MANCHESTER 1824

The University of Manchester

Economics
Discussion Paper

EDP-0708

Vulnerability and poverty dynamics in Vietnam

By Raghav Gaiha, Katsushi Imai and Woojin Kang

April 2007

Download paper from:

http://www.socialsciences.manchester.ac.uk/economics/research/discuss.htm

Economics
School of Social Sciences
The University of Manchester
Oxford Road
Manchester M13 9PL
United Kingdom

Revised on 23rd April 2007

Vulnerability and Poverty Dynamics in Vietnam

Raghav Gaiha
Centre for Population and Development Studies, Harvard University, and Faculty of Management Studies, University of Delhi, India

Katsushi Imai*
Department of Economics, School of Social Sciences, University of Manchester, UK

&
Woojin Kang
Department of Economics, School of Social Sciences, University of Manchester, UK

Abstract

Drawing upon the Vietnam Household Living Standards Survey (VHLSS) data that cover the whole of Vietnam in 2002 and 2004, *ex ante* measures of vulnerability are constructed. These are then compared with static indicators of poverty (i.e. the headcount ratio in a particular year). Detailed analyses of the panel data show that (i) in general, vulnerability in 2002 translates into poverty in 2004; (ii) vulnerability of the poor tends to perpetuate their poverty; and (iii) sections of the non-poor slip into poverty. Durable reduction in poverty is conditional on (i) identification of the vulnerable, (iii) their sources of vulnerability, and (iii) design of social safety nets that would enable the vulnerable to reduce risks and cope better with rapid integration of markets with the larger global economy.

Key words: vulnerability, risks, poverty dynamics, ethnicity, infrastructure.

JEL codes: C21, C25, I32

*Corresponding Author:
Katsushi Imai (Dr)
Department of Economics, School of Social Sciences
University of Manchester
Oxford Road, Manchester M13 9PL, UK
Phone: +44-(0)161-275-4827
Fax: +44-(0)161-275-4928
E-mail: Katsushi.Imai@manchester.ac.uk

Vulnerability and Poverty Dynamics in Vietnam

1. Introduction

The objective of this paper is to measure vulnerability of households in Vietnam and assess how it affects their poverty status over time. Vulnerability is distinguishable from poverty, as there are households or individuals who are currently non-poor but vulnerable to a variety of shocks (e.g. changes in macro policy regime, weather shocks, illness or death of a household head). Vulnerability is a *dynamic* concept associated with the change of welfare or poverty status over time, taking account of not just fluctuating levels of living but also the resilience of subsets of households (e.g. landless, smallholders) against aggregate and idiosyncratic shocks. Identification of the vulnerable is, however, far from straightforward. One difficulty is that there are different measures of vulnerability (e.g. *ex ante* versus *ex post* vulnerability). A second, and more serious difficulty, is that tracking the well-being of a particular household over time –especially before and after a major aggregate shock- requires reliable panel data that are seldom available.

There has been a surge of interest in measuring vulnerability in developing countries (e.g. Chaudhuri, Jalan and Suryahadi,2002; Dercon, 2005; Gaiha and Imai, 2004; Gaiha and Imai, 2006, Hoddinott and Quisumbing, 2003a b; Ligon, 2005; Ligon and Schechter, 2003). These studies point to the need for designing anti-poverty policies specifically to address vulnerability -especially in rural areas where agricultural yields and revenues fluctuate a great deal due to changes in weather, floods, pest infestation, and market forces. Many of these risks are compounded by lack of financial intermediation and

formal insurance, credit market imperfections, and weak infrastructure (e.g. physical isolation because of limited transportation facilities). Low income households and/or those living in remote areas are also subject to idiosyncratic risks arising from morbidity, dependence on a single adult male for much of household income and exclusion from community networks of support.

As identification of the poor requires assessment of income during a previous year and a specific poverty threshold, many may already have ceased to be poor while others may have slipped into poverty given the volatility of incomes. One approach would be to focus on poverty dynamics (e.g. Gaiha and Deolalikar, 1993; Baulch and Hoddinott, 2000) or chronic poverty (e.g. Hulme, Moore and Shepherd, 2001), taking into account poverty transition or long-term poverty status *ex-post*. Another, and perhaps a more challenging, approach would be to draw insights from a combination of both *ex ante* and *ex post* measures of vulnerability. This, however, presupposes that (many of the) risks and resilience of subsets of households against such shocks can be anticipated. This is of course easier said than done. It is nevertheless argued and demonstrated here that, to the extent that *ex post* measures could be combined with *ex ante* measures of vulnerability, more effective policies designed to ensure durable reduction in poverty are feasible.

As a case study, we will construct *ex ante* measures of vulnerability for households in Vietnam, drawing upon the Vietnam Household Living Standards Survey (VHLSS) data for 2002 and 2004. Vietnam has experienced remarkable poverty reduction in recent years, but the poverty reduction does not necessarily imply that it is durable. In fact, there are fears of slowing down of poverty reduction, if not of reversals (Gaiha and Thapa, 2006). Nor is it clear whether *ex ante* vulnerability translates into *ex post* poverty or how it affects poverty transitions. Large cross-sectional data sets covering households in all of

Vietnam in 2002 and 2004 and the panel data constructed by the overlap of these will enable us to throw light on these issues.

The rest of the paper is organized as follows. The next section provides an overview of the transition of the Vietnamese economy from a centrally planned to a market-oriented regime. The data sets are briefly described in Section 3. Section 4 discusses the econometric methodology and the specifications estimated with household panel data. Econometric results are discussed in Section 5. The final section offers concluding observations.

2. Economic Growth and Poverty Reduction in Vietnam

Vietnam recorded an impressive growth during the 1990s, and agriculture played a key role in it. A reform programme (i.e. Doi Moi), launched in 1986, marked the beginning of the transition from a planned to a market economy. Decollectivisation of land, dismantling of barriers to production and freeing up of the agricultural terms of trade benefited a vast majority of the population –especially the rural poor whose livelihoods were closely linked to subsistence agriculture. In fact, Vietnam emerged as an early achiever in a majority of MDG targets-including halving of extreme poverty (ESCAP, 2006). Moreover, in the face of growing vulnerability to natural disasters (e.g. extreme weather events), epidemics (e.g. SARS, avian influenza), market volatility (e.g. fluctuating primary commodity world prices), the Vietnamese economy has shown remarkable resilience. There is, however, concern that agricultural growth is slowing down, inequality is rising and poverty reduction is slackening. New challenges are emerging that call for a review of policy priorities and a sharper poverty focus in public

investment to enhance livelihood options for ethnic minorities concentrated in remote mountainous and other regions that have lagged behind others in the transition to a rapidly growing market economy.

High economic growth in the last decade was accompanied by poverty reduction at national level. Vietnam reduced the poverty headcount ratio by 4% a year- on average much higher than the average of 2% a year in other developing countries in Asia during the period 1993-1998 (Balisacan, Pernia, and Estrada, 2003). This was partly due to the relatively equitable redistribution of agricultural land among rural households[1] as well as high levels of education and standards of literacy and numeracy which enabled them to respond to any change taking place during the shift to a market economy, such as the increased relative price of rice and other agricultural products. Table 1 shows that the national poverty rate fell from 58.1% in 1993 to 37.4% in 1998 and to 28.9% in 2002.[2, 3] Table 1 shows that by 1998 Vietnam had already achieved the Millennium Development Goal of halving income poverty.

[1] The liberalisation of the land market affected the land redistribution. Using VLSS in 1993 and 1998, Ravallion and van de Walle (2006) show that after a market in land-use emerged, land was reallocated that attenuated the inefficiency of the administrative assignment of land use and that the households which enjoyed an inefficiently low land use increased their holdings over this period.

[2] Poverty rates used here are based on the international poverty line which was derived by the Vietnamese General Statistics Office (GSO) to reflect the food expenditure for an intake of 2100 calories a day and the non-food expenditure. The basket of food and non-food items is determined by the consumption patterns of the third quintile of households in terms of per capita expenditure. The poverty lines were VND 1.16 million per person per year in 1993, VND 1.79 million in 1998 and VND 1.92 million in 2002. In the present study, we use the same international poverty line and adjust it for 2004, based on the annual CPI. We are not using the poverty lines developed by the Ministry of Labour, Invalids and Social Affairs (MOLISA) which reflect the regional disparity of rice consumption.

[3] The national poverty rate further declined in 2004, but the extent of reduction varies according to different assumptions or samples in VHLSS data. United Nation (2005), for example, reported 24.1 % while ADB's (2006) estimate is 19.5%. Our estimate is 19.8% which is closer to ADB's (see 2).

(Table 1 to be inserted)

Further, poverty rates remained much higher in rural areas than in urban areas. Among rural areas, poverty rates were high in high mountain areas, with the headcount ratio being as high as 55% in 2002 (see Appendix 2). More importantly, poverty was concentrated among ethnic minorities. Even in 2002, 69% of ethnic minorities were poor, as against 23% of the Kinh and Chinese.

This brief overview of growth and poverty reduction in Vietnam is based on *static* indicators in a specific year and thus raises two questions in the context of our study of vulnerability. First, what precisely is the relationship between poverty and vulnerability? For example, if a household's income increases, is it less vulnerable to downside shocks? Or, are vulnerable households more likely to remain poor or more likely to slip into poverty if non-poor? Second, why did some sections of the population experience more dramatic poverty reductions than others? Does the difference in vulnerability offer any clues? These questions are addressed with the household panel data.

3. Data

Most of the poverty assessments in Vietnam are based on Vietnam Living Standards Surveys (VLSS) in 1992/3 and 1997/8, which covered 4,800 and 6,000 households, respectively. Of these, about 4,300 households constitute a panel data set. The surveys were designed to collect detailed data on households, communities, and market prices. While VLSS were widely recognised as high quality, they required additional surveys,

called Multi-Purpose Household Surveys (MPHS), to provide estimates at provincial level due to the relatively small sample size of VLSS. In 2002, VLSS and MPHS were merged into Vietnam Household Living Standards Survey (VHLSS) to cover the larger sample of households with some simplification of the questionnaires to minimize measurement errors. VHLSS is planned to be carried out every two years until 2010.

VHLSS is supposed to have two modules: the core module includes topics which are important and change rapidly over time, while the rotated module focuses on those that change less often. However, VHLSS in 2002 contains only the core module. It covers a wide range of data, including household composition and characteristics (e.g. education and health), expenditures on food or non-food items, health or education, income by sources (e.g. wage and salary, farm or non-farm production), employment and labor force participation, housing, ownerships of assets and durable goods, local infrastructure and commune characteristics. The sample size of VHLSS 2002 is 75,000 households, of which 30,000 households were interviewed with all topics, and 45,000 with all topics except expenditure. Only the former is used for the present study, as our focus is on income/expenditure poverty. Because of missing observations for some variables, the final sample size is 28,806.

VHLSS in 2004 consists of the core module virtually identical to the 2002 survey, and the rotated module on agricultural activities and non-agricultural household business, and borrowing and lending activities. The total number of households is 45,000, of which 9,000 households were interviewed with all topics, and 36,000 households with all topics except expenditure. We use only the former. Due to missing observations, the final size is 6,473. Out of 4,300 households in 2002 that were re-interviewed in 2004, a panel has been constructed comprising 2870 households to analyse poverty dynamics.

4. Analytical Framework and Methodology

As our data sets are cross-sectional for relatively large sample size of households only for two different years, rather than long panel data, we use the measure of 'Vulnerability as Expected Poverty' (VEP), an *ex ante* measure proposed by Chaudhuri, Jalan and Suryahadi (2002) who applied it to a large cross-section of households in Indonesia.[4]

Vulnerability is simply defined as the probability that a household will fall into poverty in the future.

$$VEP_{it} \equiv V_{it} = \Pr(c_{i,t+1} \leq z) \qquad (1)$$

where vulnerability of household i at time t, V_{it}, is the probability that the i-th household's level of consumption at time t+1, $c_{i,t+1}$, will be below the poverty line, z. One of the limitations of this definition of vulnerability is that it is sensitive to the choice of z. Accordingly, in the present study, we define the poverty line as (a) the international poverty line defined by GSO (General Statistics Office), (b) 120% of (a), or (c) 80% of (a), in order to check the sensitivity of results to the choice of a poverty threshold.

In a variant that allows for the degree of vulnerability to rise with time, vulnerability of household h for n periods, denoted as $R(\cdot)$ for risk, is the probability of observing at

[4] See an excellent summary by Hoddinott and Quisumbing (2003a, b) of methodological issues on measuring vulnerability. They contrast *ex ante* measure (VEP) with *ex post* measures, such as vulnerability as expected low utility (VEU) proposed by Ligon and Schechter (2003) and vulnerability as uninsured exposure to risk (VER), used by Townsend (1994). We use only the VEP measure because VEU or VER can be only constructed by the long panel data set where household response to shocks can be identified.

least one spell of poverty for n periods, which as shown below is one minus the probability of no episodes of poverty:

$$R_i(n, z) = 1 - \left[\left(1 - \left(\Pr\left(c_{i,t+1}\right) < z\right)\right), \ \ldots, \ \left(1 - \left(\Pr\left(c_{i,t+n}\right) < z\right)\right)\right] \qquad (2)$$

Following this definition and using $I(\cdot)$ as an indicator equalling 1 if the condition is true and zero otherwise, an alternative measure of vulnerability is that a household is vulnerable if the risk in n periods is greater than a threshold probability, p[5].

$$V_i(p, n, z) = I\{R_{it}(n, z) > p\} \qquad (3)$$

Neither (1) nor (3) takes into account other dimensions of poverty (e.g. depth of poverty). This limitation is easily overcome by rewriting equation (1) as

$$VEP_{it} = V_{it} = \sum_s {}^s p_S \cdot P\left(c_{i,t+1}, z\right) = \sum_s {}^s p_s \cdot I\left[c_{i,t+1} \le z\right] \cdot \left[\left(z - c_{i,t+1}\right) / z\right]^{\alpha} \qquad (1)'$$

where $\sum_s {}^s p_S$ is the sum of the probability of all possible 'states of the world', s in period t+1, and α is the welfare weight attached to the gap between the benchmark and the welfare measure (as in the Foster-Greer-Thorbecke class of poverty measures (1984)). In

[5] See, for example, Pritchett et al. (2000)

principle, this welfare weight could take values 0, 1, or 2.[6] Aggregating across N households[7],

$$\overline{VEP}_t = (1/N)\sum_i{}^N \sum_s{}^S p_S . I\left[c_{i,t+1} \le z\right].\left[\left(z - c_{i,t+1}\right)/z\right]^\alpha \qquad (4)$$

A vulnerability measure such as (4) has considerable appeal**.** In Indonesia, for example, the headcount index of poverty was low before the financial crisis but rose sharply in its wake. This implies that a large proportion of those above the poverty line were vulnerable to shocks. There are two risks in such a context. If the headcount index is low, governments/donors might become complacent. If negative shocks are frequent and severe, such complacency would be misplaced. Besides, if the characteristics of those above the poverty line but vulnerable to shocks differ from those of the poor, targeting the latter may miss a significant proportion of those whose living standards decline sharply when a shock occurs.

