

## **Can Vietnam achieve millennium development goal on poverty reduction in high inflation and economic stagnation?**

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# **Can Vietnam Achieve Millennium Development Goal on Poverty Reduction in High Inflation and Economic Stagnation?**

Nguyen Viet Cuong<sup>1</sup>

## **Abstract**

An important goal of Millennium Development Goals that Vietnam committed is to reduce the overall and food poverty. Although Vietnam has achieved remarkable reduction in poverty during the recent years, Vietnam might not achieve its MDG on poverty reduction because of high inflation and economic stagnation. This paper uses three recent Vietnam Household Living Standard Surveys in 2002, 2004 and 2004 to forecast poverty in 2008 and 2010 to examine whether Vietnam can achieve its MDG on poverty reduction. The forecasts take into account high inflation in 2008 and economic stagnation during 2008-2009. It is found that Vietnam can be able to achieve its MDG on reduction of overall poverty given that the economic growth rate during 2008-2009 is equal to half of the growth rate during 2006-2007. However, the MDG on reduction of food poverty might not be achieved.

JEL classification: I31, I32, O12.

Keywords: Vietnam, Millennium Development Goals, Poverty, Food Poverty, Household Survey.

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## 1. Introduction

Vietnam has committed to implementation of Millennium Development Goals (MDGs) in 2000. The first MDG is to reduce the overall as well as food poverty. More specifically, the country aims: (i) reduce by 50% the ratio of people living below an international accepted poverty line between 2001 and 2010 that means from 32 percent in 2000 to around 16 percent in 2010; (ii) reduce by 75 percent the number of people living under an internationally accepted food poverty line by 2010, i.e. from 12 percent in 2000 to around 3 percent in 2010; (iii) reduce by 60 percent the number of households living below the poverty line provided in the National Targeted Programs on Poverty Reduction and Job Creation.<sup>2</sup>

Vietnam has committed itself to a “growth with equity” strategy of development. The country has achieved high economic growth, with annual GDP growth rates of around 6 percent over the past 10 years. Poverty rates have declined remarkably from 58 percent to 16 percent between 1993 and 2006. The number of people below the food poverty line also declined from 25 to 7 percent during the same period.

In spite of remarkable achievement in poverty reduction during the recent years, Vietnam might not achieve its MDG on poverty reduction because of high inflation and economic stagnation. There is very high inflation during 2008. The overall CPI increased around 23 percent during the first 9 months of 2008. During these months, the food and non-food CPIs increased by 36 percent and 13 percent, respectively. High inflation can have ambiguous impacts on the poor. The real consumption of the poor can be reduced by inflation. On the other hand, the poor are also producers who can experience increases in income due to inflation. Depending on the reason of inflation and the structure of the economy, the effect of price increases on poverty can be negative and positive (Ravallion and Lokhsin, 2005; Hertel and Winters, 2006; Ivanic and Martin, 2008). The effect of high inflation on poverty cannot be signed a priori. Empirical findings on the impact of inflation on poverty are also not consistent. For example, Ivanic and Martin (2008) show that increases in food prices lead to increases in poverty in some countries and decreases in poverty in others. For the case of Vietnam, Minot and Goletti (2000) find that increased price of rice can increase poverty, while Ivanic and Martin (2008), Vu and Glewwe (2008) find evidence that increased price of rice and food might decrease poverty slightly.

The second challenge to the MDG on poverty reduction is the recent crisis of global economy and Vietnam economy. Global financial crisis and economic stagnation in Vietnam can lower the average economic growth rate during the period 2008-2010. As a result, the poor can be harmed and poverty will not decline as expected.

