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ABSTRACT

The Impact of Parental Health on Children's Schooling and Labour Force Participation: Evidence from Vietnam

This paper investigates the relationship between parental health shocks and children's engagement in education and labour market, using a panel data survey of Vietnamese families, interviewed between 2004 and 2008. While there is substantial evidence showing the intergenerational transmission of health, the literature investigating the impact of parental health on children's educational and labour market outcomes is limited, especially in developing countries. We use child fixed effects and control for a detailed set of household and local area characteristics. Our main findings show that maternal illness substantially decreases chances of being enrolled in school for children between 10 and 23 years old and, at the same time, increases the children's likelihood of entering the labour market and working more hours for children aged 10-15 years old. The effect is particularly pronounced for girls, who seem to experience worst adverse consequences in terms of education and labour market engagement.

JEL Classification: I10, I14, I24
Keywords: children's education, child labour, parental illness

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1. Introduction

The objective of this paper is to investigate the relationship between parental health shocks and children's schooling and participation in the labour market, using a large, rich longitudinal data set of Vietnamese families.

The analysis of investments in human capital is a critical issue in the context of developing economies and has received increasing attention among economists and policy makers in recent years. The achievement of universal primary education is specifically mentioned as one of the Millennium Development Goals and, in developing regions, children from the poorest households are more likely than others to be out of school (UNESCO et al., 2010). Further, substantial gender disparities still exist with respect to secondary and tertiary education and enrolment rates still favour males both in high school and university in several developing regions, including South Asia.

The Vietnamese education system has outperformed many other Asian and developed countries in standardised tests in recent years, thanks to substantial government investments in education, and has achieved nearly universal primary education (World Bank et al., 2011). However, important gaps exist, especially for children from ethnic minorities and low socio-economic background, and educational attainments significantly vary across the different groups (Unicef, https://www.unicef.org/vietnam/girls_education.html#_ftn1). Similarly, enrolments and completion rates in low and upper secondary schools (age 11-15 and 15-18, respectively) have improved over the recent years, but are still substantially lower for children who come from ethnic minorities and from households at the bottom of the income distribution (World Bank et al., 2011; Vietnam, Ministry for Education and Training, 2015). As reported in Badiani et al (2013), 40% of people who are 21 years and older in the richest quintile have completed a university degree; compared to less than 2 % in the poorest quintile. In fact, more than a quarter of individuals in the poorest quintile had not even completed primary school by 2010.

In addition, completion rates in Vietnamese rural areas are about two thirds of what they are in urban areas and these figures are a particular source of concern because of their impact on overall inequality, especially considering that the urban population only accounts for 20% of the total population (World Bank et al., 2011). Lastly, learning outcomes and educational achievements substantially differ across socio-economic groups, with students from ethnic minorities, rural area and poor households, showing to be about three grades behind their

counterparts from advantaged urban families (World Bank et al., 2011). All of these data raise substantial concerns because of the potential to perpetuate and aggravate intergenerational transmission of poverty in Vietnam (Badiani et al., 2013).

The evidence on child labour in Vietnam shows similar trends and concerns. The incidence and intensity of child labour has substantially decreased over the last two decades (O'Donnel et al., 2005). However, children from ethnic minorities, and children who live in rural and deprived areas still remain particularly vulnerable and seem to have missed the improvements in this context (Edmonds and Turk, 2004). Beegle et al. (2008) analyse the impact of child labour in rural areas of Vietnam and show that, as expected, child labour significantly reduces educational attainment.

The analysis of children education and child labour in conjunction with parental health shocks is particularly meaningful in the context of a developing country like Vietnam. Health shocks have a high degree of unpredictability and may have severe and sometimes devastating effects on families' well-being, and especially on rural households, who have limited levels of resources, are mostly employed in the agricultural sector, , and who are often not covered by adequate health insurance. Health shocks can suddenly increase medical expenditure and decrease available income for all family members. Families may need to adjust their consumption patterns and may use accumulated savings, sell valuable items, or borrow from relatives or financial institutions (Wagstaff, 2007; Bales, 2013). The impact of health shocks on labour supply in the family is unclear. On one hand, labour supply may be reduced both because one family member is ill and because others need to look after them . On the other hand, rural households are more likely to compensate the sudden decrease in working hours by increasing the labour supply of other family members (Wagstaff, 2007). In the Vietnamese context, caring is typically a women's responsibility (World Bank, 2011) and therefore girls are likely to be particularly affected by the illness of a family member.

This study explores the relationship between parental health shocks and children's education and engagement in the labour market in Vietnam. The connection between parental illness and children education is twofold. First, parental illness may cause a reduction in family available income, and this can in turn reduce available resources to support children education. Second, parental illness may decrease overall family labour supply and children may need to leave education and start working (Alam, 2015). For this reason, it is particularly

interesting to analyse the impact of parental health shocks on both children's education and child labour, as the two elements are strongly related.

While there is substantial evidence on intergenerational transmission of health from parents to children (see for example Currie and Moretti, 2007, among others), the economics literature analysing the relationship between parental health shocks and children's education is limited. In this framework, Vietnam is a particularly interesting case to look at, given its poor system of social protection, the limited access to the social health insurance system, and health expenditure heavily depending on direct out-of-pocket payments. Further, the study period (2004-2008) corresponds to a critical phase of changes for the Vietnamese health insurance system.