Empirically, a variant of VEP is obtained by the following procedure, as in Chaudhuri, Jalan and Suryahadi (2002). The consumption function is estimated as:

Model (a): Consumption and Variance of the Disturbance Term

$$\ln c_i = X_i \beta + e_i \qquad (5)$$

[6] These three values of α represent the headcount, depth of poverty and distributionally sensitive measures of poverty in the Foster-Greer-Thorbecke class of poverty indices. In the present study, we will deal only with the case where α =0.

[7] In a related measure, Kamanou and Morduch (2002) define vulnerability as expected change in poverty, as opposed to expected poverty *per se*. Specifically, they define vulnerability in a population as the difference between the expected value of a poverty measure in the future and its current value.

where c_i is per capita expenditure (i.e. food and non-food consumption expenditure) for the *i-th* household, X_i represents a bundle of observable household characteristics and other determinants of consumption (e.g. age of household head, dependency burden, educational attainments of household members, ethnicity, regional dummies, access to market, infrastructure)[8], β is a vector of coefficients of household characteristics, and e_i is a mean-zero disturbance term that captures idiosyncratic shocks that contribute to different per capita consumption levels. It is assumed that the structure of the economy is relatively stable over time and, hence**,** future consumption stems solely from the uncertainty about the idiosyncratic shocks, e_i. It is also assumed that the variance of the disturbance term depends on:

$$\sigma^2_{e,i} = X_i\theta \qquad (6)$$

The estimates of β and θ are obtained using a three-step feasible generalized least squares (FGLS)[9]. Using the estimates $\hat{\beta}$ and $\hat{\theta}$, we can compute the expected log consumption and the variance of log consumption for each household as follows.

$$E[\ln C_i | X_i] = X_i\hat{\beta} \qquad (7)$$

$$V[\ln C_i | X_i] = X_i\hat{\theta} \qquad (8)$$

By assuming $\ln c_h$ as normally distributed, the estimated probability that a household will be poor in the future (say, at time t+1) is given by:

[8] See Appendix 1for definitions of the variables and descriptive statistics.

[9] See Chaudhuri, Jalan and Suryahadi (2002), and Hoddinott and Quisumbing (2003b) for technical details.

$$\hat{VEP}_i \equiv \hat{v}_i = \hat{Pr}\left(\ln c_i < \ln z \middle| X_i\right) = \Phi\left(\frac{\ln z - X_i\hat{\beta}}{\sqrt{X_i\hat{\theta}}}\right) \quad (9)$$

In equation (9), other things being equal, higher expected log per capita consumption and higher expected variance of the disturbance term imply lower vulnerability. This is an *ex ante* vulnerability measure that can be estimated with cross-sectional data. Note that this expression also yields the probability of a household at time *t* becoming poor at *t+1* given the distribution of consumption at *t*.

A merit of this vulnerability measure is that it can be estimated with cross-sectional data. However, the measure correctly reflects a household's vulnerability only if the distribution of consumption across households, given the household characteristics at time t, represents time-series variation of consumption of the household. Hence this measure requires a large sample in which some households experience a good time and others suffer from negative shocks. Also, the measure is unlikely to reflect unexpected large negative shocks (e.g. Asian financial crisis), if we use the cross-section data for a normal year.

A number of extensions and related analyses are carried out to investigate the determinants of poverty and VEP in 2002 and 2004, and the relationship between VEP in 2002 and poverty transition during 2002 - 2004.

Model (b): Determinants of Poverty and VEP

First, a probit model is applied to estimate whether a household's consumption per capita is below the poverty line in 2002 or 2004, conditioned on a vector of determinants of per capita consumption, X_i.

$$\Pr(Y_i = 1) = \Phi(X_i \gamma') \tag{10}$$

where $Y_i = 1$ if $\ln c_i < \ln z$ and $Y_i = 0$ otherwise.[10] When VHLSS 2004 is used, we analyse the association between vulnerability in 2002 and the probability of being poor in 2004 by simply adding $\hat{VEP}_i$ in 2002 as one of the arguments.

The value of VEP estimated by (5)-(9) is regressed on X_i to identify the determinants of vulnerability, as opposed to poverty.

$$\hat{VEP}_i = X_i \mu + \varepsilon_i \tag{11}$$

Model (c): Determinants of Poverty Transition from 2002 to 2004

Model (b) can be further extended by a multinomial logit model to analyse the shift of poverty status during 2002 - 2004.

$$\Pr(Y_i = j) = \frac{e^{(X_{ij}\lambda + \tau \hat{VEP}_{ijt-1})}}{\sum_{k=0}^{3} e^{(X_{ij}\lambda + \tau \hat{VEP}_{ijt-1})}}, \quad j = 0,1,2,3 \tag{12}$$

where Y_i represents 4 unordered categories of poverty transition.

Y_1 = those who were poor in both 2002 and 2004 (i.e. chronically poor)

Y_2 = those who were poor in 2002, but non-poor in 2004 (i.e. transitory poor)

Y_3 = those who were non-poor in 2002, but poor in 2004 (i.e. transitory poor)

Y_0 =those who were non-poor in both 2002 and 2004 (i.e. always non-poor)

(which is the reference case where we assume that $\lambda_0 = \tau_0 = 0$. Hence the results for Y_0 do not appear in Table 4).

[10] While equation (10) looks similar to (9), the former does not capture *ex ante* vulnerability as it does not directly estimate consumption or the variance of the disturbance term by X_i.

Following Greene (2000), we normalise equation (1) by setting $\lambda_0 = \tau_0 = 0$ as:

$$\Pr(Y_i = j) = \frac{e^{(X_i\lambda_j)}}{1 + \sum_{k=1}^{3} e^{(X_i\lambda_k + \tau_k \hat{VEP}_i)}}, \quad j = 1,2,3 \tag{13}$$

$$\Pr(Y_i = 0) = \frac{1}{1 + \sum_{k=1}^{3} e^{(X_i\lambda_k + \tau_k \hat{VEP}_i)}}, \quad j = 0 \tag{14}$$

Probabilities for four different choices can be obtained from equations (13) and (14).

Upon normalization, we can identify the 'protective effect' (i.e. the effect of preventing the non-poor from falling into poverty), and the 'promotional effect' (i.e. the effect associated with helping the poor escape poverty in a dynamic framework).[11]

Equations (13) and (14) allow us to compute the log-odds ratio for category 3:

$$\ln\left[\frac{\hat{\Pr}(Y_i = 3)}{\hat{\Pr}(Y_i = 0)}\right] = X_i\hat{\lambda}_3 + \hat{\tau}_3 \hat{VEP}_i \tag{15}$$

Equation (15) suggests that the probability of the non-poor falling into poverty, relative to remaining non-poor, is lower (i.e. the protective effect is higher) if a component of $\hat{\lambda}_3$ (for a positive component of X_i), or $\hat{\tau}_3$, is negative and significant. A positive $\hat{\tau}_3$ implies that non-poor households are more likely to fall into poverty.

The promotional effect can be measured by comparing the probabilities of the household belonging to categories 2 and 1.

$$\ln\left[\frac{\hat{\Pr}(Y_i = 2)}{\hat{\Pr}(Y_i = 1)}\right] = X_i[\hat{\lambda}_2 - \hat{\lambda}_1] + [\hat{\tau}_2 - \hat{\tau}_1]\hat{VEP}_i \tag{16}$$

[11] See Ravallion, van de Walle, and Gautam (1995), and Gaiha and Imai (2002) for protective and promotional roles of public policies.

Hence, the higher the promotional effect, the greater is the difference between coefficient estimates for categories 2 and 1.

Model (d): Determinants of Poverty and Poverty Change at Commune Level

Finally, as an extension of Model (b), poverty and poverty change are estimated at the commune level, by aggregating dependent and explanatory variables.

Denoting a commune by v, we estimate the following models by OLS.

$$\overline{P}_v = \overline{X}_v \xi + \psi \overline{VEP}_{v\,t-1} + \omega_v \qquad (17)$$

where $\overline{P}_v = (1/N)\sum_i^N I[c_{i,t+1} \le z]$, the poverty head count ratio in commune v in 2004, $\overline{X}_v$ is a vector of average household characteristics or commune characteristics (e.g. infrastructure), $\overline{VEP}_v$ is vulnerability aggregated at the commune level in 2002, defined by equation (4), and ω_v is an error term. Equation (17) is estimated by OLS.

5. Results

Here we report econometric results in Tables 2, 3, 4 and 5, which correspond to Models (a), (b), (c) and (d), as described in the previous section.

Model (a): Consumption and Variance of the Disturbance Term

The results of the consumption function are given in Table 2. The first four columns show the regression results for equations (5) and (6) whereby log of per capita consumption in 2002 and variance of the disturbance term are estimated by household

characteristics and other determinants. Two cases are shown depending on the choice of variables on household characteristics: the cases with and without squares of household head's age and share of female members, because of the (possible) non-linearity of the relationship between these variables and log consumption per capita. The results for 2004 are given in the last four columns for these two cases. We will discuss a selection of the results.

(Table 2 to be inserted)

The first set of results in Table 2 show that households with older heads have higher per capita consumption in 2002, as suggested by the positive and significant coefficient of age of household head. However, it ceased to be significant in 2004. The negative and statistically significant coefficient of share of female members in 2002 implies that larger share of female members tends to decrease household consumption in 2002. Somewhat surprisingly, it was positive in 2004, which may imply greater economic opportunities for female household members. Second, we include the squares of head's age and share of female members to check the non-linearity. In 2002 (the third and fourth columns), the coefficient of age of household head is negative and of its square is positive and highly significant, confirming the non-linearity. The coefficient of share of female members is negative and significant and of its square is positive and highly significant. The pattern of the results remains the same in 2004 (the sixth and the seventh columns). Given the nonlinearity for these variables, we will use the case with squares of head's age and share of female members to calculate vulnerability measures.

The coefficient estimate of dependency burden is negative and highly significant in both 2002 and 2004, implying that a household with many old or young members tends to have lower log consumption per capita. Other factors being equal, a household with a married head had *lower* consumption in 2002 but higher consumption in 2004. It is not obvious why the effect is reversed over a short period. With illiterate households as the base case, all the dummy variables on educational attainment of household members have positive and statistically significant coefficients. The coefficient gets larger for higher levels of education, which implies that consumption tends to increase as the household head's educational attainment rises. There is a non-linear relationship between land and expenditure in both 2002 and 2004.

Results on ethnicity and regional dummies confirm disparity in per capita consumption among different ethnic groups and geographical regions. For example, the Kinh and Khmer have higher consumption, implied by the relatively large and significant coefficients of the dummies. Households in high mountains are likely to have lower per capita consumption. Easier access to power supply or markets is an important determinant of household consumption.

As implied by equation (9), the higher the estimated value of variance of the disturbance term, other things being equal, the lower is VEP. For example, the positive and statistically significant coefficient estimate of land area is consistent with the fact that households with larger land tended to have lower VEP in 2002.

Model (b): Determinants of Poverty and VEP

We first contrast the determinants of poverty and vulnerability in 2002, as shown in Table 3. Three different poverty lines, 100%, 120%, and 80% of the international poverty line

defined by GSO, are used for measurement of poverty and vulnerability. The coefficients of the probit model are replaced by marginal effects. The signs of the coefficients and their significance are similar in both cases. For example, education, land, belonging to the Kinh or Khmer, *not* living in mountain areas, or having access to electricity or markets tend to reduce not only poverty but also vulnerability. A household with older head tends to be more likely to be poor and vulnerable regardless of the poverty thresholds chosen, but with highly significant non- linear effects. The coefficient of 'Married' is positive and significant for VEP (for 100% and 80%) but not for poverty, suggesting that having a spouse increases vulnerability but decreases poverty. This is an intriguing result.

(Table 3 to be inserted)

In the last three columns of Table 3, we test whether vulnerability in 2002 influences poverty status in 2004, using the panel data. Regardless of the poverty threshold used, vulnerability translates into significantly higher poverty. The coefficients (or the marginal effects) of vulnerability are 0.074 in the case where 100% of poverty line is applied, 0.108 in the case of 120% of the poverty line, and 0.034 in the case of 80% of the poverty line. These results imply that 1 % increase of the *ex ante* probability of becoming poor tends to increase the *ex post* probability of becoming poor by 0.034% to 0.108%.

