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Trade openness and vulnerability to poverty: Vietnam in the long-run (1992-2008)

Emiliano Magrini
Sapienza University

Pierluigi Montalbano
University of Sussex and Sapienza University.
pierluigi.montalbano@uniroma1.i

Abstract:
Following on from the existing poverty assessments of trade liberalisation in Vietnam under "doi moi", the aim of this paper is to provide a parallel assessment of vulnerability from trade. Taking advantage of the existence of extensive household data from two different sets of Vietnamese household surveys (VLSS and VHLSS) covering the entire period 1992-2008, it applies a new vulnerability measure to assess empirically the presence of robust heterogeneity in the vulnerability of Vietnamese households according to their relative position in trade related activities. The contribution of this paper is twofold: it sheds light on the timely debate on vulnerability to poverty from trade openness focusing on micro linkages between trade liberalisation and household consumption over a longer time span than is usually covered by current literature; it proposes a new vulnerability measure capable of assessing, besides the non-stochastic poverty determinants and the observed impact of shocks on households, the net welfare effect of risk-induced "ex-ante" changing behaviour, using cross-sectional data. The main results of this paper are the following: it highlights the presence of a growing phenomenon of vulnerability induced by risk exposure alongside the reduction of poverty rates in Vietnam; it demonstrates the presence of a negative welfare effect of "ex ante" changing behaviour induced by risk exposure. On the top of that, it assesses robust heterogeneity in vulnerability according to households' relative position in trade related activities. Our empirical results are relevant for policymaking. They highlight that the so-called “economic stabilisation policies” should receive more consideration even in absence of downside shocks.

JEL Classification: F14, O12, D12, C31

Key Words: trade openness, vulnerability, poverty, Vietnam

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1 Background

Following the so-called "Asian option" of transition, Vietnam adopted the "doi moi" (renovation) process from the early 1990s, a combination of liberalisation, stabilisation and structural reforms. The liberalisation component included: the removal of CMEA trade constraints; the liberalisation of the exchange rate and foreign exchange controls; the relaxation of imports and exports controls and the adoption of a tariff based system; the introduction of export promotion policies and export processing zones; the promotion of foreign investments and provision of a new legal framework for FDI. Within this component, Vietnam experiences two main waves of trade liberalisation, one in the 1990s and a second in the 2000s (Coello at al., 2010). The first wave lasts from the initial opening of the country till approximately 2001, after the total abolition of trade licences and the removal of most of the quantitative restrictions (Than, 2005); the second wave begins in 2001 and includes the full involvement of the country in the world network of reciprocal trade agreements (both multilateral, see the WTO accession in January 2007, and bilateral, see the agreements signed with the USA, ASEAN and, more recently, with the EU).

The process of trade liberalisation in Vietnam has been extensively studied. Empirical investigations agree that trade liberalisation has been crucial for poverty alleviation in Vietnam, even if at the cost of rising inequality (Liu, 2001; Thoburn, 2004; Niimi & al., 2007; Heo & Doanh, 2009; Coello at al., 2010). However, the above analyses have focused mainly on the first sub-period, where the process of liberalisation was still restricted and subject to trade licences. Moreover, they do not provide any clue on the possible impact of the opening up process on households' exposure to foreign shocks.

This work aims to bridge the above knowledge gaps. Following on from the existing debate on "vulnerability from trade openness" (Montalbano, 2011), it complements existing poverty assessment of trade liberalisation in Vietnam with a parallel assessment of vulnerability to trade openness at household level for the entire period 1992-2008. It also enlarges the analysis by including in the assessment the second stage of the Vietnam's trade liberalisation process. The contribution of this paper is twofold: it sheds light on the timely debate on vulnerability to poverty from trade openness focusing on micro linkages between trade liberalisation and household consumption over a longer time span than is usually covered by current literature; it proposes a new vulnerability measure capable of assessing, besides the non-

stochastic poverty determinants and the observed impact of shocks households, the net welfare effect of "ex-ante" risk-induced changes in behaviour, using cross-sectional data. The main results of this paper are the following: it highlights the presence of a growing phenomenon of vulnerability induced by risk exposure alongside the reduction of poverty rates in Vietnam; it demonstrates the presence of a negative welfare effect of "ex ante" changing behaviour induced by risk exposure. On the top of that, it assesses robust heterogeneity in vulnerability according to households' relative position in trade related activities. Our empirical results are relevant for policymaking. They highlight that the "economic stabilisation policies" - whose value has been assumed to be low since Lucas (1987) - should receive more consideration even in the absence of downside shocks.

The paper is organised as follows: section 2 provides an introduction to the main outcomes of past investigations on trade liberalisation and poverty dynamics in Vietnam after "doi moi"; section 3 introduces the issue of vulnerability from trade; section 4 provides the details on the applied measures of vulnerability; section 5 presents the main empirical results; section 6 presents the conclusion.

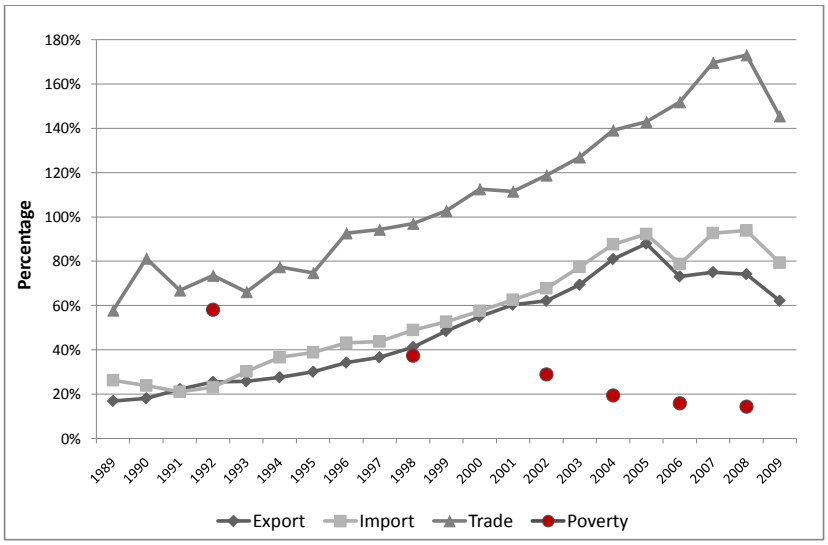
2 Trade liberalisation and poverty dynamics in Vietnam

As already underlined, a substantial amount of empirical investigations on trade liberalisation and poverty dynamics in Vietnam has been carried out to date (Irvin, 1997; Liu, 2001; Fritzen, 2002; Jenkins, 2004; Nadvi et al., 2004; van de Walle and Cratty, 2004; Jensen and Tarp, 2005; Nguyen and Ezaki, 2005; Fujii and Roland-Holst, 2007; Niimi et al., 2007; Abbott et al., 2008 ; Heo and Doanh, 2009; Coello et al., 2010). The above analyses agree that trade liberalisation has been crucial for poverty alleviation in Vietnam and consistently underline the following stylised facts:

- the increased importance of international trade on the Vietnamese economy;
- the positive empirical correlation between trade liberalisation, growth and poverty reduction (measured by the increase of the growth elasticity of poverty).

The growing importance of international trade on the Vietnamese economy is shown by the impressive the increase of total trade as a share of GDP (from 57.90 percent in 1989 to 172.96 percent in 2008, before the drop induced by the world crisis). In particular, exports as a share of GDP grew from 16.96% in 1989 to 62.22% in 2009 while imports grew from 26.35% to 79.35%. This growth has been constant over the last 20 years, except for drops in 2006 and 2009 (see Fig. 1) and it occurred alongside a significant reduction in the level of absolute poverty (from 58.1% of the population in 1992 to 16.40% in 2008).

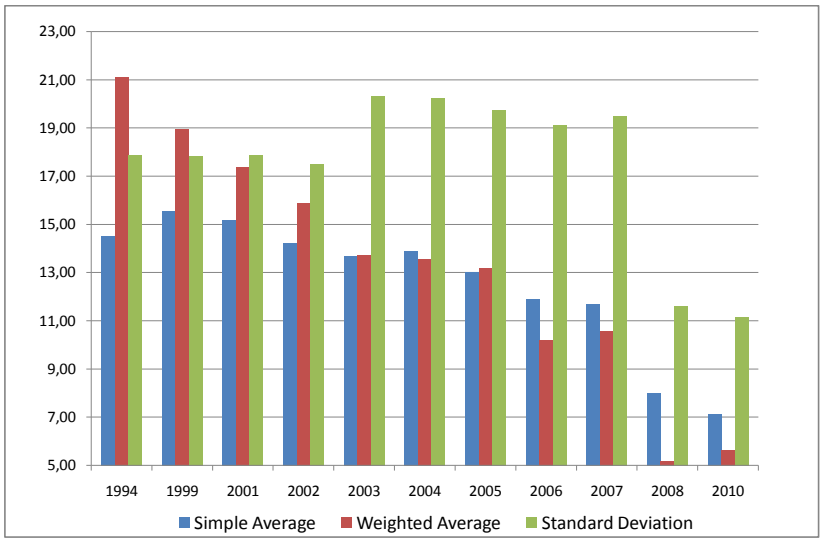
Figure 1: Dynamics of Trade and Poverty in Vietnam



Source: Authors' own calculations on Comtrade

As concerns the second issue, the majority of the above studies support a positive empirical correlation between trade liberalisation, growth and poverty in Vietnam, even if at the cost of increased inequality. Abbott et al. (2009) claim the poverty impacts of trade reforms in Vietnam are even larger than those anticipated by existing model predictions, because of the intrinsic limitations of the most common applied methods and because they generally overlook the fact that institutional rather than tariff reforms have been the main driving factor of the recent development in Vietnam. The evidence that the tariff structure had not changed significantly in Vietnam at least until

Figure 2: Vietnamese tariff structure



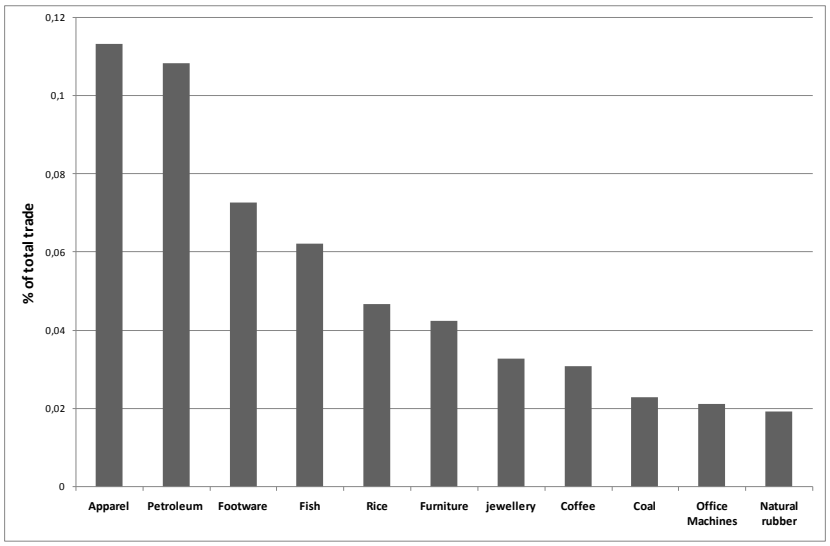
Source: Authors' own calculations on WITS

2008, when both averages and dispersion of tariffs reduced substantially (see Fig.2), actually reinforces the point of view of Abbott et al. (2009)[1].

Because of the structure of the Vietnamese economy, the identification of the direct impact channels of trade on households, namely price and employment/wages, remain ambiguous (Winters, 2002). While the economy remains substantially agrarian economy, mainly concentrated on rice production (see Table B.6) the majority of exports comes from the manufacturing sector (58% of total exports in 2009). Moreover, the manufacturing sector increased its quota during last ten years to more than 10%, while the agricultural sector, during the same period, reduced its relative weight (from 30% to 23% of total exports). Fig. 3 shows that, if we exclude petroleum, the main Vietnamese export-led sectors are: light industrial products, mainly apparel (11% of total exports), footwear (7%), fish (6%), furniture (4%) and jewellery (3%); and some main farm products, e.g. rice (4%), coffee (3%) and natural rubber (2%).

[1] The increase in (simple) average tariff in 1999 is due to the *tariffication* of goods previously subject to quantitative restrictions.

Figure 3: Vietnamese export-led sectors (2009)



Source: Authors' own calculations on Comtrade

The extensive past empirical investigations on the impact of trade reforms in Vietnam reach consensus on the following issues:

- price liberalisation has had a great impact on agricultural households and consumers since 1986 (Niimi et al., 2007) with poverty reduction figures for rice net producers better than for rice net consumers (Heo and Doanh, 2009);
- trade liberalisation has been beneficial for the poor thanks to the highly labour intensive structure of the Vietnamese exports. The presence of a relatively high and stable annual growth rate of real wages registered in the agricultural sector during "doi moi" suggests a likely net benefit for the poor in rural areas too (Heo and Doanh, 2009). This can partially be attributed to a diversification of income sources such as, for instance, switching to non-farm self-employed (part time) jobs (Coello et al., 2010);
- the negative effects of trade liberalisation occurred mainly in coffee production. While Vietnamese coffee producers registered substantial

poverty reductions in the period 1992-1998[2], Vietnam's entry into the world coffee market, combined with rising stocks, inelastic demand and a shift toward low-cost Robusta for processing (Ponte, 2002) contributed to a precipitous decline in international coffee prices (below 40 cents a pound in late 2001 - a three-decade low in constant dollar terms - Brown et al., 2001), reversing the fortunes of many smallholders (De Fontenay and Leung, 2001; the World Bank, 2004 and Lindskog et al., 2005).

Critics highlight the relatively high concentration of poor households near the poverty line during the 1990s as a likely explanation for the pro-poor nature of growth in Vietnam. They also highlight the persistence of a high poverty gap in rural areas, in the Northern Mountain and in the inland Central Highland regions (see Fig. 7) as well as increased inequality throughout the country, resulting in an extensive urban-rural division, with the richest 20% of the population living in urban areas (Heo and Doanh, 2009). Furthermore, trade openness seems to have promoted a distributional impact within the rice sector too, further penalising the poorer small net producers (Coello et al, 2010). Last but not least, 80 per cent of the poor are still living (and working) in rural areas.

