

Trade Openness and Vulnerability to Poverty in Viet Nam under *Doi Moi*¹

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1. Introduction

Following the so-called “Asian option” of transition, from the early 1990s Viet Nam adopted the *Doi Moi* (renovation) process, a combination of liberalization, stabilization and structural reforms. This included two main waves of trade liberalization, one in the 1990s and a second in the 2000s (Coello et al., 2010). The first wave lasted from the initial opening of the country until approximately 2001 and foresaw the total abolition of trade licences and the removal of most quantitative restrictions (Thanh and Duong, 2009). The second wave—still ongoing—includes the full involvement of the country in the global network of reciprocal trade agreements (both multilateral, WTO accession in January 2007, and bilateral, such as agreements signed with the United States in 2001 as well as FTA negotiations with the EU concluded in 2016).

Extensive empirical investigation of trade liberalization and poverty dynamics in Viet Nam has been carried out (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, 2009; Coello et al., 2010). Empirical analyses consistently highlight the increased importance of international trade in the Vietnamese economy as well as the positive correlation between trade liberalization, growth and poverty reduction.

However, these studies focus mainly on the first sub-period, when the process of liberalization was still restricted and subject to trade licences. Moreover, the studies do not examine the relationship between openness and vulnerability to poverty. This is because they generally overlook the possible impact of the opening process on households’ exposure to risk as well the role of trade openness as one of the possible channels of risk.

This work aims at addressing this gap, assessing differences in households’ vulnerability according to specific features such as the typology of economic activities (farm versus non-farm), gender, and trade exposure. The value added of this analysis lies in taking advantage of a full set of available rounds of household surveys in Viet Nam to give a careful interpretation of the cross-sectional evidence of risk-induced household vulnerability, its determinants, and its heterogeneity across “trade-related” industries.⁴

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⁴ Because of the lack of panel data, our analysis is not able to directly control for cross-sectional household heterogeneity or for measurement error and their evolution over time. The main problem is that the cross-sectional variation in vulnerability to poverty across the various trade-exposed sectors can actually be driven by a number of factors other than risk (e.g., differences in household characteristics across sectors due to self-selection) that are unobservable to the researcher. By providing sound empirical techniques and taking advantage of the full set of available household and community controls, we are confident to be able to minimise the relevance of unobservables and provide useful upper bound of the phenomena under analysis.

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The contribution of this paper is twofold: using six Living Standards Measurement Surveys in Viet Nam (covering the period 1992-2008), we first assess the level and changes over time in the shares of vulnerable people across economic sectors, organized according to their relative degree of trade exposure; second, we measure how much of households' consumption variation (which is at the core of vulnerability analysis) can be explained by its stochastic *ex-ante* component, namely the variance of income within trade-exposed groups, as well as by actual income shocks, defined as the component of income variation unexplained by observables.

Our main results are the following. Vulnerability to poverty fell in Viet Nam during the *Doi Moi* period, together with an increased share of its stochastic (risk) determinant. The share of the vulnerable population in the relatively more trade-exposed sectors fell more slowly than in non-traded sectors. Even after *Doi Moi*, farming households engaged in the production of export crops and import-competing crops faced higher levels of vulnerability than those engaged in the production of non-traded crops or in non-farm activities.

Moreover, the risk of future poverty for households engaged in activities directly affected by trade liberalization was driven by high volatility, not from expected mean consumption below the poverty line. The above results are key for policymaking. They highlight a link between trade openness and risk-induced vulnerability, underlining the need to address vulnerability to poverty, even in the context of trade liberalization policies that result in a net reduction in poverty.

The paper is organized as follows: section 2 reviews the literature and presents the conceptual framework; section 3 presents the data; section 4 shows the empirical results; and section 5 concludes and provides key policy implications.

2. Trade openness and vulnerability to poverty: the conceptual framework

The literature on trade liberalization and poverty dynamics in Viet Nam has reached consensus on the following issues: price liberalization has had a great impact on agricultural households since 1986 (Niimi et al., 2007), with a substantial poverty reduction for rice net producers that exceeds that for rice net consumers (Heo and Doanh, 2009); trade liberalization has been beneficial to the poor thanks to the highly labor intensive structure of Vietnamese exports;⁵ the negative effects of trade liberalization occurred mainly in coffee production after 1998 (Ha and Shively, 2008).

However, a key issue remains unanswered: has trade openness magnified households' exposure to risk and raised their vulnerability to poverty? The topic is currently debated by practitioners, whereas it is largely ignored by the trade literature (Montalbano, 2011). In principle, trade can change the level of risk faced by households in two ways: by changing the riskiness of existing activities, for instance, by altering the weight of foreign compared with domestic shocks faced by the economy, or by shifting the composition of household activities, for example switching from subsistence food crops to cash crops (McCulloch et al., 2001).

⁵Abbott et al. (2009) claim that the poverty impacts of trade reforms in Viet Nam 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 behind recent development in Viet Nam.

The poor face particularly severe challenges if trade reform increases risk. Their ability to insure themselves against adverse impacts tends to be limited, while their traditional coping mechanisms may be ineffective in dealing with the greater exposure to foreign shocks and changes in incentives generated by trade liberalization (Dercon, 2001; 2005). Moreover, the poor may lack information on the risks associated with the new activities induced by openness (Winters et al., 2004). Trade openness can also affect government ability to adopt price stabilization policies 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 economic activities and, eventually, lead to net welfare effects that are less positive than expected in the long run (Winters, 2002; Winters and al., 2004; Calvo and Dercon, 2007). 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 and eventually the possibility to fall into poverty traps (Carter and Barret, 2006; Dercon and Christiaensen, 2011; Barrientos, 2013).

For instance, in the Vietnamese context, poor farmers in the midst of trade reform have two options. The first one is to rely on conservative choices (for example, subsistence farming) as their main risk management strategy, thus insulating themselves from trade-related risks. This leaves them still vulnerable to shocks that existed before liberalization (for example, natural ones), and fails to improve their income. The second option is to make changes in production in response to the new incentives generated by trade liberalization (for example, moving to an export crop such as coffee), with an expected increase in mean income as well as an increase in its volatility. With this choice they could climb out of poverty, but remain vulnerable to risks that existed before liberalization as well as the new ones relating to openness. Assuming that different risks (domestic and foreign) call for different risk

management strategies (as well as different risk coping ones when shocks occur), and that households adopting the second option (changing behaviour to get benefit of trade liberalization) do not have appropriate risk sharing strategies, we would register different welfare impacts *ex-post*.

3. Data

Our empirical analysis uses the standard measure of vulnerability to expected poverty (VEP)⁶ (explained in detail in Appendix B), drawing on cross-sectional data for the following years: 1992, 1998, 2002, 2004, 2006 and 2008. Data come from two different sets of Vietnamese household surveys: the Viet Nam Living Standards Survey (VLSS) and the Viet Nam Household Living Standards Survey (VHLSS).⁷ 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 of regions and months. Poverty lines for computing vulnerability are expressed in Vietnamese Dong as follows: 1,160,000 for 1992; 1,790,000 for 1998; 1,915,000 for 2002; 2,070,000 for 2004; 2,559,000 for 2006; 3,360,000 for 2008.



⁶ For a taxonomy of the main methods applied in vulnerability analysis, see Montalbano (2011).

⁷ 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: whereas VLSS used the 1989 Population Census, the VHLSS 2002 exploited the Population and Housing Census from 1999. As a result, while there are short panel samples from the last waves, no household was re-interviewed between the VLSS and the VHLSS and, generally speaking, a comparison between VLSS and VHLSS rounds is not possible.

The variable used for household real per capita income has been derived by aggregating income into six major categories: income from crops, income from agricultural sidelines, household business income, wage income, gifts and remittances, and other residual sources of income. While we acknowledge possible measurement errors, when errors are random errors with a mean of zero, and the variable with errors is used as a dependent variable, as in our case, it is well known that those errors will not cause estimation bias. Furthermore, as suggested by Nakata et al. (2009), measurement errors in retrospective expenditure reports seem to be systematically related to household size. This suggests that the inclusion of household size as one of the control variables in our regressions contributes to mitigating biases arising from measurement errors in consumption.