However, it should be noted that these coefficient estimates as well as z values are sensitive to the choice of explanatory variables. We have tried two 'minimalist' approaches with parsimonious specifications: (i) one includes expected vulnerability measure in 2002, educational attainments, ethnic groups, geographical regions and rural areas as explanatory variables; and (ii) another in which educational attainment is

omitted. In these cases, the coefficient estimates of vulnerability are much larger and more significant. In case (i), coefficient estimates (z values in brackets) are 0.132 (5.04) for 100% of the poverty line, 0.172 (7.49) for 120%, and 0.054 (2.65) for 80%, while in case (ii), the corresponding values are 0.211 (8.22) for 100%, 0.257 (11.98) for 120%, and 0.092 (4.11) for 80% of the poverty line. These results reinforce the conclusion that vulnerability in 2002 significantly influences poverty status in 2004.

In the last three columns of Table 3, we test whether vulnerability in 2002 influences poverty status in 2004, using the panel data constructed by the overlap of two cross-sectional data sets. Regardless of the poverty threshold used, vulnerability translates into significantly higher poverty.

Model (c): Determinants of Poverty Transition from 2002 to 2004

Table 4 reports the results of multinomial logit models for analyzing poverty transitions during 2002-04. Note that the base case is the category of households which are chronically non-poor, that is, always non-poor (in both 2002 and 2004). Hence, the coefficient estimates of category (3), the last columns of Cases (a), (b) and (c) –non-poor households that slipped into poverty- are of interest. Three cases have been tried: Case (a) where the expected VEP in 2002 used as one of the explanatory variables is based on 100% of the poverty line, Case (b) where VEP for 120% of the poverty line is used and Case (c) where VEP is based on 80% of the poverty line. The VEP measure has a positive and significant coefficient at the 10% level in Case (b) (using 120% VEP), implying that the more vulnerable non-poor are likely to slip into poverty. In Case (c) (using 80% VEP), the coefficient of vulnerability is positive but not significant. In Case (a) (using 100% VEP), it is not significant. The other results for category (3) identify the

factors that prevent the non-poor from slipping into poverty. These include lower dependency burden, higher education, larger land area, and belonging to the Kinh.

(Table 4 to be inserted)

The difference between coefficients of vulnerability for categories (2) and (1) reflects the promotional effect. Since the coefficient for (2) is smaller than for (1), the vulnerable poor are more likely to stay poor. The factors that help the poor overcome poverty in the next period include lower dependency burden, education (at the level of upper secondary school or higher levels of education), larger land, and belonging to the Kinh.

We have tried alternative cases (i.e. 'minimalist' approaches), as above. Two specifications are considered: (i) one includes education, ethnic groups, geographical regions and rural areas, and (ii) another in which education is omitted, to focus better on the role of vulnerability. The results are shown at the bottom of Table 4. In the first case with education, we find positive and significant coefficient estimates of category (3) (non poor →poor) in Case (b) (120% VEP is used), and Case (c) (80% VEP is used) which shows that those vulnerable and non poor in 2002 are more likely to fall into poverty in 2004 than those neither vulnerable nor poor. We find a positive and significant coefficient for all the cases in the last row where variables on education are omitted. The previous finding that the vulnerable poor are more likely to stay poor is corroborated by the larger difference of coefficient estimates of vulnerability for categories (1) and (2)

and larger z values for both categories. Coefficient estimates of other variables show a similar pattern.[12]

The Hausman tests for the independence of irrelevant alternatives support the hypothesis that omitting one of the categories will not change the coefficient estimates systematically in any of the three cases. This corroborates the use of multinomial logit models.

Model (d): Determinants of Poverty and Poverty Change at Commune Level

To supplement the household-level analyses, we carry out commune-level regressions. The results are given in Table 5. Regardless of the poverty threshold, higher vulnerability in 2002 translates into higher poverty at the commune level in 2004. Other factors influencing poverty in 2004 include land area, educational attainment, and dependency burden. These are similar to those identified on the basis of household data.

(Table 5 to be inserted)

Decomposition of Poverty and Vulnerability by Ethnicity, Geographical Area and Education

In Appendix 2 we decompose poverty and vulnerability in 2002 and 2004, respectively, by ethnicity, geographical area, educational attainment of household members, age of household head, market access and infrastructure to see how poverty and vulnerability, defined by 100%, 120% and 80% of the poverty line, differ among different groups or categories and change over time in Vietnam. Selected cross tabulations are constructed

[12] Detailed results will be furnished on request.

for some of these groups. Key results in Appendix 2 are graphically shown in Figures 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1, 4-2, 5-1 and 5.2, based on 100 % of the poverty line.

(Figures 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1, 4-2, 5-1 and 5.2 to be inserted)

Two comments on these figures are in order. First, both poverty and vulnerability vary a great deal across these groups. In general, a group with a relatively high poverty rate tends to have much higher VEP while low poverty rates are associated with considerably lower VEP, as illustrated by Figures 1-1 and 1-2 on the decomposition by ethnic group. In 2002, the Kinh had a relatively low poverty rate of 0.23 and much lower VEP of 0.06, while the Muong had a high poverty rate of 0.71 and higher VEP 0.85. The same pattern is observed in the decomposition by geographical region in Figures 2-1 and 2-2. However, there are also some groups whose VEPs were relatively low compared to their poverty rates. For example, the poverty rate (for 100% poverty threshold) of the Muong in 2004 was 0.52, but the average VEP was 0.48. By contrast, the poverty rate for other ethnic groups, mainly ethnic minority groups, was 0.53, almost the same as the Muong's, but its VEP of 0.58 was much higher (see Figure 1-2).

Second, looking only at the national poverty rate masks diversity across different ethnic groups and geographic regions. For example, while some ethnic groups experienced dramatic poverty reduction in 2002-2004, a few ethnic groups (e.g. the Hmomg, the Thai, and other groups) remained not only poor but also vulnerable (Figures 1-1 and 1-2). Figures 2-1 and 2-2 show that those living in high mountains also continued to be poor and vulnerable. Among them, the households with heads who are younger or

possessed primary school education are more vulnerable (see Figures 1-2 and the cross-tabulation results at the bottom of Appendix 2).

Households with some education reduced their poverty and vulnerability in 2002-2004, as in Figures 3-1 and 3-2, but the rate of poverty reduction varied across different categories. In 2002, households with the maximum educational attainment of primary school education had a poverty rate of 0.38 while those with upper secondary school recorded a rate of 0.16. In 2004, the former recorded a small reduction (i.e. from 0.38 to 0.30), as compared to the latter who nearly halved their poverty (i.e. from 0.16 to 0.08).

Figures 4-1 and 4-2 compare poverty and vulnerability by age of household head in 2002 and 2004. The poorest as well as the most vulnerable group is that with household heads younger than 30 years old. Households with heads older than 30 years but less than 60 years are less vulnerable and poor.

Both Figure 5-1 and Figure 5-2 show that market access dramatically reduces vulnerability, but not necessarily poverty. In 2002, the poverty rate is slightly higher for those with market access than for those without. This implies that households can mitigate consumption vulnerability through market transactions. If the consumption volatility is caused by income volatility, this result also suggests that market access reduces income volatility but does not necessarily raise mean income or consumption. That is, those without access to the market are more vulnerable to shocks. Figures 4-1 and 4-2 and the results at the bottom of Appendix 2 show that vulnerability of households without market access further increases if household heads are young or the educational level of household members is low.

6. Concluding Observations

Some observations are made from a broad policy perspective.

While there is a close correspondence between poverty and vulnerability, these are distinct concepts. In fact, there is a case for a broader focus in anti-poverty interventions in Vietnam, as those who are poor are not necessarily the most vulnerable and vice versa. Although Vietnam witnessed a dramatic reduction in poverty with accelerated growth, the broad ethnic and spatial contours of poverty have remained largely unchanged. Some ethnic minorities and those living in mountainous regions continue to remain in abject poverty in striking contrast to the Kinh and the Khmer.

Our analysis of poverty dynamics and the role that vulnerability plays in the evolution of poverty are of special interest. The main findings are that, (i) in general, higher vulnerability translates into poverty over time; (ii) vulnerability of the poor tends to perpetuate their poverty; (iii) while some manage to overcome their poverty despite being vulnerable, their prospects of doing so are less likely than of remaining in poverty; and (iv) vulnerability of the non-poor propels them into poverty.

While there is overlap between the determinants of poverty and vulnerability, three observations are pertinent. (i) Landlessness, ethnicity, and lack of education are associated with greater proneness to both poverty and vulnerability, as also infrastructure. (ii) However, these associations vary a great deal. Some of the ethnic groups and locations (e.g. the Tay, Thai, among the ethnic groups, and Inland Delta, among the different locations), for example, are not prone to poverty but vulnerable. (iii) It is plausible that, in the context of rapid integration of Vietnam in the global economy, and better infrastructural support, both poverty and vulnerability are likely to decline. However, greater attention must be given to other sources of vulnerability and design of

social safety nets (including insurance) to mitigate the effects of various aggregate and idiosyncratic shocks to the vulnerable, through diversification of income sources, expansion of human capital, and easier access to land.

In conclusion, for poverty reduction to be durable, accelerated growth must be combined with lower volatility of income, and greater resilience of segments of the population belonging to deprived ethnic groups and/or living in remote mountainous regions against a wide array of shocks.

References

ADB (Asia Development Bank), 2006. *Strategy and Programme Assessment- Vie: Poverty Assessment*. February 2006, Retrieved April 11, 2007 from http://www.adb.org/Documents/Reports/Poverty-Assessment/poverty-assessment-vie.pdf.

Balisacan, A. M., Pernia, E. M., and Estrada, G. E. B., 2003. Economic Growth and Poverty Reduction in Viet Nam in *Poverty, growth, and institutions in developing Asia*. E. M. Pernia and A. B. Deolalikar (Eds.) Basingstoke: Palgrave Macmillan.

Baulch, B. and Hoddinott, J., 2000. Economic Mobility and Poverty Dynamics in Developing Countries, *Journal of Development Studies*, *36* (5)

Chaudhuri, S., Jalan, J. and Suryahadi, A., 2002. Assessing Household Vulnerability to Poverty from Cross-Sectional Data: A Methodology and Estimates from Indonesia, Discussion Paper, Columbia University.

Dercon, S., 2005. Risk, Insurance and Poverty in S. Dercon (ed.) *Insurance Against Poverty*, New York, Oxford, Oxford University Press.

Dollar, D. and Litvack, J. I., 1998. Macroeconomic Reform and Poverty Reduction in

Vietnam, in *Household welfare and Vietnam's transition* in D. Dollar, P. Glewwe and J. I. Litvack (eds.) World Bank Regional and Sectoral Studies, Washington, D.C.: World Bank.

ESCAP, 2006. *The Millennium Development Goals: Progress in Asia and the Pacific 2006*, Retrieved April 15, 2007 from http://www.adb.org/Media/Articles/2006/10790-regional-MDGs/MDG-report.pdf.

Gaiha, R. and Deolalikar, A., 1993. Persistent, Expected and Innate Poverty: Estimates for Semi Arid Rural India, 1974-1984, *Cambridge Journal of Economics*, 17 (4).

Gaiha, R. and Imai, K., 2002. Rural Public Works and Poverty Alleviation -The Case of the Employment Guarantee Scheme in Maharashtra, *International Review of Applied Economics*, 16 (2), 131-151.

Gaiha, R. and Imai, K., 2004. Vulnerability, Persistence of Poverty and Shocks-Estimates for Semi-Arid Rural India", *Oxford Development Studies,* 32 (2), 261-281.

Gaiha, R. and Imai, K., 2006. Vulnerability and Poverty in Rural India, Draft presented at 13th International Conference on Panel Data, at University of Cambridge, UK, 7-9 July 2006.

Gaiha, R. and Thapa, G., 2006. Growth, Equity and Poverty Reduction in Vietnam– Prospects and Challenges, Draft, Rome: Asia and Pacific Division, the IFAD, December 2006.

Greene, W., 2000. *Econometric Analysis, Fourth Edition*, New Jersey: Prentice-Hall, Inc.

Foster, J. E., Greer, J., Thorbecke, E., 1984. A Class of Decomposable Poverty Indices, *Econometrica* 52, 761-766.

Hoddinott, J., and Quisumbing, A., 2003a. Data Sources for Microeconometric Risk and Vulnerability Assessments, Social Protection Discussion Paper Series No.0323, The World Bank.

Hoddinott, J., and Quisumbing, A., 2003b. Methods for Microeconometric Risk and Vulnerability assessments, Social Protection Discussion Paper Series No.0324, The World Bank.

Kamanou, G. and Morduch, J., 2002. Measuring Vulnerability to Poverty, UNU- WIDER Discussion Paper, No. 2002/58.

Ligon, E., 2005. Targeting and Informal Insurance in S. Dercon (ed.) *Insurance Against Poverty*, Oxford, Oxford University Press.

Ligon, E and Schechter, L., 2003. Measuring Vulnerability, *The Economic Journal*, 113(486), C95-C102

Pritchett, L., Suryahadi, A. and Sumarto, S., 2001. Quantifying Vulnerability to Poverty: A Proposed Measure Applied to Indonesia', Draft.

Que, T. T., 1998. Economic Reforms and Their Impact on Agricultural Development in Vietnam, *ASEAN Economic Bulletin* 15(1):30-46.

Ravallion, M. and van de Walle, D., 2006. Land Reallocations in an Agrarian Transition, *The Economic Journal*, 116, 924-942.

Ravallion, M., van de Walle, D. and Gautam. M., 1995. Testing a Social Safety Net. *Journal of Public Economics* 57(2).

Townsend, M.R., 1994. Risk and Insurance in Village India, *Econometrica*, 62 (3), 539-591.

United Nations, 2005. The Millennium Development Goals and Viet Nam Socio-Economic Development Plan 2006-2010, Hanoi: United Nations.

World Bank, 2004. Vietnam Development Report 2004: Poverty Hanoi. World Bank.

