UNIVERSITY OF SUSSEX
ECONOMICS

Working Paper Series

No. 20-2017

Vulnerability from trade in Vietnam

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Abstract

This paper assesses vulnerability from trade in Vietnam by presenting an extended version of Ligon and Schechter's (2003) Vulnerability as low Expected Utility (VEU) measure. It uses the VHLSS panel data covering the period 2002-06. The empirical results show that risk-induced vulnerability and heterogeneity in trade exposure matters in determining household overall vulnerability and that this is not linked to the actual manifestation of shocks. Although it does not represent, by any means, an argument against free trade, this work is relevant for policymaking since it contributes to deepen our knowledge on the subtle links between trade openness and vulnerability providing some insight on the stabilisation needs of trade reforms. These include protecting vulnerable farmers from excessive price volatility, as well as fostering their risk management strategies.

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1. Introduction

Vietnam is seen as the success story of trade liberalisation. Over the first ten years after the adoption of the "Doi Moi" (renovation), a combination process of stabilization, liberalisation and structural reforms, the annual average growth rate of Vietnam's merchandise exports boomed at 25 per cent (1986-1996), and it fell only to 18.5 per cent in the subsequent decade (1996-2006). An extensive empirical literature highlights the importance of trade surge on the Vietnamese economy, identifying the positive correlations between trade liberalisation, growth and poverty reduction (Irvin, 1997; 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, 2008; Niimi et al., 2007; Abbott et al., 2009 ; Heo and Doanh,

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2009; Coello et al., 2010; Hoang et al., 2016).[1]

The growth of average income is obviously hugely important to economic welfare, but even for an individual household it is not the only thing that matters. A key unanswered question is thus: did trade liberalisation magnify households' exposure to risk, offsetting some of the benefits of the increase in average income, or even raising vulnerability to poverty? This topic, which essentially entails moving the discussion of trade liberalization beyond the first moment of incomes to include the second, is currently hotly debated by practitioners and it is also at the heart of the global trade negotiations on special safeguard mechanisms to protect farmers from excessive price volatility. The empirical evidence is mixed, scattered in separate fields of analysis and does not reach a common stance (for a survey, see Montalbano, 2011). Among the few papers that tackle risk and trade liberalization directly are Newbery and Stiglitz (1984), which shows that trade may actually be welfare decreasing in the absence of insurance and, more recently, Allen and Atkin (2016) which demonstrates how falling trade costs can affect farmers' revenue volatility and thus their crop allocation in a portfolio choice framework where returns are determined in general equilibrium in a many-location, many-good Ricardian trade model with flexible trade costs.

In this paper, we assess the changes in vulnerability due to trade using a workable empirical identification strategy which focuses on the presence of heterogeneity in vulnerability scores across clusters of households classified by trade exposure which implies heterogeneity in their risk exposure and/or their mitigating strategies.[2] Specifically, we present: i) an extended version of Ligon and Schechter's (2003) measure of Vulnerability as low Expected Utility (VEU) which can isolate the

Notes

[1] Critics highlight also 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 the inland Central Highland regions as well as increased inequality throughout the country, resulting in an extensive urban-rural division, with the richest 20 per cent 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.

[2] Note that we do not provide information about the nature of the foreign risks and/or their channels of transmission to household welfare, which is outside the scope of this empirical exercise. Furthermore, we do not make any additional assumptions on the typology and sign of possible correlations between domestic and foreign risks (an issue on which empirical evidence has been quite inconclusive indeed, see McCulloch et al., 2001) since this it is neither necessary nor particularly informative for our empirical analysis.

component of risk-exposure associated with trade openness (i.e., risks that are not fully shared across trade-related industries) and identify the ex-ante effects of risk from the ex-post effects of shocks; and ii) an empirical application of the proposed "extended measure" by exploiting the Household Living Standard Surveys (VHLSS) panel data available in Vietnam for the period 2002-06.

Our results show that trade exposure and its related risks matter in determining household overall vulnerability. This empirical evidence has strong policy implications. Although it does not represent, by any means, an argument against free trade, it is a quest to deepen our knowledge on the stabilisation needs of trade reforms, e. g., the promotion of credible stabilisation policies (e.g., reducing price fluctuations) and/or the design of new insurance schemes that target vulnerable households (e.g., raise the creditworthiness of small farmers' participation in tradable cropping).

The paper is organised as follows: section 2 presents the conceptual framework on trade and vulnerability to poverty; section 3 provides the details on the adopted vulnerability measures; section 4 presents the empirical model; section 5 provides details on data; section 6 presents the empirical results; section 7 some robustness checks; section 8 concludes.

2. Trade and vulnerability to poverty: the conceptual framework

The seminal paper of Newbery and Stiglitz (1984), about the negative welfare impacts of trade in the absence of insurance has been followed by a systematic exploration of the links between macro-economic volatility and trade (see, inter alia, Easterly et al., 2001; di Giovanni and Levchenko, 2009; Karabay and McLaren, 2010; Lee 2014). However, the above analyses generally overlooked the possible impacts of the liberalization process on households' exposure to risk (Montalbano, 2011). A relevant exception in this respect is Allen and Atkin (2016) who explore - both analytically and quantitatively -the second moment effects of trade on Indian farmers using forty years of agricultural micro-data. They demonstrate that when households are risk averse and financial markets incomplete - as is the often case in developing countries -the interaction between trade and volatility may have important welfare implications.

According to the theory (Kimball, 1990; Caballero, 1990; Deaton, 1992; Carroll 2001; Carroll &

Kimball, 2008), risk-averse people react to risk by modifying their behaviour. Specifically, by undertaking additional (precautionary) saving and reducing current consumption. This implies a smooth path of consumption that is lower than if the same average income were available with certainty and thus produces permanent negative effects on household welfare. This is particularly true for people characterised by a poor ability to take advantage of the positive opportunities linked to trade reforms and weak mitigating strategies. In the midst of trade reform, they carry out extra/unproductive saving and follow conservative choices shying away from profitable but risky investments (Winters et al., 2004). This is the innermost source of vulnerability induced by trade. It is neither directly observable nor linked to the actual manifestation of shocks. Moreover, it also implies that mean consumption reflects the negative impact of risks. Thus, mean consumption cannot be used as a riskless counterfactual. As a result, current vulnerability measures tend to underestimate the overall impact of risk on consumption, leading to downward biased estimates of the overall effect of risk on welfare (Elbers and Gunning, 2003).

In principle, trade can magnify risks 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 example, switching from subsistence food crops to cash crops (McCulloch et al., 2001) or to crops with less volatile yields (Allen and Atkin, 2016). In this latter case, reductions in trade costs reduce the elasticity of local prices to local quantities thereby raising revenue volatility for farmers causing them to move into crops with higher mean (a first moment effect) and less risky yields (a second moment effect). Hence, trade openness could alter households' optimal portfolios, so that their current ones become sub-optimal *ex-ante*.[3] This is especially the case with the poor, because of their poor ability to take advantage of the positive opportunities created by trade reforms, 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 (Winters et al., 2004). Thus, they suffer the costs of trade

[3] This is different from the fact that, *ex post*, a household may actually lose out from an unlucky realisation. 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).

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 (Carter and Barret, 2006; Dercon and Christiaensen, 2011).

The poor might also 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 might not work as well as in the preliberalisation scenario, hampering people's standard management strategies (Dercon, 2001). Trade openness can also affect governments' 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 portfolios and, eventually, lead to net welfare effects less positive than expected in the long run (Winters, 2002; Winters et al., 2004; Calvo and Dercon, 2007).