We use longitudinal data and child fixed effects to control for child's time-invariant characteristics that might be associated with parental health and children schooling and we separately analyse the impact of parental illness by gender and age of the child.

Our results suggest that children (ages 10-23) of unhealthy mothers are 3 percentage points less likely to be enrolled in school than children with healthy mothers, and girls are particularly strongly affected by parental illness. Results also show that that maternal illness significantly increases the probability of children to enter employment, as well as their number of working hours. In contrast, father's illness has small and statistically insignificant effects on school enrolment of children in the sample but moderately increases the probability of children working. Our results are consistent with existing literature on the impact of parental health in developing countries, in particular with Bratti and Mendola (2014).

The rest of the paper is organised as follows. Section 2 discusses the existing literature on the relationship between parental health shocks and children's education. Section 3 presents Vietnam's context in the period of analysis, the data, and descriptive statistics. Section 4 describes the econometric methodology. Section 5 presents our results and Section 6 provides concluding remarks.

2. Literature review

Economists have been interested in the intergenerational transmission of health and education and, more generally, in the effect of parental characteristics on children's education attainment, because of the substantial impact of an individual's education on her/his future life and achievements (see for example Currie, 2009; Case and Paxson, 2011, among many

others). However, the effect of parental health on children's education has received a rather limited attention in the economics empirical literature (Haveman and Wolfe, 1995).

The study of the impact of parental health shocks is particularly important in developing countries, where social protection is limited and people have restricted access to formal health insurance (Gertler and Gruber, 2002; Wagstaff, 2007). Major illnesses are unpredictable and can represent very serious shocks for families, both in the rural and urban context (Wagstaff, 2007; Sun and Yao, 2010). In these circumstances, negative health shocks can impose monetary and non-monetary costs on families, due to cost to access health care, reduction in labour supply, income, and productivity, as well as emotional and psychological distress (Gertler and Gruber, 2002; Wagstaff, 2007; Somi et al., 2009; Wagstaff and Lindelow, 2014). These factors can have short and long run consequences on the family, because of reduction in consumption, and decreased accumulation of productive assets, including education (Sun and Yao, 2010). The effect of adverse health events has been found to be particularly pronounced for poor and lower-educated families (Dercon and Krishnan, 2000; Genoni, 2012) and may lead households to chronic poverty (Wagstaff, 2007; Sun and Yao, 2010).

Wagstaff (2007) analyses the economic consequences of health shocks in Vietnam, and shows that, as a consequence of health shocks, families are likely to significantly reduce per-capita food consumption, and at the same time increase other household expenses, such as housing and electricity. Rural households are also more likely to adjust their labour supply, and compensate for the reduced activity of the sick member of the family. Similarly, Mitra et al. (2015) use fixed effects to show that Vietnamese female headed and rural households are the most vulnerable to health shocks, and in general families tend to reduce their non-health related expenditures, on items such as food and education.

A separate strand of literature has analysed the impact of parental death on children outcomes and generally shows that parents' recent death has a large and significant negative effect on children enrolment into education (see for example Gertler et al., 2004 for evidence on Indonesia, and Case and Ardington 2006 for evidence on Centre and South Africa).

The limited literature on parental health and child labour in developing countries has considered various transmission channels of health shocks to offspring's educational attainments. First, parental health shocks may reduce children's education by increasing the need of children substituting adult labour supply and therefore decreasing school attendance

(Choi, 2011; Bratti and Mendola, 2014; Alam, 2015). Second, children may be required to care for a sick parent in the household, and therefore reducing the time available for school work (Mont and Nguyen, 2013; Bratti and Mendola, 2014). Further, parental illness may reduce parental engagement with the child's schooling, as well as increase the child's emotional distress, and both factors are likely to have adverse effect on educational achievements (Guryan et al., 2008; Bratti and Mendola, 2014).

Sun and Yao (2010) examine the effect of major illnesses of working age adults in households on a child's chances to enter or finish middle school in rural China and show that primary school age children (and girls in particularly) are the most vulnerable to family health shocks. Similarly, Choi (2011) explores the effect of parental self-reported health problems on children's education and employment in Russia and show that the father's poor health substantially reduces daughters' educational attainment and labour market engagement. Mont and Nguyen (2013) use cross-sectional data from Vietnam Household Living Standard Survey 2006 to show that parental disability significantly decreases the likelihood of child school enrolment and the impact of maternal disability is the strongest. However, all of these studies rely on data that only record children's schooling at one particular point in time, and therefore are not able to exploit the variation over time in children education and to control for individual characteristics that do not vary over time.

The studies that are closest to ours, in terms of methodology, are Bratti and Mendola (2014) and Alam (2015). Both papers use child fixed effects to analyse the impact of parental health on children education, also analysing the effect on child labour.

Bratti and Mendola (2014) use a longitudinal panel data and child fixed effects to investigate the causal relationship between parental illness and child schooling in Bosnia and Herzegovina. Their results show that mother's poor self-reported health decreases the chances of school enrolment of children aged 15-24 and increases a child's likelihood of working due to a large increase in health expenditures. However, father's poor health does not have significant effects on children's education.

On the other hand, Alam (2015) employs a panel data survey and child fixed effects to investigate the effect of parental illness on the education of children aged 7-15 in Tanzania and show that only father's illness has a significantly negative effect on children's school attendance but there is no evidence of reallocation of children's time from school to work.

