (2010), "Vietnam Informality and Social and Health Insurance Issues", *International Conference "The Informal Sector and Informal Employment: Statistical Measurement, Economic Implications and Public Policies*", Hanoi, May 6-7, 2010.

Chaudhuri, A., & Roy, K. (2008). Changes in out-of-pocket payments for healthcare in Vietnam and its impact on equity in payments, 1992–2002. Health Policy, 88, 38–48.

Chirikos, T.N., & Nestel, G. (1981). Impairment and labor market outcomes: a cross-sectional and longitudinal analysis. in: H.S. Parnes, ed., Work and retirement: a longitudinal study of men (MIT Press, Cambridge, MA) pp. 91-131.

Chirikos, T.N., & Nestel, G. (1985). Further evidence on the economic effects of poor health. The Review of Economics and Statistics, 67, 61-69.

d'Adda, G., Goldstein, M., Graff Zivin, J., Nangami, M., & Thirumurthy, H. (2009). ARV Treatment and Time Allocation to Household Tasks: Evidence from Kenya. *African Development Review*, 21(1), 180–208.

De Walque, D. (2010). Education, Information, and Smoking Decisions. Journal of Human Resources, 45(3), 682-717.

de Walque, D., Kazianga, H., Over, M., & Vaillant, J. (2011). Food Crisis, Household Welfare and HIV/AIDS Treatment: Evidence from Mozambique. Policy Research Working Paper 5522, The World Bank.

Dercon, S. & Krishnan, P. (2000). In sickness and in health: Risk sharing within households in rural Ethiopia. Journal of Political Economy, 108(4), 688–727.

Ensor, T. (1995). Introducing health insurance in Vietnam. *Health policy plan*. 10(2):154-63.

Ensor, T., & San, P.B. (1996) Access and payment for health care: the poor of northern Viernam. *Int J Health Plann Mgmt.*11(1): 69–83

Eswaran, M. & Kotwal, A. (1989). Credit as Insurance in Agrarian Economies. Journal of Development Economics, 31(1), 37-53.

Genoni, M.E. (2012). Health shocks and consumption smoothing: evidence from Indonesia. Economic Development and Cultural Change, 60, 475–506.

Gunasekara, F.I., Carter, K., & Blakely, T. (2011). Change in income and change in self-rated health: systematic review of studies using repeated measures to control for confounding bias. Social Science & Medicine, 72, 193-201.

Grimm, M. & Treibich, C. (2016) Why do some motorbike riders wear a helmet and others don't? Evidence from Delhi, India. *Transportation Research Part A*, 88, 318–336

Kerkhofs, M. & Lindeboom, M. (1997). Age related health dynamics and changes in labour market status. Health Economics, 6, 407 -423.

Kochar, A. (1995). Explaining Household Vulnerability to Idiosyncratic Income Shocks. American Economic Review Papers and Proceedings, 85, 159–64.

Kochar, A. (2004). Ill-health, savings and portfolio choices in developing economies. Journal of Development Economics, 73(1), 257–285.

Kim, Y., & Yang, B. (2011). Relationship between catastrophic health expenditures and household incomes and expenditure patterns in South Korea. Health Policy, 100, 239–246

Knaul, F.M., Arreola-Ornelas, H., Méndez-Carniado, O. et al. (2006). Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico. Lancet, 368, 1828-41.

Mitra, S., Palmer, M., Mont, D., & Groce, N. (2015). Can households cope with health shocks in Vietnam ? Health Economics, DOI: 10.1002/hec.3196

McIntyre, D., Thiede, M., Dahlgren, G., & Whitehead, M. (2006). What are the economic consequences for households of illness and of paying for health care in low-and middle-income country context? Social Science & Medicine, 62, 858–65.

Mutangadura, G., Mukurazita, D., & Jackson, H. (1999). A review of household and community responses to the HIV/ AIDS epidemic in the rural areas of sub-Saharan Africa. Geneva: UNAIDS best practice collection.

Nahar, S., & Costello, A. (1998). The hidden cost of 'free' maternity care in Dhaka, Bangladesh. Health Policy and Planning, 13(4), 417–422.

Nguyen, H.C., & Nordman, C.J. (2014). Household entrepreneurship and social networks : panel data evidence from Vietnam. DIAL working paper, DT/2014-22.

Nguyen, H.H.T., Berman, P., & Larsen, U. (2002). Household utilization and expenditure on private and public health services in Vietnam. Health Policy and Planning, 17, 61–70.

Nguyen, K.T., Khuat, O.T.H., Ma, S., Pham, D.C., Khuat, G.T.H., & Ruger, J.P. (2012a). Coping with health care expenses among poor households: Evidence from a rural commune in Vietnam. Social Science & Medicine, 74, 724-733.

Nguyen, K.T., Khuat, O.T.H., Ma, S., Pham, D.C., Khuat, G.T.H., & Ruger, J.P. (2012b). Impact of health insurance on health care treatment and cost in Vietnam: a health capability perspective. American Journal of Public Health, 102(8), 1450-61.

O'Donnell, O., Van Doorslaer, E., Rannan-Eliya, R. et al. (2005). Who pays for health care in Asia? Journal of Health Economics, 27(2), 460–475.