It follows that any measure of vulnerability which is not able to take adequately into account trade exposure and the effect of the *ex-ante* change in behaviour induced by trade liberalization may be missing an important component of the welfare analysis.

3. Measuring vulnerability from trade

To isolate the trade risk component of vulnerability, we propose an extended version of Ligon and Schechter's (2003) measure of Vulnerability as low Expected Utility (VEU). It overcomes the weak theoretical background of the most popular vulnerability measures based on expected values of the common Foster-Greer-Thorbecke (FGT) class of decomposable poverty measures (Chaudhuri, Jalan, Suryahadi, 2002; Kamanou and Morduch, 2004; Pritchett, Suryahadi, Sumarto, 2000; Gunther and Harttgen, 2009)[4] and presents some clear advantages with respect to other micro founded class of vulnerability measures looking at the threat of poverty (Calvo, 2008; Dutta et al., 2011; Calvo and Dercon, 2013; Povel, 2015).[5]

[4] For a survey of the main methods applied in vulnerability analysis please refer to Montalbano (2011).

[5] Differently to the these class of measures, VEU addresses vulnerability to risk only after aggregation across states has been

According to VEU, the vulnerability of household *i* is measured as the difference between the utility derived from some level of certainty-equivalent consumption, *z* (above which the household would not be considered vulnerable; something analogous to a poverty line), and the expected utility of actual consumption $EU_i\,(c_i)$, as follows:

$$V_i = U_i(z) - EU_i\,(c_i) \qquad [1]$$

where U_i is a weakly concave, strictly increasing function.

By adding and subtracting the utility of expected consumption $U_i\,(Ec_i)$, VEU decomposes vulnerability into two distinct components as follows:

$$V_i = [U_i(z) - U_i\,(Ec_i)] + [U_i\,(Ec_i) - EU_i\,(c_i)] \qquad [2]$$

where the first bracketed term (i.e. the difference in utility at *z* compared to the utility of households' expected consumption) is a measure of vulnerability to poverty and involves no random variables, while the second term, according to the ordinal measures of risk proposed by Rothschild & Stiglitz (1970), measures vulnerability to risk.[6] The risk component can be further decomposed into covariate and idiosyncratic components. Let $(Ec_i|x_t)$ be the expected value of consumption conditional on a vector of covariant variables x_t, then we can rewrite the VEU measure as follows:

$$V_i = [U_i(z) - U_i\,(Ec_i)] + [U_i\,(Ec_i) - EU_i\,(Ec_i|x_t)] + [EU_i\,(Ec_i|x_t) - EU_i\,(c_i)] \qquad [3]$$

where the first bracketed component is again vulnerability to poverty, but the second and third components break down vulnerability to risk into two sub-components: vulnerability to covariate risks and vulnerability to idiosyncratic risks.

To assess vulnerability from trade, following on Ligon (2006), we further decompose the risk

performed (Calvo, 2008). It implicitly measures vulnerability net of the adoption of all the feasible precautionary saving and/or other insurance mechanisms whereby households can smooth away, even if not fully, variations in outcomes over states of the world. Second, VEU empirical applications overcome the need to approximate all possible states of the world, a somewhat heroic assumption of these class of measures using the short panel data currently available in developing countries.

[6] 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_i.

component of the VEU measure filtering out a "meso (trade-related) risk" from "aggregate risk" and "idiosyncratic risk" (and likely measurement error), as follows:

$$
\begin{aligned}
V_i = \; & [U_i(z) - U_i\,(Ec_{it})] + && \text{[poverty]} \\
& [U_i\,(Ec_{it}) - EU_i\,(Ec_{it}|\mu_k)]+ && \text{[trade related risk]} \\
& [EU_i\,(Ec_{it}|\mu_k) - EU_i\,(Ec_{it}|\mu_k, \mu_t)]+ && \text{[aggregate risk]} \\
& [EU_i\,(Ec_{it}|\mu_k, \mu_t) - EU_i\,(Ec_{it}|\mu_k, \mu_t, x_{it})]+ && \text{[idiosyncratic risk]} \\
& EU_i\,(Ec_{it}|\mu_k, \mu_t, x_{it}) - EU_i\,(c_{it})] && \text{[unexplained risk and measurement error]}
\end{aligned}
\qquad [4]
$$

where μ_k represents a risk term which varies across *k* clusters of households characterised by heterogeneity in their exposure to trade openness and μ_t is an aggregate risk term, common to all households, which may vary over dates and (aggregate) states. The fourth sub-component in Eq. 4 contains the remaining idiosyncratic risk, i.e., any systematic deviation by households from the predictions of complete markets, other than trade risk heterogeneity, where the last subcomponent is by construction unexplained risk and likely measurement errors. The rationale of this further decomposition is the following: with complete markets, household *i*'s consumption is supposed to vary over time only in response to aggregate shocks (i.e., common to all households). However, if trade exposure and/or risks themselves vary by trade categories we should observe households' heterogeneity in risk exposure by sector of occupation. A simple joint significance test of the latent terms (μ_k) in an equation describing households' consumption (eq. 6) will provide an appropriate empirical test for this (see section 6).

4. Model specification

To compute household vulnerability by using our extended VEU measure we follow a three-step procedure. First, we choose the utility function. As in Ligon and Schechter (2003) we adopt the Constant Relative Risk Aversion (CRRA) utility function which takes the form:

$$
U(c) = \begin{cases} \log(c)\ if\ \gamma = 1 \\ \frac{c^{1-\gamma}}{1-\gamma}\ otherwise \end{cases} \qquad [5]
$$

where γ measures household relative risk aversion (Arrow, 1965; Pratt, 1964), that is the degree of concavity of the utility function.

Second, we estimate the unconditional and the conditional expectations of household *i*'s consumption included in our vulnerability measure. In the first case, we assume a stationary environment - which is indeed reasonable in our case considering the very short panel - and compute the unconditional expectation of consumption as follows: $Ec_i = 1/T \sum_{t=1}^{T} c_i$. For the conditional expectations, as in Ligon (2006) we assume that the expected consumption expenditure of household *i* in industrial trade cluster *k* can be estimated using a linear equation of conditional log consumption expenditure as follows:

$$E(logc_{it} | \mu_k, \mu_t, s^2_{\eta it}, x_{it}) = \alpha_i + \mu_k + \mu_t + \boldsymbol{\omega}\, s^2_{\eta it} + \boldsymbol{\beta} x_{it} + \upsilon_{it} \qquad [6]$$

where α, $\mu_k, \mu_t, \omega, \boldsymbol{\beta}$ are unknown parameters to be estimated: α captures the influence of the fixed household characteristics on predicted consumption; μ_k is our latent variable of interest: it captures the influence of the (meso) trade-related fixed effects; μ_t captures the remaining effect of common changes in aggregates which are not captured by the meso component; $\boldsymbol{\omega}$ cleans our measure of trade risks controlling for the remaining effect of all the other permanent *ex-ante* risks other than those trade related ($s^2_{\eta it}$); finally, $\boldsymbol{\beta}$ is a vector of parameters attached to the matrix of household characteristics (x_{it}).[7] Note that if the latent variables μ_k are jointly significant, then we can reject the null hypothesis of complete aggregate risk sharing across households clustered by trade-related industries.[8] The intuition behind all this is that this component of risk captures the presence of risk heterogeneity across

[7] In order to catch the individual contribution of the *m* sources of idiosyncratic risks, we orthogonalise the *m* variables x_{it} by using a Gram-Schmidt procedure and then rewrite the fourth line of equation 4 as follows:

$[EU_i\,(Ec_i|\mu_k, \mu_t) - EU_i\,(Ec_i|\mu_k, \mu_t, x_{it})] =$

$[EU_i\,(Ec_i|\mu_k, \mu_t) - EU_i\,(Ec_i|\mu_k, \mu_t, x_{1it})] +$

$[EU_i\,(Ec_i|\mu_k, \mu_t, x_{1it}) - EU_i\,(Ec_i|\mu_k, \mu_t, x_{2it})] +$

...