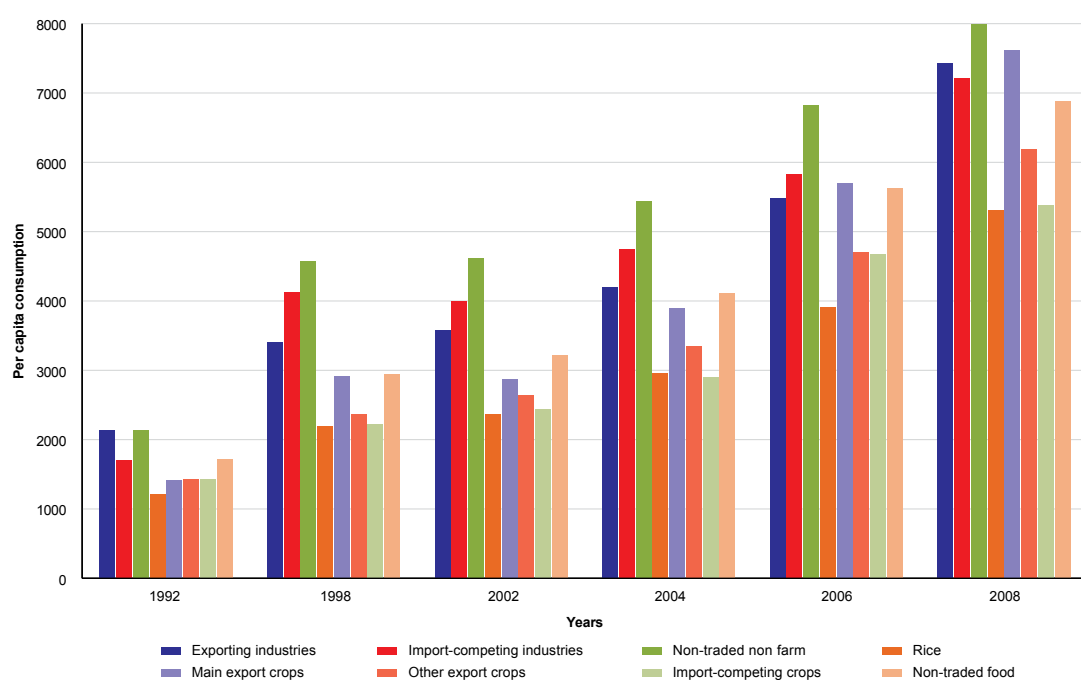
The set of covariates used for our consumption estimates includes household characteristics (such as characteristics of the head of household, i.e., linear and quadratic age, marital status, sex, linear and quadratic terms of family size and number of children); education achievements (primary, secondary, 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).

Since VLSS and VHLSS surveys do not relate production and external trade, we group households according to the trade openness of their sector of specialization, as in Coello et al. (2010). This requires matching the ISIC code of any sector with the SITC classification used in trade data and classifying sectors as follows: exported manufactures; import-competing manufactures; non-traded services; and agricultural goods. A further breakdown of the agricultural sector is also provided, as follows: rice (considered separately because of its special status for the Vietnamese economy: it acts as the main staple food as well as the main cash crop); the main agricultural export products, other agricultural export products, import-competing crops and subsistence crops. Thus, we come up with eight trade-related production sectors articulated into traded and non-traded, farm and non-farm activities (see Table A.1 for details on the surveyed industries included in each sector).

Figure 1 reports the average levels of mean real per capita consumption for each trading group across time (Table A.2 in Appendix A provides additional statistics

Figure 1: Real per capita consumption (average levels by trade categories in VN Dong)



Source: Authors' calculations

on real per capita consumption, real per capita income, the current values of assets/durables, and the number of surveyed households by each category). The figure shows that, although both farm and non-farm activities actually increased their consumption levels over time, people involved in non-farm activities are on average characterized by higher consumption levels than farmers (the highest consumption is registered by households involved in non-traded non farm), followed by export industries and import-competing manufacturing (and, more recently, by export crops). Conversely, households involved in rice production (actually the vast majority of sampled ones, see Table A.2) show, on average, the lowest level of real per capita consumption. This is consistent with the fact that incidence of poverty is lower in non-farm sectors than in farm sectors (with the exception of farm main-exports and non-traded crops) and fell sharply in households engaged in non-traded farm activities.

4. The empirical analysis

Our empirical analysis adds new pieces of information to the standard picture of poverty and trade liberalization in Viet Nam under *Doi Moi*, by computing both the

overall VEP and its risk-induced sub-component for each household in the sample.⁸ Table 1 reports the new statistics alongside the poverty rates for each round of household data.⁹

Both poverty and vulnerability fell during the *Doi Moi* reforms. The share of Vietnamese households under the poverty threshold fell from more than 50% at the eve of the liberalization process to about 16% in 2008, while the share of vulnerable households fell from around 56% in 1992 (68% in the case of rural households) to 8.3% in 2008 (10.2% of rural households). The decline in poverty was greatest at the start of the liberalization process (between 1992 and 1998) and more relevant for rural households than for urban households: vulnerable urban households were about 7% of the total at the beginning of the openness process, falling to about 0.5% already in 1998. The same pattern is confirmed when we disentangle farm and non-farm households' activities, although 25% of households involved in non-farm activities were vulnerable in 1992. Vulnerability was higher among male-headed households (9.4% in 2008) than in female-headed households (4%).

Table 1: Vulnerability and poverty in Viet Nam (1992-2008)

	1992	1998	2002	2004	2006	2008
Poverty Rate in the Survey	55.2	29.9	28.0	19.4	15.3	16.4
VEP Rate (%)	56.1	21.5	18.3	10.8	7.1	8.3
Non-Farm	25.1	6.5	6.7	3.4	2.0	2.0
Farm	69.0	30.9	27.9	17.5	12.0	11.7
Rural	68.2	29.8	23.6	14.0	9.3	10.2
Urban	7.1	0.5	0.5	0.1	0.2	0.2
Female	43.5	13.5	8.4	4.4	2.7	4.0
Male	60.7	24.4	21.1	12.6	8.3	9.4
Risk-induced VEP (% vulnerable)	18.7	33.7	31.0	31.2	32.6	31.1
Non-Farm	30.3	47.8	45.9	46.9	46.3	61.7
Farm	17.0	31.9	28.0	28.5	30.4	28.2
Rural	17.7	33.4	30.9	31.2	32.6	31.0
Urban	61.0	87.5	39.4	100.0	33.3	50.0
Female	22.6	40.5	39.5	50.6	46.0	53.7
Male	17.7	32.4	30.0	29.3	31.4	28.6

Source: Authors' calculations.

Note: VEP rates = shares of vulnerable households on total sampled households.

⁸ As is common practice, we consider households as vulnerable if they show a probability higher than 0.50 to fall into poverty at least once in the following two years. To this end, we compute vulnerability as one minus the probability of no episodes of poverty, as follows: $V_{h,t} = 1 - [P(\ln c_{h,t} > \ln z)]^2$, given the information set at t .

⁹ *Ex-ante* vulnerability and *ex-post* poverty should be viewed as different statistics: while we can compare their evolution over time, we cannot draw any cross comparisons between them. For those who are interested in this, Imai et al., (2011) suggest a method of making such a comparison by means of a multinomial logit model, adding $VEP_{h,t-1}$ as one of the arguments.

A different picture comes out if we look at the share of the risk-induced component of vulnerability (i.e., the component of vulnerability associated with a high estimated variance of consumption, but expected consumption above the poverty line). In this case, after a common drop moving from VLSS to VHLSS (between 1998 and 2002), probably due to the substantial difference in the sampling frame between the two surveys, the risk-induced vulnerability never fell below the threshold of 31% of the overall VEP. Moreover, differently than in the overall measure, a higher share of female-headed households than male-headed households are vulnerable by the risk-induced VEP measure, and the former share rises, with more than 50% of vulnerable female-headed households risk-induced in 2008. Also remarkable is the

higher incidence of risk-induced vulnerability among urban than rural households, as well as in households involved in non-farm than in farm activities (even if in both cases the former categories show very low percentages of vulnerable households overall). In other words, our analysis shows that the nature of vulnerability changed over time (from poverty-induced to risk-induced).