This paper uses three recent Vietnam Household Living Standard Surveys in 2002, 2004 and 2004 to forecast poverty in 2008 and 2010 to examine whether Vietnam can achieve its MDG on poverty reduction. The forecasts take into account high inflation in 2008 and economic stagnation during 2008-2009. Since the poverty line provided in the National Targeted Programs

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<sup>2</sup> This program is implemented by Ministry of Labor, Invalid and Social Affairs. This program provides the poor with supports and assistances in education, healthcare, production, etc. For the period 2006-2010, this program is structured and renamed “National Targeted Programs on Poverty Reduction”.

on Poverty Reduction and Job Creation is not consistent overtime, the paper will rely on the overall and food poverty lines that are constructed by General Statistical Office of Vietnam and World Bank in the analysis. These poverty lines are often regarded as international accepted poverty lines. In other words, the paper investigates whether Vietnam can achieve the first and second objectives of the MDG on poverty reduction.

Compared to previous studies in Vietnam and other countries, this paper has several special features. Firstly, the paper examines the poverty trend when there is quite high inflation and economic stagnation in Vietnam as well as global economy. At the moment, mass media in Vietnam claims that the poor are harmed by high inflation and the MDG on poverty reduction might not be achieved by 2010. However, there has not been a quantitative study on this issue so far. Secondly, unlike other studies on relation between inflation and poverty, the paper not only estimates the effect of inflation on poverty but also forecasts the poverty in the future period. Thirdly, the paper investigates the effects of inflation on both overall and food poverty measured by the three popular Foster-Greer-Thorbecke poverty indexes. All the previous studies in Vietnam focus only on the impacts of increases in rice and food prices on the overall poverty incidence.

The paper is structured in 5 sections. The second section introduces data set. The third section briefly describes the poverty trend in Vietnam. The fourth section presents estimation method and empirical findings. Finally, the fifth section concludes.

## **2. Data sets**

The paper relies on available data from Vietnam Household Living Standard Surveys (VHLSS) in years 2002, 2004, and 2006. The surveys were conducted by General Statistical Office of Vietnam with technical support of World Bank. The number of sampled households in VHLSS 2002, 2004 and 2006 is 29533, 9188, and 9189, respectively. The surveys are representative for the national, rural and urban, regional levels. It is interesting that VHLSSs 2002 and 2004 set up panel data of 4008 households, and VHLSSs 2004 and 2006 set up panel data of 4126 households. These panel data are representative for urban and rural Vietnam. However, there are only 1872 households covered by the three VHLSSs. It means that the panel data sample from VHLSSs 2002 and 2006 have only 1872 households.

The surveys collect information through household and community level questionnaires. Information on households includes basic demography, employment, education, health, income, expenditure, housing, assets, and especially information on healthcare utilization, out-of-pocket healthcare spending, and health insurance. Information on commune characteristics consists of demography and general situation of communes, economic conditions, non-farm employment, agriculture production, local infrastructure and transportation, education, health, and social affairs.

Expenditure and income per capita are collected using very detailed questionnaires in VHLSS. Expenditure includes food and non-food expenditure. Food expenditure includes purchased food and foodstuff and self-produced products of households. Non-food expenditure

comprises expenditure on education, healthcare expenditure, expenditure on houses and commodities, and expenditure on power, water supply and garbage. Regarding to income, household income can come from any source. Income includes income from agricultural and non-agricultural production, salary, wage, pensions, scholarship, income from loan interest and house rental, remittances and social transfers. Income from agricultural production comprises crop income, livestock income, aquaculture income, and income from other agriculture-related activities.

### 3. Poverty in Vietnam

In this paper, a household is classified as poor if their per capita expenditure is below the overall poverty line set up by GSO and WB. Similarly, a household is defined as food poor if their per capita expenditure is below the food poverty line of GSO and WB. The food poverty line is equivalent to the expenditure level that allows for nutritional needs equivalent to 2100 calories per day. The overall poverty line is the consumption expenditure which is equal to food poverty line plus expenditure on some essential non-food consumption such as clothing and housing. The overall and food poverty lines during the period 2002-2006 are presented in Table 1.