$[EU_i\,(Ec_i|\mu_k, \mu_t, x_{(m-1)it}) - EU_i\,(Ec_i|\mu_k, \mu_t, x_{mit})]$.

[8] We are here excluding any shift in the degree of trade exposure across groups of sectors during the time span of the analysis, which is consistent with the short period of our panel data.

industries clustered by trade exposure and represents a measure of the different nature of trade risks, and/or the correlated mitigating strategies, relative to the domestic ones. Consistently, if some risk is shared at the aggregate level, then estimates of μ_t will be significant too. The use of a panel fixed effects econometric procedure wipes out further sources of bias due to unobservable household heterogeneity in consumption. It is worth noting that filtering out the permanent component of *ex-ante* risk lets us capture also the impact of risk on mean consumption, via the standard precautionary savings channel, overcoming the main weakness of the Ligon & Schechter's (2003) version of VEU.

To derive parsimonious information on ex-ante risk from our data, we first exploit the longitudinal dimension of the panel and derive the variance of innovations in income. The estimated equation, similarly to what has done in many of the previous empirical works (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) is the following:

$$y_{it} = \boldsymbol{\delta}_i + \boldsymbol{\gamma}_k + \boldsymbol{\theta}_t + \boldsymbol{\tau} z_{it} + u_{it} \qquad [7]$$

We then use [7] to filter out the permanent component of ex-ante risk from the stochastic component of consumption. This leads to unbiased estimates of the ex-ante risk since the transitory component absorbs all measurement errors, u_{it}. Also the more persistent is the effect of the stochastic component of income, the larger are assumed to be its impacts (for a thorough analysis on this issue, see Reis, 2009). To this end, as in Carroll and Samwick (1997) and Krebs et al. (2010), we assume that the stochastic term (i.e., the unpredictable component) of our income equation (u_{it}) is the sum of two unobserved components, a permanent (η_{it}) and a transitory one (ε_{it}) that are both white noise and uncorrelated with each other at all leads and lags. Then, we rely on the intuition that the random walk component in income of each household *i* implies a linearly increasing income dispersion over time as follows:

$$E[var[\Delta d y_{it}]] = 2\sigma_{\varepsilon}^2 + d\sigma_{\eta}^2 \qquad [8]$$

where $var[\Delta d y_{it}]$ is the variance of log difference of income of length *d* for each household in the sample. By using two $var[\Delta d y_{it}]$ of different lengths we can estimate the permanent component of

the variance of income innovation at the household level as follows:

$$s^2_{\eta it} = v^2_{yid} - v^2_{yid-1} \qquad [9]$$

where $E(s^2_{\eta it}) = \sigma^2_{\eta}$ and $v^2_{yid} = var[\Delta dy_{it}]$. This latter relies on the assumption of no individual specific growth rates for income (other than those predictable by occupation, education, industry and other personal characteristics).

Finally, consistently with the adoption of the CRRA utility function, we assume that poorer households are more responsive to changes in risk. To this end, we scale the permanent component of income *ex-ante* risk by the ratio between current household's income and expected lifetime wealth (Banks et al., 2001; Giles and Yoo, 2007). Our final proxy for ex-ante permanent risk for each household *i* is thus the following:

$$s^2_{\eta it} = \pi_{it}\, s^2_{\eta k} \qquad [10]$$

where $\pi_{it} = (\frac{Y_{it}}{W_{it}})^2$, Y_{it} is household income and W_{it} is a measure of the expected wealth. We squared the scaling factor to be consistent with the literature that assumes that the poorer households are characterised by a higher degree of concavity of the utility function.[9] As well as its theoretical foundation, the scaling term has the additional advantage of transforming our "risk term" into a time variant idiosyncratic component as well as introducing explicit heterogeneity in households' responses to permanent risk and, hence, heterogeneity in expected mean consumption.

5. Data

We use panel data for the period 2002-2004-2006 coming from the Vietnam Household Living Standard Surveys (VHLSS). These are nationally representative surveys based on the Population and Housing Census 1999 and developed by the Vietnam General Statistic Office (GSO), jointly with the United

[9] 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 increases with the decline of household's resources and this decline is faster the higher is the value.

Nations Development Program (UNDP) and the Swedish International Development Agency (SIDA) with World Bank's technical assistance. In each wave, two questionnaires have been filled up, a household questionnaire and a community questionnaire. The first one contains detailed information on household demographic characteristics, education, health and healthcare, income, expenditures, assets and durable goods and accommodation as well as participation in poverty reduction programs. The community questionnaire gathers information on the demographic, health, education and infrastructure of all rural communities. The VHLSS collected information from a sample of 29,530 households in 2002 of which 4,476 were re-interviewed in 2004 and 2006 out of samples of 9,188 in total in 2004 and 9,189 in 2006. The numbers of surveyed communes are 2,091 in 2002, 3,063 in 2004 and 3,065 in 2006. Taking into account some inconsistency in the GSO original panel we use here the Brandt et al. (2009) revised version of VHLSS panel data.[10] Moreover, the following sample restrictions have been introduced to reduce the influence of unobservables and measurement errors. First, we dropped all the households that for which the household head changed during the panel period or the household head was not in the labour force during the entire period. Second, to reduce the influence of outliers (e.g., they are both source of measurement error and/or unusual households whose behaviour is unlikely to be informative about the general one) we also dropped households with per capita income or consumption lower than the first percentile or higher than the last one. Finally, we keep only the households that have observations for all the panel period as well as real per capita income, consumption and assets different from zero. As result of these restrictions the sample decreases to a balanced panel of 988 households.

The variable used for consumption is the real per capita food and non-food expenditure in the past 12 months re-adjusted by price indexes for regions and months. Food expenditure includes information on both market purchases and consumption from home production of 58 items while the non-food expenditure collects information on 32 items Poverty lines are expressed in Vietnamese dongs as follows: 1,915,000 for 2002; 2,070,000 for 2004; 2,559,000 for 2006. Lastly, we convert all nominal variables

[10] As highlighted by Benjamin et al. (2009), the GSO original panel data 2002-06 are incorrect: of the 4,476 households interviewed in 2004 that should have a matching household in 2002, 429 have proven to be mismatched (9.6%) and these matching errors in the 2002-2004 VHLSS panel contribute to mismatches in the entire 02-06 VHLSS panel.

into nationally representative January 2006 prices using three different set of deflators, as suggested by Benjamin et al. (2009). Considering that households within each survey are interviewed during different months, the first set are monthly deflators, which are needed to convert the income and consumption values to January prices of the respective year. Second, to take into consideration the differences in the cost of living across regions we use regional deflators.[11] Third, to link January prices of 2002 and 2004 to January 2006, we use the Consumer Price Index (CPI) indicators provided by the GSO, which are 1.279 for 2002 and 1.193 for 2004.

Since the VHLSS does not include an overall measure of household per capita income, we construct one as follows (for additional information see also Brandt et al., 2009). We aggregated income into six major categories: income from crops, income from agricultural sidelines, household business income, wage income, gifts and remittances, and other residuals sources of income. The set of covariates used in our empirical exercise includes household characteristics (such as characteristics of the household head, that is linear and quadratic age, marital status, sex; linear and quadratic terms of family size and the number of children); 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.