Table 2 reports the breakdown of the vulnerability statistics by trading sector between farm and non-farm activities.¹⁰ For each trading sector and surveyed year, it shows the total percentage of vulnerable households and the percentage of vulnerable households that are considered as risk-induced. The percentage of vulnerable people decreased steadily in all trade-related sectors

Table 2: Overall and risk-induced vulnerability by farm and non-farm activities and trade-related sectors

		1992	1998	2002	2004	2006	2008
VEP rate (%)	Non-farm activities						
	Export manufactured goods	22.4	10.0	10.8	5.3	3.8	2.3
	Import manufactured goods	43.6	6.1	8.0	4.1	2.9	3.2
	Non-traded non farm	18.9	5.8	5.5	2.8	1.4	1.4
	Farm activities						
	Main export agricultural products	54.5	14.9	25.9	11.0	3.0	3.4
	Other export agricultural products	51.1	26.3	25.3	16.8	7.3	9.3
	Import-competing crops	58.3	39.5	36.8	26.8	13.2	19.3
	Non-traded crops	43.8	22.0	10.8	2.8	1.1	1.9
	Rice	71.6	32.1	27.8	17.8	13.4	12.3
	Net consumer	45.1	16.4	13.3	7.8	4.3	5.4
	Net producer	68.2	27.5	20.5	14.4	10.3	11.1
Risk-induced VEP (% vulnerable)	Non-farm activities						
	Export manufactured goods	31.8	48.5	39.4	41.9	40.9	55.6
	Import manufactured goods	26.4	43.8	45.1	45.5	37.5	60.0
	Non-traded non farm	33.3	48.3	49.0	49.4	52.4	66.7
	Farm activities						
	Main export agricultural products	23.6	56.8	32.1	52.4	55.6	50.0
	Other export agricultural products	20.9	17.1	31.8	31.3	62.5	45.7
	Import-competing crops	14.3	25.5	20.2	25.4	40.0	25.3
	Non-traded crops	42.9	62.5	50.9	75.0	60.0	50.0
	Rice	16.5	32.4	28.5	26.5	28.2	26.4
	Net consumer	20.5	27.5	30.4	34.6	37.7	35.4
	Net producer	17.5	37.9	34.0	28.8	29.9	29.3

Source: Authors' calculations.

¹⁰ Both the F-statistics of the one-way ANOVA and the Levene's T-test reject in each round of observations the null hypotheses that the means and the variances of the estimated income residuals are the same across trade-related production groups. We are thus confronting heterogeneity in unexplained stochastic components when households are gathered by trade-related sectors.



(with the usual jumps moving from VLSS to VHLSS). As a result, in 2008 (our last year of observation), all trade-related sectors register, without exception, a lower percentage of vulnerable households than in 1992. Nevertheless, farm activities show higher percentages than non-farm ones, with the relevant exception of households producing non-traded crops.

According to our VEP estimates, the sectors with the lowest percentage of vulnerable households are non-traded non farm and non-traded crops (in both cases, the percentage of vulnerable households is below 2% in 2008). Among farm activities, the production sector with the highest percentage of vulnerable households is import-competing sectors, followed by rice. Acknowledging the peculiar nature of the rice sector which is, at the same time, the main production sector and the main source of food for Vietnamese households, the last two rows of Table 2 show the decomposition of vulnerability patterns between rice net producers and net consumer households; although the shares of the vulnerable are higher among net rice producers than among net rice consumers, the opposite pattern holds

in the case of the risk-induced component of vulnerability. Notwithstanding the fact that the average income/consumption of households involved in main-export crops is similar to that of households involved in non-traded non farm activities (see Table A.2), the share of vulnerable people in the former is higher than in the latter for all years. This is noteworthy if we consider the low incidence of poor households involved in export crops and the roughly equal distribution of income across deciles within that sector.

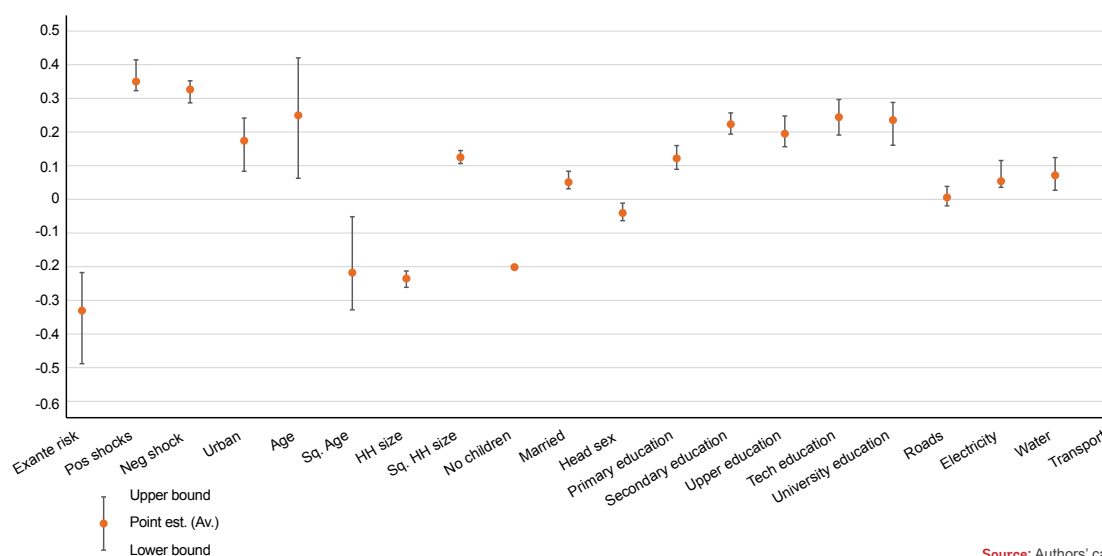
Hence, we can argue that the hypothesis of heterogeneity in vulnerability by trade sector is not rejected by the empirical data in Viet Nam. Furthermore, all non-farm activities register in 2008, generally speaking, a higher share of risk-induced vulnerability than farm ones, where import-competing crops and rice seem to be the least exposed. Although the share of risk-induced vulnerable households is computed on a smaller total number of vulnerable households, this is a relevant issue for policymaking. At the same time, we should acknowledge the inherent weaknesses of VEP of measuring risk appropriately (see Appendix B).

To shed light on the black box of the risk-induced VEP component, we further disentangle the relative weight of its various determinants by calculating the so-called dispersion importance (Achen, 1982),¹¹ i.e., the proportion of the variance in consumption explained by the different covariates in the vector X .¹² Figure 2 plots the average values over the six surveys (the estimated coefficients for each round of the observations are reported in Table A.3 in Appendix A). It shows that all the non-stochastic covariates are statistically significant and show the expected signs.¹³ The striking feature of our empirical outcomes is that both our *ex-post* and *ex-ante* stochastic components of income¹⁴ are the most important determinants of household consumption fluctuations.¹⁵

Figure 3 shows the evolution of the net contribution of the *ex-ante* component of income innovation in reducing households' consumption by clustering households across groups of industries classified as traded, not traded and rice. The picture highlights a higher average of the *ex-ante* stochastic component in the case of the trading sectors compared with non-traded ones, especially in the most recent rounds, net of the usual jump between VLSS and VHLSS.

Even if our exercise cannot be considered a proper test of consumption behavior under risk—because of its static nature—this last result confirms that we are confronting heterogeneity in the variance of income innovation which is correlated with the degree of trade openness

Figure 2: Dispersion importance of the determinants of household consumption (estimated beta coefficient of per capita consumption, period 1992-2008)



Source: Authors' calculations

¹¹ Standardized coefficients are the regression coefficients when all variables have been standardized to mean zero and variance one (z scores). For more details, see Achen (1982).

¹² See eq. B.7 in Appendix B and the estimated coefficients reported in Table A.3 in Appendix A.

¹³ The signs of age and its square coefficients confirm, in principle, the well-known concave age-consumption profile, even if the decreasing rate is in this case meaningless. Not surprisingly, having children reduces household per capita consumption while being married increases it. The significance of the parameter associated with the household dimension also mitigates possible measurement error bias. Whether the head of the household is male or female is correlated with consumption too. The education variables also behave as expected, that is, higher levels of education correspond to higher levels of consumption. Lastly, the presence of a set of village characteristics (urban status and availability of paved roads, electricity, tap water and public transport) are associated with a higher level of consumption as well.