In this paper we use longitudinal data with child fixed effects to explore the effect of parental illness on child education and labour market participation in Vietnam. Our study contributes to this existing literature by providing new evidence on the relationship between parental health and child schooling in an Asian developing country. The institutional context of Vietnam is quite different form the one of Bosnia and Tanzania, and findings from Vietnam can be more easily generalised to several other Asian developing countries, with a similar education and health system. Further, in the period of the study, Vietnam undertook a substantial process of reform of its social protection health insurance system and therefore it offers a very interesting case to analyse and the results of this study can have important policy implications for the on-going reforms of the system.

3. Data

3.1 Vietnam's institutional background

Vietnam is a developing country in the Southeast Asia with a population of 89 million in 2011 (OECD, 2013). Around 67% of the total population lives in rural areas (World Bank, http://data.worldbank.org/indicator/SP.RUR.TOTL.ZS) and 47% of the overall population is employed in the agricultural sector (World Bank, http://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=VN). Recent economic reforms have generated substantial economic progress in the Vietnamese agricultural sector, with rapid increase of farming production, lifting rural incomes, reducing rural areas poverty and under-nourishment (OECD, 2015).

Vietnam has achieved a remarkable level of economic growth in the recent years and has reduced the poverty rate from 58% in 1992 to 10% in 2010 (World Bank, 2012). Further, life expectancy and average level of education in the population have substantially increased (OECD, 2013). However, even though many Vietnamese families have risen out of poverty, many still have incomes very close to the poverty line and therefore are highly vulnerable to unexpected shocks, such as sudden changes in rainfall, animal diseases, and health shocks (Badiani et al., 2013). Further, the remaining poor in the population experience substantial challenges, such as isolation, poor health, low education, and limited assets. Ethnic poverty remains as a strong problem, as minority groups accounted for 47% of the poor in 2010, even if they make up less than 15% of the overall population (Badiani et al., 2013). Overall

inequality is rising, especially between rural and urban areas, and disparities between different socioeconomic groups are widening in rural areas. The country's rapid economic growth and modernization have pushed many people out of rural areas and into new city-based jobs, which often are in the informal sector and lack security and social protection (Badiani et al., 2013).

The Vietnamese government introduced a social health insurance scheme in 1992, called Vietnam Health Insurance, to initially provide coverage to civil servants and state enterprise workers. The Vietnamese Health Insurance system has undergone substantial changes after 1998. In 2002, the non- contributory health insurance scheme was expanded to target vulnerable groups, such as poor individuals, ethnic minorities and families experiencing socio-economic disadvantage (through the new Health Care Fund for the Poor). Since 2005, the non-contributory health insurance program also included children under 6 years old (Mitra et al., 2015). As noted in Lieberman and Wagstaff (2009), health insurance coverage rate increased from 14% to 42% between 2002 and 2006. In 2009, the Vietnamese government approved the "Law on Social Health Insurance" to create a Social Health Insurance (SHI) system to be used as main vehicle to achieve universal coverage (Somanathan et al., 2014).

However, there still are significant challenges for the Vietnamese health system, especially related to improving equity, financial protection, and enrolling rates. Further, out of pocket health-related expenses remain high and can leave households exposed to substantial risks, as well as deter utilisation and reinforce health inequalities (Somanathan et al., 2014). At the current stage, the financial protection provided by the health insurance scheme is still too low, also because of informal payments and other indirect costs (Sepehri et al., 2006).

Further, expanding the breadth of coverage remains an important priority for the Vietnamese health system, with a particular focus on reaching the large faction of the population who is working in the informal sector. These individuals constitute a large fraction of the 31.9 million of Vietnamese not enrolled in SHI, who mostly represent the so-called "missing middle" problem, typical of developing countries, where enrolments in the health system are high among lower and higher income groups, but low among individuals from the middle-income groups (Somanathan et al., 2013).

The national education system in Vietnam has 5 levels of education: pre-primary, primary, lower secondary, upper secondary and higher education. Pre-primary education includes

preschool and kindergarten for ages 3-6. Children start primary school at age 6. Primary school lasts for 5 years and is free and compulsory for all Vietnamese children. Secondary education is divided into lower secondary, which lasts for 4 years from grade 6 to 9 (age 11-15), and upper secondary education, which includes grade 10-12 for kids aged 15-18. An alternative to upper secondary education is the vocational or technical track that varies from 6 months to 3 years in length. Higher education includes universities, senior colleges or research institutes (World Bank, 2011). The Government support for education has dramatically increased over the past 25 years and Vietnam spent over 5% of its GDP in education in 2009 (World Bank, 2011). Important recent achievements include nearly universal primary education and a substantial increase of the population literacy rates. The major current challenges for the education system include targeting inequalities in grade attainments, attendance and completion across different ethnic and socio-economic groups (World Bank, 2011).

3.2 Data and descriptive statistics

In this study, we use data from three waves of Vietnam Household Living Standards Survey (VHLSS) that cover the years 2004, 2006, and 2008. Only half of households interviewed in the 2004 wave are recalled in 2006, and only half of households in 2006 are reinterviewed in the 2008 wave. Therefore, an unbalanced panel of 13,930 observations is created from these three waves. The VHLSS dataset is implemented by General Statistics Office of Vietnam (GSO) with the technical support of the World Bank, with the objective of monitoring and evaluating the implementation of Comprehensive Poverty Alleviation and Growth Strategy. VHLSS includes detailed information on the characteristics of individuals, households, and communities, such as demographics of household members, ethnicity, area of residence, educational background, employment status, income, expenditures, housing, household assets, utilities, etc.