Table 1: Overall and food poverty lines in Vietnam (thousand VND)

	2002	2004	2006
Overall poverty line	1917	2077	2560
Food poverty line	1382	1500	1915

Sources: World Bank, 2004, 2006

To examine poverty, the paper uses the three popular three popular Foster-Greer-Thorbecke poverty indexes (Foster, Greer and Thorbecke, 1984). The poverty indexes include the poverty incidence (P0), poverty gap index (P1) and poverty severity index (P2). The formulas of these indexes are presented in Appendix 1. Tables 1 and 2 present the estimates of the poverty indexes using overall and food poverty line for the period 2002-2006. It is shown that the overall and food poverty was reduced for both rural and urban areas during the period 2002-2006. In 2006, the overall poverty incidences were 20.4 percent and 3.9 percent in the rural and urban areas, respectively. The food poverty incidences were 8.2 percent and 1.2 percent in the rural and urban areas, respectively.

Poverty differs substantially across regions in Vietnam. Except for South East region, all regions experienced reduction in both overall and food poverty over the period 2002-2006. However, poverty remains very high in some regions such as North West, North East, North Central Coast and Central Highland.

It should be noted that the incidence of the overall poverty was 16 percent in 2006. It means that the first objective of the MDG on poverty reduction “reduce by 50% the ratio of people living below an international accepted poverty” was already achieved in 2006. However, because of high inflation in 2008 and economic stagnation, it is not clear whether Vietnam can achieve the MDG on poverty reduction in 2010. This issue will be addressed in the next section.

Table 1: Overall poverty during the period 2002-2006

Areas	2002			2004			2006		
	P0 (%)	P1	P2	P0 (%)	P1	P2	P0 (%)	P1	P2
<u>Rural/urban</u>									
Rural	35.6	0.0865	0.0304	25.0	0.0612	0.0221	20.4	0.0495	0.0179
Urban	6.6	0.0130	0.0041	3.6	0.0070	0.0021	3.9	0.0077	0.0021
<u>Region</u>									
Red River Delta	22.4	0.0426	0.0120	12.1	0.0212	0.0056	8.8	0.0154	0.0042
North East	38.4	0.0965	0.0329	29.4	0.0701	0.0237	25.0	0.0563	0.0186
North West	68.0	0.2410	0.1048	58.6	0.1911	0.0803	49.0	0.1565	0.0648
North Central Coast	43.9	0.1063	0.0361	31.9	0.0809	0.0292	29.1	0.0766	0.0290
South Central Coast	25.2	0.0596	0.0214	19.0	0.0510	0.0211	12.6	0.0264	0.0086
Central Highlands	51.8	0.1666	0.0705	33.1	0.1065	0.0451	28.6	0.0882	0.0366
South East	10.5	0.0224	0.0078	5.4	0.0120	0.0044	5.8	0.0141	0.0055
Mekong River Delta	23.4	0.0466	0.0142	15.9	0.0299	0.0090	10.3	0.0182	0.0048
All Vietnam	28.8	0.0694	0.0243	19.5	0.0472	0.0170	16.0	0.0383	0.0137

Source: Estimation from VHLSSs 2002, 2004 and 2006.