Moreover, it is matter of debate whether or not the coffee story in Vietnam is an isolated case. On the one hand, it has to be acknowledged that Vietnamese conversion to coffee production happened quite rapidly at the eve of the economic liberalisation: in the Nineties, coffee production in Vietnam grew so rapidly as to surpass Colombia as the world's second-largest coffee producer (Ha and Shively, 2008)[3]. Furthermore, it was characterised by strong regional dependence: in 2001 a single province (Dak Lak) accounted for 257,100 hectares and roughly 50% of total national coffee output (ICARD and Oxfam, 2002). On the other hand, empirical analyses increasingly claim that fluctuations in prices can transmit directly onto incomes with likely negative welfare effects, especially in countries with a supply heavily concentrated on few primary commodities (Razin and Rose, 1992; Koren and

[2] Starting from a position of 65,6% of the total population being in poverty in 1992-93 they reduce their incidence in the population of total poor till to 29,35% in 1997-98, a level below rice producers and consumers, and, generally speaking, below the averages of rural and total poverty in Vietnam (Ha and Shively, 2008).

[3] In the 1990s, coffee production increased at an annual average rate of 30% and by the end of the decade coffee was providing as much as 10% of Vietnam's annual export earnings (Ha and Shively, 2008).

Tenreyro, 2007 Krishna and Levchenko, 2009; Haddad al., 2010; Loayza et al., 2007). On the demand side, price cycles have been shown to affect trade flows and inflation rates in both, importing and exporting countries (Cashin et al., 2000; Barichello, 2000). Furthermore, because of a relative high incidence of natural calamities and floods in the rural areas of Vietnam, farmers are supposed to face a high probability to go back to poverty in the case of downward risks[4]. Whether this probability is actually higher among farmers than elsewhere and/or whether the likely incidence of natural risks is necessarily higher than that of man-made ones, eventually associated with the trade liberalisation process, is however still under debate. These issues have been largely overlooked by current literature. The reason is twofold: current empirical analyses lack an ex-ante assessment of poverty to risk; they generally overlook the role of trade openness as one of the possible channels of risk. Our vulnerability analysis is intended to provide both a response to the above questions and a useful tool to help overcome some of the major weaknesses affecting the applied literature on the welfare impact of trade liberalisation in Vietnam.

3 Trade openness and vulnerability to poverty

A useful attempt to provide an overall assessment of the impact of trade reforms on household welfare, was conducted by Niimi et al. (2007). Adopting the conceptual framework of Glewwe and al. (2002), Justino and Litchfield (2002) and Winters (2002), Niimi et al. (2007) analyse the impact of the "doi moi" reform process in Vietnam through three channels: prices, employment and wages, and fiscal policies. They provide robust empirical evidence that trade reforms have actually contributed to reducing poverty in Vietnam. However, they do not investigate the welfare impact of people's exposure to risk induced by the opening up process.

This is a general tendency of the current empirical estimates on the links between trade openness and poverty dynamics which are mainly "ex-post" analyses. There is a reason for that. Shedding light on the vulnerability from trade openness is far from a trivial task. It asks for a thorough conceptualisation of household vulnerability as well as for a detailed investigations of

[4] According to the MOLISA (Ministry of Labour, Invalids and Social Affairs)'s records each year about 20,000-25,000 households fall back into poverty (Heo and Doanh, 2009).

foreign shocks induced by trade openness and of their transmission channels within both supply and demand sides of the economy. This should be coupled with a full investigation of the main risk management (ex-ante) and coping strategies (ex-post) actually available for households in a trade liberalisation scenario (Dercon, 2005; Alderman and Paxson, 1994). For instance, in the first case, households could try to reduce the variability of their welfare ex-ante by relying on income diversification, multiple occupations and/or strategic migration. However, these actions usually imply conservative choices which lower the expected value of income in exchange for lower variability[5]. In the second case, they could try to cope with shocks by engaging in self-insurance practices, e.g. precautionary saving, asset smoothing or recourse to group-based risk-sharing which enables them to spread the effects of shocks (Dercon, 2005)[6].

It is worth stressing with this empirical exercise that the strategies households employ both to mitigate risks (i.e., risk-induced ex ante changing behaviour, Elbers and Gunning, 2007; Giles and Yoo, 2007; Jalan and Ravaillon, 2001) and cope with shocks (Coate and Ravallion, 1993; Udry, 1994; Townsend, 1994, 1995; Besley, 1995; Morduch, 2002) are costly in the short-run even if the overall impact in the long-run is net beneficial (Ravallion 1988; Morduch 1994; Dercon, 2005). Focusing on trade risks we could make an additional argument against the universal benefit from trade. This in line with the well-known example of Newbery and Stiglitz (1984) where free trade has been proved to be Pareto inferior to autarky when risky economies are taken into account with no insurance markets.

Current analyses generally fail to take into account the likely impact of trade openness on the future dynamics of poverty as well as the relationship between risk and openness (Montalbano, 2011). Concerning the first issue,

[5] The literature on income smoothing mainly focuses its interest on aspects related to farm production such as the intensity of inputs adoption (Morduch, 1990; Dercon and Christiaensen, 2011), the diversification of activities (Morduch, 1990, Townsend, 1995, Dercon, 1996), the occupational choices (Rosenzweig and Stark, 1989; Kochar, 1999; Rose, 1995) and their net impact on the expected profit of the household (Rosenzweig and Binswanger, 1993)

[6] Both management and coping strategies can operate through i) an informal channel, which includes personal, family and community arrangements; ii) a market-based channel, based on the opportunity provided by institutions such as banks, insurances or microfinance corporations; or iii) a public channel, which implies a series of welfare state interventions aimed at protecting specific subsets of the population, e.g. against unemployment, old-age, work injury, disability, widowhood and sickness.

a number of authors highlight the likely existence of a link between trade openness and vulnerability to expected poverty. This could derive from several channels: firstly, poorer households may be less able to take advantage of the positive opportunities created by trade reforms, preferring low-return low-risk activities to potentially highly profitable but risky ones (Winters et al., 2004). Thus, they suffer the costs of trade reforms without reaping any compensating benefits in the form of higher average earnings (see Morduch, 1994). This, together with the presence of risky assets (Elbers et al, 2007) may explain "'ex-ante" their unwillingness to pursue high average returns linked to the different activities opened up by trade reforms, resulting in "poverty traps" (see also Carter and Barret, 2006). Moreover, the poor can be less able to protect themselves against the adverse effects of a "new set" of "man-made" foreign shocks and incentives. This is because traditional mechanisms could not work as well as in the pre-liberalisation scenario, hampering people's standard management strategies (Dercon, 2001; Tesliuc and Lindert, 2004). The result is increased uncertainty and, since household welfare is negatively affected by uncertainty over future change, increased vulnerability to poverty (Ligon, 2006; Calvo and Dercon, 2007).

This leads us to the second issue: whether or not international trade actually affecst the degree of riskiness faced by households. In principle, this could happen in two ways: by changing the riskiness of existing activities, for instance by altering the weight of foreign relative to domestic shocks faced by the economy; or by changing the emphasis among the different activities households engage in such as, for instance, switching from subsistence food crop to cash crops (McCulloch et al., 2001). Hence, trade openness could alter households' optimal portfolios, so that their current ones become sub-optimal "ex-ante"[7]. This is especially the case with the poor, because of their "poor" ability to bear "new risks", their weak capabilities to insure themselves against adverse impacts and, possibly, the lack of information about the risks associated with the new activities induced by openness. Furthermore, trade openness can also affect government ability to adopt price stabilization policies and/or contribute to the elimination of institutions or policies aimed at smoothing domestic prices (Winters, 2002; Winters et al., 2004). In all the above cases, trade openness can have an impact on households' optimal

[7] Of course, *ex post*, a household may lose out from unlucky realisations. Hence, increases in observed poverty can be consistent with ex ante improvements in welfare if households trade higher mean incomes for higher variances (Winters et al., 2004).

portfolios and, eventually, lead to net welfare effects less positive than expected in the long run (Winters, 2002; Winters and al., 2004; Calvo and Dercon, 2007).

In the Vietnamese context, poor households in the midst of trade reform have two options in principle : i) rely, with respect to ongoing trade reforms, on "conservative choices" (e.g., subsistence farming) as main risk management strategy: this choice could help to insulate them from trade related man-made shocks, but have them remain vulnerable to the pre-liberalisation ones (e.g., natural ones), leaving them in the category of poverty induced vulnerable and possibly, taking them into a cycle of poverty; ii) carry out "progressive choices"[8] (e.g., moving to "export" crops), with an expected increase in mean income as well as in income variance. In this scenario, they could climb out of poverty but fall under the category of risk induced vulnerable (to both pre and post liberalization shocks). These two categories face different types of risks (foreign vs domestic) and are forced to apply different risk management strategies as well as to rely on different risk coping strategies when the shocks occur. Hence, they would show different behavioural choices "ex-ante" and different welfare impacts "ex-post".

Going into detail in this extremely complex issue goes far beyond the scope of this work. It asks also for the availability of panel data for a wide range of interrelated issues. Our aim is to begin with a limited but workable scope: to get useful hints about the presence of heterogeneity in the behavioural choices of households under risk according to their relative degree of trade exposure. This is intended as a first empirical step in isolating the relative impact of trade induced vulnerability to poverty. To this end, we focus on consumption behaviour as a key behavioural tool in explaining households choices under risk. We assume the impact on future welfare passes through a deviation from a smooth path of consumption (Loayza et al., 2007; Federici and Montalbano 2012). This is consistent with the standard vulnerability approaches that look at consumption as a more reliable indicator of individual welfare than income. Moreover, consumption choices actually engender a further set of behavioural changes also apt to produce likely effects on household welfare, such as: smoothing asset/income; self-insurance; risk-sharing arrangements; diversification, multiple occupations, migration, etc. (Morduch, 1994; Rosenzweig and Wolpin, 1993; Townsend, 1994; 1995, Carter and Barret, 2006; Zimmerman and Carter, 2003).

[8] The term progressive is here used with respect to ongoing trade reforms.

A number of attempts have been made to date to investigate "vulnerability to poverty" in Vietnam under "doi moi" (Ligon and Schechter, 2004; Imai et al., 2011). However, to our knowledge, no empirical study has yet investigated the links between vulnerability and trade openness in Vietnam. This is partially due to the intrinsically challenging nature of the "vulnerability from trade" issue. As already stated in Montalbano (2011), it implies the ability to create a unified framework two issues, trade openness and vulnerability, which are traditionally seen as separate topics. Moreover, trade theory does not provide a full understanding of the links between trade openness, shocks and uncertainty while the empirical evidence is mixed, scattered in separate fields of analysis and does not reach a common stance[9].

The objective of this work is to fill this gap by providing a first empirical test, using both VLSS and VHLSS data for the period 1992-2008 (covering the entire "doi moi" reform process), on the presence of "risk induced" vulnerability linked to trade exposure. Following up Winters (2002) and Winters at al., (2004) the degree of trade exposure of households will be assessed in relation to their belonging to the following categories: production sector, occupancy status and regional settlement. Thanks to the availability of household cross-sectional data over a longer time span (1992-2008) not on offer to previous empirical works on the issue, we can provide useful insights about the net effects of trade openness in Vietnam covering both the waves of trade liberalisation actually experienced by the country.

[9] Substantive empirical analysis has been devoted up to now to the investigation of the links between openness and fluctuations (Rodrik, 1998, 1999; Easterly and al., 2001; Kose and Yi, 2001, 2006; Acemoglu et al., 2003, Kose et al., 2003; Fatas and Mihov, 2003, 2005; Razin et al. 2003; Imbs, 2004; Koren and Tenreyro, 2007, Raddatz, 2007; Loayza and Raddatz, 2007; Malik and Temple, 2009; Di Giovanni and Levchenko, 2009; Krishna and Levchenko, 2009; Haddad and al., 2010). Within this literature, "trade induced" instability has been traditionally seen as terms-of-trade shocks (Rodrik, 1998). However, it is increasingly apparent nowadays that the more open developing economies show overall greater output volatility and, in some cases, greater consumption volatility too (Loayza et al., 2009). While the above empirical literature looks primarily at macrofluctuations, investigations on households are rare, mainly because of the lack of long term panel data (see Winters et al., 2004).

4 Our measures of vulnerability to poverty

We rely on two measures of vulnerability to poverty: the so called "Vulnerability to Expected Poverty" (VEP) method (Pritchett et al., 2000; Christiaensen and Subbarao, 2005; Chaudhuri and Datt 2001; Chaudhuri et al., 2002 and Chaudhuri 2003; Kamanou and Morduch, 2004) and an "adjusted version" of the "Vulnerability as Expected Utility" method (Ligon and Schechter, 2003; 2004). The use of the VEP measure as the baseline scenario for our analysis is justified by its widespread use in the literature as well as its undeniable efficacy in presenting a first overview of the phenomena under analysis. However, its weak theoretical background as well as the strong assumptions behind its practical implementation, push us to seek a micro-founded measure of vulnerability to poverty able to overcome the most serious limitations of previous empirical analysis. We believe that the proposed "adjusted version" of VEU measure is suitable for the scope.

The VEP method looks at vulnerability simply as the probability that a household will fall into poverty in the future. To this end, it adapts to a stochastic environment the standard FGT index (Foster et al., 1984) and takes its expected value as follows:

$$V_{\alpha,ht} = F(z) \int_0^z \left(max \left\{ 0, \frac{z - c_{h,t+1}}{z} \right\} \right)^{\alpha} \frac{f(c_{h,t+1})}{F(z)} dc_{h,t+1} \qquad (1)$$

where c_h is household's consumption; z is the standard poverty line; $F(.)$ and $f(.)$ indicate, respectively, the cumulative distribution and the density function of consumption at time $t+1$[10]. Eq. [1] measures the probability of falling below the poverty line, i.e. $F(z)$, multiplied by a conditional probability-weighted function of the shortfall below this poverty line (Christiaensen and Boisvert, 2000). Since we rely on the headcount measurement of poverty ($\alpha = 0$), the VEP measure reduces to the probability that the household will experience poverty, i.e $V = F(z)$[11]. The distribution F is taken as given and

[10] Eq. [1] is obtained by multiplying the expected value of the poverty index by $F(z)/F(z)$. For more information on the derivation procedure of Equation 1, see Christiaensen and Boisvert, 2000.

[11] The majority of works (Christiaensen and Boisvert, 2000; Pritchett et al., 2000; Chaudhuri and Datt, 2001; Chaudhuri et al., 2002) rely on this choice, but there are also some VEP applications which look at the depth of poverty ($\alpha = 1$) and at the spread of its distribution ($\alpha = 2$) (see, for example, Ravallion, 1988).

reflects both the household exposure to shocks (idiosyncratic or covariant) and ability to cope with them.