The survey also incorporates detailed information on individual health status, including morbidity (and occurrence of symptoms such as diarrhoea, nausea, fever, and cough); and physical difficulties and limitations in daily activities, which is only available in 2006. We follow Mitra et al. (2015) and use a different measure of health shocks. At each wave, all household members are asked whether they spent any days in bed due to illness or injury, where they needed someone to take care. Similarly, they are asked whether there were any days in which they were unable to carry out regular activities due to illness/injury. The survey

includes two questions for each of these indicators, where individuals are asked to report any illness event in the last 4 weeks and then in the last 12 months. Unfortunately, there is no way of exactly define when the episodes happened, as individuals who were sick in the last 4 weeks could also report that they were sick in the last 12 months. If respondents answered positively to any of those questions, they are asked to report how long the episode lasted for. These measures allow capturing individuals' functioning levels that affects the ability to work, and are close to the objective measures of health defined under the International Classification of Functioning Disability and Health (WHO, 2001). Lastly, individuals are asked whether they were hospitalised in the previous 12 months and for how long.

We define a binary variable for parental illness equal to 1 if the individual:

- Spent at least 1 day in bed and needed someone to take care of her/him, or
- Spent at least 1 day unable to carry out regular activities because of illness, or
- Was hospitalised for at least one day

We also run several sensitivity analyses, by varying the number of days (for example choosing 2 or 3 days as a threshold to define illness) and excluding hospitalisation, to show that this does not affect the main results. The average number of days spent in bed for parents in the estimation sample is 4, while the average number of days unable to carry regular activities because of illness is 12.

In general, health measures that refer to the ability to perform daily activities have been considered "more objective" and less prone to measurement error than measures based on self-reported health status, which are likely to be affected by the subjectivity of individual response scales (Gertler and Gruber, 2002; Bratti and Mendola, 2015, among others).

We follow Bratti and Mendola (2014) and include children aged 10-23 who are living with both parents in the sample. However we tested the validity of our estimates by including children living with a single parent and main results are unchanged. The sample of children aged 10-23 include those who attend secondary school (lower or upper) and university. We decided to focus on this group of children (and exclude primary school aged children) given that primary attendance in Vietnam is free and almost universal, and therefore less likely to be affected by parental illness.

Table 1 presents descriptive statistics of enrolment rates in our sample, by age and parental health status. As expected, enrolment rates are higher for younger children (around 90% for

children aged 10-15) and decrease for children in upper secondary school (around 63% in the age group 15-18). In general, the school enrolment rate is higher for girls than for boys and children with a sick parent seem less likely to be enrolled in education.

Table 1- Children's school enrolment rates by parental health status

	Enrolment	No parent ill	Any parent ill
Full sample	0.665	0.690	0.640
	(0.472)	(0.463)	(0.479)
Boys	0.636	0.661	0.612
	(0.481)	(0.473)	(0.487)
Girls	0.698	0.722	0.674
	(0.459)	(0.448)	(0.468)
Age 10-14	0.924	0.931	0.915
	(0.265)	(0.252)	(0.278)
Age 15-18	0.633	0.665	0.601
	(0.482)	(0.472)	(0.489)
Age 19-23	0.309	0.319	0.300
	(0.462)	(0.466)	(0.458)

Note: The table provides children's school enrolment rate over three survey rounds. The full sample includes children aged 10-23 and 13,930 observations over all three rounds of survey. Standard deviations are in parentheses.

Table 2 presents the proportion of children in the sample who are working and the average number of hours of work per week, by parental health status. As expected, children who have a sick parent are more likely to work, and tend to work longer hours. Interestingly, boys seem more likely to work than girls. However, this can partially be due to the fact that girls are more likely to work in the household, and therefore their work is not adequately captured in the data.

Table 2- Children's labour force participation by parental health status

	Total	No parent ill	Any parent ill
Full sample	35.53	31.53	39.55
Boys	38.70	34.81	42.53
Girls	31.80	27.75	35.95
Age 10-15	16.70	13.36	20.24
Age 15-18	42.84	37.91	47.72
Age 18-23	63.95	61.90	65.86
Weekly working hours			
Full sample	15.96 (23.42)	14.38 (22.86)	17.54 (23.87)
Boys	17.79 (24.32)	16.21 (23.95)	19.35 (25.59)
Girls	13.79 (22.12)	12.28 (21.36)	16.21 (23.95)
Age 10-14	4.43 (12.23)	3.67 (11.46)	5.26 (12.97)
Age 15-18	16.79 (23.07)	14.84 (22.44)	18.72 (23.52)
Age 19-23	32.59 (26.48)	31.63 (26.69)	33.47 (26.27)

Note: The table provides children's labour force participation over three survey rounds. The full sample includes children aged 10-23 and 13,930 observations over all three rounds of survey. Standard deviations are in parentheses.