Table 1 Changes of Poverty Headcount Ratios in Vietnam

(%)

	1993	1998	2002
Poverty rate *1	58.1	37.4	28.9
Urban	25.1	9.2	6.6
Rural	66.4	45.5	35.6
Kinh and Chinese	53.9	31.1	23.1
Ethnic minorities	86.4	75.2	69.3
US$1 per day (PPP)	39.9	16.4	13.6
US$2 per day (PPP)	80.5	65.4	58.2

Source: World Bank (2004) *1 Based on the international poverty line set by General Statistics Office.

Table 2 Estimates of VEP (Vulnerability as Expected Poverty)

	2002				2004			
	Without squares of Age & Share of female members		With squares of Age & Share of female members		Without squares of Age & Share of female members		With squares of Age & Share of female members	
	log(Consumption) Coef. Robust t stat	Variance Coef. Robust t stat	log(Consumption) Coef. Robust t stat	Variance Coef. Robust t stat	log(Consumption) Coef. Robust t stat	Variance Coef. Robust t stat	log(Consumption) Coef. Robust t stat	Variance Coef. Robust t stat
Age of Household Head	**0.000097**	**0.005**	**-0.014**	**-0.018**	0.0003	**0.007**	**-0.019**	-0.005
	(4.50)**	**(4.67)****	**(9.75)****	**(2.80)****	(0.72)	**(3.04)****	**(6.04)****	(0.32)
(Age of Household Head)2	**-**	**-**	**0.000**	**0.000**	-	**-**	**0.000**	0.000
			(10.74)**	**(3.71)****			**(6.34)****	(0.76)
Share of Female Members	**-0.037**	0.039	**-0.716**	**-1.591**	**0.054**	0.036	**-0.365**	-0.900
	(2.44)*	-0.57	**(11.77)****	**(6.21)****	**(1.67)†**	(0.22)	**(2.69)****	(1.32)
(Share of Female Members)2	**-**	-	**0.659**	**1.507**	-	-	**0.384**	0.856
			(11.74)**	**(6.38)****			**(3.15)****	(1.43)
Dependency Burden	**-0.411**	0.023	**-0.471**	-0.08	**-0.388**	**0.344**	**-0.465**	0.194
	(32.30)**	(0.41)	**(34.58)****	(1.30)	**(15.58)****	**(2.97)****	**(16.81)****	(1.44)
Married	**-0.059**	**-0.205**	-0.004	**-0.111**	**0.0342**	-0.0602	**0.061**	0.024
	(6.79)**	**(5.33)****	(0.42)	**(2.74)****	**(1.93)†**	(0.73)	**(3.38)****	(0.27)
Primary	**0.053**	**-0.089**	**0.08**	0.014	**0.067**	-0.039	**0.089**	-0.079
	(5.15)**	**(1.80)†**	**(7.87)****	(0.27)	**(3.08)****	(0.35)	**(4.06)****	(0.72)
Lower Secondary	**0.11**	**-0.081**	**0.143**	0.029	**0.118**	0.07	**0.146**	0.014
	(10.81)**	**(1.65)†**	**(14.15)****	(0.58)	**(5.38)****	(0.65)	**(6.65)****	(0.13)
Upper Secondary	**0.277**	0.033	**0.31**	**0.122**	**0.287**	0.163	**0.317**	0.143
	(24.10)**	(0.61)	**(27.12)****	**(2.15)***	**(12.07)****	(1.40)	**(13.25)****	(1.27)
Technical School	**0.448**	-0.069	**0.48**	0.057	-	-	-	-
	(33.05)**	(1.09)	**(35.61)****	(0.90)	-	-	-	-
Higher Education	**0.703**	0.073	**0.736**	**0.178**	**0.618**	0.258	**0.649**	0.184
	(45.98)**	(1.08)	**(48.26)****	**(2.55)***	**(17.24)****	(1.57)	**(18.01)****	(1.10)
Land	**4.988**	**3.943**	**5.465**	**3.83**	**5.609**	0.85	**5.88**	2.118
	(12.45)**	**(3.36)****	**(13.37)****	**(3.12)****	**(8.66)****	(0.28)	**(9.07)****	(0.73)
$Land^2$	**-12.491**	-0.603	**-14.482**	-0.002	**-16.456**	-0.735	**-17.071**	-2.403
	(4.08)**	(0.35)	**(4.55)****	(0.00)	**(7.32)****	(0.06)	**(7.38)****	(0.22)
Kinh	**0.209**	-0.131	**0.213**	**-0.162**	**0.294**	0.138	**0.283**	0.122
	(12.07)**	(1.55)	**(12.56)****	**(1.94)†**	**(8.72)****	(0.84)	**(8.41)****	(0.77)
Tay	0.012	**-0.229**	0.012	**-0.291**	**0.081**	-0.149	0.072	-0.285
	(0.62)	**(2.33)***	(0.63)	**(2.91)****	**(2.17)***	(0.77)	(1.92)	(1.45)
Thai	0.026	**-0.289**	0.029	**-0.311**	-0.022	0.001	-0.034	-0.002
	(1.12)	**(2.39)***	(1.31)	**(2.52)***	(0.51)	(0.00)	(0.80)	(0.01)

Khmer	**0.202**	-0.068	**0.214**	-0.093	**0.243**	**0.634**	**0.24**	0.494
	(5.99)**	(0.43)	**(6.51)****	(0.58)	**(3.58)****	**(2.34)***	**(3.50)****	(1.76)
Muong	**-0.09**	**-0.245**	**-0.084**	**-0.322**	-0.033	-0.083	-0.049	-0.188
	(3.88)**	**(2.02)***	**(3.66)****	**(2.49)***	(0.71)	(0.35)	(1.06)	(0.78)
Nung	**0.149**	**-0.539**	**0.152**	**-0.51**	0.073	-0.258	0.069	-0.318
	(5.36)**	**(3.08)****	**(5.57)****	**(3.08)****	(1.44)	(0.93)	(1.36)	(1.11)
Hmong	-0.017	**-0.409**	0	**-0.348**	**-0.089**	-0.198	**-0.104**	-0.412
	(0.62)	**(2.83)****	(0.02)	**(2.35)***	**(1.90)†**	(0.79)	**(2.21)***	(1.52)
Buddhism	0.007	-0.026	0.006	-0.022	**0.029**	-0.073	**0.028**	-0.056
	(1.07)	(0.89)	(1.01)	(0.75)	**(2.36)***	(1.20)	**(2.32)***	(0.93)
Inland Delta	-0.009	-0.079	-0.014	**-0.092**	0.031	-0.105	0.026	-0.13
	(0.83)	(1.61)	(1.35)	**(1.86)†**	(1.37)	(0.94)	(1.17)	(1.20)
Hills	**-0.057**	-0.101	**-0.061**	-0.101	**0.08**	0.133	**0.074**	0.109
	(3.95)**	(1.51)	**(4.26)****	(1.53)	**(2.59)****	(0.88)	**(2.43)***	(0.74)
Low Mountains	**-0.144**	**-0.218**	**-0.15**	**-0.21**	-0.009	0.055	-0.016	0.031
	(11.57)**	**(3.68)****	**(12.17)****	**(3.57)****	(0.35)	(0.43)	(0.62)	(0.25)
High Mountains	**-0.225**	**-0.116**	**-0.229**	**-0.114**	-0.046	0.158	**-0.051**	0.184
	(15.39)**	**(1.70)†**	**(15.70)****	**(1.65)**	(1.54)	(1.08)	**(1.70)†**	(1.31)
Rural	**-0.567**	**-0.442**	**-0.566**	**-0.433**	0.008	-0.005	0.008	-0.018
	(65.64)**	**(11.47)****	**(65.91)****	**(11.28)****	(0.77)	(0.09)	(0.75)	(0.32)
Electricity	**0.093**	-0.012	**0.093**	0.023	**0.144**	0.2	**0.14**	0.267
	(7.30)**	(0.18)	**(7.40)****	(0.35)	**(4.04)****	(1.05)	**(3.87)****	(1.30)
Access to the Market	**0.093**	**0.112**	**0.093**	**0.117**	**0.027**	-0.006	**0.025**	0.001
	(15.43)**	**(3.64)****	**(15.64)****	**(3.82)****	**(2.29)***	(0.11)	**(2.15)***	(0.01)
Constant	8.096	**-2.376**	8.536	-1.617	7.455	-3.699	8.011	-3.214
	(273.09)	(17.24)	(187.22)	(7.65)	(111.48)	(11.42)	(75.60)	(6.53)
Observations	28806	28806	28806	28806	6473	6473	6473	6473
R-squared	0.43	0.01	0.44	0.01	0.24	0.01	0.25	0.01
Joint Significance	F(26,28779)= 874.65**	F(26,28779)= 15.83**	F(28, 28777)= 836.38**	F(28, 28777)= 15.98**	F(25, 6447)= 85.49**	F(25, 6447)= 2.08**	F(27, 6445)= 85.49**	F(27, 6445)= 2.08**

Robust t statistics in parentheses

† significant at 10%; * significant at 5%; ** significant at 1%

Table 3 Determinants of Poverty and Vulnerability in 2002 and 2004

	2002						2004		
	Whether Poor : Poverty Line 100% **Probit** (dF/dx) (Robust t stat)	Whether Poor : Poverty Line 120% **Probit** (dF/dx) (Robust t stat)	Whether Poor : Poverty Line 80% **Probit** (dF/dx) (Robust t stat)	VEP 100% **OLS** Coef. (Robust t stat)	VEP 120% **OLS** Coef. (Robust t stat)	VEP 80% **OLS** Coef. (Robust t stat)	Whether Poor : Poverty Line 100% **Probit** (dF/dx) (Robust t stat)	Whether Poor : Poverty Line 120% **Probit** (dF/dx) (Robust t stat)	Whether Poor : Poverty Line 80% **Probit** (dF/dx) (Robust t stat)
Vulnerability in 2002	-	-	-	-	-	-	**0.074** **(2.65)****	**0.108** **(4.16)****	**0.034** **(1.69)†**
Age of Household Head	**0.006** **(4.81)****	**0.01** **(5.99)****	**0.002** **(1.79)†**	**0.009** **(17.43)****	**0.015** **(20.08)****	**0.003** **(8.51)****	**0.017** **(3.87)****	**0.017** **(3.20)****	**0.005** **(2.03)***
(Age of Household Head)2	**-0.00007** **(5.86)****	**-0.00010** **(7.03)****	**-0.00002** **(2.79)****	**-0.00008** **(17.54)****	**-0.00020** **(23.57)****	**-0.00003** **(9.92)****	**-0.00020** **(4.09)****	**-0.00020** **(3.23)****	**-0.00005** **(2.04)***
Share of female members	**0.402** **(7.50)****	**0.549** **(8.54)****	**0.198** **(5.61)****	**0.35** **(17.38)****	**0.721** **(25.62)****	**0.186** **(14.74)****	**0.432** **(2.26)***	**0.517** **(2.25)***	-0.071 (0.63)
(Share of female members)2	**-0.349** **(7.13)****	**-0.489** **(8.32)****	**-0.164** **(5.14)****	**-0.315** **(16.85)****	**-0.652** **(25.36)****	**-0.178** **(15.65)****	**-0.412** **(2.45)***	**-0.53** **(2.63)****	0.025 (0.25)
Dependency Burden	**0.323** **(26.19)****	**0.397** **(26.23)****	**0.165** **(20.61)****	**0.306** **(54.21)****	**0.636** **(93.41)****	**0.089** **(26.06)****	**0.308** **(8.26)****	**0.306** **(6.34)****	**0.131** **(5.96)****
Married	**-0.015** **(1.81)†**	-0.016 (1.58)	**-0.014** **(2.49)***	**0.012** **(3.94)****	0.003 (0.61)	**0.005** **(2.86)****	**-0.058** **(2.11)***	**-0.056** **(1.74)†**	-0.021 (1.20)
Primary	**-0.047** **(5.51)****	**-0.048** **(4.26)****	**-0.027** **(5.38)****	**-0.129** **(26.54)****	**-0.123** **(23.00)****	**-0.064** **(17.29)****	-0.039 (1.38)	-0.056 (1.54)	**-0.03** **(2.03)***
Lower Secondary School	**-0.08** **(9.40)****	**-0.085** **(7.67)****	**-0.054** **(10.71)****	**-0.196** **(41.30)****	**-0.254** **(48.07)****	**-0.093** **(26.13)****	**-0.076** **(2.70)****	**-0.101** **(2.82)****	**-0.051** **(3.30)****
Upper Secondary School	**-0.157** **(18.13)****	**-0.211** **(18.23)****	**-0.085** **(16.69)****	**-0.238** **(48.82)****	**-0.436** **(76.75)****	**-0.103** **(27.89)****	**-0.172** **(6.16)****	**-0.213** **(5.72)****	**-0.082** **(5.33)****
Technical School	**-0.213** **(22.91)****	**-0.316** **(25.07)****	**-0.101** **(17.54)****	**-0.281** **(46.49)****	**-0.475** **(68.96)****	**-0.118** **(27.73)****	**-0.215** **(5.46)****	**-0.354** **(7.07)****	**-0.081** **(3.94)****
Higher Education	**-0.237** **(18.46)****	**-0.373** **(24.05)****	**-0.107** **(12.86)****	**-0.215** **(36.11)****	**-0.379** **(48.72)****	**-0.092** **(23.67)****	**-6.684** **(5.23)****	**-8.248** **(5.05)****	**-2.601** **(3.06)****
Land	**-3.028** **(10.49)****	**-3.912** **(11.49)****	**-1.464** **(7.73)****	**-2.98** **(23.54)****	**-4.903** **(21.59)****	**-1.96** **(19.11)****	**46.604** **(3.45)****	**46.453** **(2.65)****	**15.916** **(1.53)**
$Land^2$	**4.124** **(5.21)****	**5.063** **(5.40)****	**2.172** **(4.68)****	**4.584** **(12.60)****	**7.444** **(5.96)****	**3.31** **(20.17)****	**-0.206** **(4.47)****	**-0.23** **(4.34)****	**-0.097** **(3.44)****
Kinh	**-0.165** **(9.50)****	**-0.181** **(8.36)****	**-0.105** **(9.62)****	**-0.438** **(44.31)****	**-0.206** **(23.38)****	**-0.376** **(33.97)****	**-0.09** **(2.17)***	**-0.103** **(1.71)†**	-0.032 (1.48)
Tay	0.009 (0.51)	0.033 (1.31)	-0.003 (0.28)	**-0.096** **(7.90)****	**0.025** **(2.46)***	**-0.178** **(12.93)****	0.027 (0.46)	0.062 (0.75)	-0.015 (0.55)
Thai	-0.028 (1.29)	0.011 (0.36)	-0.018 (1.56)	**-0.094** **(6.65)****	**-0.041** **(3.45)****	**-0.115** **(6.91)****	**-0.126** **(2.02)***	-0.1 (0.95)	-0.007 (0.15)
Khmer	-0.126 **(5.42)****	-0.12 **(3.44)****	-0.065 **(5.09)****	**-0.385** **(30.88)****	**-0.19** **(16.70)****	**-0.365** **(31.10)****	0.038 (0.62)	0.079 (0.92)	0.015 (0.44)
Muong	**0.109** **(4.09)****	**0.121** **(3.55)****	**0.075** **(4.68)****	**0.073** **(5.41)****	**0.112** **(8.78)****	0.01 (0.59)	**-0.113** **(1.93)†**	-0.112 (1.29)	-0.051 (1.72)
Nung	**-0.098** **(4.18)****	**-0.075** **(2.03)***	**-0.046** **(3.63)****	**-0.248** **(16.35)****	**-0.061** **(4.64)****	**-0.312** **(22.25)****	**0.200** **(2.28)***	**0.254** **(2.12)***	0.03 (0.76)
Hmong	**0.063** **(1.81)†**	**0.132** **(2.64)****	**0.029** (1.64)	**-0.067** **(6.18)****	**-0.105** **(7.37)****	**0.074** **(4.28)****	**-0.039** **(2.27)***	-0.028 (1.36)	**-0.036** **(3.25)****
Buddhism	**-0.01** **(1.74)†**	-0.011 (1.56)	-0.005 (1.39)	**-0.005** **(2.19)***	**-0.017** **(5.61)****	0.001 (0.77)	-0.029 (0.94)	-0.023 (0.61)	-0.008 (0.40)
Inland Delta	0.007 (0.64)	**0.021** **(1.72)†**	0.001 (0.09)	0.002 (0.57)	-0.007 (1.35)	**0.015** **(10.51)****	**-0.072** **(1.91)†**	-0.115 **(2.38)***	-0.021 (0.88)
Hills	**0.035** **(2.44)***	**0.038** **(2.23)***	**0.021** **(2.13)***	0.045 **(10.87)****	**0.083** **(12.40)****	**0.023** **(12.92)****	0.02 **(0.54)**	**0.004** **(0.09)**	0.029 (1.17)
Low Mountains	**0.083** **(6.48)****	**0.107** **(7.15)****	**0.055** **(6.10)****	**0.138** **(29.70)****	**0.218** **(35.39)****	**0.012** **(5.16)****	0.013 (0.31)	0.053 (1.01)	0.047 (1.65)
High Mountains	**0.171**	**0.182**	**0.11**	**0.222**	**0.233**	**0.091**	-0.005	-0.035	0.002