The VEP method is the most commonly applied measure of vulnerability[12]. The reason is twofold: it is easily interpretable since it provides results in terms of expected values of the common FGT class of decomposable poverty measures; it permits one to assess vulnerability using a single round of cross-sectional data, which is particularly convenient in the absence of panel data, as is the case for most developing countries. It can also provide a first decomposition between "poverty induced" vulnerability (i.e., vulnerable households with estimated expected mean consumption below the poverty line) and "risk induced" vulnerability (vulnerable households with estimated expected mean consumption above the poverty line, but high estimated variance of consumption). As noted by Hoddinott and Quisumbing(2003), it could be very useful for policymaking. In fact, where poverty incidence is low but a substantial proportion of households have consumption just above the poverty line, governments could assume that poverty is not an issue to be targeted, but households remain vulnerable to shocks. In these cases, the VEP index shows that public intervention is still needed.

The VEP method suffers various shortcomings, some related to the problems originated by the FGT measures of poverty and others specific to the stochastic nature of the analysis and the underlying assumptions. First of all, the VEP methodology iso only able to assess the impact of uncertainty and risk on the variance of the consumption distribution, ruling out the opportunity to detect any effect on its expected value. Secondly, it leads to somewhat perverse policy implications, since an increase of the variance of consumption is beneficial for vulnerable households with expected consumption below the poverty line. Notwithstanding its intrinsic limitations, the VEP method still represents the most convenient way to take a first look at the vulnerability phenomenon, based as it is on a simple and workable measure, apt also to

[12] A first taxonomy of the main methods applied in vulnerability analysis has been provided by Hoddinott and Quisumbing (2003). A slight update to this (provided in Montalbano, 2011) identifies three main typologies of vulnerability measures: VEP-Vulnerability to Expected Poverty (Christiaensen and Boisvert, 2000; Christiaensen and Subbarao, 2005; Chaudhuri and Datt, 2001, Chaudhuri 2003; Chaudhuri et al., 2002; Pritchett et al., 2000; Gunther and Harttgen, 2009); VEU - Vulnerability as Low Expected Utility (Ligon and Schechter 2003, 2004); VFP - Vulnerability as Threat of Future Poverty (Calvo and Dercon, 2003, 2005, 2007).

present comparisons across categories characterised by different degrees of exposure to shocks, including foreign ones.

The VEU method counteracts the weak theoretical background of VEP by assessing vulnerability as the difference (in utils) between the utility derived from some level of certainty-equivalent consumption analogous to the choice of a poverty line in the literature of poverty measurement,z (above which the household would not be considered vulnerable), and the expected utility of consumption, as follows:

$$V_h = U_h(z) - EU_h(c_h) \tag{2}$$

where U_h is a weakly concave, strictly increasing function[13]. Also VEU is able to disentangle "poverty induced" vulnerability - as low expected mean of consumption - from "risk induced" vulnerability, linked to consumption fluctuation. To this aim, it decomposes Eq. [2] into two distinct components reflecting poverty and risk, respectively:

$$V_h = [U_h(z) - U_h(Ec_h)] + [U_h(Ec_h) - EU_h(c_h)] \tag{3}$$

where the first bracketed term involves no random variables and the second one measures the "risk premium", i.e., the amount of utility the household would be prepared to give up rather than face the risky prospect[14].

Both VEP and VEU measures assume that risks affect only the volatility of consumption around its mean but not the mean itself. More specifically, they lack a solid micro-foundation able to provide a thorough assessment of the effects of risks on households' savings and consumption decisions (Elbers and Gunning, 2003).The main shortcoming is given by the fact that vulnerability literature, generally speaking, overlooks the key role of the behavioural response to risk - i.e., it does not provide any clue for distinguishing if vulnerability is generated by exposure to shocks or lack of coping mechanisms. Practically speaking, current approaches to vulnerability would register households that adopted complete self-insurance mechanisms at the cost of lower

[13] This method applies the class of von Neumann-Morgenstern expected utility functions. Ligon and Schechter (2003) adopt the CRRA utility function which takes the form $U_h(c) = \frac{c^{1-\gamma}}{1-\gamma}$, where the parameter $\gamma > 0$ measures household's relative risk aversion.

[14] It is the "natural" counterpart, denominated in utils, of the " risk premium" the household would be willing to forego in order to eliminate the risk. It can be measured, starting from a (weakly) concave utility function, as the difference between the utility of consuming the expected consumption with certainty and the expected utility from consuming c_h.

mean welfare as unaffected by risk; hence attributing their low level of welfare entirely to non-stochastic components of poverty. In other words, they fail to assess exactly the welfare impact of both mitigating and coping strategies which we aim to examine in our analysis of vulnerability to poverty from trade in Vietnam. Hence, they produce a structural underestimation of the risk component of vulnerability with a parallel overestimation of its poverty component, leading to biased outcomes.

To avoid this shortcoming, and take into account the simple evidence that risk affects "ex-ante" households savings decisions and thereby their consumption level, we introduce our "Adjusted VEU" (AVEU) measure of vulnerability. Our AVEU measure evaluates, besides the non-stochastic poverty determinants and the household's observed impact of shocks, the net effect of risk-induced "ex-ante" changing behaviour. Starting from a common theoretical background with VEU, we decompose the "risk term" of the standard VEU measure as suggested by several authors (Elbers et al. 2007, Elbers et al. 2009, Carter and Ikegami, 2009). Hence, we come up with the following empirical version of vulnerability:

$$V_{ht} = T_t \left\{ [U(z) - U(Ec_h)] + [U(Ec_h) - EU(c_{ht}^{EA})] + [EU(c_{ht}^{EA}) - EU(c_{ht}^{FS})] \right\} \tag{4}$$

$$\text{where } T_t \begin{cases} 1 & \text{if } [U(z) - U(c_{ht}^{FS})] > 0 \\ 0 & \text{if } [U(z) - U(c_{ht}^{FS})] \leq 0 \end{cases}$$

Where Ec_h indicates, as usual, the non-random expected level of consumption; c_{ht}^{EA} the ex-ante consumption counterfactual; and c_{ht}^{FS} the full-stochastic consumption counterfactual. The non-random level of consumption represents the optimal choice of the household in a risk-free context. The ex-ante counterfactual represents the consumption level we would have if the household correctly perceives the distribution of risks but actually never experiences shocks. Finally, the full-stochastic counterfactual indicates the mean outcome when the distribution of risks is known and the household is also hit by the shock realizations. T_t is an indicator function which allows us to consider the non-vulnerable outcomes as if they just have reached the future poverty line, forcing the vulnerability index to be non-negative[15].

[15] Something similar to what Calvo and Dercon (2007b) call the "Focus Axiom". In this case it prevents any *compensation* of deprivation spells by non-deprivation ones.

Before estimating our measures of vulnerability to poverty (VEP and AVEU), we need to assume a consumption generating process. According to a consolidated literature, the household's consumption in any period is determined by its wealth, its expectations of future income, the income and asset uncertainty it faces and its behavioural responses to cope with and manage risks. In turn, all these factors are functions of a variety of observable household characteristics, such as demographics, education, occupation and depend on a set of characteristics related to the surrounding economic environment (Deaton 1992; Browning and Lusardi, 1995; Chaudhuri, 2003; Dercon, 2005). Hence, assuming that consumption is log normally distributed and that the log-consumption is normally distributed and following Gleewee et al., (2000); Minot and Baulch, (2005); Niimi et al., (2007); Justino et al., (2008); Cuong et al., (2010), Nguyen and Winters, (2011), we apply a reduced-form of the consumption function based on the following simple linear econometric specification:

$$c_{ht} = \alpha + \beta X_{ht} + \varphi V_t + \epsilon_{ht} \tag{5}$$

where c_{ht} is the log of per capita consumption of household h at time; X_{ht} and V_t are two vectors of exogenous variables which control, respectively, for the household's and village's characteristics; ϵ_{ht} is the error term.

The VEP method (Chaudhuri et al., 2002; Chaudhuri, 2003) acknowledges the stochastic nature of consumption simply by noting that the error term in Eq. [5] is not the same for all households (heteroskedasticity), rather there is heterogeneity in consumption volatility around the mean. It thus addresses the issue, by using a 3-steps Feasible Generalized Least Squares (FGLS) econometric procedure suggested by Amemiya (1977). At first, it estimates Eq. [5] using an ordinary least squares (OLS) procedure. Then it estimates the residuals from the equation and runs the following estimating process of the error variance which is usually a function of the same covariates included in the specification of the consumption process. Specifically, we have:

$$\hat{\epsilon}^2_{ht,OLS} = \hat{\rho} + \hat{\delta}_1 X_{ht} + \hat{\delta}_2 V_t + \eta_{ht} \tag{6}$$

Eq. [6] solves the heteroskedasticity problem and contributes to the building up of efficient estimates of the expected consumption level. From an economic perspective, it provides us with a robust method to link the household's characteristics to the amount of unexplained consumption in Eq.

[5], which is peculiar to vulnerability analysis. The predictions of Eq. [6] are thus used to weight the previous equation, obtaining the transformed version:

$$\frac{\hat{\epsilon}^2_{ht}}{\hat{\epsilon}^2_{ht,OLS}} = \frac{\rho}{\hat{\epsilon}^2_{ht,OLS}} + \delta_1 \frac{X_{ht}}{\hat{\epsilon}^2_{ht,OLS}} + \delta_2 \frac{V_t}{\hat{\epsilon}^2_{ht,OLS}} + \frac{\eta_{ht}}{\hat{\epsilon}^2_{ht,OLS}} \tag{7}$$

As reported by Chaudhuri (2003), the OLS estimation of Eq. [7] gives us back an asymptotically efficient FGLS estimate, δ_1^{FGLS} and δ_2^{FGLS} and thus ϵ^2_{ht} is a consistent estimate of σ^2_{ht}, the variance of the idiosyncratic component of household consumption. Once we obtain an efficient estimate of the variance as the predicted value of Eq. [7] ($\hat{\sigma}^2_{ht,FGLS}$), we can finally take its square root and transform Eq. [5] as follows:

$$\frac{c_{ht}}{\hat{\sigma}_{ht,FGLS}} = \frac{\alpha}{\hat{\sigma}_{ht,FGLS}} + \beta \frac{X_{ht}}{\hat{\sigma}_{ht,FGLS}} + \varphi \frac{V_t}{\hat{\sigma}_{ht,FGLS}} + \frac{\epsilon_{ht}}{\hat{\sigma}_{ht,FGLS}} \tag{8}$$

An OLS estimation of Eq. [8] gives a consistent and asymptotically efficient estimate of α^{FGLS}, β^{FGLS}, and φ^{FGLS}. Once we have these estimates, it is possible to estimate both the expected log consumption and its variance:

$$\begin{aligned} \hat{E}[(c_{ht}|X_{ht}, V_t)] &= \alpha^{FGLS} + \beta^{FGLS} X_{ht} + \varphi^{FGLS} V_t \\ \hat{Var}[(c_{ht}|X_{ht}, V_t)] &= \rho^{FGLS} + \delta_1^{FGLS} X_{ht} + \delta_2^{FGLS} V_t \end{aligned} \tag{9}$$

The VEP index thus measures "vulnerability to poverty" as the probability that household h will be poor, as follows:

$$\hat{V}_{ht} = Pr[(c_{ht} < z)|X_{ht}, V_t] = \Phi\left(\frac{z - \hat{E}(c_{ht})}{\sqrt{\hat{Var}(c_{ht})}}\right) \tag{10}$$

where $\Phi(\cdot)$ is the cumulative function of the standard normal[16].

For what concerns our AVEU index, we acknowledge the stochastic nature of consumption by exploiting Eq. [5] to retrieve our three consumption counterfactuals. The non-random consumption is assumed to be simply equal to the predicted value of the Eq. [5]. The measure of both the expected ex-ante and ex-post consumption counterfactuals (c^{EA}_{ht} and c^{FS}_{ht}) calls instead for

[16] To address measurement errors and likely omitted variable bias, Chaudhuri and Datt (2001) make a multiplicative adjustment to the estimated variances such that the predicted mean of the consumption be equal to its observed mean for each year of estimation.

an empirical test of household precautionary behaviour in consumption under risk[17]. To this end, we first need to identify an observable and exogenous proxy of risk. The most applied method to extract parsimonious information on risk from data is to calculate the variance of innovations to income, i.e., the unexpected component of income variation. This is usually performed by estimating the innovation errors as the residuals of an income equation, i.e. $\hat{\mu}_{ht}$ and calculating their variance in order to obtain a measure of income risk (Carroll and Samwick 1997, 1998; Hubbard et al, 1994; Gourinchas and Parker, 2002; Jalan and Ravallion, 2001; Meghir and Pistaferri, 2004; Storesletten et al., 2004). Following this common method, we estimate:

$$y_{ht} = \tau + \gamma Z_{ht} + \pi V_t + \mu_{ht} \tag{11}$$

Where y_{ht} is the log of per capita income, Z is similar to X in Eq. [5] with the inclusion of the occupation characteristics [18], and V is the same set of commune characteristics than in Eq. [5]. Since the lack of panels prevents us from exploiting the time dimension of the data, we address the issue here by computing the variances of income innovations within sub-samples of households grouped by the relative trade exposure of their sector of activity[19]. As discussed in section 3, we assume here that households face heterogeneity in risk exposure according to their relative degree of trade exposure or, alternatively, that households involved in the same trade-related production activities share a similar level of risk. This can be related to heterogeneity between domestic and foreign risks. In other words, we are assuming that income from "conservative activities" (non traded sectors) are mainly affected by similar shocks (e.g. bad weather, crops failure or livestock diseases). These sources of risk are assumed to be different in nature from those mainly affecting people engaged in "progressive activities" (i.e. import and export related sectors) who are supposed to face mainly foreign market induced risks (e.g. international price fluctuations, exchange rate fluctuations,

[17] Browning and Lusardi (1996) provide an excellent survey of the empirical test on precautionary saving based on linear regression.

[18] The occupation characteristics are assumed to influence consumption behaviour only through income and asset. Please note this procedure does not let us include income among the assets' regressors. This because most of the variables included in the Z set are highly correlated with the level of income, raising a problem of multicollinearity.