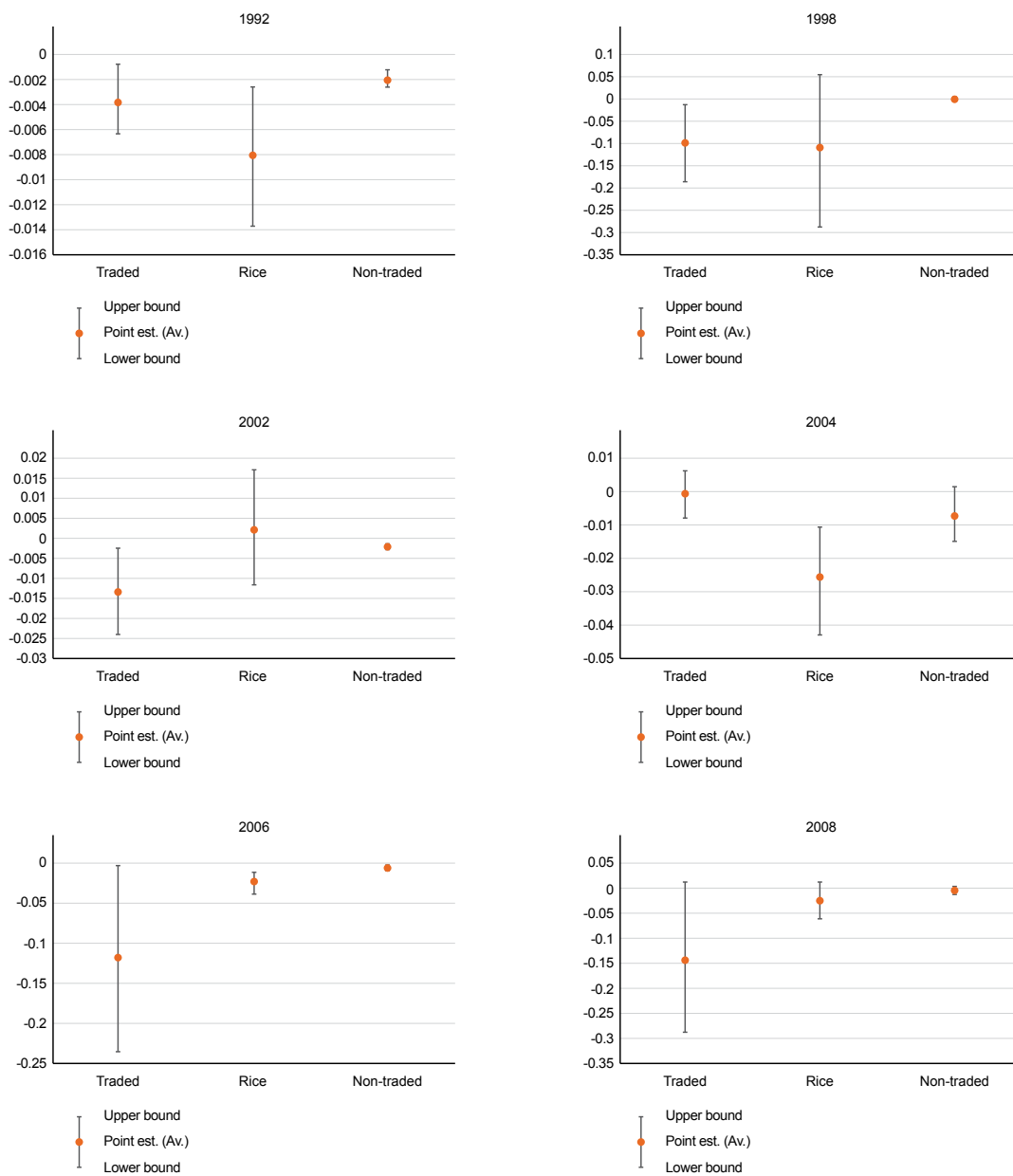
¹⁴ The outcomes of the income equation (eq. 1) which are used to separate the *ex-ante* and *ex-post* components of risk are reported in Table A.4 in Appendix A.

¹⁵ For sensitivity purposes additional estimates of eq. B.7 (see Appendix B) were carried out, including dummies for trade categories. On the one hand, this helps us capture possible unobservable income effects other than those already controlled for by the observable characteristics, neutralizing differences in average income between groups (i.e., households in different trade categories show heterogeneous consumption because of heterogeneous income). On the other hand, while the risk term is supposed to capture both within and between group effects, the inclusion of trade categories acknowledges that some risks can be common to households in the same trade group and allows us to isolate the risk effect within groups (i.e., risks are identified within the groups) better than in the estimates without trade categories. While the overall fit of the model with the trade dummies slightly improves, the coefficients of the risk terms do not change significantly. The above evidence suggests that the trade dummies mainly capture differences in mean income that do not influence the risk channel depicted above.

of production sectors. Again, if we are willing to assume it is the upper bound of a proper measure of the trade-induced risk component, the plain conclusion is that, not only is risk increasing over time in Viet Nam under *Doi Moi*, but that its relevance (in terms of net contribution to the variance of household consumption) is proportionally higher the higher the trade exposure of the sector the household is involved in. It is unlikely

that this could be caused only by unobserved heterogeneity other than risk, especially if we take into account that it is negatively correlated with consumption behaviour. If that were the case, it would be a very relevant issue for policymaking anyway since it would also imply a revision of the assumed trade benefits for the welfare of Vietnamese households working in the most exposed trading sectors.

Figure 3: Evolution of the net contribution of the risk component on average household consumption (1992-2008) in traded, rice and not traded sectors.



5. Conclusions

This paper presents a comprehensive analysis of vulnerability to poverty in Viet Nam during *Doi Moi*. The results show a decreasing trend in vulnerability to poverty along with a decreasing trend in poverty, confirming the well-known positive impact of the reforms—including trade liberalization—on the overall performance of the country. By these measures, the liberalization process reduced both the observed poverty as well as the risk of future poverty.

However, a more disaggregated picture on the distribution of these benefits reveals that the encouraging results shown at the aggregate level hide the presence of some subsets of the population who face increased risk and thus a high probability of falling back into poverty in the near future. Our analysis tests if this risk depends on the relative position of a household with respect to some specific features such as the typology of its economic activities (non-farm versus farm), trade exposure, and gender. Despite the fall in the vulnerability level from 56% to 8% over the sampled period, we still observe that after *Doi Moi* those employed in farm activities are, on average, five times more likely to fall into poverty compared to households engaged in non-farm activities. The same is true when we look at the distinction between rural and urban areas, making evident that farmers in rural areas still deserve special attention by policymakers interested in limiting an increase of poverty in the near future. Finally, when we look specifically at the risk-induced components of vulnerability to poverty, we detect a relatively higher incidence of vulnerable households in non-farm activities and in female-headed households.

Our estimates also show that vulnerability to poverty varies systematically according to trade exposure of surveyed households, especially for those involved in farm activities. In particular, farmers engaged in the production of export crops and import-competing crops still registered higher levels of vulnerability after *Doi Moi* than those engaged in non-traded crops or non-farm activities and, in some cases, also a new increase in recent years. More interestingly, for the categories exposed to international trade and, therefore, the liberalization

process, the risk of future poverty is mainly driven by the risk-induced component. This implies that the threat of falling into poverty does not come from an expected mean consumption below the poverty line, but from its high volatility. By further investigating the determinants of consumption volatility we finally highlight the role of risk heterogeneity across households according to their degree of risk exposure.

These results provide some useful insights to policymakers. First of all, they show that “risk-induced” vulnerability is relevant and significant even in absence of *ex-post* shocks. Second, they demonstrate that the liberalization process needs to be accompanied by additional support to households engaged in those farm activities more exposed to international competition, since trade openness can magnify risk. This is because liberalization changes the riskiness of existing activities, altering the weight of foreign relative to domestic shocks faced by the economy and, as a consequence, the households’ optimal economic activities. This is especially true for the smallholder 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. Interventions to address these issues should primarily target trade-induced vulnerable households. First, we need to better protect them from excessive price volatility, in the spirit of the global trade negotiations on special safeguard mechanisms. Second, we also need to help them to carry out progressive choices and take full benefit of trade reforms. This means fostering their ability to take risks consciously. This can be done by supporting self-insurance via savings (through micro-financial instruments), assisting income risk management by providing access to credit, sustaining community-based risk-sharing and pushing the public and private institutions to develop new insurance products targeted to farmers most involved in tradable cropping.

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Appendix

Appendix A: Methods

Table A.1: Industries classification by trade-related sectors

Exports Non-Farm

Fishing, aquaculture
 Mining of coal and lignite: extraction of peat
 Extraction of crude petroleum and natural gas
 Wearing apparel: dressing and dyeing of fur
 Footwear
 Wood and of products of wood and cork
 Office, accounting and computing machinery

Import-Competing Non-Farm

Forestry, logging and related service activities
 Mining of uranium and thorium ores
 Food products and beverages
 Tobacco products
 Textiles
 Tanning and dressing of leather: luggage
 Paper and paper products
 Coke, refined petroleum products and nuclear fuel
 Chemicals and chemical products
 Rubber and plastic products
 Other non-metallic mineral products
 Basic metals
 Fabricated metal products
 Machinery and equipment
 Electrical machinery and apparatus
 Radio, television and communication equipment
 Medical, precision and optical instruments
 Motor vehicles, trailers
 Furniture; manufacturing n.e.c.