Table 3- Sample Descriptive Statistics- Independent variables

Independent Variables	**Sample Average**	**Sample standard deviation**
Mother ill only	0.179	(0.383)
Father ill only	0.114	(0.318)
Both parents ill	0.204	(0.403)
Age	15.822	(3.704)
Male	0.541	(0.498)
Kinh (main ethnic group)	0.789	(0.408)
Urban	0.210	(0.407)
Age of mother	43.108	(7.073)
Age of father	45.677	(7.687)
Mother's highest qualification		
No degree (omitted)	0.289	(0.453)
Primary	0.268	(0.443)
Lower secondary	0.313	(0.464)

Upper secondary	0.103	(0.304)
Higher education	0.026	(0.158)
Father's highest education		
No degree (omitted)	0.214	(0.410)
Primary	0.270	(0.444)
Lower secondary	0.347	(0.476)
Upper secondary	0.133	(0.340)
Higher education	0.034	(0.182)
Household size	5.290	(1.627)
Number of children	2.862	(1.289)
Number of houses	1.034	(0.203)
House owned	0.984	(0.126)
Living area (in square metres)	67.174	(36.018)
Safe water in the household	0.805	(0.396)
Computer in the household	0.076	(0.265)
Per capita income in the last year (1,000 Vietnamese Dong)	662.447	(915.429)
Regions		
Red River Delta	0.180	(0.384)
North West	0.062	(0.242)
North East	0.146	(0.353)
North Central Coast	0.126	(0.332)
South Central Coast	0.096	(0.294)
Central Highlands	0.095	(0.294)
South East	0.124	(0.329)
Mekong River Delta	0.170	(0.375)
No of observations	13,930	

Note: The summary statistics are from three waves of VHLSS 2004, 2006, 2008.

Table 3 presents descriptive statistics of all independent variables included in the model. Around 18% of mothers and 11% of fathers are classified as ill in the estimation sample, according to the definition above. Not surprisingly, the average level of parental education is quite low in the estimation sample, and there are a substantial proportion of parents (more than 20%) without any educational qualification. The major ethnic group (Kinh) includes about 80% of the estimation sample, and about 20% of the sample lives in urban areas.

5. Methodology and Estimation

We begin our analysis of the impact of parental health on children outcomes by estimating a simple linear model:

$$c_{ijt} = \beta_0 + \beta_1 H_{ijt} + \beta_2 \boldsymbol{X}'_{ijt} + \varepsilon_{it} \quad (1)$$

Where c_{ijt} represents the outcome for child *i* (school enrolment; labour force participation or working hours) living in household *j* at time *t*; H_{ijt} represents the parental health shock; $\boldsymbol{X'}_{ijt}$ represents a vector of individual and household characteristics and ε_{it} is an idiosyncratic individual error term. The parameter of interest is β_1 that captures the effect of parental health shock on children's outcomes.

An important challenge in the estimation is the possible endogeneity of parental health shocks due to unobserved variables that might affect both parental health status and children's outcomes, and therefore could bias estimation results. For example, parents with poor living conditions are more likely to have poor health, and at the same time, invest less time and money in their children's health and education. To address the endogeneity problem, we estimate the model using child fixed effects, and therefore taking into account unobserved time invariant factors that might affect both parental health and children's outcomes:

$$c_{ijt} = \beta_0 + \beta_1 H_{ijt} + \beta_2 \boldsymbol{X'}_{ijt} + \gamma_i + \varepsilon_{it} \quad (2)$$

In order to capture the specific differences between the effect of maternal and parental illness, we follow Bratti and Mendola (2014) and separately include in the model each parent's health status:

$$c_{ijt} = \beta_0 + \beta_1 MH_{ijt} + \beta_2 FH_{ijt} + \beta_3 PH_{ijt} + \beta_4 \boldsymbol{X'}_{ijt} + \gamma_i + \varepsilon_{it} \quad (3)$$

Where MH_{ijt} represents mother's poor health status, FH_{ijt} represents father's illness, and PH_{ijt} equals 1 if both parents report poor health.

The model includes an extensive set of control variables, such as demographic characteristics of parents and children (child's age and ethnicity, mother's and father's age and education attainment), demographic structure of household (household size, number of children), proxies of household wealth (house ownership, number of houses, living area, availability of safe water, computer), region of current residence and time fixed effects. These time and region fixed effects will capture macroeconomic and local conditions, such as the local provision of education, health services, and labour market conditions.

As already mentioned, the child fixed effect γ_i will capture the effect of all observable and unobservable time-invariant characteristics associated with both parents' health and children's outcomes, such as birth order, gender, religiosity, personality traits and time

preferences, and any other unobserved time-invariant factor. Therefore, it is not possible to include any time-invariant controls in fixed effects estimations.

In the fixed effects model, the causal interpretation of results relies on the assumption that the time-dependent error term is independent of changes in parental health, conditional on the regressors included in the model and on the individual fixed effect. This assumption will not hold if there are unobserved yearly random shocks that affect parental health and children's outcomes at the same time. For this reason, we control for a wide set of individual and family characteristics, such as child's health, and several indicators of socio-economic status.

In other words, identification comes from time variations in parental health for the same individual, and the underlying assumption of the model is that these variations are exogenous, conditional on the set of independent variables. In practice, children living in specific conditions may be systematically more likely to have sick parents, but the time variation in parental health should not be related to children's outcomes (Bratti and Mendola, 2014).

6. Results

6.1 Parental health and children education

This section presents the main empirical findings of the investigation of the impact of parental health on children's outcomes. We begin by presenting results of the impact of parental illness, using a binary indicator equal to 1 if any parent reported illness, and then distinguish maternal and paternal health shocks.