[19] To group the households we used here the characteristics of the head of the family. We have also performed the same exercise according to the occupation status and sector of activity of the majority of household members. The outcomes do not change significantly.

etc.). As we will see in the section 5, our assumption is confirmed by empirical tests.

Following this approach, we first categorize households in the following eight groups: non-farm export; non-farm import; non-farm non-traded; rice; farm main export; farm other export; farm import and farm non-traded. Then, we estimate income risk by calculating the variance of the income innovations intra-group in each round of observations as follows:

$$\sigma^2_{ygt} = \sum_{h=1}^{n} (\mu_{hgt} - \bar{\mu}_{gt})^2 / n \tag{12}$$

where $\mu_{h,g,t}$ indicates income innovation of household h in group g in round t of observations. Following Skinner (1988), Guiso et al. (1992), Blundell and Stoker (1999), Banks et al., (2001) and Giles and Yoo (2007) we further refine our measure of risk, scaling it by a specific factor (π_{ht}) based on household expected wealth. In particular, consistent with the adoption of the CRRA utility function, we assume that poorer individuals are more responsive to changes in risk scaling up the variance of income innovations by the square of the ratio between current household's income and expected lifetime wealth[20]. Our final proxy for income risk is thus the following:

$$\sigma^2_{yht} = \pi_{ht} \sigma^2_{ygt} \tag{13}$$

where $\pi_{ht} = \left(\frac{y_{ht}}{\hat{W}_{ht}}\right)^2$ and W_{ht} is our measure of the expected wealth. However, considering the difficulties of extracting reliable information on the expected wealth from the available cross-sections, we follow Banks et al. (2001) and Giles and Yoo (2007) by replacing the expected wealth with the observed level of per capita consumption. Despite its theoretical foundation, the scaling term has the additional advantage of allowing us to get a specific risk measure for each household in the sample in each period, further differentiating risk exposure across the households belonging to the same group. Income risk is not the only component of risk households face. Another autonomous source of risk is "asset risk", which also influences saving decisions (Dercon, 2005).

[20] According to Skinner (1988) and Guiso et al (1992), the exponent of the scaling factor measures the sensitivity to the level of expected wealth exhibited by the reaction to uncertainty. If the exponent is more than zero, the effect of risk on consumption declines with the household's resources and the decline is faster the higher is the value. Usually, the adopted value is two and this is why we use the square of that ratio.

Asset risk is a plausible hypothesis especially in developing countries where assets such as livestock and stored crops are the only way for households to smooth consumption and generate income (Gunning, 2010). Hence, following Jalan and Ravallion (2001) we include asset risk in our model, using the same procedure adopted for income risk. It means we re-estimate Eq. [11] by replacing the level of per-capita income with the per-capita value of assets as the dependent variable. Thus, we retrieve the asset innovations, calculate their intra-group variance and, finally, scale it by the square ratio between current household income and our measure of expected wealth.

Besides the ex-ante impact of risk on consumption choice, we also want to catch the ex-post effects of idiosyncratic shocks in order to isolate the ex-post component of the AVEU measure. Unfortunately, the design of the VLSS and VHLSS does not allow us to differentiate between trade and non-trade related shocks and, as a consequence, we are forced to rely on income and asset risk realisations. The empirical literature provides numerous methods for capturing the realisations of risk and they are based either on a direct and self-reported measure of income and asset losses (e.g. Udry, 1995; Dercon and Krishnan, 2000) or on an indirect and estimated version of them (e.g. Rosenzweig, 1988; Paxson, 1992; Jacoby and Skoufias, 1997; Kochar, 1999, Jalan and Ravallion, 1999; Morduch 2004). Considering that the self-reported measures of idiosyncratic shocks can be biased by subjective perceptions and influenced by the available coping mechanisms of the respondents, we prefer to rely on actual estimates by extracting the information from the residuals of the income and asset regressions already used to calculate the two proxies of risk. In particular, we calculate the income shock variable as the ratio between the household residual from Eq. [11] and its predicted level of income, i.e.:

$$\zeta_{yht} = \frac{\hat{\mu}_{ht}}{\hat{y}_{ht}} \tag{14}$$

In order to obtain the true idiosyncratic shocks we insert a series of provincial dummies into the Eq. [11] which allows us to "clean" the residual from its covariate component. We repeat the same procedure for the asset shock variable (ζ_{kht}). Finally, we disentangle the positive (ζ_y^+ and ζ_k^+) from the negative (ζ_y^- and ζ_k^-) shocks for both asset and income in order to consider the possibility that the households are credit constrained and thus unable to fully smooth their consumption in case of negative shocks. The last step is to exploit the two proxies of risk and the four shock variables to retrieve our

ex-ante and ex-post consumption counterfactuals. Firstly, we add the two proxies of income and asset risk to the non-random consumption function estimated in Eq. [5]. It allows us to calculate the ex-ante counterfactual, c_{ht}^{EA}, for household h at time t as the predicted value of the following equation:

$$c_{ht} = \alpha + \beta X_{ht} + \varphi V_t + +\theta_1 \sigma_{yht}^2 + \theta_2 \sigma_{kht}^2 + \epsilon_{ht} \tag{15}$$

Secondly, we re-estimate Eq. [15] adding up also the four shocks variables and obtaining the full-stochastic consumption counterfactual , c_{ht}^{FS}, as the predicted value of the following equation:

$$c_{ht} = \alpha + \beta X_{ht} + \varphi V_t + \theta_1 \sigma_{yht}^2 + \theta_2 \sigma_{kht}^2 + \theta_3 \zeta_y^+ + \theta_4 \zeta_y^- + \theta_5 \zeta_k^+ + \theta_6 \zeta_k^- + \epsilon_{ht} \tag{16}$$

Having obtained the three consumption counterfactuals ($E(c_{ht})$, c_{ht}^{EA}, c_{ht}^{FS}), we can plug them into the AVEU index, and calculate the empirical version of the Eq. [4]. Following Ligon and Schechter (2003), we adopt the logarithmic version of a CRRA utility function (i.e. imposing a coefficient of risk aversion, γ, equal to 1)[21].

It should be noted, finally, that our measure of vulnerability is applicable also using single rounds of cross-sectional data. Hence, it is highly suitable for empirical analyses in developing countries, which chronically are characterised by lack of long panel data. The drawback is that it relies, as in the VEP case, on the standard assumption that the observed inter-household distribution of consumption at a point in time should represent the future distribution of consumption across states of nature for each household. Notwithstanding this common caveat, it presents clear added value with respect to the standard VEP measures, widely used in current applied literature.

5 Trade Liberalisation in Vietnam and vulnerability to poverty in the long run (1992-2008): the empirical results

Taking into consideration the lack of panel data covering the entire period, our empirical exercise relies on cross-sectional data for the following years:

[21] Please note that assuming $\gamma = 1$, CRRA utility equals natural log of consumption, since $\lim_{\gamma \to 1} \frac{c^{1-\gamma}}{1-\gamma} = \ln c$

1992, 1998, 2002, 2004, 2006 and 2008. First, we perform an aggregate analysis of vulnerability estimating the three consumption counterfactuals using the entire sample available for each round of cross-sectional data; then, we investigate the evolution of vulnerability, focusing on the average values reported by subsets of the population characterised by different degrees of involvement in trade related activities.

5.1 Data and consumption estimates

Data come from two different sets of Vietnamese household surveys (VLSS and VHLSS). The VLSS was undertaken in the period 1992/93 using a sample of 4.800 households, of which 4.000 were re-interviewed in 1997/98, out of a sample of 6.000 households in total. The VHLSS collected information from a new sample of 29.530 households in 2002; 9.188 in 2004; 9.189 in 2006 and 2008. Unfortunately, as reported by Pham and Reilly (2007) and Le and Booth (2010), the sampling frame for VHLSS differs substantially from that of VLSS: while VLSS used the 1989 Population Census, the VHLSS 2002 exploited the Population and Housing Census from 1999. Moreover, as highlighted by McCaig (2009), panel data for the period of 2002-2004-2006 are also incorrect: of the 4.476 households interviewed in the 2004 VHLSS that should have a matching household in the 2002 VHLSS, 429 appeared to be mismatched (9.6 percent) and these matching errors in the 2002-2004 VHLSS household panel contribute to mismatches in the 2002-2004-2006 VHLSS household panel.

As explained in the previous section, the first step of our empirical analysis is to estimate expected consumption for each household in the sample for each available survey. Concerning the VEP method, this means applying the FGLS econometric procedure discussed in the previous section. Concerning AVEU it means estimating the three consumption counterfactuals needed to apply the proposed decomposition procedure. To this end, we run separate OLS regressions with robust standard errors, controlling also for intra-group correlation of errors at the commune level. Table B.1 provides the regression results of Eq. [16] which includes the impact of both income/asset "ex-ante" and "ex-post" components, as well as, a set of covariates for the deterministic component of consumption[22]. The set of covariates used for this exercise includes household's characteristics (such as characteristics of the household head,

[22] Eq. [5] and Eq. [15] are not reported in this work, however, the sign and the significance of the coefficients are the same of Eq. [16]

e.g. linear and quadratic age, marital status, sex, etc.; linear and quadratic terms of family size; the number of children, etc.); education achievements (primary, secondary, upper secondary, technical/vocational, university) as well as village-level infrastructure characteristics (such as the presence of roads, water pipelines, public transports, urban/rural environment). We also include province dummies to control for spatial heterogeneity. The variable used for consumption is the real per capita food and non-food expenditure readjusted by price indexes of regions and months, while the poverty lines are expressed in Vietnamese dongs as follows: 1160000 for 1992; 1790000 for 1998; 1915000 for 2002; 2070000 for 2004; 2559000 for 2006; 3360000 for 2008[23]. The variable for assets is computed as the current value of items included in Table B.3.

As is apparent from Table B.1, all the deterministic components of consumption are statistically significant and show the expected signs. The coefficients of age and its square confirm the well-known concave age-consumption profile: consumption grows together with the age but at a decreasing rate. Not surprisingly, having children reduces household per capita consumption while being married increases it. Interestingly, whether the household head is male or female has an impact on expected consumption. Education variables too behave as expected, i.e. the higher the level, the higher the consumption. Lastly, most of the village characteristics (urban status, availability of electricity, tap water and public transport) increase the level of consumption while the presence of paved road does not seem to be a key factor. The ex-ante components are significant too. They assess the role played by the presence of uncertainty in income/asset on household behavioural choices. In each of the surveys under analysis the net effect on consumption (in levels) of the ex-ante components is negative. With the relevant exception of 1992, it passes through a negative impact of income uncertainty. Even if our exercise cannot be considered a proper test of the precautionary saving theory - because of its static nature - our results are consistent with provisions made by the theory, i.e., income fluctuations imply a lower level of consumption (and higher level of assets). Note, however, that if we control for uncertainty in assets too (less common in previous empirical literature) this precautionary saving effect is partially counterbalanced by household incentive to increase

[23] For the regional deflators, we use the indices provided by the GSO in the VHLSS. We also replicate the same exercise using the different set of regional deflators provided by Brian McCaig and the results do not change significantly.

current consumption (and reduce saving) induced by asset uncertainty. The net effect on current consumption of "ex ante" changing behaviour is indeed negative for all the surveys.

Finally, the estimates confirm that income and asset shocks have a significant impact on consumption (positive in the case of positive shocks, negative in the case of downside ones). These results indicate that households are not able to smooth their consumption fully, i.e., completely ensure themselves against idiosyncratic shocks. It is interesting to note as well that the impact of ex-ante components are substantial and that the impact of negative income shock is almost always significantly higher than its positive counterpart (see Table B.2), indicating that household consumption fluctuates more in the presence of negative events, with permanent effects on future welfare

5.2 Poverty and Risk induced vulnerability in Vietnam: a comparative analysis in the long run (1992-2008)

As already underlined by previous empirical works, during our period of investigation (1992-2008), poverty rates in Vietnam decrease dramatically: while at the beginning of the "doi moi" 1 out of 2 Vietnamese household was poor, this statistic actually reduces to 1 out of 6 in 2008 (see Table 1). This strong poverty reduction came alongside the pervasive liberalisation process carried out under "doi moi". That is why scholars look at the Vietnam process as the success story of the trade liberalisation strategy.

Table 1: Poverty and vulnerability to poverty in Vietnam (1992-2008)

	1992	**1998**	**2002**	**2004**	**2006**	**2008**
Poverty Rate in the Survey (%)	55.21	29.89	27.99	19.44	15.33	16.40
Poverty Rate (%) GSO	58.1	37.4	28.9	19.5	16.00	14.5
VEP Rate (%)	56.11	21.50	18.26	10.77	7.06	8.31
Risk-induced VEP (% vulnerable)	18.74	33.73	30.99	31.24	32.64	31.06
AVEU Rate (%)	55.31	28.02	25.67	16.57	12.75	14.12
AVEU Poverty comp. (average % weight)	37.26	19.69	17.47	17.19	14.58	15.79
AVEU Ex ante comp. (average % weight)	29.28	34.89	30.77	26.86	28.28	29.03
AVEU Ex post comp. (average % weight)	33.46	45.43	51.75	55.95	57.14	55.18
Poverty as main AVEU comp. (% vulnerable)	45.01	23.39	19.79	19.48	16.23	18.39
Ex Ante as main AVEU comp. (% vulnerable)	16.27	23.13	15.98	13.61	12.78	12.79
Ex-Post as main AVEU comp. (% vulnerable)	38.72	53.47	64.23	66.91	70.99	68.82

Table 1 adds new pieces of information to the general picture, by reporting the vulnerability rates, alongside the poverty ones. As our measures of vul-

nerability rely on different units (probabilities in VEP and utils in AVEU, see section 4), for the sake of comparison, we report both vulnerability outcomes using the same metric, i.e., as the percentage of vulnerable households out of the total population. Please note that the lack of yearly observations prevents us from looking properly at the dynamic of vulnerability over time. Each of our cross-section measures of vulnerability should be assumed to be "snapshots" of the expectation to be poor "in the near future", given the information set at t. Last but not least, "ex ante" vulnerability and "ex post" poverty should be viewed as different statistics. Hence, while we can compare their evolution over time, we cannot draw any cross comparisons between them[24].