Oudin, X., Pasquier-Doumer, L., Pham, M.T., Roubaud, F., & Vu H.D. (2014). Adjustment of the Vietnamese Labour Market in Time of Economic fluctuations and Structural Changes. DIAL working paper, DT/2014-04.

Okunade, A., Suraratdecha, C., & Benson, D. (2010). Determinants of Thailand household healthcare expenditure: the relevance of permanent resources and other correlates. Health Economics, 19, 365–376.

Lieberman, S.S., & Wagstaff, A. (2009). Health Financing and Delivery in Vietnam: Looking Forward. The World Bank: Washington DC.

Lucas, H., Ding, S., & Bloom, G. (2008). What do we mean by 'major illness'? The need for new approaches to research on the impact of ill-health on poverty. In Meessen B, Pei X, Criel B, Bloom G, eds. Health and social protection: experiences from Cambodia, China, and Lao PDR. Studies in Health Services Organisation & Policy, Antwerp 23: 29–54.

Palmer, M., Mitra, S., Mont, D., Groce, N. (2015) The impact of health insurance for children under age 6 in Vietnam : A regression discontinuity approach. *Social Science & Medicine*, 145, 217-226.

Russell, S. (2004). The Economic Burden of Illness for Households in Developing Countries: A Review of Studies Focusing on Malaria, Tuberculosis, and Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome. *American Journal of Tropical Medicine and Hygiene*, 71(Supp. 2): 147–55.

Russell, S., & Gilson, L. (2006). Are health services protecting the livelihoods of the urban poor in Sri Lanka? Findings from two low-income areas of Colombo. Social Science & Medicine, 63(7), 1732-1744.

Sauerborn, R., Adams, A., & Hien, M. (1996). Household strategies to cope with the economic costs of illness. Social Science & Medicine, 43(3), 291–301.

Sauerborn, R., Nougtara, A., Hien, M., & Diesfeld, H. J. (1996). Seasonal variations of household costs of illness in Burkina Faso. Social Science & Medicine, 43(3), 281–290.

Schultz, T. P. & Tansel, A. (1997). Wage and labor supply effects of illness in Cote d'Ivoire and Ghana: Instrumental variable estimates for days disabled. Journal of development economics, 53(2), 251–286.

Sepehri, A., Chernomas, R., & Akram-Lodhi, A. H. (2003). If they get sick, they are in trouble: health care restructuring, user charges, and equity in Vietnam. International Journal of Health Services, 33(1), 137-161.

Sepehri, A., Moshiri, S., Simpson, W., & Sarma, S. (2008). Taking account of context: how important are household characteristics in explaining individual health seeking behaviour? The case of Vietnam. Health Policy and Planning, 3(6), 397-407.

Sepehri, A. (2014). Does autonomization of public hospitals and exposure to market pressure complement or debilitate social health insurance systems? Evidence from a low-income country. *Int J Health Serv.* 44(1):73-92.

Sparrow, R., Van-De-Poel, E., Hadiwidjaja, G., Yumna, A., Warda, N., & Suryahadi, A. (2014). Coping with the economic consequences of ill health in Indonesia. Health Economics, 23, 719–728.

Strauss, J. & Thomas, D. (1998). Health, nutrition, and economic development. Journal of economic literature, 36(2), 766–817.

Thomas, D., Frankenberg, E., Friedman, J., et al. (2006). Causal effect of health on labor market outcomes: Experimental evidence. Working paper.

Tibaijuka, A. K. (1997). AIDS and economic welfare in peasant agriculture: case studies from Kagabiro Village, Kagera Region, Tanzania. World Development, 25(6), 963–975.

Turner, S. & Schoenberger, L. (2012). Street Vendor Livelihoods and Everyday Politics in Hanoi, Vietnam: the Seeds of a Diverse Economy? *Urban Studies*, 49(5) 1027–1044.

Van Damme, W., Van Leemput, L., Por, I., Hardeman, W., & Meessen, B. (2004). Out-of-pocket health expenditure and debt in poor households: evidence from Cambodia. Tropical Medicine & International Health, 9(2), 273–80.

Van Doorslaer, E., O'Donnell, O., Rannan-Eliya, R.P. et al. (2007). Catastrophic payments for health care in Asia. Health Economics, 16, 1159–1184.

Vietnam Ministry of Health. (2003). Vietnam National Health Survey 2001/02. Main report, Hanoi.

Wagstaff, A. (2007). The economic consequences of health shocks: evidence from Vietnam. Journal of health economics, 26(1), 82–100.

Wagstaff, A., & Van Doorslaer, E. (2003). Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–98. Health Economics, 12, 921–934.

Whitehead, M., Dahgren, G., & Evans, T. (2001). Equity and health sector reforms: can low-income countries escape the medical poverty trap? The Lancet, 358, 833–836.

World Bank. (2014). Moving toward Universal Coverage of Social Health Insurance in Vietnam. Assessment and Options. Somanathan, A., Tandon, A., Dao, H.L., Hurt, K.L., & Fuenzalida-Puelma, L. The World Bank, Washington, D.C.

Wyszewianski, L. (1986). Financially catastrophic and high cost cases: Definitions, distinctions and their implications for policy formulation. Inquiry, 23(4), 382–394.

Yamano, T., & Jayne, T.S. (2004). Measuring the Impacts of Working-Age Adult Mortality on Small-Scale Farm Households in Kenya. World Development, 32(1), 91–119.