	(11.16)**	**(10.52)****	**(9.99)****	**(32.29)****	**(30.87)****	**(21.84)****	(0.32)	(1.86)	(0.26)
Rural	**0.238**	**0.345**	**0.114**	**0.123**	**0.366**	**0.026**	0.058	0.091	0.016
	(33.10)**	**(40.02)****	**(22.65)****	**(41.40)****	**(83.72)****	**(16.78)****	(1.12)	(1.26)	(0.56)
Electricity	**-0.074**	**-0.076**	**-0.042**	**-0.172**	**-0.092**	**-0.184**	-0.007	0.005	-0.008
	(5.76)**	**(4.63)****	**(5.56)****	**(23.15)****	**(14.18)****	**(23.03)****	(0.41)	(0.23)	(0.80)
Market	**-0.065**	**-0.088**	**-0.029**	**-0.098**	**-0.181**	**-0.039**	2870	2870	2870
	(11.94)**	**(12.98)****	**(8.38)****	**(39.13)****	**(55.25)****	**(24.20)****	(0.51)	(0.15)	(0.79)
Constant	-	-	-	0.352	-0.086	0.484	-	-	-
				(17.93)	(3.62)	(29.86)			
Observations	28806	28806	28806	28806	28806	28806	2870	2870	2870
Pseudo R Squared	0.22	0.23	0.22	0.71	0.71	0.67	0.15	0.13	0.15
R-squared	-	-	-	-	-	-	-	-	-
Joint Significance									
Wald Chi2 (28)	5350.54**	6103.25**	4030.21**	-	-	-	407.45**	428.97**	280.35**
F(28, 287797)	-	-	-	2612.82**	2938.41**	476.51**	-	-	-

Notes: 1. Robust z statistics in parentheses. 2.† significant at 10%; * significant at 5%; ** significant at 1%. 3. For probit models, marginal effects are shown. For dummy variables, they are calculated by discrete changes from 0 to 1.

Table 4 Multinomial Logit Models of Change in Poverty Status (based on 100% of poverty line) from 2002 to 2004

1. With all the explanatory variables

	Case (a)			**Case (b)**			**Case (c)**		
Shift in Poverty Status from 2002 to 2004	**(1) Poverty →Poverty**	**(2) Poverty →Non Poverty**	**(3) Non Poverty →Poverty**	**(1) Poverty →Poverty**	**(2) Poverty →Non Poverty**	**(3) Non Poverty →Poverty**	**(1) Poverty →Poverty**	**(2) Poverty →Non Poverty**	**(3) Non Poverty →Poverty**
4	Coef. (Robust t stat)	Coef. (Robust t stat)	Coef. (Robust t stat)	Coef. (Robust t stat)	Coef. (Robust t stat)	Coef. (Robust t stat)	Coef. (Robust t stat)	Coef. (Robust t stat)	Coef. (Robust t stat)
Vulnerability in 2002 (based on Poverty Line 100%)	**0.855**	**0.502**	-0.092	-	-	-	-	-	-
	(4.20)**	**(2.38)***	(0.30)						
Vulnerability in 2002 (based on Poverty Line 120%)	-	-	-	**0.904**	**0.829**	**0.337**	-	-	-
				(5.55)**	**(5.33)****	**(1.69)†**			
Vulnerability in 2002 (based on Poverty Line 80%)	-	-	-	-	-	-	**1.086**	0.314	0.759
							(3.29)**	(0.87)	(1.45)
Age of Household Head	**0.123**	0.049	**0.101**	**0.121**	0.05	**0.107**	**0.119**	0.044	**0.105**
	(3.43)**	(1.52)	**(2.48)***	**(3.43)****	(1.58)	**(2.62)****	**(3.31)****	(1.34)	**(2.62)****
(Age of Household Head)^2	**-0.001**	**-0.001**	**-0.001**	**-0.001**	**-0.001**	**-0.001**	**-0.001**	-0.001	**-0.001**
	(3.75)**	**(1.98)***	**(2.69)****	**(3.68)****	**(1.97)***	**(2.83)****	**(3.60)****	(1.81)	**(2.84)****
Share of female members	**3.057**	**3.328**	**4.598**	**2.858**	**3.141**	**4.53**	**2.889**	**3.383**	**4.566**
	(2.08)*	**(2.39)***	**(2.38)***	**(1.95)†**	**(2.25)***	**(2.35)***	**(1.97)***	**(2.43)***	**(2.36)***
(Share of female members)^2	**-2.851**	**-2.708**	**-4.082**	**-2.661**	**-2.573**	**-4.057**	**-2.648**	**-2.727**	**-4.068**
	(2.18)*	**(2.24)***	**(2.50)***	**(2.04)***	**(2.13)***	**(2.49)***	**(2.04)***	**(2.26)***	**(2.48)***
Dependency Burden	**2.167**	**1.114**	**2.084**	**1.912**	**0.764**	**1.879**	**2.332**	**1.232**	**2.05**
	(7.42)**	**(4.06)****	**(6.24)****	**(6.46)****	**(2.64)****	**(5.51)****	**(8.15)****	**(4.54)****	**(6.13)****
Primary School	-0.199	-0.103	**-0.588**	-0.223	-0.136	**-0.609**	-0.188	-0.09	**-0.598**
	(0.96)	(0.54)	**(2.52)***	(1.09)	(0.71)	**(2.61)****	(0.92)	(0.47)	**(2.56)***
Lower Secondary School	**-0.486**	-0.176	0.128	**-0.521**	-0.194	0.156	**-0.537**	-0.232	0.14
	(2.27)*	(0.81)	(0.44)	**(2.46)***	(0.89)	(0.54)	**(2.47)***	(1.07)	(0.48)
Upper Secondary School	**-0.651**	-0.223	-0.293	**-0.67**	-0.204	-0.236	**-0.701**	-0.297	-0.259
	(3.01)**	(1.02)	(0.97)	**(3.14)****	(0.94)	(0.79)	**(3.22)****	(1.37)	(0.86)

Higher Education	**-1.968**	**-0.954**	-0.864	**-1.873**	**-0.779**	**-0.723**	**-2.075**	**-1.06**	**-0.817**
	(7.12)**	**(3.97)****	**(2.54)***	**(6.68)****	**(3.20)****	**(2.16)***	**(7.51)****	**(4.50)****	**(2.44)***
Land	**-4.15**	**-1.905**	**-3.068**	**-3.933**	**-1.626**	**-2.877**	**-4.313**	**-2.032**	**-3.009**
	(4.17)**	**(4.16)****	**(2.86)****	**(3.91)****	**(3.53)****	**(2.70)****	**(4.19)****	**(4.44)****	**(2.82)****
$Land^2$	**-51.344**	**-26.921**	**-43.152**	**-48.569**	**-24.395**	**-41.498**	**-51.15**	**-27.327**	**-42.329**
	(4.40)**	**(2.86)****	**(3.31)****	**(4.02)****	**(2.54)***	**(3.15)****	**(4.48)****	**(2.93)****	**(3.22)****
Kinh	**322.735**	**220.114**	**315.986**	**297.058**	**206.961**	**310.08**	**325.695**	**216.652**	**314.463**
	(1.92)†	**(2.48)***	**(2.91)****	**(1.65)**	**(2.28)***	**(2.85)****	**(2.04)***	**(2.47)***	**(2.91)****
Tay	**-1.391**	**-0.671**	**-1.055**	**-1.548**	**-0.742**	**-0.969**	**-1.368**	**-0.765**	**-0.842**
	(4.76)**	**(2.20)***	**(2.26)***	**(5.39)****	**(2.48)***	**(2.17)***	**(4.62)****	**(2.55)***	**(1.75)†**
Thai	**-0.65**	-0.277	**-1.713**	**-0.683**	-0.312	**-1.721**	-0.584	-0.243	**-1.641**
	(1.84)†	(0.76)	**(2.09)***	**(1.97)***	(0.86)	**(2.09)***	(1.60)	(0.67)	**(1.98)***
Khmer	0.494	0.419	-0.974	0.541	0.451	-1.001	0.49	0.47	-1.061
	(1.11)	(0.86)	(0.90)	(1.22)	(0.92)	(0.92)	(1.08)	(0.96)	(0.98)
Muong	-0.706	-0.194	-1.807	-0.92	-0.354	-1.781	-0.616	-0.263	-1.615
	(1.29)	(0.32)	(1.57)	(1.63)	(0.59)	(1.55)	(1.10)	(0.44)	(1.39)
Nung	0.492	0.51	0.379	0.499	0.446	0.277	0.474	0.567	0.261
	(1.04)	(0.93)	(0.56)	(1.08)	(0.84)	(0.41)	(0.99)	(1.06)	(0.39)
Hmong	**-1.189**	-0.481	-0.851	**-1.241**	-0.503	-0.787	**-0.982**	-0.494	-0.639
	(2.18)*	(0.97)	(1.02)	**(2.29)***	(1.02)	(0.92)	**(1.79)†**	(1.01)	(0.73)
Buddhism	**1.458**	0.931	**1.715**	**1.348**	0.825	**1.655**	1.486	0.957	**1.773**
	(2.02)*	(1.10)	**(1.84)†**	**(1.89)†**	(1.00)	**(1.76)†**	(2.04)*	(1.15)	**(1.88)†**
Inland Delta	**-0.466**	-0.206	-0.046	**-0.486**	**-0.214**	-0.047	**-0.472**	**-0.215**	-0.039
	(3.45)**	(1.70)	(0.29)	**(3.59)****	**(1.76)†**	(0.29)	**(3.53)****	**(1.77)†**	(0.25)
Hills	-0.198	0.019	-0.14	-0.191	0.015	-0.149	-0.192	0.024	-0.143
	(0.81)	(0.08)	(0.50)	(0.75)	(0.06)	(0.54)	(0.80)	(0.11)	(0.52)
Low Mountains	-0.433	0.227	-0.463	-0.487	0.153	-0.505	-0.372	0.246	-0.464
	(1.31)	(0.80)	(1.16)	(1.41)	(0.53)	(1.26)	(1.13)	(0.87)	(1.16)
High Mountains	-0.003	-0.059	0.249	-0.106	-0.28	0.083	0.212	0.036	0.206
	(0.01)	(0.21)	(0.76)	(0.37)	(0.99)	(0.25)	(0.78)	(0.13)	(0.63)
Rural	0.337	0.455	-0.236	0.322	0.265	-0.459	**0.588**	**0.637**	-0.355
	(1.05)	(1.51)	(0.55)	(1.02)	(0.89)	(1.08)	**(1.92)†**	**(2.22)***	(0.85)
Electricity	0.119	0.121	-0.146	0.076	0.100	-0.136	0.098	0.105	-0.132
	(0.99)	(1.09)	(0.95)	(0.63)	(0.90)	(0.89)	(0.82)	(0.95)	(0.86)
Market	-0.05	**-0.883**	-0.786	-0.056	**-0.887**	-0.788	0.133	**-0.864**	-0.708
	(0.11)	**(1.96)***	(1.15)	(0.13)	**(2.00)***	(1.13)	(0.28)	**(1.95)†**	(1.00)
Constant	-0.099	-0.105	-0.039	-0.047	-0.044	-0.005	-0.104	-0.122	-0.027
	(0.76)	(0.88)	(0.23)	(0.36)	(0.36)	(0.03)	(0.80)	(1.03)	(0.16)
Observations		2870			2870			2870	
Pseudo R^2		0.13			0.14			0.13	
Joint Significance		Wald $Chi^2(84)$= 652.11**			Wald $Chi^2(84)$= 671.91**			Wald $Chi^2(84)$= 597.75**	
Hausman Tests for IIA assumption	Omitted	chi^2	df	Omitted	chi^2	df	Omitted	chi^2	df
	0	0.140	53	0	-2.123	53	0	-1.189	53
	1	0.180	52	1	0.714	51	1	2.175	50
	2	1.999	51	2	0.199	50	2	2.862	52
		P>chi2	evidence		P>chi2	evidence		P>chi2	evidence
		1.00	for Ho		1.00	for Ho		1.00	for Ho
		1.00	for Ho		1.00	for Ho		1.00	for Ho
		1.00	for Ho		1.00	for Ho		1.00	for Ho