Main Export Farm

Black pepper
 Exports Cashew, coffee
 Rubber, tea

Other Export Farm

Bananas
 Cassava manioc
 Coconut
 Cotton
 Cabbage, cauliflower
 Mango, Papaya
 Peanuts
 Pineapple
 Sesame seeds
 Soy beans
 Specialty rice
 Sweet potatoes

Rice

Non-Traded Non-Farm

Recycling
 Electricity, gas, steam and hot water supply
 Collection, purification and distribution of water
 Construction
 Sale, maintenance and repair of motor vehicles
 Wholesale trade and commission trade
 Retail trade, repair
 Hotels and restaurants
 Land transport; transport via pipelines
 Water transport
 Air transport
 Supporting and auxiliary transport activities
 Post and telecommunications
 Financial intermediation
 Insurance and pension funding
 Activities auxiliary to financial intermediation
 Real estate activities
 Renting of machinery and equipment
 Computer and related activities
 Research and development
 Other business activities
 Public administration and defense
 Education
 Health and social work
 Sewage and refuse disposal, sanitation
 Activities of membership organizations n.e.c.
 Recreational, cultural and sporting activities
 Other service activities
 Private households as employers
 Extraterritorial organizations and bodies

Import-Competing Farm

Apples, grapes
 Fresh vegetables
 Indian Corn
 Jackfruit, durian
 Jute, ramie
 Mulberry
 Oranges, limes
 Other leafy greens
 Plums, potatoes
 Sugar cane
 Tobacco
 Tomatoes

Non-Traded Farm

Custard apple (subsistence)
 Litchi, logan, rambutan
 Sapodilla
 Water morning glory

Source: Coello et al., (2010).

Table A.2: Main descriptive statistics of sampled households by farm and non-farm activities and trade-related sectors (all monetary values are in VN Dong)

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
1992				
Non-farm activities				
Exporting industries	Mean	2192.451	4411.844	50768.46
	Std Dev.	1561.628	4115.385	60503.03
	Min	659.5261	702.151	770
	Max	9416.787	28112.09	254030
	Obs.	90	90	90
Import-competing industries	Mean	1703.968	4010.86	40157.48
	Std Dev.	1096.584	4141.78	69949.56
	Min	644.5936	685.3751	420
	Max	6964.31	32100.77	557640.00
	Obs.	248	248	248
Non-traded non farm	Mean	2141.634	4513.755	54588.53
	Std Dev.	1344.579	4356.647	110483.2
	Min	632.6236	588.8931	325
	Max	13302.89	31179.41	1856910
	Obs.	764	764	764
Farm activities				
Rice	Mean	1205.835	2228.961	11760.01
	Std Dev.	588.1142	2181.356	14503.86
	Min	632.6989	581.9226	250
	Max	9823.781	32836.96	200165
	Obs.	1984	1984	1984
Main export crops	Mean	1415.444	3392.292	14058.95
	Std Dev.	763.8515	3268.074	13966.92
	Min	655.5554	595.1584	700
	Max	5502.093	20253.97	65835
	Obs.	79	79	79
Other export crops	Mean	1422.605	2839.797	12518.11
	Std Dev.	685.3914	3739.296	16657.67
	Min	641.1921	601.6185	145
	Max	4300.459	25073.38	125210
	Obs.	115	115	115
Import-competing crops	Mean	1434.692	2303.38	16439.59
	Std Dev.	785.5209	1808.142	52780.9
	Min	638.0425	583.5345	310
	Max	4542.778	11332.75	429000
	Obs.	68	68	68
Non-traded food	Mean	1713.105	3394.557	9093.655
	Std Dev.	821.2369	2458.819	8167.273
	Min	766.6361	707.5646	1240
	Max	3904.79	9992.304	38770
	Obs.	29	29	29

(continued)

Table A.2: continued

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
1992				
Total	Mean	1501.673	2994.423	24725.37
	Std Dev.	985.8579	3260.65	61269.39
	Min	632.6236	581.9226	145
	Max	13302.89	32836.96	1856910
	Obs.	3377	3377	3377
1998				
Non-farm activities				
Exporting industries	Mean	3412.447	5272.34	36800.08
	Std Dev.	2260.809	4494.307	40726.13
	Min	781.2977	580.001	2891
	Max	13071.95	31198.08	320369
	Obs.	313	313	313
Import-competing industries	Mean	4128.725	6742.565	37319.39
	Std Dev.	2521.305	4987.061	41747.78
	Min	1000.463	725.8027	1789
	Max	15113.75	28302.5	339667
	Obs.	246	246	246
Non-traded non-farm	Mean	4575.739	7008.84	39891.78
	Std Dev.	2869.457	5516.867	44393.46
	Min	672.0535	607.9286	1606
	Max	18447.21	33397.65	569448
	Obs.	1444	1444	1444
Farm activities				
Rice	Mean	2188.854	3272.888	29498.69
	Std Dev.	1134.081	2615.77	15094.29
	Min	641.6957	580.1642	4395
	Max	17954.53	32352.02	187352
	Obs.	2233	2233	2233
Main export crops	Mean	2913.869	6095.626	50035.58
	Std Dev.	1396.513	5332.938	22506.29
	Min	668.3075	641.0767	13251
	Max	7743.051	31930.03	161200
	Obs.	243	243	243
Other export crops	Mean	2371.039	3299.853	30405.18
	Std Dev.	1352.125	2531.955	16198.06
	Min	642.0324	616.2089	6555
	Max	12183.87	16451.14	162416
	Obs.	257	257	257
Import-competing crops	Mean	2223.277	4110.429	30030.66
	Std Dev.	1124.119	3511.499	14803.79
	Min	763.335	687.3796	5162
	Max	7330.38	23243.84	101753
	Obs.	369	369	369

TRADE AND POVERTY REDUCTION: NEW EVIDENCE OF IMPACTS IN DEVELOPING COUNTRIES

Table A.2: continued

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
1998				
Non-traded food	Mean	2944.834	5428.627	36216.86
	Std Dev.	1560.53	4595.308	18145.84
	Min	1133.982	650.2026	4147
	Max	12939.04	27087.97	119059
	Obs.	107	107	107
Total	Mean	3075.931	4828.271	34363.51
	Std Dev.	2202.777	4409.839	30268.27
	Min	641.6957	580.001	1606
	Max	18447.21	33397.65	569448
	Obs.	5212	5212	5212
2002				
Non-farm activities				
Exporting industries	Mean	3581.795	6192.238	90606.57
	Std Dev.	2319.123	4590.791	135475.1
	Min	666.2547	908.5842	780
	Max	18474.96	32929.32	1612400
	Obs.	1882	1882	1882
Import-competing industries	Mean	3993.802	6906.522	99507.89
	Std Dev.	2495.643	4745.421	139213.7
	Min	774.4517	877.4553	800
	Max	17656.49	32483.17	1128750
	Obs.	1715	1715	1715
Non-traded non farm	Mean	4610.45	7149.777	122618.8
	Std Dev.	2846.255	4654.243	182739.7
	Min	776.3353	600.4697	330
	Max	18206.18	32900.31	2690650
	Obs.	8192	8192	8192
Farm activities				
Rice	Mean	2370.043	3881.12	37594.71
	Std Dev.	1262.312	2637.034	50991.64
	Min	636.3497	592.4973	400
	Max	16062.52	32126.7	1653200
	Obs.	9992	9992	9992
Main export crops	Mean	2865.149	4745.447	87781.05
	Std Dev.	1681.762	3278.303	108277.1
	Min	661.9562	697.8714	1100
	Max	15316.62	32263.17	936000
	Obs.	1181	1181	1181