It is generally agreed that VHLSS data can be considered to be of high quality and provide legitimate nationally representative household data based on stratified random samples. However, we cannot avoid all possible sources of measurement errors, although provided that they are random, have mean zero and apply to the dependent variable (as in our case) they will not cause estimation bias. On the other hand, as suggested by Nakata et al. (2009) measurement errors in retrospective expenditure seem to be systematically related to household size and so we include household size as one of the control variables in our regressions to try to mitigate the biases arising from measurement errors in consumption.

As regards the measure for expected wealth in the denominator of the scaling factor, it is widely

[11] 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 kindly provided (upon request) by Brian McCaig and the results do not change significantly.

recognised that living standards are determined by a multitude of factors. In a popular work, Filmer and Prichett (2001) suggest that asset indices are as reliable as conventionally measured consumption expenditure as proxy of household living standards. Following this approach, to soften the risk of endogeneity, as a measure of expected wealth we use the linear combination of the principal component factors of a sub-set of housing characteristics and land physical availability, as in Povel, 2015. Table A.1 in Appendix A reports the list of the housing characteristics used in the principal component analysis and some descriptive statistics. Table A.2 reports the set of the linear coefficients (i.e., factor loadings) of the first two common factors (i.e., those factors with eigenvalues greater than one). To improve the interpretability of the retained factors we applied the standard orthogonal varimax rotation (Kaiser 1958).[25] We have this freedom to re-express the factors because of the inherently indeterminate nature of the factor model (e.g., if z1 and z2 are two factors, then z1 + z2 and z1 − z2 are equally valid solutions). The orthogonal rotated factor loadings are every bit as good as the original loadings.

To group households according to the trade openness of their sector of specialisation, since the VHLSS survey do not relate production and external trade, we acknowledge here the work done by Coello et al., (2010). They 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 the 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. This provides us with eight trade-related production sectors (see Table A.3 for details about the surveyed industries included in each sector). Tables A.4 and A.5 show the main characteristics of households by trade groups.[12] They show that the vast majority of sampled households are involved in rice production where mean income and consumption are significantly lower than in the other sectors (with the relevant exception of mean consumption in import-competing crops). People involved in non-farm activities are, on average, richer than farmers. Among the non-farm activities, the highest mean consumption levels

[12] 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.

are registered in non-traded services followed by import-competing manufacturing.

6. Empirical results

In this section, we follow the pattern depicted in the previous sections by estimating the different conditional expectations of consumption and derive our vulnerability measure and its sub-components.

Table 1 reports the estimated coefficients of eq. 6. The signs of the coefficients on age of the head of household and its square confirm the well-known concave age-consumption profile. Not surprisingly, having children reduces per capita household consumption. The education variables also behave as expected: i.e., higher levels of education correspond to higher levels of consumption (although the estimated coefficients are significant only for low secondary education, and then only moderately so). Geographical location as well as the characteristics of the head of household do not seem to be significant. As expected, the ex-ante permanent component of risk is significantly and negatively correlated with household consumption. This also shows the consistency of our empirical exercise with the theoretical prediction of precautionary saving behaviour under risk. In other words, our consumption estimates confirm that Vietnamese households register, generally speaking, a lower path of consumption because of ex-ante risk (as a function of mitigating strategies) even when they do not experience any shock.

The significance of the trade-related fixed effects (specifically, in the case of main export and import-competing crops) confirms the intuition of the presence of a significant systematic variation in household consumption patterns by trade-related clusters of farmers (the benchmark category being non-traded non-food activities).[13] The significance of the aggregate year fixed effects (the benchmark category being year 2002) shows that some time variant shocks are shared at the macro level too. We should note that because of the inclusion of household fixed effects, the identification of trade fixed effects is driven by those households that move across trade-related groups.

[13] We believe that the random effects estimators may be inconsistent since we cannot rule out the possibility that the heterogeneity terms are correlated with the observables. This implies the inability to identify separately the parameters associated with the set of household time-invariant observed characteristics.

Table 1: Panel regression on household consumption (period 2002-06)

dep.var.: log consumption

***Ex-post* components**		***Ex-ante* components**	
Age hh head	0.0322***	perm risk	-1.78e-13***
	(0.00899)		(4.23e-14)
Age sq. hh head	-0.000311***	trans risk	8.37e-14***
	(0.000830)		(1.99e-14)
hh size	-0.148***	***Fixed Effects***	
	(0.0264)	*Exporting industries*	-0.00458
hh size sq	0.00613***		(0.0532)
	(0.00223)	*Import-competing industries*	-0.0180
No of children	-0.0118***		(0.0391)
	(0.0149)	*Rice*	-0.0330
Married hh head (yes=1)	-0.0313		(0.0250)
	(0.0558)	*Main export crops*	-0.106**
hh head sex (male=1)	-0.0238		(0.0513)
	(0.0645)	*Other export crops*	-0.0461
Prim educ (yes=1)	0.0307		(0.0431)
	(0.0363)	*import-competing crops*	-0.0948**
Low secondary educ (yes=1)	0.0651^{+}		(0.0137)
	(0.0147)	*Non-traded food*	-0.0176
Upper secondary educ (yes=1)	0.0248		(0.0765)
	(0.634)	*household*	yes
Tech/voc edu (yes=1)	0.0713	*year*	yes
	(0.0556)		
Univers. Edu (yes=1)	0.880		
	(0.108)		
Geographical loc (urban=1)	0.0172		
	(0.0760)		
cons	8.076***		
	(0.358)		
pos. Income shocks	2.988***		
	(0.424)		
neg. Income shocks	2.220***	No Obs.	2,341
	(0.111)	Adj R-sq	0.833

****,**,* denote significance at the 1, 5 and 10 per cent level, respectively.*

The categories "non-traded activities" and year 2002 act, respectively, as the benchmark from trade related and year fixed effects.

This is because the *k* trade cluster fixed effects turn out to be zero for any household that does not change trade group over the period under observation (for more details, see Andrews et al., 2006). Hence, to be sure to have properly identified trade-related risk we should assume there is no difference between moving and not-moving households. The kernel densities reported in Fig. A.2 in the Appendix show that the two groups of households look similar in term of log consumption. Moreover, to exclude the possibility that the moving decision is driven by risk we also control for possible correlation across households between ex-ante risk and the trade-related fixed effects on consumption. Table A.6 in the Appendix supports the assumption of exogeneity. For a closer look into how many households move

from one trade group to another over the course of the panel and what the origin and destination trade groups are, see Tables A.7 and A.8 in Appendix A.

Based on the consumption estimates of eq. 6, Table 2 shows overall vulnerability, in utils, as well as the relative weights of its poverty and risk components (eq. 4). To this end, we normalize consumption with respect to the poverty lines available for each period, so that for poor households consumption is below 1. Total vulnerability is the sum of risk-induced and poverty components (first three columns). The columns from four to eight report the further decomposition of overall risk proposed in Eq. 4. The fourth column shows the meso (trade-related) component of overall risk-induced vulnerability, purged of unobservables and measurement errors. This confirms our intuition that trade-related risks (i.e., risks that are not fully shared across households but are clustered by trade-related industries) matter in determining household risk-induced vulnerability, specifically in the case of farm households. The fifth column filters out the component of truly covariate shocks. The sixth column isolates the component of vulnerability due to the remaining ex-ante permanent risk (i.e., other than the trade-related one). In line with the literature (Lucas, 2003; Reis, 2009), the overall loss due to permanent risk is very small, but nonetheless statistically significant. The seventh column refers to the ex-post idiosyncratic components of risk. The last one is the residual unexplained sub-component. All these sub-components sum together to form the overall risk component.