2. Only with vulnerability in 2002, education dummies, ethnicities, geographical dummies and 'rural' dummy

	Case (a)			Case (b)			Case (c)		
Shift in Poverty Status from 2002 to 2004	**(1) Poverty →Poverty** Coef. (Robust t stat)	**(2) Poverty →Non Poverty** Coef. (Robust t stat)	**(3) Non Poverty →Poverty** Coef. (Robust t stat)	**(1) Poverty →Poverty** Coef. (Robust t stat)	**(2) Poverty →Non Poverty** Coef. (Robust t stat)	**(3) Non Poverty →Poverty** Coef. (Robust t stat)	**(1) Poverty →Poverty** Coef. (Robust t stat)	**(2) Poverty →Non Poverty** Coef. (Robust t stat)	**(3) Non Poverty →Poverty** Coef. (Robust t stat)
Vulnerability in 2002 (based on Poverty Line 100%)	**1.209**	**0.699**	0.328	**-**	**-**	**-**	**-**	**-**	**-**
	(6.78)**	**(3.67)****	(1.13)						
Vulnerability in	**-**	**-**	**-**	**1.329**	**1.050**	**0.648**	**-**	**-**	**-**

2002 (based on Poverty Line 120%)				**(9.13)****	**(7.74)****	**(3.63)****			
Vulnerability in 2002 (based on Poverty Line 80%)	**-**	**-**	**-**	**-**	**-**	**-**	**1.445**	**0.701**	**1.204**
							(4.74)**	**(2.08)***	**(2.41)***
Observations	2967			2967			2967		
Pseudo R^2	0.13			0.12			0.10		
Joint Significance	Wald Chi^2 (51)=510.50**			Wald Chi^2 (51)=567.28**			Wald Chi^2(51)=455.31		
Hausman Tests for IIA assumption	Omitted	chi^2	df	Omitted	chi^2	df	Omitted	chi^2	df
	0	-0.114	36	0	-2.938	36	0	0.382	36
	1	-3.831	36	1	-6.203	35	1	-6.420	36
	2	-0.904	36	2	1.704	36	2	-0.113	36
		P>chi2	evidence		P>chi2	evidence		P>chi2	evidence
		1.00	for Ho		1.00	for Ho		1.00	for Ho
		1.00	for Ho		1.00	for Ho		1.00	for Ho
		1.00	for Ho		1.00	for Ho		1.00	for Ho

3. Only with vulnerability in 2002, ethnicities, geographical dummies and 'rural' dummy

	Case (a)			Case (b)			Case (c)		
Vulnerability in 2002 (based on Poverty Line 100%)	**1.740**	**0.981**	**0.704**	**-**	**-**	**-**	**-**	**-**	**-**
	(10.49)**	**(5.55)****	**(2.57)****						
Vulnerability in 2002 (based on Poverty Line 120%)	**-**	**-**	**-**	**1.805**	**1.285**	**0.985**	**-**	**-**	**-**
				(13.42)**	**(10.46)****	**(5.80)****			
Vulnerability in 2002 (based on Poverty Line 80%)	**-**	**-**	**-**	**-**	**-**	**-**	**1.876**	**0.958**	**1.498**
							(6.44)**	**(2.96)****	**(3.09)****
Observations	2967			2967			2967		
Pseudo R^2	0.08			0.10			0.07		
Joint Significance	Wald Chi^2= 407.45**			Wald Chi^2= 511.71**			Wald Chi^2= 31.97**		
Hausman Tests for IIA assumption	Omitted	chi^2	Df	Omitted	chi^2	Df	Omitted	chi^2	df
	0	0.411	28	0	0.266	28	0	3.690	28
	1	-1.297	28	1	-6.374	28	1	-0.046	28
	2	-0.028	28	2	-0.250	28	2	0.144	28
		P>chi2	evidence		P>chi2	evidence		P>chi2	evidence
		1.00	for Ho		1.00	for Ho		1.00	for Ho
		1.00	for Ho		1.00	for Ho		1.00	for Ho
		1.00	for Ho		1.00	for Ho		1.00	for Ho

1. Robust z statistics in parentheses
2.† significant at 10%; * significant at 5%; ** significant at 1%
3. Base line case is 'Non Poverty in 2002 → Non Poverty in 2004'.
100 % of poverty line

Table 5 Commune-Level Determinants of Poverty in 2004

	Case (a) Poverty 100% Coef. (Robust t stat)	Case (c) Poverty 120% Coef. (Robust t stat)	Case (e) Poverty 80% Coef. (Robust t stat)
Vulnerability in 2002	**0.201**	**0.124**	**0.203**
	(3.54)**	**(2.61)****	**(2.70)****
Age of Household Head	0.013	0.01	0.008
	(1.42)	(0.95)	(1.07)
(Age of Household Head)^2	0.00	0.00	0.00
	(1.61)	(1.12)	(1.21)
Share of female members	0.015	0.78	-0.099
	(0.03)	(1.24)	(0.23)
(Share of female members)^2	-0.071	-0.845	-0.046
	(0.14)	(1.43)	(0.11)
Dependency Burden	**0.344**	**0.313**	**0.172**
	(5.74)**	**(4.43)****	**(3.77)****
Married	-0.013	0.015	-0.045
	(0.29)	(0.28)	(1.38)
Primary School	**-0.12**	**-0.108**	**-0.139**
	(2.05)*	**(1.84)†**	**(2.59)****
Lower Secondary School	-0.08	-0.09	**-0.11**
	(1.44)	(1.51)	**(2.16)***
Upper Secondary School	**-0.227**	**-0.23**	**-0.178**
	(3.86)**	**(3.54)****	**(3.44)****
Higher Education	**-0.38**	**-0.478**	**-0.206**
	(5.80)**	**(6.04)****	**(3.52)****
Land	**-4.967**	**-6.583**	-1.472
	(2.60)**	**(2.77)****	(1.06)
Land^2	43.486	51.344	-3.738
	(1.11)	(1.04)	(0.14)
Kinh	**-0.153**	**-0.188**	**-0.103**
	(2.52)*	**(3.39)****	**(1.87)†**
Tay	-0.081	-0.071	-0.053
	(1.15)	(1.02)	(0.80)
Thai	0.099	0.079	0.06
	(1.30)	(1.15)	(0.77)
Khmer	-0.135	-0.062	-0.045
	(1.47)	(0.60)	(0.51)
Muong	0.022	0.044	-0.005
	(0.29)	(0.54)	(0.06)
Nung	-0.101	-0.106	-0.107
	(0.85)	(0.88)	(1.39)
Hmong	**0.213**	**0.18**	0.068
	(2.30)*	**(1.88)†**	(0.77)
Buddhism	-0.022	-0.015	**-0.024**
	(1.33)	(0.72)	**(2.07)***
Inland Delta	-0.019	0.007	-0.004
	(0.59)	(0.18)	(0.17)
Hills	-0.061	-0.066	-0.014
	(1.55)	(1.35)	(0.52)
Low Mountains	-0.002	0.008	0.031
	(0.05)	(0.17)	(1.10)
High Mountains	-0.034	0.056	0.028
	(0.68)	(0.97)	(0.77)
Rural	0.004	-0.021	0.005

	(0.26)	(1.11)	(0.45)
Electricity	0.07	0.05	0.033
	(1.16)	(0.67)	(0.51)
Market	-0.006	-0.003	-0.006
	(0.37)	(0.13)	(0.49)
Constant	0.073	0.144	0.168
	(0.25)	(0.46)	(0.74)
Observations	1076	1076	1076
R-squared	0.27	0.23	0.24
Joint Significance	F(28,1047)= 15.07**	F(28,1047)= 15.06**	F(28,1047)= 6.20**

1. Robust z statistics in parentheses

2.* significant at 5%; ** significant at 1%

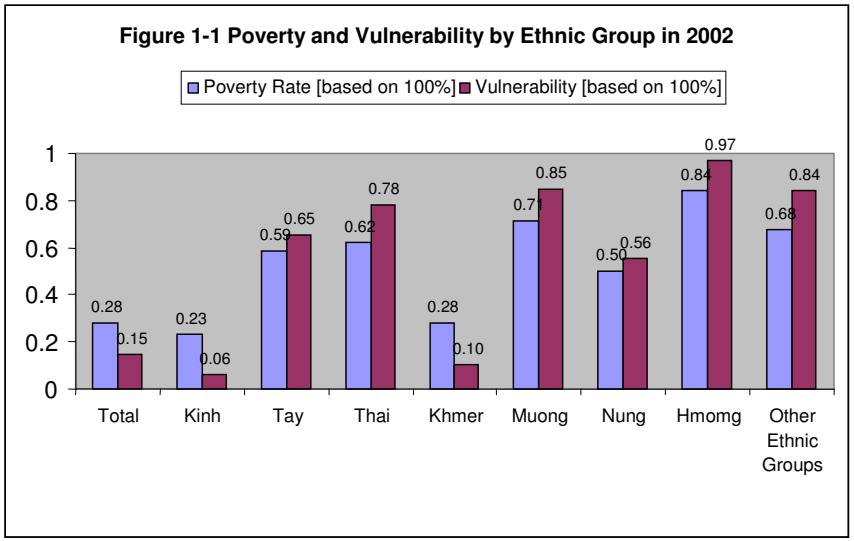
Figure 1-1 Poverty and Vulnerability by Ethnic Group in 2002
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.28
0.15
0.23
0.06
0.59
0.65
0.62
0.78
0.28
0.10
0.71
0.85
0.50
0.56
0.84
0.97
0.68
0.84
Total
Kinh
Tay
Thai
Khmer
Muong
Nung
Hmomg
Other Ethnic Groups

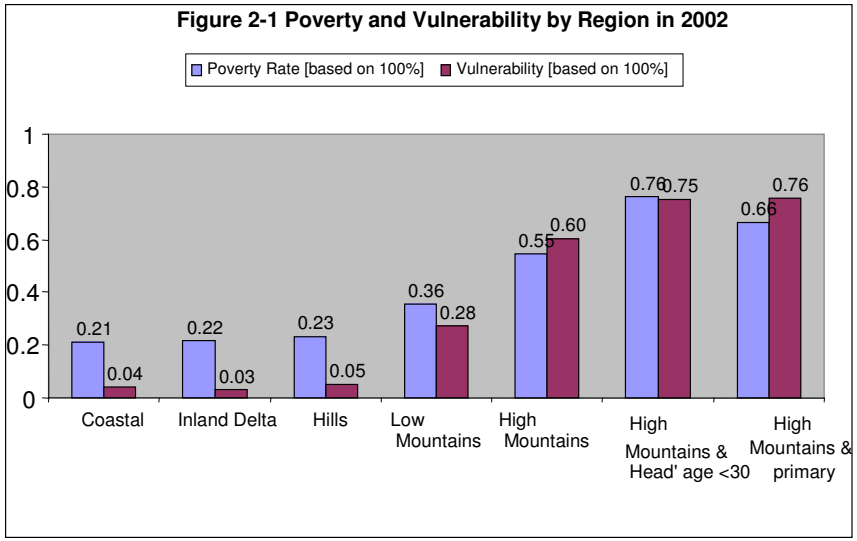
Figure 2-1 Poverty and Vulnerability by Region in 2002
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.21
0.04
0.22
0.03
0.23
0.05
0.36
0.28
0.55
0.60
0.76
0.75
0.66
0.76
Coastal
Inland Delta
Hills
Low Mountains
High Mountains
High Mountains & Head' age <30
High Mountains & primary