Table 2: Food poverty during the period 2002-2006

Areas	2002			2004			2006		
	P0 (%)	P1	P2	P0 (%)	P1	P2	P0 (%)	P1	P2
<u>Rural/urban</u>									
Rural	13.6	0.0257	0.0076	9.7	0.0195	0.0062	8.7	0.0181	0.0059
Urban	1.9	0.0031	0.0008	0.8	0.0015	0.0004	1.2	0.0015	0.0003
<u>Region</u>									
Red River Delta	5.3	0.0074	0.0017	2.3	0.0034	0.0008	2.1	0.0034	0.0007
North East	15.4	0.0265	0.0071	11.4	0.0189	0.0051	9.5	0.0172	0.0051
North West	46.1	0.1080	0.0358	34.8	0.0822	0.0268	29.9	0.0710	0.0249
North Central Coast	17.5	0.0293	0.0077	13.6	0.0254	0.0077	14.3	0.0304	0.0099
South Central Coast	9.0	0.0183	0.0063	8.1	0.0201	0.0082	4.8	0.0085	0.0021
Central Highlands	29.5	0.0718	0.0241	18.8	0.0462	0.0156	16.4	0.0395	0.0146
South East	3.0	0.0067	0.0025	1.5	0.0040	0.0015	2.3	0.0061	0.0022
Mekong River Delta	6.5	0.0101	0.0026	4.0	0.0064	0.0017	2.7	0.0033	0.0007
All Vietnam	10.9	0.0204	0.0061	7.4	0.0149	0.0047	6.7	0.0137	0.0044

Source: Estimation from VHLSSs 2002, 2004 and 2006.

## 4. Estimation of Poverty in 2008 and 2010

### 4.1. Poverty Estimation under Assumption of No Inflation and Economic Stagnation

#### *Methodology*

To predict the poverty in 2008 and 2010, we need to predict per capita expenditure of households in 2008 and 2010. To do so, we assume the following relations between assets, income and consumption of households:

$$C_{it} = Y_{it} - S_{it}, \quad (1)$$

$$Y_{it} = F(A_{i(t-1)}, Y_{i(t-1)}) + \varepsilon_{it}, \quad (2)$$

where  $C_{it}$ ,  $Y_{it}$  and  $S_{it}$  are consumption expenditure, income and saving of household  $i$  at the current period, the time  $t$ , respectively;  $A_{i(t-1)}$  and  $Y_{i(t-1)}$  are assets and income of the household at the previous period ( $t-1$ );  $\varepsilon_{it}$  denotes stochastic income shocks to the household at the time  $t$ . Equation (2) means that the expected income in the future period depends on the assets and income of the current period. However, the realized income in the future period can be different from the expected income because of income shocks  $\varepsilon_{it}$ . A lucky season can lead to higher income than expected. On the contrary, adverse shocks can reduce the realized income of the households.

Now suppose that we have panel data on income, consumption expenditure and assets at the time ( $t-1$ ) and  $t$  and want to forecast consumption expenditure at the time ( $t+1$ ). Based on the model specified in (1) and (2) and features of panel data, we can estimate expenditure and poverty at the time ( $t+1$ ) by the following steps:

- (i) Estimate the relation between per capita income at the time  $t$  and assets at the time ( $t-1$ ) using the panel data from surveys at the time  $t$  and ( $t-1$ ):

$$\ln(Y_{it}) = \beta_0 + \ln(Y_{i(t-1)})\beta_1 + X_{i(t-1)}\beta_2 + \varepsilon_{it}, \quad (3)$$

where  $X_{i(t-1)}$  denotes the asset variables and  $\varepsilon_{it}$  denotes stochastic income shocks.  $\varepsilon_{it}$  is distributed as  $N(0, \sigma^2)$ .

- (ii) Apply the estimated relationship from (3) to the survey at the time  $t$  to predict households' per capita income at the time ( $t+1$ ):

$$\ln(\hat{Y}_{i(t+1)}) = \hat{\beta}_0 + \ln(Y_{it})\hat{\beta}_1 + X_{it}\hat{\beta}_2 + \hat{\varepsilon}_{i(t+1)}. \quad (4)$$

To attribute the predicted income to the time ( $t+1$ ), we need an assumption that the marginal return of assets, i.e., coefficients  $\beta_1$  and  $\beta_2$ , are unchanged during the period

between  $(t-1)$  and  $(t+1)$ . Since we do not observe  $\hat{\varepsilon}_{i(t+1)}$ , we predict it by drawing a number randomly from the distribution of  $\hat{\varepsilon}_{it}$  in equation (3), i.e.,  $N(0, \hat{\sigma}^2)$ . The simulation of errors to estimate per capita expenditure is also used in several studies such as Elbers et al. (2003), Barham and Boucher (1998). We cannot use the predicted income without the predicted error to compute income and expenditure, since this way leads to biased estimates of poverty indexes (Hentschel, et al., 2000).