Table 4 reports estimates results of the impact of parental health shocks on children's enrolment in education, using a full sample of children aged 10-23. In the first column, we present OLS results. Columns 2-5 present results from the model including child fixed effects, with a progressively more extended set of independent variables. The choice of regressors follows the literature, and in particular, Bratti and Mendola (2015). We begin by estimating a simple model including child's illness, and month and year of the survey (model 2). In model 3, we also include child's age, parental education and age. Model 4 further controls for other demographic characteristics of the family, such as number of children and family members, as well as some proxies for household's wealth (home ownership, size of the house, access to clean water, computer ownership) and an indicator of whether the family lives in an urban area. This is our preferred specification. Model 5 also controls for per capita household income in the previous year. We follow Bratti and Mendola (2014) and do not

control for parental employment in the main specification, because this variable is potentially endogenous and likely to be affected by parental health. Therefore, our estimates will capture the pecuniary and non-pecuniary effects of parental health shocks on children's outcomes. However, we run a sensitivity test including binary indicators of parental employment and main results are unchanged.

Results are very stable and consistent across the different specifications of the model. Children with an unhealthy parent are around 2 percentage points less likely to be enrolled in school than children having healthy parents (on average, 66% of children in the sample are enrolled in education) and this results is stable when we include additional control variables. Interestingly, estimates from Model 5 show that the effect of parental illness on child school enrolment is not affected by inclusion of per capita household income.

Table 4- Effect of parental health shocks on child school enrolment (children aged 10-23)

	OLS (1)	FE (2)	FE (3)	FE (4)	FE (5)
Parental health shock (any parent)	-0.0165**	-0.0223**	-0.0225**	-0.0232***	-0.0232***
	(0.0066)	(0.0089)	(0.0089)	(0.0089)	(0.0089)
N. of obs	13,930	13,930	13,930	13,930	13,930

Note: Column 1 reports OLS results; column 2-5 represent child fixed effects estimations of the effect of parental health shocks on the probability of children's schooling. All models control for kids' illness, month of interview and the round of survey. Model (3) additionally controls for child's age, age and education of parents. Model (4) controls for the household's demographic structure as well as household's wealth indicators. Model (5) adds control for per capita income in the household. Standard errors are in brackets. * denotes statistical significance at 10 percent; ** denotes significance at 5 percent; *** denotes significance at 1 percent. In additional, model (1) also controls for sex, ethnicity, and region fixed effects.

In Table 5, we use separate indicators variables for maternal and paternal illness, in order to further investigate the impact of parental health shocks (see equation 3 in the previous section) and to allow for non-linearities in the impact of parental health (Bratti and Mendola, 2014). Interestingly, results show that the impact of maternal poor health is stronger than the effect of paternal health. Children living with an unhealthy mother are over 3 percentage points less likely to be enrolled in education, and the effect is significant at 1%. However, the effect of paternal health shock is smaller (-2%) and only significant at 10%.

This finding is consistent with results from the existing literature on parental health shocks and children outcomes, such as Bratti and Mendola (2014) and Chen et al. (2009), as well as with findings from economics literature, showing that investments in children are primarily made by mothers (see for example Case and Paxson, 2001). The negative effect can be driven by a decrease in maternal time and inputs in the child's education, as well as by reallocation

of the child's time from education to work, either in the labour market, or at home to care for the sick mother.

The impact of having both parents ill is not significantly different from zero in the fixed effects estimation. This result is similar to findings from Bratti and Mendola (2014) and could be explained by the lack of variation in the binary variable indicating that both parents got sick, as well as by the high level of measurement error, and therefore higher attenuation bias for the estimator.

Table 6 further explores the impact of parental illness by gender and age group of the children. For reasons of parsimony, we focus on the preferred specification, including a fixed effects model with controls for individual and parents' demographics, as well as proxies of the household's wealth (other results are available on request). Girls are clearly more affected than boys by parental health shocks, and their chances to be enrolled in education decrease by about 4-5 percentage points because of parental illness. Further, children aged 15-18 (in upper secondary school) are the most vulnerable to maternal poor health status and their probability to be enrolled in education is reduced by 5.5 percentage points. As already discussed, these results can be driven by several transmission channels for children in this age group, such as the negative impact of maternal absence and lack of supervision, as well as reduced resources to fund education.

Table 5 - Effect of maternal and parental health shocks on child school enrolment (children aged 10-23)

	OLS (1)	FE (2)	FE (3)	FE (4)	FE (5)
Maternal health shock	-0.0351***	-0.0313***	-0.0315***	-0.0320***	-0.0320***
	(0.0087)	(0.0112)	(0.0112)	(0.0112)	(0.0112)
Paternal health shock	-0.0260**	-0.0254*	-0.0264*	-0.0259*	-0.0259*
	(0.0104)	(0.0137)	(0.0137)	(0.0137)	(0.0137)
Both parents' health shocks	0.0124	-0.0060	-0.0055	-0.0075	-0.0075
	(0.0092)	(0.0125)	(0.0125)	(0.0125)	(0.0126)
N. of obs	13,930	13,930	13,930	13,930	13,930

Notes: Control variables are reported in Table 4. Standard errors are in brackets. * denotes statistical significance at 10 percent; ** denotes significance at 5 percent; *** denotes significance at 1 percent.

Table 6 – Effect of parental health shocks on child school enrolment, by age group and gender of the child.