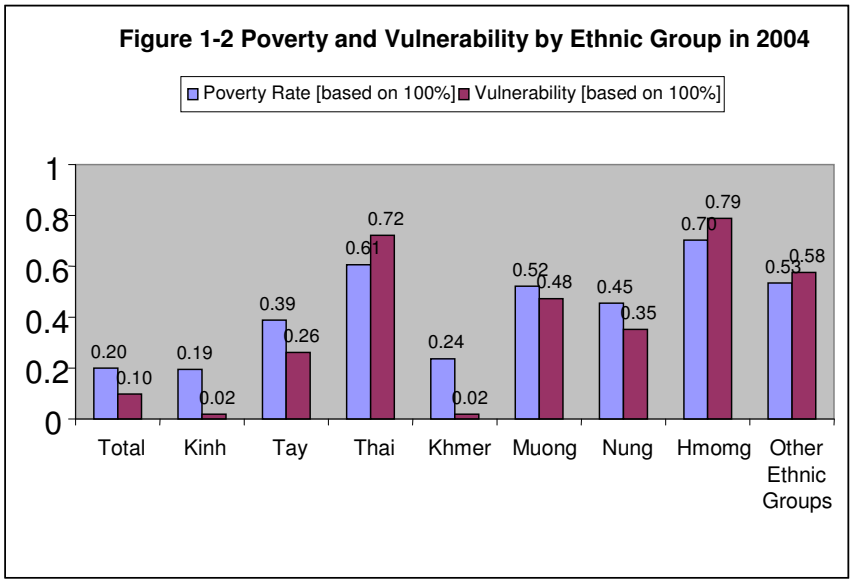
Figure 1-2 Poverty and Vulnerability by Ethnic Group in 2004
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.20
0.10
0.19
0.02
0.39
0.26
0.61
0.72
0.24
0.02
0.52
0.48
0.45
0.35
0.70
0.79
0.53
0.58
Total
Kinh
Tay
Thai
Khmer
Muong
Nung
Hmomg
Other Ethnic Groups

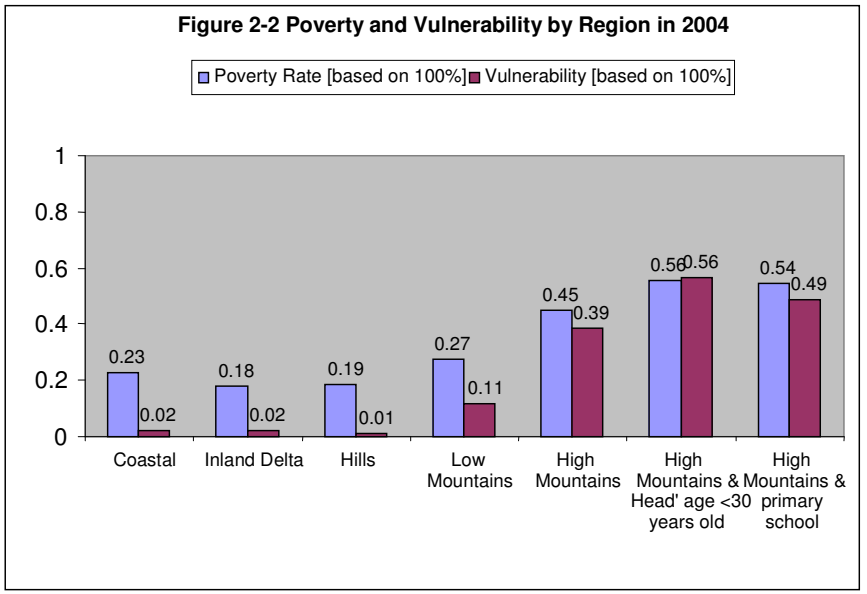
Figure 2-2 Poverty and Vulnerability by Region in 2004
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.23
0.02
0.18
0.02
0.19
0.01
0.27
0.11
0.45
0.39
0.56
0.56
0.54
0.49
Coastal
Inland Delta
Hills
Low Mountains
High Mountains
High Mountains & Head' age <30 years old
High Mountains & primary school

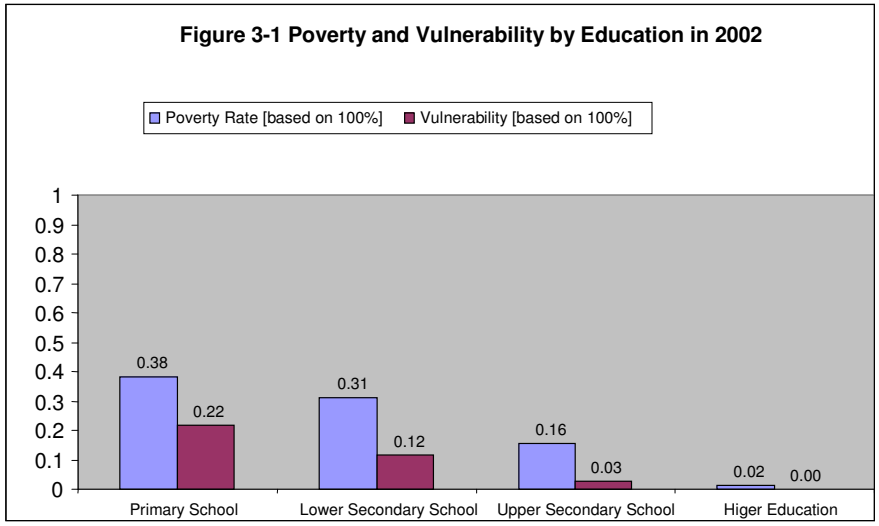
Figure 3-1 Poverty and Vulnerability by Education in 2002
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.38
0.22
0.31
0.12
0.16
0.03
0.02
0.00
Primary School
Lower Secondary School
Upper Secondary School
Higer Education

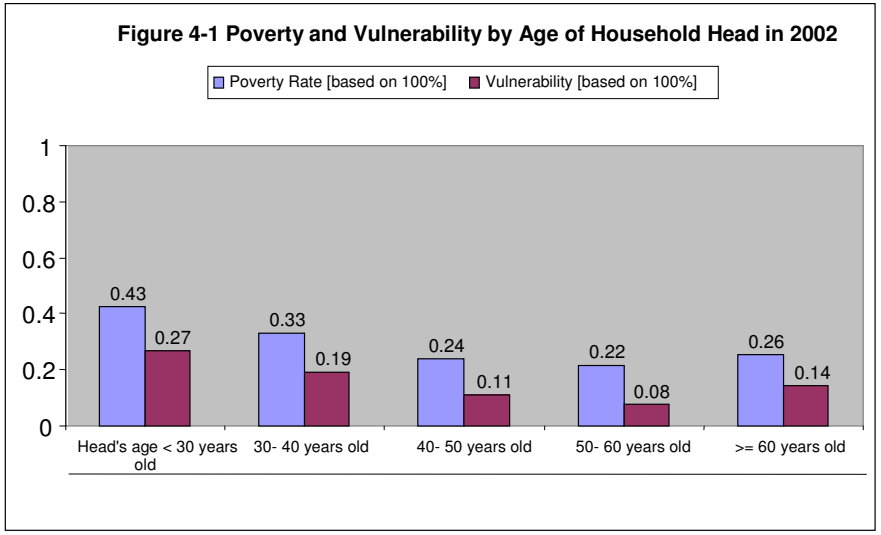
Figure 4-1 Poverty and Vulnerability by Age of Household Head in 2002
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.43
0.27
0.33
0.19
0.24
0.11
0.22
0.08
0.26
0.14
Head's age < 30 years old
30- 40 years old
40- 50 years old
50- 60 years old
>= 60 years old

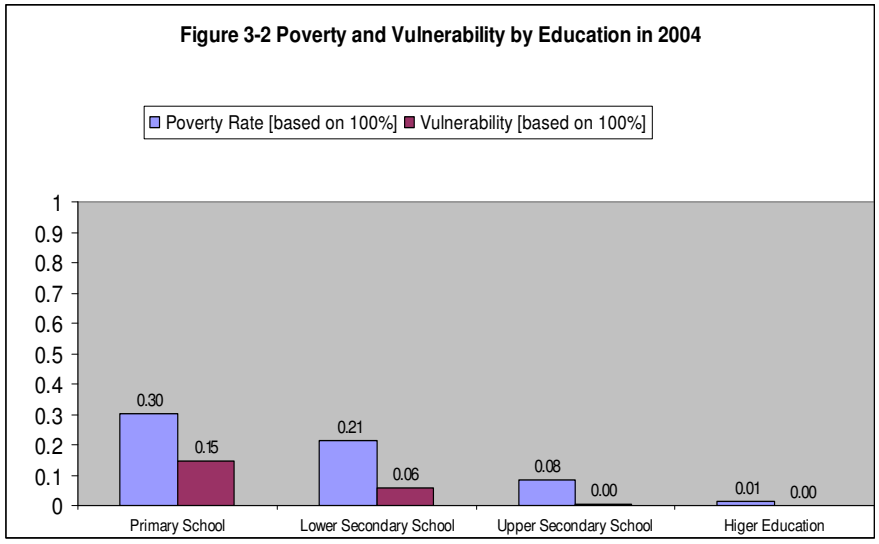
Figure 3-2 Poverty and Vulnerability by Education in 2004
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.30
0.15
0.21
0.06
0.08
0.00
0.01
0.00
Primary School
Lower Secondary School
Upper Secondary School
Higer Education

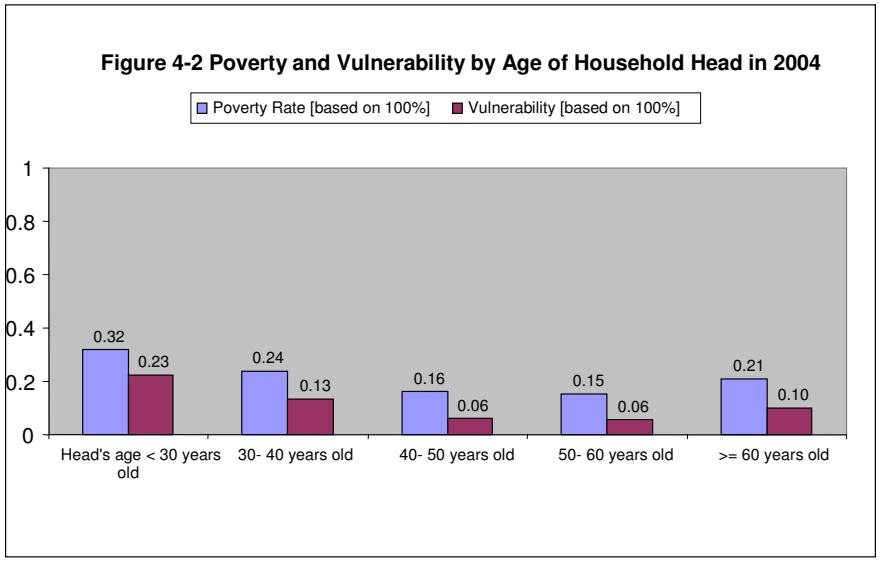
Figure 4-2 Poverty and Vulnerability by Age of Household Head in 2004
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.32
0.23
0.24
0.13
0.16
0.06
0.15
0.06
0.21
0.10
Head's age < 30 years old
30- 40 years old
40- 50 years old
50- 60 years old
>= 60 years old

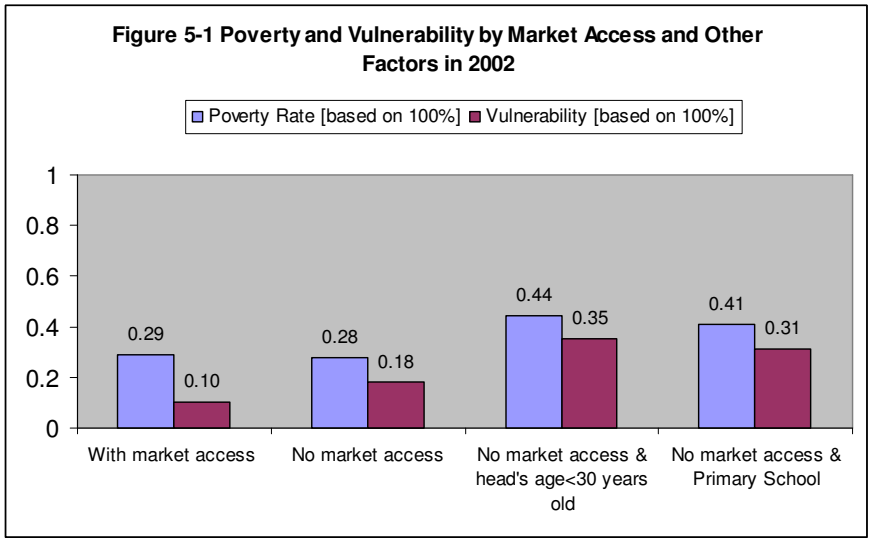
Figure 5-1 Poverty and Vulnerability by Market Access and Other Factors in 2002
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.29
0.10
0.28
0.18
0.44
0.35
0.41
0.31
With market access
No market access
No market access & head's age<30 years old
No market access & Primary School

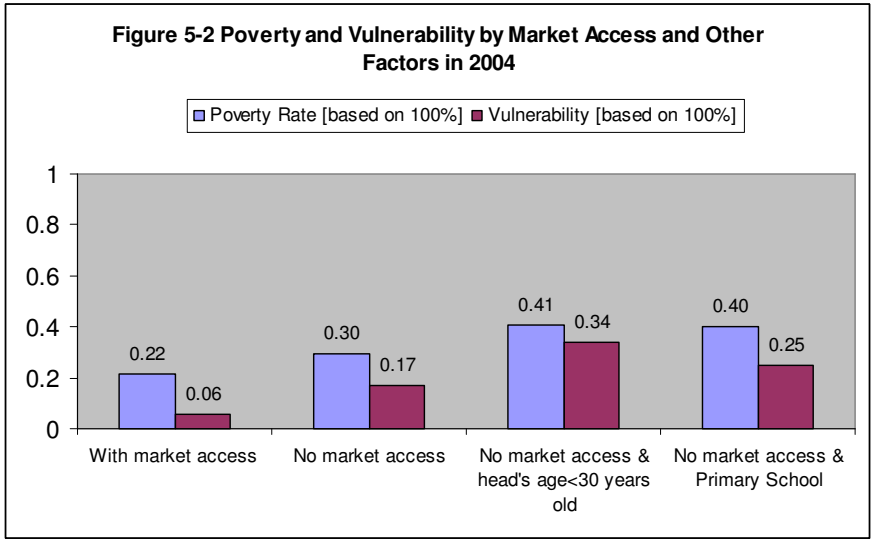
Figure 5-2 Poverty and Vulnerability by Market Access and Other Factors in 2004
Poverty Rate [based on 100%]
Vulnerability [based on 100%]
1
0.8
0.6
0.4
0.2
0
0.22
0.06
0.30
0.17
0.41
0.34
0.40
0.25
With market access
No market access
No market access & head's age<30 years old
No market access & Primary School