TRADE AND POVERTY REDUCTION: NEW EVIDENCE OF IMPACTS IN DEVELOPING COUNTRIES

Table A.2: continued

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
2002				
Other export crops	Mean	2641.501	4309.072	42263.15
	Std Dev.	1633.2	3023.609	58158.55
	Min	678.9702	683.3324	810
	Max	16090.9	30092.4	1260690
	Obs.	1129	1129	1129
Import-competing crops	Mean	2438.909	4152.161	41147.29
	Std Dev.	1495.762	3064.595	68697.35
	Min	632.3506	766.8577	500
	Max	12432.19	30170.09	1301850
	Obs.	1712	1712	1712
Non-traded food	Mean	3212.053	5584.73	80363.81
	Std Dev.	1635.302	3774.486	88996.52
	Min	781.5004	1139.245	1250
	Max	10509.04	33041.25	759300
	Obs.	501	501	501
Total	Mean	3314.752	5368.969	75403.3
	Std Dev.	2309.087	4038.796	128504.5
	Min	632.3506	592.4973	330
	Max	18474.96	33041.25	2690650
	Obs.	26304	26304	26304
2004				
Non-farm activities				
Exporting industries	Mean	4194.41	7098.479	166570.5
	Std Dev.	2373.103	4872.359	243364.5
	Min	659.4932	1068.277	1300
	Max	18009.55	31422.96	1600000
	Obs.	567	567	567
Import-competing industries	Mean	4751.13	7275.56	209212.8
	Std Dev.	2883.759	4727.285	289705.9
	Min	804.9464	1373.189	2000
	Max	17426.08	31739.94	2048380
	Obs.	506	506	506
Non-traded non farm	Mean	5442.173	7799.166	240375
	Std Dev.	3058.865	4758.865	309790.3
	Min	762.8577	742.0001	600
	Max	18538.53	32610.54	3400000
	Obs.	2548	2548	2548
Farm activities				
Rice	Mean	2963.063	4482.403	67849.33
	Std Dev.	1632.501	3113.673	114108
	Min	636.2792	662.9399	500
	Max	15168.72	32610.57	2250000
	Obs.	2891	2891	2891

TRADE AND POVERTY REDUCTION: NEW EVIDENCE OF IMPACTS IN DEVELOPING COUNTRIES

Table A.2: continued

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
2004				
Main export crops	Mean	3897.313	6512.622	152681.3
	Std Dev.	2201.884	4347.045	174252
	Min	660.0689	723.0797	10000
	Max	15519.49	30273.98	1980700
	Obs.	379	379	379
Other export crops	Mean	3343.519	5054.932	90692.55
	Std Dev.	2152.001	3978.047	143519
	Min	649.9424	618.9159	1500
	Max	15193.62	29642.49	1262000
	Obs.	372	372	372
Import-competing crops	Mean	2900.893	4627.119	69519.02
	Std Dev.	1667.725	3135.846	108253.4
	Min	671.829	993.0854	2000
	Max	10585.72	21311.11	1020000
	Obs.	417	417	417
Non-traded food	Mean	4114.86	5867.191	162244.5
	Std Dev.	2018.181	4038.008	180554
	Min	1184.327	878.6608	2000
	Max	12254.45	26558.29	1039000
	Obs.	140	140	140
Total	Mean	4056.495	6091.663	147345.6
	Std Dev.	2617.109	4341.264	235251
	Min	636.2792	618.9159	500
	Max	18538.53	32610.57	3400000
	Obs.	7820	7820	7820
2006				
Non-farm activities				
Exporting industries	Mean	5484.575	8104.154	178169.8
	Std Dev.	2910.144	4973.715	243101.4
	Min	1267.986	1358.74	1800
	Max	17637.29	31921.04	2014000
	Obs.	561	561	561
Import-competing industries	Mean	5830.48	8496.445	225846
	Std Dev.	2881.169	4785.573	280211.4
	Min	1176.05	1406.036	2800
	Max	17756.82	32552.32	1643450
	Obs.	519	519	519
Non-traded non farm	Mean	6827.813	8997.766	264558
	Std Dev.	3450.417	4902.625	319453.3
	Min	930.5538	1295.668	417
	Max	18586.1	33385.17	2400000
	Obs.	2664	2664	2664

Table A.2: continued

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
2006				
Farm activities				
Rice	Mean	3909.159	7039.552	83972.15
	Std Dev.	2107.268	4862.857	116821.2
	Min	672.7744	1287.076	1500
	Max	18482.16	33404.89	2400000
	Obs.	3242	3242	3242
Main export crops	Mean	5693.544	8731.128	257178.7
	Std Dev.	2959.028	5593.56	283022.7
	Min	1234.334	1582.989	8000
	Max	17913.47	31283.97	2090000
	Obs.	290	290	290
Other export crops	Mean	4698.161	6307.187	131835.8
	Std Dev.	2419.178	3901.14	155912.8
	Min	779.4249	1259.98	2500
	Max	13095.32	25989.33	1230200
	Obs.	215	215	215
Import-competing crops	Mean	4671.11	6601.615	118328.4
	Std Dev.	2424.836	4061.37	206149.1
	Min	1258.001	1334.528	5000
	Max	17009.25	24843.68	2000000
	Obs.	220	220	220
Non-traded food	Mean	5629.526	7690.066	180524.9
	Std Dev.	3147.224	5826.151	170270.9
	Min	1548.176	1482.076	4400
	Max	17925.98	31339.33	916500
	Obs.	90	90	90
Total	Mean	5276.399	7919.612	171695.1
	Std Dev.	3079.31	4964.403	248729.6
	Min	672.7744	1259.98	417
	Max	18586.1	33404.89	2400000
	Obs.	7801	7801	7801
2008				
Non-farm activities				
Exporting industries	Mean	7431.721	8807.368	305554.5
	Std Dev.	3326.838	5019.76	392335.1
	Min	1890.487	1399.764	3000
	Max	18603.3	32504.56	3200000
	Obs.	357	357	357

TRADE AND POVERTY REDUCTION: NEW EVIDENCE OF IMPACTS IN DEVELOPING COUNTRIES

Table A.2: continued

Trade sectors	Statistics	Real pc consumption	Real pc income	Current value of Assets/Durables
2008				
Import-competing industries	Mean	7213.916	8786.651	306531.6
	Std Dev.	3409.095	5256.447	362044.7
	Min	1202.683	831.3502	6000
	Max	18455.94	32561.08	3006300
	Obs.	584	584	584
Non-traded non farm	Mean	7998.437	9280.396	362571.2
	Std Dev.	3773.926	5262.812	449682.1
	Min	1290.584	909.3856	2400
	Max	18620.55	33084.13	3023950
	Obs.	1151	1151	1151
Farm activities				
Rice	Mean	5315.16	7805.027	125349.8
	Std Dev.	2800.208	5300.841	161537.2
	Min	682.2064	857.7307	1199
	Max	18584.97	33315.67	2065000
	Obs.	3032	3032	3032
Main export crops	Mean	7612.386	8280.179	389977.8
	Std Dev.	3490.674	5379.078	376865.4
	Min	1485.559	1027.04	3000
	Max	18552.71	28746.93	2118500
	Obs.	328	328	328
Other export crops	Mean	6193.856	6795.463	162927.4
	Std Dev.	3323.963	4636.765	190772.5
	Min	1199.062	954.6352	3388
	Max	17675.93	31684.09	1530000
	Obs.	369	369	369
Import-competing crops	Mean	5374.714	5834.104	152408.7
	Std Dev.	3098.08	3888.351	223396.5
	Min	1300.961	1141.184	2200
	Max	18198.8	29505.73	1803800
	Obs.	384	384	384
Non-traded food	Mean	6875.863	7992.48	283518.5
	Std Dev.	3200.153	5353.364	343254.9
	Min	1828.302	1525.087	4000
	Max	16404.09	32152.04	1724500
	Obs.	102	102	102
Total	Mean	6300.213	8070.583	215784.7
	Std Dev.	3373.366	5239.045	309481.4
	Min	682.2064	831.3502	1199
	Max	18620.55	33315.67	3200000
	Obs.	6307	6307	6307

Note: All monetary values are in VN dong.