At first sight, it is evident from Table 1 that there is a decreasing trend of vulnerability rates too. This is apparent looking at both measures of vulnerability. The percentage of vulnerable people decreased from around 55% of the total population in 1992 to 8-14% in 2008. Please note that the AVEU measure regularly registers percentages of vulnerable people higher than the VEP one for all the surveys, except that 1992. This confirms, from our perspective, the structural underestimation made by the VEP measure of both the "ex-ante" and "ex-post" changing behaviour components of vulnerability, especially when the poverty dimension of the phenomenon is reducing, as in the case under analysis. The decomposition method made by our AVEU measure of vulnerability detects the presence of vulnerability, in terms of utils, linked to "ex-ante" changing behaviour, even when households are not actually hit by any shock. Moreover, it assesses the welfare cost of consumption changing behaviour induced by downside shocks. The VEP method also allows for a decomposition of vulnerable households between "poverty induced" and "risk induced" (see section 4). However, it does not distinguish between "ex-ante" and "ex-post" effects of risk and, generally speaking, overlooks the welfare cost of the behavioural responses to risk. Moreover, the VEP vulnerability rate comes from a probability rate based on a specific probability threshold and is thus sensitive to the choice of threshold (see appendix A for additional details).

All that considered, as long as the "poverty component" is becoming less compelling in Vietnam, both vulnerability measures detect the presence of an emerging issue: i.e., the "risk induced" component of vulnerability. Because

[24] Imai et al., (2011) suggest a method to make such comparison by means of a multinomial logit model, adding $VEP_{h,t-1}$ as one of the arguments.

of the intrinsic difference in the computation method (see section 4), with AVEU we cannot provide direct comparisons of "risk-induced" vulnerable people as a percentage of the overall number of vulnerable people. However, alternatively, we can provide similar insights by computing the percentage of people who show "ex-ante" and/or "ex-post" components as the main components in their final AVEU score (see last three rows in table 1). Both measures (risk-induced VEP vulnerability and the sum of "ex-ante" and "ex-post" components in the AVEU case) show a stable increase of their "risk induced" components from 1998 on. Nevertheless, they also show different outcomes (from 55% in 1992 to over 80% in 2008 in the case of AVEU and from nearly 18% to nearly 30% in 2008 in the case of VEP, see Table 1). As already underlined, the VEP measure fails to estimate correctly both the "ex-ante component" (which according to our calculations represents the main source of vulnerability for around 12% of overall AVEU households, see second last line of table 2) as well as "ex post" vulnerability (which according to our calculations represents the main source of vulnerability for around 70% of overall AVEU households, see last line of Table 1) producing overall a structural underestimation of their risk-induced component.

Generally speaking, if we sum up the relative weights of the "ex-ante" and "ex-post" components of our AVEU measure (see the percentage weight of the various AVUE components in Table 1) over 80% of overall vulnerability since 1998 is actually dependent on "risk-induced" determinants. This captures the net cost, in utils, of the likely impact of risk on future consumption, which is actually underestimated by standard measures, such as VEP (our baseline scenario). It should be noted that the above net cost is not zero even when people are not hit by any kind of shock. This empirical evidence is justified by the presence of a net welfare cost of the "ex-ante" changing behaviour in consumption induced by a risky environment (see section 4).

Notwithstanding sensible differences in the outcomes of the two vulnerability measures, they show consistent trends by deciles. First, not surprisingly, we observe two interacting trends: the percentage of vulnerable households tends to decrease through deciles as well as over time (e.g., the percentage of VEP households in the poorest decile, nearly 90% in 1992, decreases to less than 50% in 2008, but it is still the highest score if compared with the other deciles, Table 2). Second, consistent with the outcomes on aggregate, the percentage of risk-induced vulnerable households actually increased across deciles and over time (even in the poorest decile, the percentage of risk induced vulnerable households grew from 7% in 1992 to over 20% in 2008 according

to VEP calculations; and from 55% to 75% of expected vulnerability if we sum up the number of vulnerable households that show the two risk AVEU components as main components in their vulnerability scores).

Table 2: Vulnerability in Vietnam by deciles (1992-2008)

	1992						1998					
	VEP	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
dec1	87.23	7.05	99.29	38.23	16.81	44.96	72.66	16.67	97.43	29.03	25.93	45.04
dec2	88.15	9.41	99.29	40.89	24.07	35.03	46.24	34.92	78.35	17.45	36.14	46.40
dec3	82.23	11.53	95.26	40.17	29.44	30.39	37.50	41.18	53.49	14.92	45.29	39.79
dec4	74.88	20.57	87.44	37.81	34.55	27.64	24.04	46.56	29.54	9.24	41.99	48.77
dec5	63.98	15.19	67.54	35.87	36.53	27.60	14.89	46.91	12.13	11.25	32.82	55.93
dec6	57.21	25.62	52.01	33.03	35.63	31.34	9.36	50.98	5.69	11.26	35.25	53.49
dec7	49.53	32.54	31.28	31.44	36.75	31.81	5.69	54.84	3.12	14.98	42.93	42.09
dec8	29.62	40.80	14.22	26.95	37.79	35.26	2.94	50.00	0.37	0.00	53.60	46.40
dec9	19.19	41.98	5.45	15.22	45.45	39.33	1.28	85.71	0.00	.	.	.
dec10	9.00	57.89	1.18	19.35	46.93	33.72	0.37	50.00	0.00	.	.	.
	2002						**2004**					
	VEP	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
dec1	65.92	17.78	95.36	23.88	23.64	52.48	55.54	20.40	89.78	22.32	23.19	54.49
dec2	42.00	30.79	77.56	16.16	33.95	49.89	21.31	38.73	42.86	13.28	29.67	57.05
dec3	27.34	39.76	44.95	13.08	37.52	49.40	13.30	42.59	18.97	10.56	32.90	56.54
dec4	18.46	38.52	22.11	11.29	35.28	53.44	8.01	49.23	9.12	5.57	35.06	59.37
dec5	12.45	44.38	10.02	7.63	34.15	58.22	4.43	38.89	2.22	6.45	39.32	54.22
dec6	7.77	49.29	4.83	6.17	31.07	62.77	2.59	47.62	1.85	4.76	24.98	70.26
dec7	5.01	52.94	1.47	5.89	30.68	63.44	0.86	57.14	0.86	0.00	22.01	77.99
dec8	2.65	58.33	0.29	7.82	27.95	64.23	0.62	60.00	0.00	.	.	.
dec9	0.96	42.31	0.11	0.00	7.02	92.98	0.86	57.14	0.00	.	.	.
dec10	0.04	0.00	0.00	.	.	.	0.12	100.00	0.00	.	.	.
	2006						**2008**					
	VEP	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
dec1	41.74	23.46	81.76	17.50	25.27	57.23	47.99	20.50	82.41	21.40	25.27	53.33
dec2	14.58	34.45	26.10	13.47	29.36	57.18	15.52	38.46	33.28	8.93	35.52	55.55
dec3	6.74	56.36	7.84	6.41	34.51	59.08	8.21	36.36	14.18	8.68	30.09	61.23
dec4	3.80	58.06	5.64	1.26	39.64	59.10	5.97	55.00	6.42	4.96	35.79	59.25
dec5	2.08	52.94	3.43	4.57	43.27	52.16	2.24	53.33	3.13	0.00	38.45	61.55
dec6	0.73	100.00	1.71	0.00	51.76	48.24	1.34	66.67	0.75	14.65	26.03	59.32
dec7	0.74	50.00	0.74	3.09	47.33	49.58	0.90	100.00	0.45	0.00	47.63	52.37
dec8	0.00	.	0.25	0.00	26.23	73.77	0.45	100.00	0.45	0.00	31.34	68.66
dec9	0.00	.	0.00	.	.	.	0.30	100.00	0.00	.	.	.
dec10	0.00	.	0.00	.	.	.	0.15	0.00	0.00	.	.	.

VEP indicates the percentage of households which are vulnerable according to the VEP method. **Risk-VEP** indicates the percentage of households which are vulnerable because of a high fluctuation of the consumption according to the VEP method. **AVEU** indicates the percentage of households which reports an adjusted-VEU index more than zero. **Pov, Ante and Post** indicates the average percentage weight of, respectively, poverty, ex-ante and ex-post components of the adjusted-VEU index. They sum up to 100.

It should be noted, as well, that the ex-ante component of vulnerability has become increasingly important for the lowest deciles, even if the ex-post component is usually the main determinant of vulnerability (as discussed above, this decomposition is not feasible using VEP). This is a relevant feature

for policymaking. It highlights the need to take account of an additional cost the poorer undertake ex-ante because of their ex-ante change in behaviour in a risky environment. Please note that since the last three columns of table 2 make comparisons, in percentages, between components within the same decile, we cannot assume an absolute higher incidence, in magnitude, of the ex-ante components versus the ex-post ones across deciles. Despite its growing importance, the issue of "risk induced" vulnerability has been largely overlooked by previous vulnerability and poverty analyses. Moreover, the presence in 1992 of a relatively higher percentage of vulnerable people not related to risks in the top decile raises additional concern about the unbiasness of the VEP vulnerability measure when the risk induced component is substantial. Our aim is to go further in exploring this phenomenonby looking at the presence of heterogeneity of both ex-ante and ex-post effects of risk on the changing behaviour in consumption of Vietnamese households according to their relative position with respect to the trade opening process which occurred in Vietnam during the time span under analysis. This issue needs additional and careful investigations.

5.3 Vulnerability to poverty and trade liberalisation in Vietnam

Having acknowledged that in Vietnam "risk induced" vulnerability is becoming the major issue, along with a reduced pressure from the "poverty component", and that existing measures overlook the "ex ante" impact of risk on future consumption, it is now time to undertake the most difficult task of our analysis: to investigate the presence of a likely relationship between risk induced vulnerability and trade liberalisation in Vietnam. The simple evidence that the two phenomena coexist after "doimoi" cannot be the only argument in favour of a direct link between the two. At the same time, this coexistence makes the effort worthwhile.

We focus on the micro linkages between trade liberalisation and household consumption, firstly described by Winters (2002) and Winters at al., (2004) and widely applied to Vietnam during the 90s (Justino et al., 2008; Niimi et al., 2007). According to this framework, direct effects go through products and factor markets.

Following on from the above framework and to get a first glance of the likely impact of trade liberalisation on vulnerability in Vietnam, a preliminary step is grouping households according to the trade openness of their sector of specialisation as well as their employment status, and check for the presence

of heterogeneity in observed vulnerability across groups. Since VLSS and VHLSS surveys do not relate production and external trade, we acknowledge here the work already done by Coello et al. (2010), which have matched the ISIC code of any sector with the SITC classification used in trade data and classified sectors as follows: export manufactured goods; import competing manufactured goods; non traded services; agriculture. A further breakdown of agricultural sector is also provided, as follows: rice (considered apart because of its special status); main export agricultural products, other export agricultural products, import-competing crops and subsistence crops (see Table B.4 for details about the surveyed industries included in each sector)[25]. This allows us to come up with eight trade related production sectors (three non-farm sectors: non-farm exports, non-farm import competing, non-farm non-traded goods; four farm sectors: farm main exports; farm other exports, farm import competing, non-traded farm plus rice considered alone because of its peculiar status in Vietnam). We also grouped the surveyed households by looking at the employment status of the household head[26] as follows: i) wage earners; ii) self-employed farms; iii) self-employed non-farms; iv) "multi-activity"[27].

Table B.5 shows the main characteristics for each production group across time in terms of mean consumption, income, assets and poverty levels. It shows that the vast majority of households in the sample is involved in rice production where however mean income and consumption are significantly lower than in the other sectors. Since 2006, the highest mean income and consumption levels in each rounds of observations are registered in "non-traded non-farm" sectors followed by "farm main exports"[28]. It should also be noted the relative lower incidence of poverty in non-farm sectors as well as the relative strong decrease of its incidence in non-traded farm activities (covering however a limited range of sectors and a small % of the total workforce). Generally speaking, the incidence of poverty seems to be structurally lower in

[25] The classification of industries as net exporters or net importers is made according to the average trade flows in 2002 (at the eve of the new wave of trade liberalization). For additional details about the procedure adopted see Coello et al. (2010).

[26] Also in this case we performed the same exercise according to occupational status and sector of activity of the majority of household members. The outcomes do not change significantly

[27] For additional details about the procedure adopted to match households into the above categories, see Coello et al., (2010).

[28] For details about the sectors, see Table 3 Appendix B.

"non-farm activities" than in farm ones with the relevant exception of "farm main exports" and "non traded farm" sectors.

To test for the presence of likely statistical differences across households in relation to their affiliation to each group we apply Levines T-test for equal variances and oneway ANOVA test for differences in the mean. The F-statistics reject in each round of observation (with, not surprisingly, the exception of year 1992, at the eve of the reform process) with reference to asset residuals) the null hypotheses that the means and the variances of the estimated income/asset residuals are not statistically different across trade related production groups (see Table 3). Hence, it is plausible to assume that if we distinguish production sectors according to their relative degrees of trade openness, we are confronting heterogeneity in the observed risks too. Figures B.2 and B.3 provide further hints on the dispersion of the asset and income residuals for each category.

Table 3: Testing Mean and Variance of the income and asset residuals for trade categories

Levene's T-test for equal variances						
	1992	**1998**	**2002**	**2004**	**2006**	**2008**
Income	9.27	4.93	22.72	6.05	6.27	6.43
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Asset	5.93	187.98	82.27	20.5	17.81	7.82
p-value	0.000	0.03	0.000	0.000	0.000	0.000
One-way ANOVA Test with unequal variances						
	1992	**1998**	**2002**	**2004**	**2006**	**2008**
Income	3.78	10.501	43.086	17.107	6.861	18.084
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Asset	1.736	5.019	63.303	23.971	20.511	14.209
p-value	0.100	0.000	0.000	0.000	0.000	0.000

The subsequent step is to assess the presence of heterogeneity in the impact of observed variance on expected consumption across the production sectors characterised by different degrees of trade openness. This is a necessary condition for trade and vulnerability analysis, since if there are no significant differences by product/sector, we lack one of the main assumed direct links between trade openness and vulnerability. Of course, the presence of significant differences does not provide information about the nature of the foreign shocks and/or their channels of transmission to household welfare.