Appendix 1: Descriptive Statistics

		2002					2004				
Variable	Definition	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Log (Consumption)	log of per capita household expenditure in food and non-food items.	29530	7.94741	0.6253	5.7497	10.927	9188	8.177	0.5964	5.97677	10.8464
Age of Household Head	Age of head of the household	29530	47.55093	14.281	16	107	9188	49.09	14.032	15	98
Share of female members	Share of number of female members in total number of household members.	29530	0.5125043	0.2012	0	1	9066	0.519	0.1895	0.11111	1
Dependency Burden	Share of household members under 15 years old or above 65 years old in total household members.	29530	0.3804642	0.2446	0	1	9188	0.338	0.2543	0	1
Married	Whether the household head is married or not.	29530	0.8191331	0.3849	0	1	9188	0.816	0.3877	0	1
Primary School	Whether the highest level of education of household members is primary school or not.	29530	0.241788	0.4282	0	1	9188	0.226	0.4184	0	1
Lower Secondary School	Whether the highest level of education of household members is lower secondary school or not.	29530	0.3193701	0.4662	0	1	9188	0.321	0.467	0	1
Upper Secondary School	Whether the highest level of education of household members is upper secondary school or not.	29530	0.1699966	0.3756	0	1	9188	0.274	0.4459	0	1
Technical School	Whether the highest level of education of household members is technical school or not.	29530	0.0844565	0.2781	0	1	N.A.				
Higher Education	Whether the highest level of education of household members is college or university.	29530	0.0707755	0.2565	0	1	9188	0.087	0.2818	0	1
Land (Owned) (million m2)	Total land area owned by household members.	29530	0.0060888	0.015	0	0.93	8750	0.007	0.0147	0	0.37871
Land^2	Square of land area.	29530	0.0002634	0.0059	0	0.8649	8750	3E-04	0.0032	0	0.14342
Kinh	Whether the household belongs to Kinh or not.	28806	0.871624	0.3345	0	1	6728	0.827	0.3787	0	1
Tay	Whether the household belongs to Tay or not.	28806	0.0362772	0.187	0	1	6728	0.043	0.2034	0	1
Thai	Whether the household belongs to Thai or not.	28806	0.0177046	0.1319	0	1	6728	0.028	0.164	0	1
Khmer	Whether the household belongs to Khmer or not.	28806	0.0090259	0.0946	0	1	6728	0.012	0.111	0	1
Muong	Whether the household belongs to Muong or not.	28806	0.0156217	0.124	0	1	6728	0.02	0.1387	0	1
Nung	Whether the household belongs to Nung or not.	28806	0.0079844	0.089	0	1	6728	0.012	0.111	0	1
Hmong	Whether the household belongs to Hmong or not.	28806	0.009373	0.0964	0	1	6728	0.016	0.1274	0	1
Buddhism	Whether the main religion is Buddhism or not.	28806	0.6464278	0.4781	0	1	6728	0.46	0.4984	0	1
Inland Delta	Whether the household is located in Inland Delta.	28806	0.5654378	0.4957	0	1	6728	0.532	0.499	0	1
Hills	Whether the household is located in Hills.	28806	0.0704714	0.2559	0	1	6728	0.07	0.2552	0	1
Low Mountains	Whether the household is located in Low Mountains.	28806	0.1516351	0.3587	0	1	6728	0.158	0.3646	0	1
High Mountains	Whether the household is located in High Mountains.	28806	0.1341734	0.3408	0	1	6728	0.172	0.3774	0	1
Rural	Whether the household is located in rural areas (=1) or urban areas (=0)	28806	0.76675	0.4229	0	1	9188	0.496	0.5	0	1
Electricity	Whether the household belongs to the commune with power supply.	28806	0.9359508	0.2448	0	1	6728	0.981	0.1371	0	1
Access to the Market	Whether the household belongs to the commune with the access to the market.	29530	0.3885879	0.4874	0	1	6728	0.622	0.4848	0	1

Appendix 2: Poverty and Vulnerability by Ethnicity, Region, Education, Age of Household Head, Market Access and Infrastructure

	2002						2004					
	Poverty 100%	Vulnerability 100%	Poverty 120%	Vulnerability 120%	Poverty 80%	Vulnerability 80%	Poverty 100%	Vulnerability 100%	Poverty 120%	Vulnerability 120%	Poverty 80%	Vulnerability 80%
Total	**0.281**	**0.147**	**0.406**	**0.335**	**0.155**	**0.054**	**0.198**	**0.1**	**0.315**	**0.219**	**0.096**	**0.019**
No. of Obs.			**29530**						**9188**			
Ethnic Groups												
Kinh	**0.232**	**0.063**	**0.358**	**0.26**	**0.113**	**0.003**	**0.193**	**0.019**	**0.331**	**0.101**	**0.08**	**0.000002**
No. of Obs.			25108						5561			
Tay	***0.586***	***0.654***	***0.71***	***0.804***	**0.389**	**0.3**	**0.388**	**0.26**	***0.591***	***0.61***	**0.216**	**0.019**
No. of Obs.			1045						291			
Thai	***0.622***	***0.778***	***0.751***	***0.856***	***0.437***	***0.456***	***0.608***	***0.724***	***0.737***	***0.94***	**0.414**	**0.212**
No. of Obs.			510						186			
Khmer	**0.281**	**0.102**	**0.496**	**0.344**	**0.135**	**0.00064**	**0.238**	**0.021**	**0.369**	**0.157**	**0.107**	**0.0000162**
No. of Obs.			260						84			
Muong	***0.711***	***0.846***	***0.807***	***0.943***	**0.542**	**0.504**	**0.523**	**0.475**	***0.659***	***0.818***	**0.318**	**0.035**
No. of Obs.			450						132			
Nung	***0.5***	***0.555***	***0.683***	***0.803***	**0.33**	**0.115**	**0.452**	**0.353**	***0.595***	***0.714***	**0.214**	**0.008**
No. of Obs.			230						84			
Hmomg	***0.844***	***0.97***	***0.919***	***0.992***	***0.689***	***0.799***	***0.702***	***0.79***	***0.793***	***0.94***	**0.495**	**0.381**
No. of Obs.			270						111			
Other ethnic Groups	***0.677***	***0.841***	***0.774***	***0.926***	***0.499***	***0.516***	***0.534***	***0.577***	***0.656***	***0.887***	**0.344**	**0.118**
No. of Obs.			933						279			
Areas												
Rural	**0.351**	**0.192**	**0.499**	**0.436**	**0.196**	**0.071**	**0.193**	**0.097**	**0.308**	**0.215**	**0.092**	**0.017**
No. of Obs.			22087						4559			
Urban	**0.054**	**0.00015**	**0.106**	**0.0006**	**0.022**	**0.00015**	**0.203**	**0.103**	**0.322**	**0.223**	**0.099**	**0.021**
No. of Obs.			6791						4626			
Geographical Regions												
Coastal	**0.213**	**0.041**	**0.323**	**0.232**	**0.104**	**0.0003**	**0.228**	**0.023**	**0.364**	**0.159**	**0.092**	**0.00000003**
No. of Obs.			2255						456			
Inland Delta	**0.215**	**0.032**	**0.346**	**0.263**	**0.099**	**0.000003**	**0.181**	**0.021**	**0.321**	**0.085**	**0.071**	**0.00007**
No. of Obs.			16288						3582			
Hills	**0.231**	**0.051**	**0.342**	**0.279**	**0.115**	**0.002**	**0.187**	**0.013**	**0.323**	**0.069**	**0.081**	**0.0000006**
No. of Obs.			2030						471			
Low Monntains	**0.355**	**0.275**	***0.489***	***0.548***	**0.21**	**0.065**	**0.273**	**0.114**	**0.413**	**0.282**	**0.137**	**0.0061**
No. of Obs.			4368						1062			
High Mountains	***0.548***	***0.601***	***0.655***	***0.736***	**0.348**	**0.33**	**0.451**	**0.388**	***0.59***	***0.642***	**0.282**	**0.103**
No. of Obs.			3865						1157			
Education												
Primary School	**0.383**	**0.219**	**0.53**	**0.53**	**0.227**	**0.091**	**0.303**	**0.148**	**0.453**	**0.33**	**0.159**	**0.023**
No. of Obs.			7140						2079			
Lower Secondary School	**0.311**	**0.117**	**0.467**	**0.35**	**0.153**	**0.029**	**0.213**	**0.057**	**0.354**	**0.167**	**0.089**	**0.003**
No. of Obs.			9431						2953			
Upper Secondary School	**0.156**	**0.027**	**0.265**	**0.073**	**0.067**	**0.0097**	**0.083**	**0.004**	**0.173**	**0.03**	**0.028**	**0.00002**
No. of Obs.			5020						2515			
Higer Education	**0.015**	**0**	**0.034**	**0.0002**	**0.007**	**0**	**0.014**	**0**	**0.023**	**0.000008**	**0.005**	**0**

No. of Obs.			2090						799			

Appendix 2: Poverty and Vulnerability by Ethnicity, Region, Education, Age of Household Head, Market Access and Infrastructure (cont.)

	2002						2004					
	Poverty 100%	Vulnerability 100%	Poverty 120%	Vulnerability 120%	Poverty 80%	Vulnerability 80%	Poverty 100%	Vulnerability 100%	Poverty 120%	Vulnerability 120%	Poverty 80%	Vulnerability 80%
Household head's Age												
< 30 yrs. old	**0.428**	**0.269**	**0.557**	**0.512**	**0.275**	**0.133**	**0.318**	**0.225**	**0.462**	**0.359**	**0.185**	**0.056**
No. of Obs.				2591						515		
30- 40 yrs. old	**0.328**	**0.192**	**0.465**	**0.46**	**0.185**	**0.078**	**0.236**	**0.132**	**0.366**	**0.282**	**0.124**	**0.032**
No. of Obs.				8341						2352		
40- 50 yrs. old	**0.241**	**0.112**	**0.359**	**0.268**	**0.124**	**0.042**	**0.161**	**0.063**	**0.27**	**0.153**	**0.069**	**0.012**
No. of Obs.				8122						2768		
50- 60 yrs. old	**0.215**	**0.076**	**0.33**	**0.178**	**0.112**	**0.028**	**0.152**	**0.056**	**0.252**	**0.128**	**0.07**	**0.009**
No. of Obs.				4454						1574		
>= 60 yrs. old	**0.255**	**0.142**	**0.381**	**0.311**	**0.135**	**0.034**	**0.21**	**0.099**	**0.332**	**0.298**	**0.097**	**0.014**
No. of Obs.				6022						1979		
Market Access												
With access	**0.289**	**0.099**	**0.434**	**0.318**	**0.15**	**0.024**	**0.215**	**0.056**	**0.356**	**0.166**	**0.094**	**0.007**
No. of Obs.				11475						4188		
Without access	**0.276**	**0.182**	**0.388**	**0.352**	**0.158**	**0.0078**	**0.296**	**0.167**	**0.433**	**0.326**	**0.162**	**0.042**
No. of Obs.				18055						2540		
Infrastructure												
With electricity	**0.255**	**0.107**	**0.382**	**0.301**	**0.132**	**0.026**	**0.237**	**0.083**	**0.377**	**0.213**	**0.112**	**0.011**
No. of Obs.				0.6961						6599		
Without	***0.68***	***0.766***	***0.782***	**0.889**	**0.503**	**0.498**	***0.69***	***0.85***	***0.806***	***0.951***	**0.512**	**0.454**
No. of Obs.				1845						129		
Selected Cross Tabulations												
No Mkt access	**0.441**	**0.354**	**0.564**	**0.584**	**0.292**	**0.188**	**0.406**	**0.341**	**0.568**	**0.474**	**0.254**	**0.087**
& age <30 yrs. old				1588						197		
No Mkt access	**0.24**	**0.151**	**0.361**	**0.288**	**0.13**	**0.046**	**0.307**	**0.138**	**0.443**	**0.353**	**0.16**	**0.035**
& age >=60 yrs. old				3561						476		
No Mkt access	**0.407**	**0.313**	**0.547**	**0.579**	**0.251**	**0.139**	**0.403**	**0.248**	**0.56**	**0.492**	**0.239**	**0.054**
& primary school				3969						677		
High Mountains	**0.762**	**0.751**	**0.811**	**0.877**	**0.518**	**0.458**	**0.556**	**0.564**	**0.676**	**0.786**	**0.366**	**0.164**
& age <30 yrs. old				598						142		
High Mountains	**0.664**	**0.76**	**0.794**	**0.891**	**0.492**	**0.418**	**0.544**	**0.489**	**0.714**	**0.775**	**0.343**	**0.102**
& primary school				1148						364		
High Mountains	**0.541**	**0.608**	**0.639**	**0.705**	**0.385**	**0.373**	**0.491**	**0.468**	**0.619**	**0.721**	**0.317**	**0.135**
& No Mkt access				2850						708		