Table 2. Vulnerability decomposition in utils (period 2000-2006)

	Vulnerability decomposition			Risk decomposition				
Trade-related clusters	Overall Vulnerability (V)	Poverty induced (P)	Overall Risk (V-P)	Trade related risk	Aggr. risk	*ex-ante* id. risk	*ex-post* id. risk	unexplained risk
Exporting industries	0.238	0.158	0.080	-0.024	0.164	0.0000699	0.075	-0.135
Import-competing industries	0.320	0.220	0.100	-0.019	-0.010	0.0000102	0.185	-0.056
Non-traded industries	0.162	0.101	0.061	-0.010	0.092	0.0003140	0.045	-0.066
Rice	0.358	0.275	0.083	0.020	0.180	0.0010780	-0.106	-0.010
Main export crops	0.355	0.208	0.147	0.014	0.075	0.0003770	0.103	-0.046
Other export crops	0.471	0.402	0.069	0.028	0.243	0.0008010	0.026	-0.229
import-competing crops	0.382	0.307	0.074	0.021	0.180	0.0005600	-0.065	-0.062
non-traded crops	0.368	0.239	0.130	-0.006	0.576	0.0021620	1.073	-1.513
Overall	0.346	0.261	0.085	0.016	0.167	0.0008670	-0.058	-0.039

Source: Authors' calculations

7. Sensitivity and Robustness checks

For sensitivity purposes, Tab. A.9 presents the vulnerability outcomes for different values of the CRRA utility derived for different levels of the risk aversion parameter (γ = 1; 2; 3).[14] As expected, if we increase our risk aversion parameter, the vulnerability estimates also increase in magnitude, but the relative pattern across its components does not change much. For instance, as we move from gamma = 1 to gamma = 3, "risk-induced" vulnerability (reported in the "overall risk" column in Table 2) actually doubles for the entire sample (from 3% to 6% of overall vulnerability) and becomes more than five times larger for vulnerable households (from 3% to 16%), but its relative contribution on overall vulnerability does not change.

As a further robustness check, we also run another income equation by controlling for an additional time trend component by trade categories in order to capture additional predictable linear unobservable components in the model (which may not be captured by the existing ones). As can be seen from Table A.10 whereas the outcomes are of course different in detail, the parameters for the consumption equation are consistent with those in Tables 1. The relationship between expected consumption and the permanent risk components (computed using the new set of income residuals) is still negative and statistically significant (even if smaller in magnitude).

Finally, we acknowledge that in VEU the order of the decomposition drives the empirical results. We can thus alternatively look at the aggregate/covariate risk as a residual risk term after controlling for trade groups' deviations from risk sharing or rather assume deviations from risk sharing by trade categories as a residual subcomponent of the VEU overall risk component. Note however that, in choosing the order of the decomposition, we are just attempting to provide alternative possible distributions across sub-components of the VEU overall risk which remains invariant. Table A.11 in Appendix reports the VEU decomposition by reversing the order of the decomposition of the VEU

[14] However, we do not expect our results to be very sensitive to the actual choice of γ since in this exercise we are more interested in investigating the relative importance of the various vulnerability components than its overall magnitude. While in fact the estimates of total vulnerability, poverty and risk are all sensitive to one's choice of the shape of the utility function (i.e., the γ parameter), the relative magnitudes of the different components are less sensitive as greater concavity reflects greater welfare losses associated with all the components (Ligon and Schechter, 2003).

overall risk between aggregate/covariate risk and risk by trade groups (i.e., assuming deviations from risk sharing by trade categories to be a residual subcomponent of the VEU overall risk component). Also in this case, the risk-sharing deviations by trade categories are still positive for farm tradable crops, in line with the statistical significance of the fixed effects by trade categories. It means that, even though the exact weight of the trade related sub-component depends from the order of the decomposition (which ultimately reflects different conceptual views), a trade meso component of risk should be included in the VEU measure in any case.

8. Conclusions

This paper addresses the important issue of vulnerability from trade, which is at the heart of the global trade negotiations on special safeguard mechanisms to protect farmers from excessive price volatility. It focuses on Vietnam and takes advantage of the Vietnam Household Living Standard Surveys (VHLSS) panel data available for the period 2002-2004-2006. The added value of this exercise lies in proposing an extended version of the VEU measure of vulnerability able to address more appropriately the presence of trade-related heterogeneity in households' exposure to risk and to overcome the most common weaknesses of current available measures of vulnerability. More specifically, we present a method to decompose the impact on vulnerability of the ex-ante risk and its correlated risk mitigating strategies from the ex-post ones and to look separately at the relationship between ex-ante risk, trade-related risk, aggregate risk and mean consumption.

Our empirical results show a number of useful insights for policymaking. First, we demonstrate that the risk-induced component of vulnerability consistently matters in determining households' overall vulnerability even in a context of decreasing poverty and that this is not linked to the actual manifestation of shocks. Second, we show the presence of a relative inability, on average, to share risks across households involved in different trade-related clusters, specifically in the case of farm households. This confirms our intuition that trade-related risks (i.e., risks that are not fully shared across trade-related industries) matter in determining household overall vulnerability. Our empirical evidence highlights that households engaged in farm activities more exposed to international competition may

warrant support. This can be in the form of assisting them in managing trade-related risks (e.g., by raising the creditworthiness of small farmers' participation in tradable cropping) and/or in providing them better protection from excessive price volatility (e.g., by performing special safeguard mechanisms).

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Appendix A

Tab A.1 - List of the housing characteristics used in the principal component analysis

Variables	Question	Options	2002					2004					2006				
			Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max
House type	What type of structure does your household belong to?	1= Temporary House; 2=Semi-permanent house; 3=Houses with a shared kitchen or bath/toilet; 4=Houses with a private kitchen and bath/toilet;5=Villas	26,274	1.96	0.74	1	5	7,820	2.04	0.76	1	5	7,801	2.11	0.77	1	5
House prop	Does your household own this dwelling?	2=No; 3=yes	26,274	2.97	0.17	2	3	7,820	2.99	0.11	2	3	7,801	2.99	0.10	2	3
Living area	What is the household total living area in sqm?		26,287	56.11	45.87	0	1998	7,820	59.81	32.91	1	600	7,801	62.32	33.00	5	425
Land decile	reference decile of the total agricultural land area		26,304	5.19	3.13	1	10	6,733	6.42	2.53	1	10	5,410	7.01	2.23	3	10

Tab A.2 - Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor 1	Factor 2	Uniqueness
House prop	0.1966	-0.0407	0.9597
House type	0.8039	-0.1279	0.3374
Living area	0.8036	0.1658	0.3267
Land deciles	0.0151	0.985	0.0295

Uniqueness is the percentage of variance for the variable that is not explained by the common factors.