Table 4 shows the outcomes of our vulnerability analysis by trade related production sector. In the first two columns, for each production sector, it

Table 4: Vulnerability to poverty by trade-related sectors

	1992								1998							
	% ≤ III dec	**% Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**% ≤ III dec**	**% Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
Non-Farmer																
Exp	13.27	28.57	22.45	31.82	47.96	6.08	46.10	47.82	23.94	20.30	10	48.48	33.33	5.48	11.7	82.82
Imp	18.58	47.30	43.58	26.36	65.20	13.34	19.99	66.66	12.60	12.21	6.11	43.75	17.94	4.41	8.04	87.55
Nontr	12.57	23.25	18.86	33.33	21.12	27.05	8.44	64.52	11.62	10.36	5.78	48.28	4.85	12.9	4.15	82.95
Farmer																
Mexp	29.70	59.41	54.46	23.64	42.57	52.47	17.88	29.65	18.55	20.56	14.92	56.76	27.82	5.28	34.25	60.46
Oexp	40.45	62.92	51.12	20.88	74.72	21.58	24.67	53.75	42.86	38.35	26.32	17.14	24.44	40.56	35.13	24.31
Imp	46.30	62.96	58.33	14.29	82.41	25.74	32.61	41.65	34.63	44.96	39.53	25.49	59.95	19.47	35.96	44.57
NonTr	18.75	28.13	43.75	42.86	15.63	45.84	20.71	33.45	17.43	18.35	22.02	62.5	54.13	2.83	38.27	58.9
Rice																
Total	36.44	66.95	71.55	16.50	64.19	43.52	32.66	23.82	44.23	43.88	32.12	32.36	37.25	23.66	41.36	34.99
Cons	25.63	51.10	45.06	20.51	52.52	30.24	26.21	43.55	21.70	24.29	16.35	27.45	24.6	20.27	28.49	51.23
Prod	34.75	59.72	68.16	17.52	58.39	44.07	32.29	23.64	39.41	36.51	27.48	37.88	32.06	19.16	40.53	40.32

	2002								2004							
	% ≤ III dec	**% Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**% ≤ III dec**	**% Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
Non-Farmer																
Exp	22.04	21.58	10.82	39.44	39.36	4.34	24.73	70.93	20.07	12.86	5.32	41.94	9.61	11.83	0.35	87.83
Imp	13.10	13.10	7.95	45.07	22.12	5.22	23.95	70.83	15.76	9.19	4.13	45.45	5.63	16.42	11.65	71.93
Nontr	11.22	9.80	5.51	49.05	5.65	12.85	0.38	86.77	13.63	6.12	2.81	49.35	7.29	6.05	10.44	83.51
Farmer																
Mexp	33.92	31.07	25.86	32.14	34.59	15.51	35.95	48.54	23.24	16.45	10.97	52.38	19.06	7.71	38.09	54.2
Oexp	39.67	38.02	25.35	31.85	35.07	16.40	36.86	46.74	43.83	28.87	16.8	31.25	53.02	5.82	31.74	62.44
Imp	46.14	44.71	36.82	20.19	42.02	27.93	30.67	41.40	47.29	36.24	26.82	25.44	39.29	18.01	46.53	35.46
NonTr	22.50	20.94	10.76	50.91	27.40	4.78	34.09	61.13	31.21	13.48	2.84	75	32.62	0.34	28.82	70.84
Rice																
Total	46.38	43.16	27.76	28.49	35.53	20.95	35.51	43.54	46.46	32.11	17.77	26.54	19.51	28.01	26.94	45.05
Cons	22.92	21.31	13.28	30.37	21.29	14.64	27.75	57.61	23.28	14.52	7.76	34.58	14.9	11.62	25.64	62.74
Prod	39.06	32.28	20.54	34.00	26.80	17.94	34.58	47.47	38.44	24.99	14.36	28.8	17.94	23.52	27.64	48.84

	2006								2008							
	% ≤ III dec	**% Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**% ≤ III dec**	**% Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
Non-Farmer																
Exp	27.44	10.98	3.77	40.91	7.89	8.68	2.56	88.76	21.85	7.20	2.31	55.56	7.97	1.44	28.27	70.28
Imp	20.98	7.23	2.89	37.50	7.05	5.53	12.80	81.67	22.26	6.68	3.18	60	16.53	2.4	26.54	71.06
Nontr	18.18	4.48	1.45	52.38	2.65	5.75	7.74	86.51	18.07	5.44	1.36	66.67	3.02	2.42	4.96	92.62
Farmer																
Mexp	27.85	10.07	3.02	55.56	13.76	3.67	27.18	69.15	30.70	7.04	3.38	50	17.46	1.23	30.65	68.12
Oexp	48.62	17.43	7.34	62.50	47.25	1.30	36.35	62.35	43.50	18.83	9.28	45.71	22.81	7.86	24.88	67.25
Imp	40.53	19.38	13.22	40.00	41.41	4.32	44.77	50.91	52.84	28.09	19.33	25.33	26.03	22.41	25.98	51.61
NonTr	35.79	9.47	1.05	0.00	53.68	0.09	33.53	66.38	32.41	8.33	1.85	50	23.15	0.41	21.36	78.23
Rice																
Total	40.50	27.28	13.40	28.18	17.97	22.75	29.58	47.68	33.00	23.72	12.32	26.42	15.86	23.18	33.06	43.76
Cons	25.72	10.96	4.28	37.70	12.19	6.01	27.14	66.84	28.37	12.46	5.38	35.43	14.09	8.5	24.28	67.22
Prod	35.35	20.15	10.34	29.94	13.03	24.79	29.70	45.50	31.57	19.92	11.1	29.26	13.9	22.42	33.81	43.78

reports also information about the characteristics of the workforce in terms of income distribution and poverty level. As it apparent from the Table, under the period of observation, the percentage of vulnerable people actually decreased in all trade related sectors. However, while according to the VEP measure, this decrease followed a quite regular pattern (with jumps in some statistics between the two different household surveys), according to AVEU, it has not been the case for import-competing (farm and not farm) sectors as well as for non-traded farm ones that actually registered an increase of the percentage of vulnerable households between 2004 and 2006. However, in 2008 (our last year of observation), all trade related sectors register, generally speaking, a lower percentage of vulnerable households than in 1992, with all farm sectors showing higher percentages than non-farm ones. The only relevant exception is the non-traded farm sectors in the VEP case (but not in the AVEU case). Thus, our analysis supports the view that vulnerability is currently higher among farmers than elsewhere. Among farm activities the production sector with the highest percentage of vulnerable households is import-competing sectors, while, according to AVEU, the farm sector with the lowest degree of vulnerable households is rice. Acknowledging the peculiar nature of this sector, which is at the same time the main production sector and the main source of food for Vietnamese households, Table 4 reports also the decomposition of vulnerability patterns between rice net producer and net consumer households. Notwithstanding that, the percentage of poor is higher among net rice producers than among net rice consumers, our AVEU measure does not register appreciable differences in the percentage of vulnerable households between the two categories from 2006. Both measures agree the sector with the lowest percentage of vulnerable households is "not traded not farm" (it shows the lowest percentage of poor people and, in general, of people with income in the first three income deciles also). Notwithstanding the fact that households involved in "main export farm" activities share similar mean income/consumption levels with those involved in "non-traded non-farm" ones (see Table B.5), the percentage of vulnerable people in the former is permanently higher than in the latter. This is noteworthy if we consider the relative low incidence of poor households in the sector and the relative equal distribution of income across deciles that characterise it. Hence, we can argue that the hypothesis of the existence of trade induced vulnerability is not rejected by empirical data in Vietnam. Furthermore, households in "main exports farm" activities share with rice farmer a higher component of "ex ante" vulnerability with respect to the other sectors (around 7 times higher

than non-traded non-farm ones). However, in contrast to rice, the poverty component in this category is very limited. The nature of the "ex ante" risk exposure in the trade related sector as well as the role of risk management strategies actually engaged by Vietnamese households need more careful investigation. Additional investigations should also focus on assessment of the relative impact on vulnerability of progressive vs conservative options that households can put in place under trade reform. For instance, a similar pattern of vulnerability in "export farm activities" is also found in "non-traded farm" ones. It should be noted, however, that the latter cover a very low percentage of the total Vietnamese workforce (around 3-4 per cent on average during the entire period under consideration) as well as a very limited range of subsistence agricultural sectors. Last but not least it is worth noting that, starting from 2002, the VEP measure underestimates, also in this case, the percentage of vulnerable households across all sectors.

Figure 4: AVEU breakdown for trade and non-trade related sectors

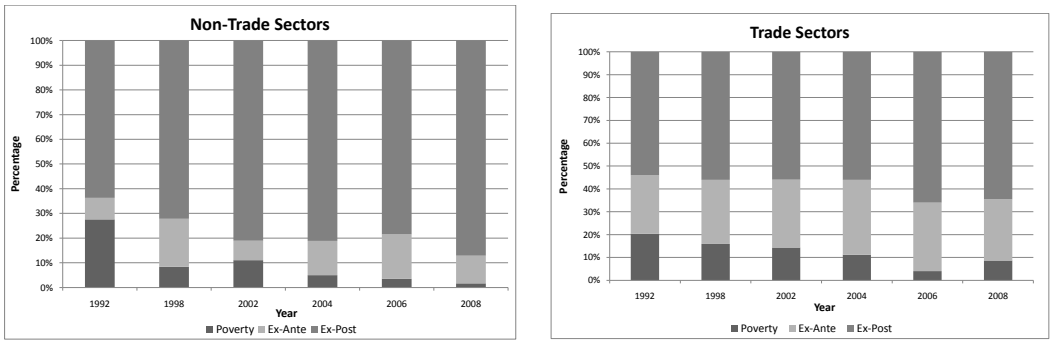


Figure 5: AVEU breakdown for rice sector

To present a clearer picture of the phenomena under analysis, Fig. 4 compares the breakdown of the various components of our AVEU measure for trade and non-trade sectors, taken as groups while Fig. 5 presents, separately, the same breakdown for the rice sector. The figures show that the incidence of the poverty component is generally reducing in all sectors (trade, non-trade and rice) and that the poverty induced component of vulnerability is still an issue only in the rice one. They show as well that along with a general decrease in the poverty component, the relative relevance of the "ex ante" component is increasing in the trade sector rather than in the non-trade ones. This latter evidence is particular relevant for policymaking and calls for additional investigation concerning the main difference in the risk mitigating strategies actually adopted by households working in the trade and non-trade related sectors.

Finally, we should acknowledge that Vietnamese production is still very regionally dependent, with peaks of agricultural production of more than 70% of total production in the North West and in the Central Highlands. Rice production is predominant in almost all the agricultural regions (more than 60% of the total agricultural workforce in the North East and the North Central Coast, Table B.6). Households working in exports and import competing farm activities are gathered instead mainly in the Central Highlands, the South East, and the Mekong River Delta, whereas exports and import competing non-farm activities are mainly concentrated in the Red River, the Southern Central Cost, the South East, and the Mekong River Delta (see Table B.6). It should be noted that the Central Highlands is the region with the higher concentration of workforce involved in main export farm production (it reached over 40% of the total workforce in 2008). At the same time, it has to be acknowledged that there is a strong spatial dimension of poverty incidence in Vietnam, as well as a significant urban-rural poverty gap (Heo and Doanh, 2009).It is thus worthwhile to conclude our study with a spatial analysis of vulnerability across Vietnam.

Table 6 presents a comparative picture between poverty and vulnerability across the eight Vietnamese regions. The first two columns show the well-known geographical distribution of poverty dynamics, which are indeed indirectly correlated with production specialisation. As it is evident from table B.6 the poorest regions (the North West, the North East and the North Central Cost) display in fact a relatively specialisation in farm activities, with

Table 5: Poverty and vulnerability to poverty by region

	1992								1998							
	% ≤ III dec	**Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**% ≤ III dec**	**Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
RedRiver	30.18	60.45	67.14	14.73	63.56	41.61	30.64	27.76	31.29	25.26	12.53	59.26	22.28	4.20	36.24	59.55
NE	32.68	73.05	81.02	10.04	74.24	48.77	26.09	25.14	34.03	49.41	47.04	19.81	48.96	34.79	34.64	30.57
NW	37.56	73.83	81.31	11.49	75.70	47.06	29.93	23.01	35.94	63.20	73.60	16.30	68.00	42.08	29.14	28.78
NCC	33.62	72.74	82.44	15.42	74.25	47.82	26.66	25.52	35.69	39.61	32.53	40.74	39.01	15.18	35.90	48.92
SCC	27.19	42.78	37.97	28.87	41.71	20.60	29.73	49.67	30.17	26.32	16.70	35.87	25.05	13.62	42.44	43.94
CH	32.39	53.25	46.75	11.11	54.55	39.50	28.12	32.39	31.29	52.05	47.54	9.48	53.69	41.21	29.48	29.31
SE	23.57	36.19	26.75	31.37	33.57	19.73	30.53	49.74	21.84	11.11	3.43	65.79	7.77	3.97	32.78	63.25
MRD	29.80	39.90	31.71	41.95	36.46	12.53	33.64	53.83	30.00	28.44	16.37	48.78	25.55	9.34	34.22	56.44

	2002								2004							
	% ≤ III dec	**Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**% ≤ III dec**	**Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
RedRiver	28.83	23.36	9.59	52.03	20.12	5.18	31.80	63.03	28.58	11.65	2.64	47.83	8.61	4.38	23.10	72.52
NE	34.37	38.07	31.08	25.08	35.65	25.43	31.39	43.18	35.36	27.92	18.48	29.00	25.04	18.40	28.73	52.87
NW	39.38	60.72	66.99	13.30	62.19	44.26	24.94	30.80	39.48	56.66	57.63	19.33	54.72	40.90	24.51	34.59
NCC	33.41	38.27	28.13	33.03	34.74	15.11	36.12	48.77	33.55	29.03	17.18	37.89	25.72	14.38	29.83	55.79
SCC	27.28	24.17	15.76	39.51	23.47	11.53	34.40	54.07	27.38	16.78	6.24	50.00	12.87	5.60	29.27	65.12
CH	32.86	44.95	40.98	21.79	43.03	29.63	28.78	41.59	28.35	29.02	21.07	29.82	27.73	21.66	29.75	48.59
SE	23.02	12.75	5.94	37.97	10.58	9.53	30.10	60.37	21.54	6.04	2.19	38.10	3.65	4.83	29.55	65.62
MRD	28.63	18.76	4.57	60.56	16.55	2.18	25.37	72.45	29.78	11.69	1.00	73.33	8.70	0.18	19.46	80.37

	2006								2008							
	% ≤ III dec	**Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**	**% ≤ III dec**	**Poor**	**VEP**	**RiskVEP**	**AVEU**	**% Pov**	**% Ante**	**% Post**
RedRiver	28.48	8.60	1.21	52.38	4.56	2.87	28.52	68.61	27.55	8.68	1.58	65.22	5.85	1.45	30.20	68.36
NE	33.28	23.70	13.13	35.98	20.02	15.93	29.61	54.45	31.48	25.65	17.40	30.41	22.69	21.36	33.31	45.32
NW	36.48	50.37	47.19	18.13	51.59	38.18	25.91	35.91	36.63	48.13	46.52	22.41	50.27	32.94	31.39	35.67
NCC	31.89	22.46	11.02	38.24	17.93	8.03	26.86	65.10	30.67	21.09	8.33	33.33	17.80	7.26	29.23	63.50
SCC	28.55	10.85	1.68	69.23	9.17	0.27	30.66	69.07	28.26	13.45	1.94	25.00	9.24	2.90	22.52	74.57
CH	31.03	24.73	13.27	43.84	19.82	13.53	32.88	53.59	32.01	23.24	12.45	30.00	20.75	17.70	28.86	53.44
SE	24.97	5.28	1.04	30.00	5.49	1.49	33.76	64.75	26.67	5.32	2.16	40.00	3.59	10.23	27.99	61.78
MRD	29.73	7.78	0.00	.	6.56	0.00	22.63	77.37	31.16	9.20	1.11	84.62	8.26	0.00	16.29	83.71

RedRiver=Red River Delta; NE=North East; NW=North West; NCC=North Central Coast; SCC=South Central Coast; CH= Central Highlands; SE=South East; MRD=Mekong River Delta

the relevant exception of the Central Highlands[29]. Our vulnerability analysis shows the poorest regions are among the most vulnerable too. Actually, in 2008, 1 out of 2 households in the North West can be considered as vulnerable to poverty (it was over 75% of households in 1992, see table 6). It is worth highlighting the peculiar situation of the Central Highlands, which shows a relative high incidence of poor as well as vulnerable households (actually, it was the second most vulnerable region till 2002). It shares with the North West and the North East a relatively high level of the poverty component of vulnerability too. However, its relatively specialisation is in main and other farm export activities. This spatial empirical evidence also calls for more and careful investigation about the trade and vulnerability nexus. It should be noted, in the end, that in all regions the sum of the "ex-ante" and "ex-post" components of AVEU explain over 80% of the overall vulnerability phenomenon.