Table A.3: Consumption estimates (1992-2008)

	1992		1998		2002		2004		2006		2008	
	beta	se	beta	se	beta	se	beta	se	beta	se	beta	s.e.
Ex ante risk	-0.601	0.022	-1.302	0.027	-0.900	0.011	-0.970	0.022	-1.586	0.028	-1.627	0.030
Pos shocks	3.078	0.103	4.710	0.094	5.715	0.058	5.480	0.102	6.113	0.108	5.869	0.121
Neg shock	2.382	0.097	4.039	0.104	5.881	0.052	5.574	0.109	6.175	0.108	5.776	0.116
Urban	0.377	0.042	0.358	0.021	0.309	0.005	0.278	0.013	0.182	0.017	0.111	0.015
Age	0.016	0.003	0.012	0.002	0.010	0.001	0.003	0.002	0.010	0.002	0.015	0.002
Sq. age	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HH size	-0.057	0.008	-0.080	0.008	-0.088	0.003	-0.079	0.007	-0.087	0.007	-0.095	0.008
Sq. HH size	0.003	0.001	0.004	0.001	0.005	0.000	0.004	0.001	0.004	0.001	0.005	0.001
No children	-0.078	0.005	-0.099	0.005	-0.105	0.002	-0.113	0.004	-0.111	0.004	-0.115	0.005
Married	0.072	0.018	0.118	0.014	0.094	0.006	0.094	0.012	0.078	0.012	0.043	0.014
Head sex	-0.057	0.016	-0.041	0.012	-0.070	0.005	-0.105	0.010	-0.052	0.010	-0.014	0.011
Primary education	0.152	0.014	0.118	0.016	0.157	0.004	0.180	0.009	0.172	0.009	0.205	0.010
Secondary education	0.263	0.016	0.297	0.018	0.281	0.005	0.329	0.010	0.300	0.010	0.339	0.011
Upper education	0.364	0.025	0.458	0.020	0.449	0.007	0.473	0.014	0.451	0.014	0.453	0.016
Tech education	0.339	0.021	0.473	0.025	0.576	0.008	0.596	0.013	0.588	0.013	0.564	0.015
Univisity education	0.591	0.047	0.763	0.028	0.792	0.009	0.865	0.016	0.806	0.015	0.854	0.018
Roads	-0.013	0.023	0.092	0.018	-0.024	0.006	0.081	0.011	0.023	0.012	0.022	0.013
Electricity	0.029	0.028	0.229	0.021	0.143	0.006	0.133	0.020	0.323	0.021	0.185	0.030
Water	0.126	0.039	0.171	0.022	0.134	0.005	0.048	0.012	0.069	0.016	0.041	0.014
Transport	-0.017	0.014	0.032	0.011	0.051	0.004	0.055	0.008	0.057	0.008	0.052	0.008
Constant	6.199	0.086	6.082	0.075	6.847	0.028	7.176	0.059	6.254	0.066	6.670	0.073
No Obs.	4222		5446		27140		8117		8162		6702	
Province Dummies	yes		yes		yes		yes		yes		yes	
F	29376.991		53429.174		334587.8804		87373.78528		94107.34282		77907.02981	
Prob > F	0.000		0.000		0.000		0.000		0.000		0.000	
R-squared	0.998		0.999		0.999		0.999		0.999		0.999	
Adj R-squared	0.998		0.999		0.999		0.999		0.999		0.999	
Root MSE	1.898		1.917		1.915		1.879		1.914		1.893	

Note: Feasible Generalized Least Squares (FGLS) coefficients.

Table A.4: Income regressions (1992–2008)

dep.variable: log of real per capita income	1992	1998	2002	2004	2006	2008
Demographic characteristics						
Age of the household head	0.000682 (0.908)	0.0173 ^a (0.001)	0.0103 ^a (0.000)	0.00204 (0.574)	0.0128 ^a (0.000)	0.0176 ^a (0.000)
Age ² of the household head	0.0000117 (0.841)	-0.000136 ^a (0.006)	-0.0000836 ^a (0.000)	-0.0000341 (0.325)	-0.000114 ^a (0.000)	-0.000167 ^a (0.000)
Household Size	-0.0147 (0.496)	-0.0373 ^b (0.048)	-0.0747 ^a (0.000)	-0.0256 ^b (0.037)	-0.0619 ^a (0.000)	-0.0668 ^a (0.000)
Household Size ²	0.000731 (0.637)	0.00204 (0.181)	0.00422 ^a (0.000)	0.000954 (0.344)	0.00336 ^a (0.003)	0.00380 ^b (0.029)
No. of Children	-0.0872 ^a (0.000)	-0.113 ^a (0.000)	-0.118 ^a (0.000)	-0.118 ^a (0.000)	-0.110 ^a (0.000)	-0.117 ^a (0.000)
Married Head	0.0347 (0.326)	0.134 ^a (0.000)	0.100 ^a (0.000)	0.0782 ^a (0.001)	0.113 ^a (0.000)	0.117 ^a (0.000)
Head sex	0.00275 (0.937)	-0.00864 (0.757)	-0.0396 ^a (0.000)	-0.0598 ^a (0.004)	-0.0459 ^b (0.013)	-0.0401 ⁺ (0.106)
Education						
Primary education	0.119 ^a (0.002)	0.103 ^a (0.005)	0.131 ^a (0.005)	0.125 ^a (0.000)	0.141 ^a (0.000)	0.161 ^a (0.000)
Lower secondary education	0.206 ^a (0.000)	0.280 ^a (0.000)	0.228 ^a (0.000)	0.238 ^a (0.000)	0.244 ^a (0.000)	0.287 ^a (0.000)
Upper secondary education	0.282 ^a (0.000)	0.424 ^a (0.000)	0.355 ^a (0.000)	0.288 ^a (0.000)	0.310 ^a (0.000)	0.384 ^a (0.000)
Tech/voc education	0.213 ^a (0.000)	0.349 ^a (0.000)	0.437 ^a (0.000)	0.381 ^a (0.000)	0.423 ^a (0.000)	0.450 ^a (0.000)
University	0.305 ^a (0.001)	0.559 ^a (0.000)	0.569 ^a (0.000)	0.550 ^a (0.000)	0.517 ^a (0.000)	0.640 ^a (0.000)
Occupation						
White-collar	0.0898 (0.156)	0.223 ^a (0.000)	0.0914 ^a (0.000)	0.103 ^a (0.001)	0.112 ^a (0.000)	0.133 ^a (0.000)
Personal services	0.267 ^a (0.000)	0.182 ^a (0.000)	0.110 ^a (0.000)	0.0343 (0.228)	0.0618 ^b (0.016)	0.00921 (0.757)
Production	0.106 ^c (0.052)	0.0286 (0.436)	0.0286 ^b (0.024)	-0.0165 (0.478)	-0.0240 (0.269)	-0.00320 (0.930)
None	-0.00468 (0.913)	-0.0462 (0.193)	-0.0173 (0.230)	-0.0830 ^a (0.003)	-0.0604 ^b (0.035)	-0.0179 (0.587)
Village characteristics						
Urban	-0.0574 (0.655)	-0.0840 (0.240)	0.0785 ^a (0.000)	0.0114 (0.695)	-0.0538 ^c (0.083)	-0.0987 ^a (0.007)
Roads	-0.0853 (0.258)	-0.0326 (0.613)	-0.0452 ^b (0.038)	0.0606 ^b (0.014)	-0.0611 ^b (0.026)	0.00751 (0.804)
Electricity	0.0533 (0.445)	0.315 ^a (0.000)	0.110 ^a (0.000)	0.0843 (0.150)	0.302 ^a (0.000)	0.201 ^a (0.006)
Water	0.117 (0.314)	0.105 (0.185)	0.0719 ^a (0.000)	0.0162 (0.518)	0.0341 (0.231)	0.0616 ^c (0.051)
Transport	0.00384	0.0308	0.0408 ^a	0.0269 ^c	0.0373 ^b	0.0416 ^b
Constant	7.627 ^a (0.000)	6.959 ^a (0.000)	8.114 ^a (0.000)	8.743 ^a (0.000)	8.121 ^a (0.000)	8.420 ^a (0.000)