Tab. A.3 - 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)

Tab. A.4 - Main descriptive statistics of the variables used in the empirical analysis by trade categories

	Exporting industries					Import-competing industries				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Real pc income (in dongs)	98	10,170.52	31,512.73	1,245.48	306,380.10	110	8,635.61	6,810.55	1,452.95	53,522.48
Real pc food & non food consumption (in dongs)	98	3,965.80	2,166.41	1,172.04	11,693.78	110	4,766.76	3,010.91	926.15	21,632.55
Age hh head	98	44.35	9.48	26.00	70.00	110	44.18	9.93	25.00	80.00
Age sq. hh head	98	2,055.67	888.58	676.00	4,900.00	110	2,049.67	964.17	625.00	6,400.00
Household size	98	4.84	1.59	2.00	9.00	110	4.44	1.52	2.00	12.00
Household size sq	98	25.90	16.73	4.00	81.00	110	21.96	17.04	4.00	144.00
No of children	98	1.41	1.15	0.00	5.00	110	1.16	0.98	0.00	4.00
Married hh head (yes=1)	98	0.94	0.24	0.00	1.00	110	0.92	0.28	0.00	1.00
Household head sex (male=1)	98	0.90	0.30	0.00	1.00	110	0.84	0.37	0.00	1.00
Prim educ (yes=1)	98	0.33	0.47	0.00	1.00	110	0.22	0.41	0.00	1.00
Low secondary educ (yes=1)	98	0.27	0.44	0.00	1.00	110	0.40	0.49	0.00	1.00
Upper secondary educ (yes=1)	98	0.04	0.20	0.00	1.00	110	0.06	0.25	0.00	1.00
Tech/voc edu (yes=1)	98	0.05	0.22	0.00	1.00	110	0.12	0.32	0.00	1.00
Univers. Edu (yes=1)	98	0.00	0.00	0.00	0.00	110	0.05	0.23	0.00	1.00
Geographical loc (urban=1)	98	0.15	0.36	0.00	1.00	110	0.19	0.39	0.00	1.00
House prop (yes=1)	98	0.96	0.20	0.00	1.00	110	0.99	0.10	0.00	1.00
House type (1=Temp.-5=Villa)	98	2.00	0.79	1.00	4.00	110	2.03	0.76	1.00	4.00
Living area (mq)	98	57.60	32.68	13.00	211.00	108	58.52	31.45	15.00	200.00
Land deciles	98	3.47	2.74	1.00	10.00	110	3.72	2.20	1.00	10.00

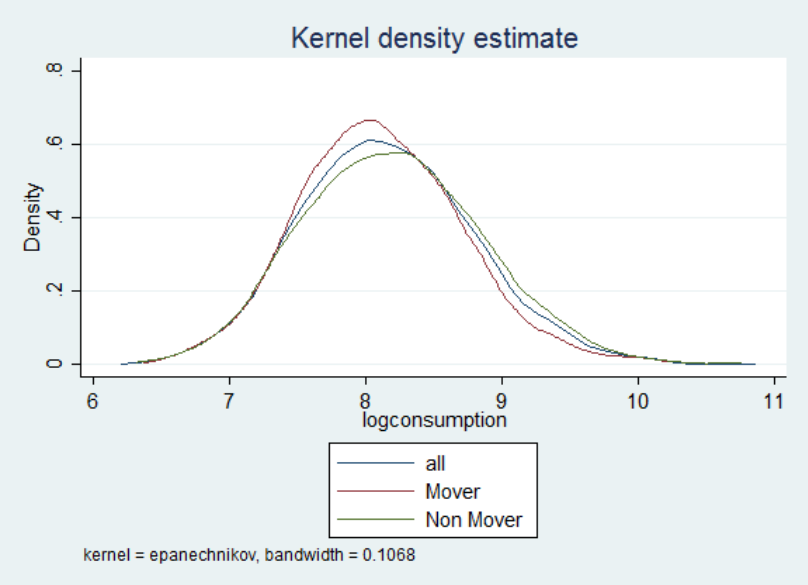
	Non traded non food					Rice				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Real pc income (in dongs)	549	8,342.43	7,907.23	1,332.98	112,984.60	1,138	5,691.47	4,965.25	813.37	53,922.07
Real pc food & non food consumption (in dongs)	549	4,891.99	3,084.55	1,128.27	23,517.45	1,138	3,231.16	1,916.06	554.68	17,623.94
Age hh head	549	43.16	9.66	21.00	97.00	1,138	46.20	10.24	23.00	81.00
Age sq. hh head	549	1,955.94	924.29	441.00	9,409.00	1,138	2,239.32	984.22	529.00	6,561.00
Household size	549	4.43	1.34	2.00	11.00	1,138	4.87	1.87	1.00	20.00
Household size sq	549	21.38	13.76	4.00	121.00	1,138	27.25	26.09	1.00	400.00
No of children	549	1.12	0.99	0.00	5.00	1,138	1.26	1.29	0.00	9.00
Married hh head (yes=1)	549	0.92	0.27	0.00	1.00	1,138	0.89	0.31	0.00	1.00
Household head sex (male=1)	549	0.85	0.36	0.00	1.00	1,138	0.85	0.36	0.00	1.00
Prim educ (yes=1)	549	0.23	0.42	0.00	1.00	1,138	0.25	0.44	0.00	1.00
Low secondary educ (yes=1)	549	0.38	0.49	0.00	1.00	1,138	0.36	0.48	0.00	1.00
Upper secondary educ (yes=1)	549	0.09	0.28	0.00	1.00	1,138	0.07	0.25	0.00	1.00
Tech/voc edu (yes=1)	549	0.15	0.36	0.00	1.00	1,138	0.05	0.21	0.00	1.00
Univers. Edu (yes=1)	549	0.05	0.21	0.00	1.00	1,138	0.00	0.07	0.00	1.00
Geographical loc (urban=1)	549	0.26	0.44	0.00	1.00	1,138	0.04	0.19	0.00	1.00
House prop (yes=1)	549	0.98	0.13	0.00	1.00	1,138	0.97	0.16	0.00	1.00
House type (1=Temp.-5=Villa)	549	2.09	0.78	1.00	5.00	1,138	1.99	0.71	1.00	5.00
Living area (mq)	544	59.06	37.03	10.00	480.00	1,124	58.89	32.31	10.00	400.00
Land deciles	549	3.68	2.66	1.00	10.00	1,138	6.00	2.47	1.00	10.00

Tab. A.5 - Main descriptive statistics of the variables used in the empirical analysis by trade categories (cont'd)

	Main export crops					Other export crops				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Real pc income (in dongs)	195	7,487.78	6,300.18	1,438.25	43,851.20	99	5,243.90	4,885.85	1,087.22	29,642.49
Real pc food \& non food con	195	4,037.54	2,820.95	660.07	16,379.20	99	3,101.61	1,721.26	837.21	7,745.69
Age hh head	195	44.16	9.81	24.00	74.00	99	45.65	10.42	26.00	72.00
Age sq. hh head	195	2,045.85	946.69	576.00	5,476.00	99	2,191.08	1,005.46	676.00	5,184.00
Household size	195	5.17	1.78	1.00	12.00	99	4.80	1.78	1.00	10.00
Household size sq	195	29.87	20.98	1.00	144.00	99	26.15	18.75	1.00	100.00
No of children	195	1.59	1.24	0.00	7.00	99	1.46	1.49	0.00	7.00
Married hh head (yes=1)	195	0.86	0.35	0.00	1.00	99	0.80	0.40	0.00	1.00
Household head sex (male=1)	195	0.88	0.33	0.00	1.00	99	0.84	0.37	0.00	1.00
Prim educ (yes=1)	195	0.36	0.48	0.00	1.00	99	0.30	0.46	0.00	1.00
Low secondary educ (yes=1)	195	0.27	0.45	0.00	1.00	99	0.31	0.47	0.00	1.00
Upper secondary educ (yes=1	195	0.03	0.17	0.00	1.00	99	0.02	0.14	0.00	1.00
Tech/voc edu (yes=1)	195	0.03	0.16	0.00	1.00	99	0.07	0.26	0.00	1.00
Univers. Edu (yes=1)	195	0.01	0.10	0.00	1.00	99	0.00	0.00	0.00	0.00
Geographical loc (urban=1)	195	0.09	0.29	0.00	1.00	99	0.02	0.14	0.00	1.00
House prop (yes=1)	195	0.97	0.17	0.00	1.00	99	0.94	0.24	0.00	1.00
House type (1=Temp.-5=Villa)	195	2.00	0.72	1.00	4.00	99	2.08	0.91	1.00	4.00
Living area (mq)	193	58.93	28.40	14.00	198.00	95	63.16	39.13	15.00	200.00
Land deciles	195	8.18	2.16	1.00	10.00	99	6.38	2.54	1.00	10.00