6 Conclusions

Our analysis of vulnerability to poverty from trade liberalisation in Vietnam in the long run (1992-2008) shows a number of useful empirical outcomes. First of all, a decreasing trend of vulnerability to poverty along with the decreasing trend of poverty. Second, a decreasing share of the "poverty component" of vulnerability and a parallel increase of the share of vulnerable households induced by risk exposure (i.e., "risk induced vulnerable"). According to our "adjusted" calculations, in 2008 around 80% of the roughly 14% of all vulnerable households in Vietnam can be classified as "vulnerable to risk". On the top of that, roughly 12% of the total vulnerable households are so mainly because of their "ex-ante"changing behaviour induced by a risky environment, even without experiencing any shock. This additional source of the welfare cost of risk exposure has been traditionally overlooked by empirical literature. Vulnerability outcomes by deciles also highlight the presence of an additional cost the households undertake ex-ante because of their ex-ante change in behaviour in a risly environment. Third, and most importantly, our estimates

[29] A number of studies underline the incidence on poverty of the regional distribution of land and production in Vietnam. For instance, in the Mekong River Delta, where rice land and production is unequally distributed, poverty reduced only slightly, since the beneficial effects of higher prices of rice accrue to landowners, though benefits may be transferred indirectly through wage channels too (Heo and Doanh, 2009).

confirm the presence of robust heterogeneity in vulnerability according to the trade related status of surveyed households. Notwithstanding the fact that households involved in "main export farm" activities share similar mean income/consumption levels with those involved in "non-traded non-farm" ones, the percentage of vulnerable people in the former is permanently higher than in the latter. Hence, we can argue that the hypothesis of the existence of trade induced vulnerability is not rejected by empirical data in Vietnam. According to the decreasing trend of poverty, and the fact that the residual vulnerability is mainly a "risk induced" phenomenon, especially in trade related sectors, it may signal the relative importance of foreign shocks relative to domestic ones. Finally, the work highlights a spatial link between specialisation of production and vulnerability. While the most vulnerable regions are both the most agrarian and the poorest, vulnerability induced by the "ex-ante" changing behaviour in a risky environment is a widespread phenomenon. While the nature of the "ex-ante" risk exposure in the trade related sector as well as the role of risk management strategies (progressive vs conservative options) actually engaged in by Vietnamese households need more careful investigation, these first empirical outcomes appear relevant for policymaking: they contribute focusing the attention on the need for stabilisation policies alongside the liberalisation dimension of the Vietnamese reforms; they show that the net cost of vulnerability is not only linked to the actual manifestation of risks. Hence, the relevance of stabilisation policies should be assumed as high in Vietnam even in absence of actual downside shocks. In this respect, the coffee story appears not to be just an isolated phenomenon.

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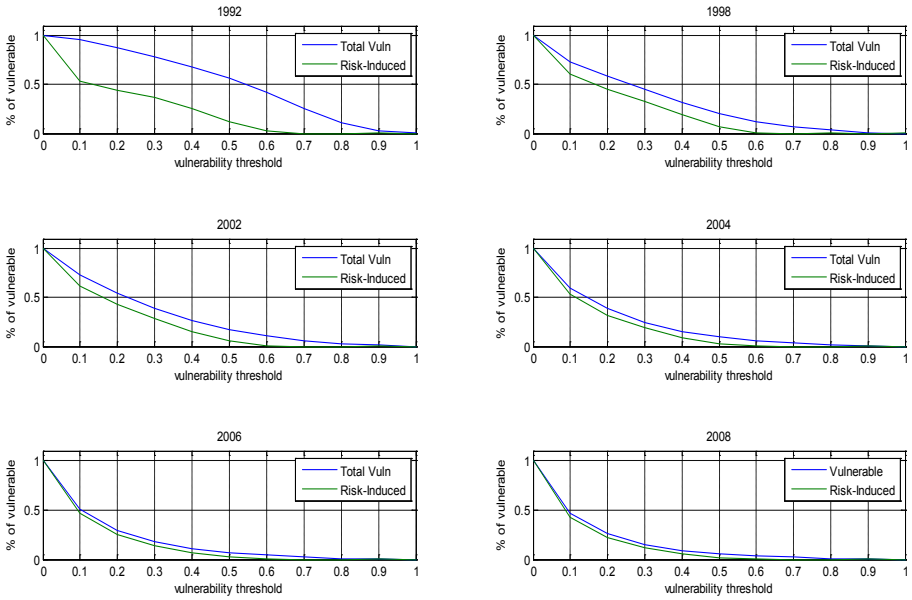
Appendices

Appendix A: VEP method and probability thresholds

Following on from Chaudhuri (2003) in Table A.1 we have considered a household as vulnerable if its probability of registering a consumption below the poverty line is higher than 0.50, relating our vulnerability assessment to the "near future"', without making explicit when this future will actually happen. In other words, according to VEP, households are considered vulnerable to expected poverty in the "near future" if they show a probability of being poor($\hat{V}_h$) bigger than that of being non-poor ($1 - \hat{V}_h$), which seems to us a fair decision strategy.

Figure A.1: Incidence of Vulnerability for different thresholds



To further clarify the concept, it is useful to provide a representation of the distribution of the aggregate VEP vulnerability across different thresholds and comparing this across the different years of observation. Figure 6 represents the incidence of vulnerability in the population for different thresholds ranging from 0 to 1. Of course, when the threshold is equal to zero, all the households are vulnerable; when it is equal to one, the vulnerability incidence is equal to zero; when the threshold is somewhere in between, vulnerability is somewhere

in between too. It is worth noting, however, that, in our exercise, the decreasing trend of vulnerability is apparent for all the possibile thresholds. This becomes evident when looking at the decreasing slopes of the curves representing vulnerability which become increasingly convex year after year. From this figure it is also easy to detect the narrowing gap between the fraction of "risk induced" vulnerable within the overall vulnerable population. As we can see from Figure A.1, the distance between the two lines decreases over time, indicating that recently most Vietnamese households are vulnerable not because of their structural characteristics, rather because of the presence of risk.

Appendix B: Tables and Figures

Table B.1: Results of our full stochastic consumption regression for each round

	1992	1998	2002	2004	2006	2008
Demographic characteristics						
Age of the household head	0.013***	0.017***	0.011***	0.004**	0.013***	0.016***
Age2 of the household head	-0.000***	-0.000***	-0.000***	-0.000*	-0.000***	-0.000***
Household Size	-0.047***	-0.079***	-0.083***	-0.075***	-0.089***	-0.090***
Household Size2	0.002***	0.004***	0.004***	0.003***	0.005***	0.004***
No. of Children	-0.088***	-0.104***	-0.109***	-0.115***	-0.111***	-0.118***
Married Head	0.077***	0.124***	0.092***	0.097***	0.072***	0.047***
Male Head of Household	-0.048***	-0.019*	-0.048***	-0.098***	-0.044***	-0.022*
Education						
(No education)						
Primary education	0.160***	0.117***	0.145***	0.168***	0.158***	0.220***
Lower secondary education	0.278***	0.285***	0.260***	0.318***	0.278***	0.350***
Upper secondary education	0.386***	0.420***	0.409***	0.443***	0.399***	0.455***
Tech/voc education	0.341***	0.426***	0.499***	0.563***	0.529***	0.571***
University	0.500***	0.661***	0.709***	0.836***	0.737***	0.847***
Village characteristics						
Urban	0.245***	0.167***	0.237***	0.231***	0.118***	0.115***
Roads	-0.04	0.044*	-0.030***	0.071***	0.001	0.025
Electricity	0.021	0.257***	0.141***	0.125***	0.328***	0.193***
Water	0.132*	0.127***	0.105***	0.038***	0.041**	0.031**
Transport	-0.018	0.018	0.044***	0.055***	0.036***	0.049***
Ex-Ante Components						
Income Uncertainty	1.470***	-1.825***	-1.405***	-2.106***	-2.360***	-1.333***
Asset uncertainty	-2.666***	0.238***	0.520***	0.848***	0.774***	0.048*
Ex-Post Components						
Positive Income Shock	2.813***	4.259***	4.335***	4.919***	4.968***	4.351***
Negative Income Shock	3.645***	4.391***	5.519***	5.082***	5.578***	5.045***
Positive Asset Shock	1.152***	1.494***	1.246***	0.999***	1.344***	1.685***
Negative Asset Shock	0.815***	1.901***	0.331***	0.485***	0.544***	0.554***
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	7.116***	6.275***	6.059***	5.781***	5.291***	6.942***
Adjusted R2	0.763	0.849	0.844	0.828	0.828	0.769
Obs	4222	5446	27140	8117	8162	6702

Table B.2: Standardised coefficients for each round

	1992	**1998**	**2002**	**2004**	**2006**	**2008**
Demographic characteristics						
Age of the household head	0.340	0.363	0.243	0.075	0.269	0.348
Age2 of the household head	-0.259	-0.320	-0.212	-0.062	-0.241	-0.322
Household Size	-0.184	-0.244	-0.236	-0.201	-0.238	-0.244
Household Size2	0.118	0.135	0.135	0.103	0.129	0.118
No. of Children	-0.230	-0.217	-0.203	-0.203	-0.191	-0.204
Married Head	0.053	0.078	0.055	0.056	0.043	0.028
Male Head of Household	-0.038	-0.014	-0.033	-0.064	-0.030	-0.015
Education						
(No education)						
Primary education	0.125	0.090	0.101	0.115	0.112	0.161
Lower secondary education	0.216	0.218	0.187	0.220	0.199	0.262
Upper secondary education	0.149	0.228	0.181	0.183	0.170	0.195
Tech/voc education	0.179	0.158	0.199	0.280	0.263	0.287
University	0.132	0.196	0.217	0.268	0.245	0.278
Village characteristics						
Urban	0.176	0.121	0.162	0.155	0.082	0.075
Roads	-0.023	0.022	-0.015	0.033	0.001	0.012
Electricity	0.011	0.110	0.057	0.025	0.048	0.031
Water	0.100	0.089	0.067	0.028	0.031	0.023
Transport	-0.015	0.013	0.035	0.042	0.029	0.040
Ex-Ante Components						
Income Uncertainty	0.993	-0.712	-0.394	-0.565	-0.522	-0.355
Asset uncertainty	-1.490	0.403	0.248	0.347	0.301	0.016
Ex-Post Components						
Positive Income Shock	0.338	0.367	0.273	0.318	0.302	0.295
Negative Income Shock	0.479	0.402	0.298	0.299	0.297	0.298
Positive Asset Shock	0.135	0.105	0.120	0.093	0.117	0.147
Negative Asset Shock	0.102	0.108	0.041	0.051	0.053	0.057
Obs	**4222**	**5446**	**27140**	**8117**	**8162**	**6702**

Table B.3: Households' Asset Items

Perennial crop gardens	Telephone sets
Aquaculture production area	Mobilephones
Fish/shrimp-rearing cages/rafts	Sewing, weaving, embroidering machines
Other production land area	Other machines and equipment
Buffalo, cow, horse for production and breeding	Fishing net
Breeding male and female pig	Durable containers for storage
Basic herds of poultry and cattle	Other professional equipment
Breeding facilities	Video players
Feed grinding machines	Color T.V sets
Rice milling machines	Black and white T.V sets
Rice plucking off machine	Multi-tier stereos
Pesticide sprayers	Radios/Cassette
Workshops	Recorders/Disc players
Shops	Computers
Other production bases	Cameras, Video cameras
Cars	Refreezerators, Freezers
Tractors	Air-condioners
Trailers	Washing machines and driers
Tractor ploughs	Electric fans
Motorbikes	Water heaters
Bicycles	Gas cookers
Cart	Electric cookers, rice cookers, pressure cookers
Motor boats, ferries ...	Trollers of various kinds
Boats, ferries without motor	Wardrobes of various kinds
Other means of transportation	Beds
Lathes and welding and milling machines	Tables, chairs, sofas ...
Punchers	Vacuum cleaners, water filters
Wooden sawing machines	Microwaves
Pumps	Liquidizer, juicer
Power generators	Other valuable things
Printers, photocopiers	(Antiques, pianos, dressing tables...)
Fax machines	