Table A.4: Income regressions (1992–2008) *continued*

dep.variable: log of real per capita income	1992	1998	2002	2004	2006	2008
Dummies for trade categories	(0.933)	(0.437)	(0.003)	(0.094)	(0.016)	(0.015)
Exporting industries	0.0144 (0.857)	-0.0550 (0.380)	-0.0337 ^c (0.081)	0.0231 (0.435)	-0.00539 (0.845)	-0.00468 (0.887)
Import-competing industries	0.0457 (0.463)	0.101 ^c (0.054)	0.0471 ^b (0.011)	0.0361 (0.197)	0.0661 ^b (0.013)	0.0506 ^c (0.072)
Rice	-0.265 ^a (0.000)	-0.293 ^a (0.000)	-0.260 ^a (0.000)	-0.273 ^a (0.000)	-0.0573 ^b (0.013)	-0.0000530 (0.998)
Main export crops	0.182 (0.264)	0.136 (0.243)	-0.103 ^a (0.000)	-0.0208 (0.636)	0.0811 ^c (0.086)	-0.0187 (0.706)
Other export crops	-0.162 ^c (0.070)	-0.275 ^a (0.000)	-0.198 ^a (0.000)	-0.214 ^a (0.000)	-0.231 ^a (0.000)	-0.202 ^a (0.000)
Import-competing crops	-0.223 ^b (0.016)	-0.0979 (0.016)	-0.186 ^a (0.000)	-0.227 ^a (0.000)	-0.125 ^a (0.005)	-0.204 ^a (0.000)
Non-traded food	0.0609 (0.660)	0.0715 (0.536)	-0.0839 ^b (0.019)	-0.193 ^a (0.001)	-0.188 ^a (0.009)	-0.134 ^b (0.041)
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.263	0.357	0.427	0.353	0.296	0.305
Obs	3377	5212	26304	7820	7801	6307

a p<0.1
b p<.05
c p<0.1

Appendix B: Methodology for empirical analysis

In this paper, we rely on the most common measure of vulnerability, i.e. the “Vulnerability to Expected Poverty” (VEP). It adapts the standard Foster-Greer-Thorbecke (FGT) index (Foster et al., 1984) to a stochastic environment and looks at vulnerability as the probability that a household will fall into poverty, as follows:^a

$$V_{ht} = \Pr(\ln c_{ht} < \ln z | X_{ht}) = \Phi \left(\frac{\ln z - \ln c_{ht}}{\sqrt{\hat{\sigma}_{ht}^2}} \right) \quad [\text{B.1}]$$

where c_{ht} is the per-capita consumption expenditure of household h at time t , z is the monetary equivalent of the poverty line, X_{ht} is a vector of household’s characteristics, $\hat{\sigma}_{ht}^2$ is the estimated consumption variance, and Φ is the cumulative function of the standard normal distribution.

The choice to apply the VEP method is driven by two main reasons: (i) it helps us to derive a vulnerability measure for each survey despite the cross-sectional nature of our dataset; (ii) it is consistent with existing poverty analyses since it provides results in terms of expected values of the common FGT class of decomposable poverty measures. On top of that, the VEP method provides a decomposition between “poverty-induced” vulnerable households and “risk-induced” vulnerable households (Gunther and Harttgen, 2008). While the first component refers to vulnerable households with estimated expected mean consumption below the poverty line (i.e., permanent low consumption prospects), the second refers to vulnerable households with estimated expected mean consumption above the poverty line, but high estimated variance of consumption (i.e., high consumption volatility). In other words, although characterized by sufficient consumption prospects for the future, risk-induced vulnerable households face the threat of poverty because of risk exposure.

The VEP method uses an ordinary least squares (OLS) procedure to estimate a standard reduced form of the consumption function based on the following simple linear econometric specification:

$$\ln c_{ht} = \gamma_0 + \gamma_1 X_{ht} + \gamma_2 V_t + \varepsilon_{ht} \quad [\text{B.2}]$$

where V_t is an additional vector of exogenous variables controlling for the village’s characteristics and ε_{ht} is the error term. The VEP method does not model risk explicitly, but assumes that the observed inter-household distribution of consumption at a point in time represents the future distribution of consumption across states of nature for each household.^b It also overlooks the key role of the behavioral response to risk. Moreover, it does not provide any clue to distinguishing whether vulnerability is properly generated ex-ante (mainly linked to a lack of strategies to reduce

^a Further details on the computation of this measure for different time horizons will be provided later on. For additional details see Pritchett et al. (2000); Christiaensen and Subbarao (2005); Chaudhuri and Datt (2001); Chaudhuri et al. (2002) and Chaudhuri (2003); Kamanou and Morduch (2004); Gunther and Harttgen (2009).

^b In practice, the stochastic nature of consumption is acknowledged by assuming that there is heterogeneity in consumption volatility around the mean. Thus, it addresses the issue of heteroskedasticity by using a 3-steps Feasible Generalized Least Squares (FGLS) econometric procedure suggested by Amemiya (1977).

whether vulnerability is properly generated ex-ante (mainly linked to a lack of strategies to reduce risk) or ex-post (mainly associated with a lack of coping mechanisms). To avoid these shortcomings, in section 4 we provided additional insights into the risk-induced sub-component of the VEP to infer the relative importance of the various components of vulnerability (non-stochastic, risk induced and shocks).

The most commonly applied method of extracting parsimonious information on risk from data is to calculate the variance of innovations to income. This is usually performed by calculating the variance of the residuals of an income equation such as the following (e.g., 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):^c

$$y_{ht} = \alpha_0 + \alpha_1 Z_{ht} + \alpha_2 V_t + v_{ht} \quad [B.3]$$

where y_{ht} is the log of per capita income and Z is a vector of exogenous household characteristics.^d In estimating equation B.3 we insert also a series of provincial dummies which allow us to “clean” the residual of its covariate component. Furthermore, since our aim is to assess households’ vulnerability according to the relative trade exposure by trade categories (i.e., households’ main sector of employment) in estimating equation B.3 we also insert dummies for trade categories. This assumes that households know which group they are in and hence they do not consider inter-group differences in income as risk, which would be implicitly assumed if we did not control for trade group dummies in the income regression. For each round of observations, we compute the variance of the income innovations by “trade-related” groups as follows:

$$\sigma_{gt}^2 = \frac{\sum_{h=1}^n (v_{hgt} - \bar{v}_{hgt})^2}{n} \quad [B.4]$$

where v_{hgt} indicates income innovation of household h in trading group g at time t . Following Skinner (1988), Guiso et al. (1992), Blundell and Stoker (1999), Banks et al. (2001), and Giles and Yoo (2007), we further rescale it by a factor (π_{ht}) based on household expected wealth. In particular, consistent with the adoption of the constant relative risk aversion 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.^e Our final proxy for income innovation is thus the following:

$$\sigma_{ht}^2 = \pi_{ht} \sigma_{gt}^2 \quad [B.5]$$

^c Note that the lack of panel data prevents us from exploiting the time dimension. Hence, we are assuming the unexplained component of income in cross-section data in Eq. B.3 to proximate stochastic innovation. This is not unreasonable: while it is true that the unexplained component also contains non-stochastic unobservables as well as measurement error, it is not necessarily true for the variances of income innovations within sub-samples of households grouped according to their trade openness position.

^d For identification purposes, the occupation characteristics are assumed to influence consumption behavior only through income.

^e 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 the value. Usually, the adopted value is two and this is why we use the square of that ratio.

^f The current value in thousand dong of the households’ fixed assets and durable goods has been used as a proxy for wealth in the denominator of the scaling factor. Robustness checks using alternative proxies for wealth such as the linear combination of the principal component factors or observed consumption have been implemented. They show the same pattern, suggesting that the negative relationship between ex-ante risk and consumption volatility seems to be robust to alternative empirical proxies for wealth.

where $\pi_{ht} = \frac{y_{ht}}{w_{ht}}$ and \hat{w}_{ht} is a measure of the expected wealth.^f As well as its theoretical foundation, the scaling term has the additional advantage of allowing us to obtain a risk measure that is specific to each household in the sample in each period, further differentiating risk exposure across the households belonging to the same trading group.

To provide a separate measure of the impact of idiosyncratic shocks on consumption, in addition to the ex-ante impact of risk (the former influenced by the available coping mechanisms of the households, the latter by their mitigating strategies), we avoid using self-reported measures of idiosyncratic shocks and instead rely on objective measures based on income realizations, such as the ratio between the household residual from equation B.3 and the predicted level of log income, as follows:

$$\zeta_{ht} = \frac{\vartheta_{ht}}{y_{ht}} \quad [B.6]$$

We also disentangle the positive (ζ_{ht}^+) from the negative (ζ_{ht}^-) shocks in order to consider the possibility that the households are credit constrained and thus unable to fully smooth their consumption in the event of negative shocks. We exploit these proxies for risk and shock, amending eq. B.2 and estimating the following reduced form:

$$\ln c_{ht} = \beta_0 + \beta_1 X_{ht} + \beta_2 V_t + \beta_3 \sigma_{ht}^2 + \beta_4 \zeta_{ht}^+ + \beta_5 \zeta_{ht}^- + \varepsilon_{ht} \quad [B.7]$$

where ζ_{yht}^+ and ζ_{yht}^- measure, respectively, positive and negative idiosyncratic shocks to differentiate their asymmetric impact on consumption.