	Age 10-14	Age 15-18	Age 19-23	Girls	Boys
Maternal health shock	-0.0035	-0.0545**	-0.0380	-0.0466***	-0.0171
	(0.0129)	(0.0276)	(0.0312)	(0.0161)	(0.0157)
Paternal health shock	0.009	-0.0370	-0.0486	-0.0398**	-0.0148
	(0.0164)	(0.0348)	(0.0397)	(0.0201)	(0.0191)

Both parents' health shocks	0.009 (0.0152)	-0.0381 (0.0311)	-0.0230 (0.0347)	-0.0111 (0.0183)	-0.0063 (0.0174)
No of obs	5,604	4,678	3,648	6,393	7,537

Notes: Control variables are reported in Table 4. Standard errors are in brackets. * denotes statistical significance at 10 percent; ** denotes significance at 5 percent; *** denotes significance at 1 percent.

We run several sensitivity tests, to verify the stability of our results. In particular, fixed effects results will not be valid if there are any time-varying yearly shocks to parental health that also affect with child schooling at the same time. For this reason, we test the model by controlling for other family members' illness (and specifically for grandparents and young siblings' health shocks), as well as controlling for a series of interactions between survey wave and region of residence. These time-region fixed effects should capture time-specific local shocks, as well as local provision of health and education facilities. Lastly, we also expand our estimation sample to include single parent families and include one indicator variable for single parent status. All results are reported in Table 7 and are consistent with findings presented in the previous tables.

Table 7: Sensitivity analyses for the impact of parental health shocks on child's education (Estimation with FE)

	Ctrl for Illness of children <6 y.o.	Ctrl for Grandparents illness	Ctrl for other family members' illness	Ctrl for time-region fixed effects	Incl. single parent indicator
Maternal health shock	-0.0324*** (0.0112)	-0.0318*** (0.0112)	-0.0317*** (0.0112)	-0.0330*** (0.0112)	-0.0305*** (0.0108)
Paternal health shock	-0.0261* (0.0137)	-0.0258* (0.0137)	-0.0259* (0.0145)	-0.0266* (0.0137)	-0.0204 (0.0131)
Both parents' health shocks	-0.0080 (0.0098)	-0.0069 (0.0126)	-0.0072 (0.0126)	-0.0095 (0.0126)	-0.0035 (0.0120)

Notes: Other independent variables are reported in Table 4. Standard errors are in brackets. * denotes statistical significance at 10 percent; ** denotes significance at 5 percent; *** denotes significance at 1 percent.

We also investigate whether the impact of parental illness on children's schooling varies when we control for parental health insurance status (results are available on request). The impact of parental health on children schooling remains stable and negative, irrespective of insurance status. Previous literature has documented the limited effect of health insurance in protecting families from the negative consequences of health shocks in Vietnam. For example, Xu et al., (2003) have showed that, when families experience a health shock, out-

of-pocket health expenditures are very high, even for insured individuals. This may be because the public health insurance system is not efficient and many insured individuals who are covered by public health scheme still use private healthcare services, or because the level of financial protection of public health insurance scheme is low, and individuals spend a substantial amount of money on informal payments and other indirect costs (Sepehri et al., 2006). We have further investigated this issue by estimating the effect of parental health shocks on health expenditure in our sample. Results show a substantial increase of health expenditure as consequence of negative health shocks, in line with findings in earlier studies in Vietnam (Wagstaff, 2007; Mitra et al., 2015). This increase in health expenditures could have a directly negative effect on child enrolment, through the need of reducing educational expenditures. Similarly, parental health shocks (and the related increase in health expenditures) can have an indirect effect on child's education, by creating an incentive for the child to leave education and enter the labour market. For this reason, in the next section, we explore the impact of parental employment on children work.

6.2 Parental health and children work

The VHLSS data include information on employment status and number of working hours of all family members. We extend the existing literature on parental health and children outcomes and use both measures of child labour to investigate whether parental health shocks affect child labour. Therefore, we are able to investigate the effect of parental health shocks on labour force participation, as well as on the intensity of engagement in the labour market.

The estimates are reported in Tables 8-10 and show that children living with a sick parent are significantly more likely to enter the labour market (+4%, where the sample average is 36%) and work longer hours (+ 1 hour, or 4.5% of a standard deviation). Table 9 shows that the impact of maternal illness is slightly stronger than the effect of a paternal health shock, both on labour force participation and working hours. Maternal illness increases the likelihood of entering the labour market increase by over 5 percentage points and the number of weekly working hours increase by 1.6 (around 7% of a standard deviation).

When we analyse the results by age and gender of the child in Table 10, results show that girls are more likely to enter the labour market after a health shocks for both parents, while boys are significantly affected only in the case of maternal illness. As expected, the effect is stronger for children in upper secondary school. Interestingly, paternal illness seems to have a stronger effect on child labour than on child education, especially for children aged 15-18.

Table 8: Effect of parental illness on children's labour force participation

	Labour force participation			Weekly working hours		
	OLS (1)	FE (2)	FE (3)	OLS (1)	FE (2)	FE (3)
Parental health shock (any parent)	0.0413***	0.0382***	0.0383***	1.420**	1.065**	1.066**
	(0.0071)	(0.0094)	(0.0094)	(0.339)	(0.437)	(0.438)
No of obs	13,930	13,930	13,930	13,930	13,930	13,930

Note: All models control for kids' illness, month of interview and the round of survey. Model (1) also controls for sex, ethnicity, and region fixed effects. Model (2) additionally controls for child's age, age and education of parents. Model (3) additionally controls for household's demographic structure; and household's wealth indicators. Standard errors are in brackets. * denotes statistical significance at 10 percent; ** denotes significance at 5 percent; *** denotes significance at 1 percent.