	Import-competing crops					Non-traded food				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Real pc income (in dongs)	139	5,791.81	5,605.04	542.14	46,145.41	42	7,092.52	3,794.10	1,622.22	20,179.32
Real pc food \& non food con	139	3,105.19	2,125.41	586.44	12,432.19	42	4,642.70	3,730.84	984.61	24,198.92
Age hh head	139	42.56	11.47	15.00	70.00	42	46.36	10.96	26.00	74.00
Age sq. hh head	139	1,942.12	1,031.64	225.00	4,900.00	42	2,266.26	1,077.95	676.00	5,476.00
Household size	139	4.53	1.81	1.00	12.00	42	4.33	1.03	2.00	8.00
Household size sq	139	23.78	20.62	1.00	144.00	42	19.81	9.96	4.00	64.00
No of children	139	1.23	1.29	0.00	6.00	42	0.67	0.90	0.00	2.00
Married hh head (yes=1)	139	0.84	0.37	0.00	1.00	42	0.90	0.30	0.00	1.00
Household head sex (male=1)	139	0.80	0.40	0.00	1.00	42	0.88	0.33	0.00	1.00
Prim educ (yes=1)	139	0.27	0.45	0.00	1.00	42	0.33	0.48	0.00	1.00
Low secondary educ (yes=1)	139	0.31	0.46	0.00	1.00	42	0.38	0.49	0.00	1.00
Upper secondary educ (yes=1	139	0.03	0.17	0.00	1.00	42	0.07	0.26	0.00	1.00
Tech/voc edu (yes=1)	139	0.06	0.23	0.00	1.00	42	0.02	0.15	0.00	1.00
Univers. Edu (yes=1)	139	0.00	0.00	0.00	0.00	42	0.02	0.15	0.00	1.00
Geographical loc (urban=1)	139	0.17	0.38	0.00	1.00	42	0.02	0.15	0.00	1.00
House prop (yes=1)	139	0.96	0.19	0.00	1.00	42	1.00	0.00	1.00	1.00
House type (1=Temp.-5=Villa)	139	2.07	0.83	1.00	5.00	42	1.98	0.78	1.00	4.00
Living area (mq)	138	59.07	38.81	9.00	260.00	41	74.98	60.74	12.00	350.00
Land deciles	139	6.24	2.75	1.00	10.00	42	6.98	2.60	1.00	10.00

Fig. A.2 - Kernel density of log-consumption between moving and not-moving households



Tab. A.6 - Correlation matrix across aggregate and trade ex-ante permanent risk

Risk by trade categories	Aggregate Risk
Exporting industries	0.0343
Import-competing industries	-0.0919
Non-traded industries	0.1312
Rice	0.266
Main export crops	0.189
Other export crops	-0.1587
import-competing crops	-0.9389
Non traded crops	0.1732

Tab. A.7 - Between and within variation decomposition over the course of the panel by trade categories

	Overall		Between		Within		Movers	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Trade-related clusters		(of total hhs)		(of total hhs)		(of between)		(of total hhs)
Exporting industries	141	4.76	78	7.89	47	60.26	31	3.14
Import-competing industries	149	5.03	95	9.62	50	52.28	45	4.55
Non traded non food	744	25.1	366	37.04	248	67.76	118	11.94
Rice	1372	46.29	626	63.36	457	73.06	169	17.11
Main export crops	222	7.49	101	10.22	74	73.27	27	2.73
Other export crops	122	4.12	86	8.7	41	47.29	45	4.55
import-competing crops	164	5.53	101	10.22	55	54.13	46	4.66
Non-traded food	50	1.69	31	3.14	17	53.76	14	1.42
Total	2,964	100.00	1484	150.2	989	66.58	495	50.20

*The between variation looks at the variation across households whereas the within variation indicates the percentage of households that are always in the reference trade category. For example, focusing on ``exporting industries'', the table shows that 78 households have ever been in that category over the course of the panel (7.89% of the 988 total households in the panel). This figure includes 47 households that have always been in that category (i.e., 60.26% of the 78 households that have ever been in this specific trade category). This means that 31 households out of 78 (3.14% of the total households in the sample) have not always been in the same trade category over the course of the panel. Looking at all trade categories, the table confirms that, notwithstanding some heterogeneity across groups, 496 households in the panel actually move across trade-related categories over the course of the panel (i.e., 50.2\% of the 988 total households in the panel). Another way to look at the issue is to compute the between total percentage for the entire panel time frame (i.e., the fraction of total households that have ever been in one of the possible trade categories: [1484/988]*100=150.2%). This confirms that 50.2% of the households have been counted more than once because they actually moved across groups.*

Tab. A.8 - Transition matrix over the course of the panel (2002-06) by trade categories

Trade-related clusters	Exporting industries	Import-competing industries	Non traded non food	Rice	Main export crops	Other export crops	import-competing crops	Non-traded food	Total
Exporting industries	60	2	11	15	1	2	1	0	92
	65.22	2.17	11.96	16.3	1.09	2.17	1.09	0	100
Import-competing industries	4	52	21	13	1	0	3	0	94
	4.26	55.32	22.34	13.83	1.06	0	3.19	0	100
Non traded non food	9	11	359	69	9	10	4	5	476
	1.89	2.31	75.42	14.5	1.89	2.1	0.84	1.05	100
Rice	22	30	83	699	4	19	14	2	873
	2.52	3.44	9.51	80.07	0.46	2.18	1.6	0.23	100
Main export crops	0	2	8	27	117	4	1	1	160
	0	1.25	5	16.88	73.13	2.5	0.63	0.63	100
Other export crops	2	7	14	36	2	34	6	2	103
	1.94	6.8	13.59	34.95	1.94	33.01	5.83	1.94	100
import-competing crops	1	2	14	50	4	4	61	0	136
	0.74	1.47	10.29	36.76	2.94	2.94	44.85	0	100
Non-traded food	0	1	3	16	1	1	1	19	42
	0	2.38	7.14	38.1	2.38	2.38	2.38	45.24	100
Total	98	107	513	925	139	74	91	29	1,976
	4.96	5.41	25.96	46.81	7.03	3.74	4.61	1.47	100

Frequencies and associated percentages of households that moved across trade categories over the periods 2002-2004 and 2004-2006. The first row for each category indicates numbers, while the second one the corresponding percentages. Frequencies (and associated percentages) of the households that changed trade categories from one survey to another for both periods are those that lie off the diagonal of the respective transition matrix.

Tab. A.9 - Vulnerability decomposition in utils in Vietnam in the period 2002-06 for different levels of the risk aversion parameter.