Table B.4: Industries classification by trade related sectors

Exports Non-Farm	**Non-traded Non-Farm**
Fishing, aquaculture	Recycling
Mining of coal and lignite; extraction of peat	Electricity, gas, steam and hot water supply
Extraction of crude petroleum and natural gas	Collection, purification and distribution of water
Wearing apparel; dressing and dyeing of fur	Construction
Footwear	Sale, maintenance and repair of motor vehicles
Wood and of products of wood and cork	Wholesale trade and commission trade
Office, accounting and computing machinery	Retail trade, repair
	Hotels and restaurants
Import-competing Non-Farm	Land transport; transport via pipelines
Forestry, logging and related service activities	Water transport
Mining of uranium and thorium ores	Air transport
Food products and beverages	Supporting and auxiliary transport activities
Tobacco products	Post and telecommunications
Textiles	Financial intermediation
Tanning and dressing of leather; luggage	Insurance and pension funding
Paper and paper products	Activities auxiliary to financial intermediation
Coke, refined petroleum products and nuclear fuel	Real estate activities
Chemicals and chemical products	Renting of machinery and equipment
Rubber and plastics products	Computer and related activities
Other non-metallic mineral products	Research and development
Basic metals	Other business activities
Fabricated metal products	Public administration and defence
Machinery and equipment	Education
Electrical machinery and apparatus	Health and social work
Radio, television and communication equipment	Sewage and refuse disposal, sanitation
Medical, precision and optical instruments	Activities of membership organizations n.e.c.
Motor vehicles, trailers	Recreational, cultural and sporting activities
Furniture; manufacturing n.e.c.	Other service activities
	Private households as employers
Main Export Farm	Extraterritorial organizations and bodies
Black pepper	
Exports Cashew, coffee	**Import-Competing Farm**
Rubber, tea	Apples, grapes
	Fresh vegetables
Other Export Farm	Indian Corn
Bananas	Jackfruit, durian
Cassava manioc	Jute, ramie
Coconut	Mulberry
Cotton	Oranges, limes
Cabbage, cauliflower	Other leafy greens
Mango, Papaya	Plums, potatoes
Peanuts	Suger cane
Pineapple	Tobacco
Sesame seeds	Tomatoes
Soy beans	
Specialty rice	**Non-traded Farm**
Sweet potatoes	Custard apple (subsistence)
	Litchi, logan, rambutan
Rice	Sapodilla
	Water morning glory

Source: Coello et al., (2010)

Table B.5: Mean characteristics by trade-related sectors

	1992						2004				
	Cons	**Income**	**Asset**	**Poverty**	**% hhs**		**Cons**	**Income**	**Asset**	**Poverty**	**% hhs**
Total	**1373.79**	**2934.38**	**13681.6**	**55.21%**	**100%**	**Total**	**4355.61**	**6707.77**	**49751.96**	**19.44%**	**100%**
Exp NF	2147.47	4237.13	33460.82	28.57%	2.32%	**Exp NF**	4400.43	7394.45	48140.22	12.86%	7.18%
Imp NF	1649.65	3871.78	25429.75	47.30%	7.01%	**Imp NF**	5206.24	7989.11	69444.00	9.19%	6.57%
Nontr NF	2110.19	5285.13	31631.89	23.25%	19.97%	**Nontr NF**	6073.39	9200.52	87246.20	6.12%	33.81%
Rice	1090.77	2114.64	6817.22	66.95%	60.78%	**Rice**	2978.94	4573.41	19482.22	32.11%	36.06%
Mexp F	1280.42	2823.21	6655.26	59.41%	2.39%	**Mexp F**	4026.38	6633.96	42391.41	16.45%	4.72%
Oexp F	1199.22	2097.93	6685.51	62.92%	4.22%	**Oexp F**	3303.95	4982.30	25986.78	28.87%	4.69%
Imp F	1185.57	1696.29	6604.16	62.96%	2.56%	**Imp F**	2935.59	4668.70	21845.40	36.24%	5.24%
NonTr F	1649.05	3260.87	6973.77	28.13%	0.76%	**NonTr F**	4119.57	5829.48	48993.42	13.48%	1.74%
	1998						**2006**				
	Cons	**Income**	**Asset**	**Poverty**	**% hhs**		**Cons**	**Income**	**Asset**	**Poverty**	**% hhs**
Total	**3167.31**	**5431.22**	**11149.88**	**29.89%**	**100%**	**Total**	**5808.80**	**8731.80**	**53140.58**	**15.33%**	**100%**
Exp NF	3635.11	6284.58	12020.49	20.30%	6.06%	**Exp NF**	5843.23	8897.83	45521.88	10.98%	7.14%
Imp NF	4649.13	8676.28	13284.18	12.21%	4.81%	**Imp NF**	6508.03	9683.33	66370.28	7.23%	6.78%
Nontr NF	4808.71	8452.97	13200.90	10.36%	27.65%	**Nontr NF**	7868.05	10217.90	88817.17	4.48%	35.58%
Rice	2150.07	3173.17	9454.13	43.88%	42.93%	**Rice**	3965.24	7443.16	21749.23	27.28%	40.24%
Mexp F	3010.07	6693.35	13849.16	20.56%	4.55%	**Mexp F**	6003.07	9104.25	65359.96	10.07%	3.65%
Oexp F	2366.64	3430.29	11162.97	38.35%	4.88%	**Oexp F**	4794.49	6552.40	40745.76	17.43%	2.67%
Imp F	2240.72	4983.33	9055.43	44.96%	7.11%	**Imp F**	4832.58	7368.11	33852.17	19.38%	2.78%
NonTr F	2931.26	5333.35	12681.82	18.35%	2.00%	**NonTr F**	6359.47	8383.60	53658.47	9.47%	1.16%
	2002						**2008**				
	Cons	**Income**	**Asset**	**Poverty**	**% hhs**		**Cons**	**Income**	**Asset**	**Poverty**	**% hhs**
Total	**3460.16**	**5746.95**	**33473.13**	**27.99%**	**100%**	**Total**	**7077.27**	**9673.75**	**49259.00**	**16.40%**	**100%**
Exp NF	3743.15	6858.72	32770.85	21.58%	7.25%	**Exp NF**	8521.04	10134.78	69870.51	7.20%	5.80%
Imp NF	4164.20	7469.52	36132.13	13.10%	6.58%	**Imp NF**	8240.63	10704.69	68206.66	6.68%	9.39%
Nontr NF	4968.09	7950.86	67507.29	9.80%	31.65%	**Nontr NF**	9949.33	11703.98	89460.38	5.44%	19.74%
Rice	2359.26	3914.84	11257.02	43.16%	37.55%	**Rice**	5540.51	9139.06	25861.53	23.72%	46.75%
Mexp F	2891.11	4854.91	25025.48	31.07%	4.39%	**Mexp F**	8495.99	11593.03	76009.38	7.04%	5.30%
Oexp F	2625.59	4263.83	13992.92	38.02%	4.24%	**Oexp F**	6521.65	7026.70	38505.31	18.83%	5.63%
Imp F	2420.22	4115.40	13255.24	44.71%	6.44%	**Imp F**	5477.07	6009.90	31632.15	28.09%	5.79%
NonTr F	3280.45	5934.95	30565.31	20.94%	1.88%	**NonTr F**	7524.13	8743.81	63878.08	8.33%	1.61%

Table B.6: Breakdown of trade related workforce by region

	1992								1998							
	Exp NF	**Imp NF**	**Nontr NF**	**Rice**	**Mexp F**	**Oexp F**	**Imp F**	**NonTr F**	**Exp NF**	**Imp NF**	**Nontr NF**	**Rice**	**Mexp F**	**Oexp F**	**Imp F**	**NonTr F**
RedRiver	2.82	5.93	19.02	71.28	0.00	0.75	0.00	0.19	6.41	3.25	31.01	52.83	0.19	3.71	1.76	0.84
NE	1.86	4.92	12.03	72.88	0.34	2.54	4.75	0.68	4.73	4.88	17.01	55.33	0.15	3.99	9.76	4.14
NW	0.93	3.74	4.67	37.38	4.67	18.69	28.97	0.93	0.8	2.4	5.6	24	0	12.8	53.6	0.8
NCC	0.84	5.52	8.36	75.42	0.33	7.19	1.84	0.50	5.42	2.56	17.17	59.94	0.6	7.68	5.87	0.75
SCC	1.07	7.75	32.89	54.55	0.00	2.41	1.34	0.00	5.81	4.72	33.03	43.56	0.18	8.71	3.63	0.36
CH	0.00	2.60	11.69	36.36	27.27	19.48	2.60	0.00	0.41	0	6.97	40.98	36.48	2.87	12.3	0
SE	5.59	13.99	35.84	24.65	12.24	6.12	1.22	0.35	8.58	9.49	40.56	17.71	13.64	3.7	4.79	1.54
MRD	1.78	6.65	21.14	61.16	0.12	3.92	2.85	2.38	6.39	4.29	28.74	43.01	0	3.59	9.28	4.69

	2002								2004							
	Exp NF	**Imp NF**	**Nontr NF**	**Rice**	**Mexp F**	**Oexp F**	**Imp F**	**NonTr F**	**Exp NF**	**Imp NF**	**Nontr NF**	**Rice**	**Mexp F**	**Oexp F**	**Imp F**	**NonTr F**
RedRiver	6.07	9.80	34.83	42.85	0.05	2.17	2.50	1.73	7.06	9.01	39.27	39.04	0.11	2.01	1.55	1.95
NE	4.02	4.59	22.29	49.19	4.99	2.45	8.86	3.61	3.12	3.84	24.8	51.44	1.76	3.12	8.4	3.52
NW	0.98	1.86	14.50	53.38	3.82	2.94	21.16	1.37	0.73	2.66	16.46	56.42	1.94	5.33	15.74	0.73
NCC	6.14	4.85	25.95	47.43	0.94	7.59	6.68	0.41	6.62	6.3	26.89	45.36	0.64	8.86	4.91	0.43
SCC	9.11	7.79	39.55	33.28	0.35	4.09	5.61	0.23	9.36	8.45	41.61	30.04	0.78	5.46	3.9	0.39
CH	1.49	2.67	21.82	21.45	31.31	8.68	12.21	0.37	0.55	2.96	22.92	18.67	40.3	6.84	7.39	0.37
SE	8.90	10.14	44.50	12.17	12.49	4.70	5.88	1.21	8.02	11.15	49.38	9.9	12.5	3.75	3.96	1.35
MRD	12.70	5.08	33.73	35.53	0.04	4.68	4.98	3.27	13.55	4.65	34.02	34.49	0.07	5.78	4.92	2.52

	2006								2008							
	Exp NF	**Imp NF**	**Nontr NF**	**Rice**	**Mexp F**	**Oexp F**	**Imp F**	**NonTr F**	**Exp NF**	**Imp NF**	**Nontr NF**	**Rice**	**Mexp F**	**Oexp F**	**Imp F**	**NonTr F**
RedRiver	6.92	9.06	42.07	38.43	0.06	1.33	0.87	1.27	6.68	14.53	24.59	48.62	0.07	2.41	1.45	1.65
NE	3.76	4.48	25.78	59.97	0.80	0.72	3.28	1.20	5.2	5.74	12.29	64.13	1.08	2.69	6.37	2.51
NW	1.22	2.20	15.89	69.93	0.49	2.44	7.33	0.49	0.8	4.28	8.29	54.55	1.07	5.88	24.33	0.8
NCC	7.99	5.94	28.94	52.38	0.54	1.62	2.38	0.22	2.4	8.96	16.29	60.48	1.77	5.43	4.04	0.63
SCC	9.17	9.04	40.44	37.08	0.78	1.68	1.81	0.00	8.59	11.83	23.5	46.68	1.13	5.51	2.27	0.49
CH	1.64	2.73	24.55	33.09	29.27	5.64	3.09	0.00	1.45	2.7	11.83	25.31	41.91	11.83	4.77	0.21
SE	7.87	10.14	50.41	12.42	11.49	3.00	3.42	1.24	8.76	14.08	33.76	15.37	16.09	5.03	5.32	1.58
MRD	11.64	5.98	37.62	32.73	0.13	5.66	3.54	2.70	7.75	7.07	19.76	43.61	0.26	10.31	8.43	2.81

Figure B.1: Map of Regions of Vietnam

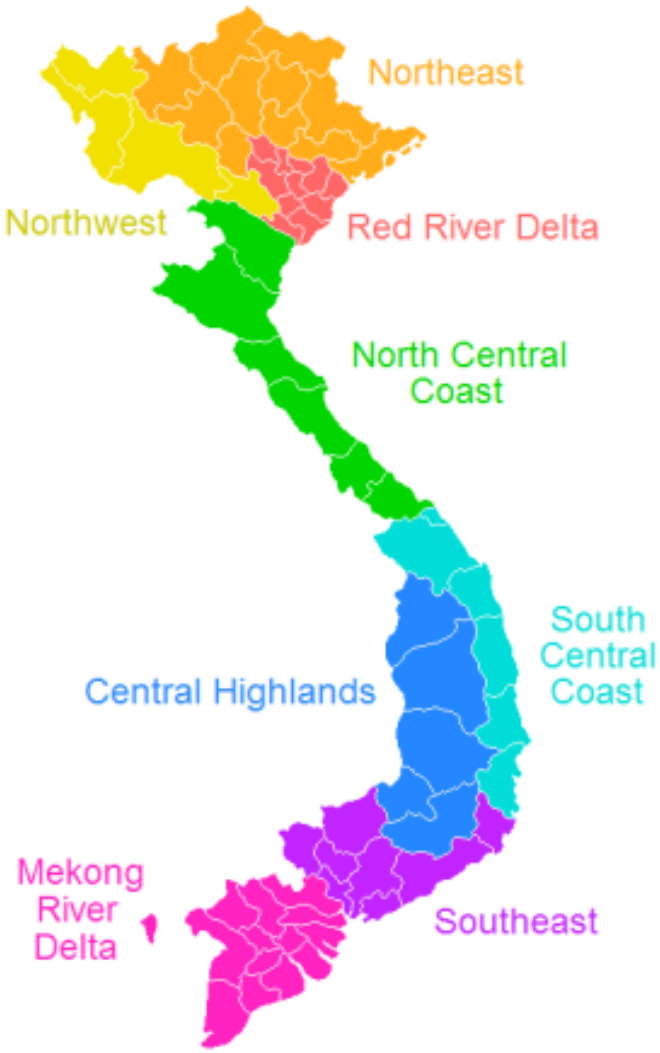


Figure B.2: Box plots of income residuals by trade categories

Figure B.3: Box plots of asset residuals by trade categories