Table 9- Effect of maternal and parental health shocks on children's labour force participation (children aged 10-23)

	Labour force participation			Weekly working hours		
	OLS (1)	FE (2)	FE (3)	OLS (1)	FE (2)	FE (3)
Maternal health shock	0.0520***	0.0533***	0.0527***	2.132***	1.666***	1.629***
	(0.0093)	(0.0118)	(0.0118)	(0.447)	(0.550)	(0.550)
Paternal health shock	0.0337***	0.0377***	0.0379***	1.527***	1.365**	1.347**
	(0.0111)	(0.0145)	(0.0145)	(0.531)	(0.674)	(0.675)
Both parents' health shocks	0.0346***	0.0159	0.0171	0.504	-0.0944	-0.027
	(0.0098)	(0.0133)	(0.0133)	(0.468)	(0.615)	(0.617)
No of obs	13,930	13,930	13,930	13,930	13,930	13,930

Note: All models control for kids' illness, month of interview and the round of survey. Model (1) also controls for sex, ethnicity, and region fixed effects. Model (2) additionally controls for child's age, age and education of parents. Model (3) additionally controls for household's demographic structure; and household's wealth indicators. Standard errors are in brackets. * denotes statistical significance at 10 percent; ** denotes significance at 5 percent; *** denotes significance at 1 percent.

Table 10 – Effect of parental health shocks on children's labour force participation, by age group and gender of the child.

Labour force participation	Age 10-14	Age 15-18	Girls	Boys
Maternal health shock	0.0508***	0.0558*	0.0449***	0.0595***
	(0.0190)	0.0292)	(0.0174)	(0.0164)
Paternal health shock	0.0215	0.0804**	0.0598***	0.0240
	(0.0237)	(0.0367)	(0.0216)	(0.0199)
Both parents' health shocks	0.0302	0.0145	0.0076	0.0314*
	(0.0219)	(0.0328)	(0.0197)	(0.0181)
Weekly working hours	Age 10-14	Age 15-18	Girls	Boys
Maternal health shock	0.631	2.399*	1.463**	1.832**
	(0.656)	(1.338)	(0.796)	(0.767)
Paternal health shock	-0.207	3.787**	2.316**	0.867
	(0.819)	(1.684)	(0.992)	(0.930)
Both parents' health shocks	0.246	-0.087	-0.717	0.805
	(0.759)	(1.504)	(0.905)	(0.847)
No of obs	5,604	4,678	6,393	7,537

Notes: Control variables are reported in Table 4. Standard errors are in brackets. * denotes statistical significance at 10 percent; ** denotes significance at 5 percent; *** denotes significance at 1 percent.

Our findings are broadly consistent with Bratti and Mendola (2014), but are different from Aslam (2015) who shows that father's illness has significant impact on school attendance of children and that this effect is not due to increased child labour. However, it is very hard to disentangle the reasons for these differences that can be attributed to the different educational and institutional context of the corresponding countries (Bosnia, Vietnam and Tanzania).

Overall, these results confirm that parental illness has a very strong negative effect on children, and substantially decreases enrolment in education, while increasing child labour. These results are particularly pronounced for girls, who seem to experience the most harmful effects from parental health shocks. The negative effect of parental illness can be mediated through an increase in health expenditure, that reduces family income and funds available for education and at the same time may increase the need for the children to enter the labour market to replace a sick parent.

7. Conclusion

Health shocks are important unpredictable events that can undermine the emotional and financial well-being of families, especially in developing countries, where citizens have access to a limited level of social protection and health insurance. However, the impact of

parental illness on children's outcomes has received very limited attention in the economics literature.

This study explores the impact of parental health shocks on child school enrolment and labour force participation in Vietnam, using an unbalanced panel data from VHLSS. We use child fixed effects in order to address potential endogeneity and control for unobserved characteristics that do not vary over time. This study contributes to the recent economic literature on the effect of parental health shocks on child education in developing countries, by providing new evidence based on Vietnam, which can be particularly meaningful for analysing several other Asian developing countries, with a similar education and health system. Vietnam is a middle income developing country, which has experienced substantial economic growth in the recent years, and has reached important milestones, but still lags behind in providing adequate education and social protection to some vulnerable groups of the population, and especially ethnic minorities and rural families at the bottom of the income distribution.

Our results show that maternal health shocks substantially decrease a child's likelihood to be enrolled in education, by about 3 percentage points. Further, parental health shocks increase children's employment probabilities as well as the number of weekly hours of work. Results are very stable across different specification of the model and several sensitivity tests, including a very detailed set of independent variables. The negative effects are particularly pronounced for girls, and for children aged 15-18.

Our findings have important policy implications. In particular, the implementation of specific policies aimed at improving access to healthcare for women, social insurance and, more broadly, maternal health, could have substantial spillover benefits on children's education and labour market outcomes. Further, specific care could be intensified for rural households, or families with middle-low income, who are particularly vulnerable to health shocks, and whose children are at a high risk to dropping out of education and entering the labour market.

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