Vulnerability decomposition			Risk decomposition				
Overall Vulnerability (V)	Poverty induced (P)	Overall Risk (V-P)	Trade related risk	Aggr. risk	*ex-ante* id. risk	*ex-post* id. risk	unexplained risk
0.177	0.138	0.039	-0.021	0.108	-0.00001520	-0.043	-0.005
0.237	0.192	0.045	-0.015	-0.041	0.00000030	0.088	0.013
0.135	0.105	0.031	-0.009	0.040	0.00001240	0.033	-0.033
0.275	0.241	0.034	0.015	0.065	0.00003400	0.049	-0.095
0.284	0.229	0.055	0.011	0.017	0.00001440	0.014	0.014
0.342	0.311	0.031	0.018	0.073	0.00000592	-0.005	-0.055
0.282	0.249	0.033	0.015	0.054	-0.00000003	0.006	-0.042
0.269	0.214	0.054	-0.005	0.383	0.00011960	0.466	-0.790
0.266	0.230	0.036	0.011	0.060	0.00002470	0.037	-0.073
0.238	0.158	0.080	-0.024	0.164	0.00000699	0.075	-0.135
0.320	0.220	0.100	-0.019	-0.010	0.00000102	0.185	-0.056
0.162	0.101	0.061	-0.010	0.092	0.00003140	0.045	-0.066
0.358	0.275	0.083	0.020	0.180	0.00010780	-0.106	-0.010
0.355	0.208	0.147	0.014	0.075	0.00003770	0.103	-0.046
0.471	0.402	0.069	0.028	0.243	0.00008010	0.026	-0.229
0.382	0.307	0.074	0.021	0.180	0.00005600	-0.065	-0.062
0.368	0.239	0.130	-0.006	0.576	0.00021620	1.073	-1.513
0.346	0.261	0.085	0.016	0.167	0.00008670	-0.058	-0.039
0.249	0.128	0.121	-0.024	0.209	0.00004770	0.439	-0.503
0.445	0.256	0.189	-0.023	0.041	0.00001510	0.391	-0.222
0.189	0.083	0.106	-0.011	0.142	0.00005930	0.077	-0.103
0.534	0.365	0.169	0.031	0.569	0.00052040	7.713	-8.249
0.495	0.213	0.282	0.017	0.181	0.00010060	0.312	-0.228
0.664	0.524	0.140	0.043	0.752	0.00044680	0.962	-1.617
0.537	0.388	0.150	0.032	0.557	0.00034240	0.891	-1.330
0.525	0.267	0.258	-0.007	0.876	0.00039110	2.516	-3.127
0.495	0.327	0.168	0.024	0.489	0.00040410	5.223	-5.614

Tab. A.10 - Panel regression on household consumption in Vietnam (2002-06) with income residuals controlling for trade categories time trend

dep.var.: log consumption			
***Ex-post* components**		***Ex-ante* components**	
Age hh head	0.0433***	perm risk	-7.74e-08***
	(0.0159)		(2.75e-08)
Age sq. hh head	-0.000408***	trans risk	4.27e-10
	(0.000148)		(1.46e-08)
hh size	-0.161***	***Fixed Effects***	
	(0.0294)	*Exporting industries*	-0.0925*
hh size sq	0.00625***		(0.0502)
	(0.00222)	*Import-competing industries*	-0.0560
No of children	-0.0522**		(0.0407)
	(0.0233)	*Rice*	-0.0415+
Married hh head (yes=1)	0.0309		(0.0269)
	(0.0837)	*Main export crops*	-0.169***
hh head sex (male=1)	-0.0268		(0.0521)
	(0.0894)	*Other export crops*	-0.0855+
Prim educ (yes=1)	0.0397		(0.0556)
	(0.0468)	*import-competing crops*	-0.123***
Low secondary educ (yes=1)	0.0814		(0.0447)
	(0.0586)	*Non-traded food*	-0.0579
Upper secondary educ (yes=1)	0.00722		(0.0978)
	(0.0813)	*household*	yes
Tech/voc edu (yes=1)	0.0730	*year*	yes
	(0.0670)		
Univers. Edu (yes=1)	0.227+		
	(0.140)		
Geographical loc (urban=1)	0.154*		
	(0.0850)		
cons	8.222***		
	(0.533)		
pos. Income shocks	2.689***		
	(0.530)		
neg. Income shocks	2.180***	No Obs.	1976
	(0.505)	Adj R-sq	0.825

****,**,* denote significance at the 1, 5 and 10 per cent level, respectively.*

The categories "non-traded activities" and year 2002 act, respectively, as the benchmark from trade related and year fixed effects.

Table A.11 - Vulnerability decomposition in utils (all sample and vulnerable households) in Vietnam in the period 2002-06 computed reversing the order in Eq.4

	Vulnerability decomposition			Risk decomposition				
Trade-related clusters	Overall Vulnerability (V)	Poverty induced (P)	Overall Risk (V-P)	Trade related risk	Aggr. risk	*ex-ante* id. risk	*ex-post* id. risk	unexplained risk
gamma=1	0.177	0.139	0.039	0.030	0.058	0.023	-0.040	-0.032
Exporting industries	0.237	0.192	0.045	0.033	-0.093	0.020	0.095	-0.011
Import-competing industries	0.135	0.105	0.030	0.028	0.004	0.008	0.033	-0.043
Non-traded industries	0.275	0.241	0.034	0.043	0.037	-0.017	0.048	-0.077
Rice	0.284	0.229	0.055	0.037	-0.009	-0.012	0.013	0.027
Main export crops	0.342	0.311	0.031	0.048	0.045	-0.024	-0.004	-0.034
Other export crops	0.282	0.249	0.033	0.042	0.023	-0.013	0.005	-0.024
import-competing crops	0.269	0.214	0.054	0.034	0.345	0.007	0.477	-0.808
non-traded crops	0.266	0.230	0.035	0.041	0.030	-0.013	0.036	-0.059
All								
gamma=2								
Exporting industries	0.238	0.158	0.080	0.076	0.065	0.031	0.113	-0.205
Import-competing industries	0.320	0.221	0.100	0.090	-0.123	0.029	0.220	-0.117
Non-traded industries	0.162	0.101	0.061	0.067	0.016	0.008	0.046	-0.076
Rice	0.358	0.276	0.083	0.149	0.050	-0.033	-0.616	0.541
Main export crops	0.355	0.209	0.147	0.096	-0.006	-0.018	0.098	-0.023
Other export crops	0.471	0.402	0.069	0.177	0.100	-0.055	0.010	-0.164
import-competing crops	0.382	0.308	0.074	0.142	0.051	-0.026	-0.080	-0.012
non-traded crops	0.368	0.239	0.130	0.089	0.482	0.012	1.113	-1.566
All	0.346	0.261	0.085	0.137	0.045	-0.027	-0.402	0.335
gamma=3								
Exporting industries	0.249	0.128	0.121	0.130	0.056	0.038	0.647	-0.750
Import-competing industries	0.445	0.256	0.188	0.189	-0.176	0.046	0.514	-0.384
Non-traded industries	0.189	0.083	0.106	0.116	0.016	0.008	0.080	-0.115
Rice	0.534	0.365	0.169	0.537	0.058	-0.107	88.162	-89.699
Main export crops	0.495	0.213	0.282	0.197	0.002	-0.029	0.286	-0.173
Other export crops	0.664	0.524	0.140	0.543	0.273	-0.161	0.559	-1.074
import-competing crops	0.537	0.388	0.149	0.413	0.148	-0.072	0.626	-0.965
non-traded crops	0.525	0.267	0.257	0.180	0.690	0.022	2.646	-3.280
All	0.495	0.327	0.168	0.443	0.066	-0.083	57.869	-58.648