(iii) Predict per capita consumption expenditure:

$$\hat{C}_{i(t+1)} = \frac{C_{it}}{Y_{it}} e^{\hat{\beta}_0 + \ln(Y_{it})\hat{\beta}_1 + X_{it}\hat{\beta}_2 + \hat{\varepsilon}_{i(t+1)}}. \quad (5)$$

With an assumption that  $\frac{C_{i(t+1)}}{Y_{i(t+1)}} = \frac{C_{it}}{Y_{it}}$ . It implies that the ratio of consumption expenditure to income of households at the time  $(t+1)$  is equal to that at the time  $t$ .

(iv) Estimate the overall and food poverty indexes using the predicted per capita expenditure,  $\hat{C}_{i(t+1)}$ . The standard errors of the estimates will be calculated using bootstrap techniques.

### *Estimation Results*

We use panel data from VHLSSs 2004-2006 to predict the relation between income in 2006 and assets and income in 2004. Then we apply this estimated relation to the assets and income in 2006 (from the 2006 VHLSS) to predict income in 2008. Expenditure in 2008 is computed from the predicted income in 2008 and ratio of expenditure to income in 2006. Similarly, we use panel data from VHLSSs 2002-2006 (lag of four years) to predict income and expenditure in 2010. However, the estimates for 2010 should be interpreted with caution, since the panel data sample of VHLSSs 2002-2006 has only 1872 households which might not be nationally representative.

The dependent and independent variables are described in Table A.1 in Appendix. Independent variables include household composition, education of household members, occupation and education of household head, lands and housing characteristics, village variables, urbanity and dummy regional variables. All the independent variables are used in the regressions of logarithm of per capita income. Then, the stepwise regressions are employed so that only independent variables which are statistically significant at the 10% level are kept in the regressions. The final regressions are presented in Table A.2 in Appendix.

It should be noted that in order to control for inflation, we have deflated all variables in VHLSSs 2002 and 2004 in terms of 2006 prices. As a result, predicted income and expenditure for 2008 and 2010 are in the 2006 prices. The poverty lines used for 2008 and 2010 are the 2006 poverty lines.



Table 3 presents the prediction of poverty indexes for 2008 under assumption that there was no high inflation in 2008. The incidence of overall poverty is reduced from 16 percent in 2006 to 13.3 percent in 2008. The food poverty incidence is also reduced slightly from 6.7 percent to 6.1 percent. The rural areas have higher rate of poverty reduction than the urban areas.

Table 3: Predicted poverty in 2008 based on panel data VHLSS 2004-2006: without high inflation in 2008

Areas	Overall poverty			Food poverty		
	P0 (%)	P1	P2	P0 (%)	P1	P2
<u>Rural/urban</u>						
Rural	16.8	0.0442	0.0173	7.8	0.0183	0.0065
	[0.6]	[0.0021]	[0.0011]	[0.4]	[0.0013]	[0.0006]
Urban	3.6	0.0078	0.0026	1.3	0.0025	0.0008
	[0.4]	[0.0012]	[0.0006]	[0.3]	[0.0007]	[0.0003]
<u>Region</u>						
Red River Delta	9.3	0.0206	0.0070	3.5	0.0067	0.0020
	[0.8]	[0.0024]	[0.0010]	[0.5]	[0.0012]	[0.0005]
North East	17.9	0.0469	0.0182	8.3	0.0192	0.0068
	[1.4]	[0.0045]	[0.0022]	[1.0]	[0.0027]	[0.0013]
North West	35.6	0.1096	0.0469	20.2	0.0523	0.0198
	[3.4]	[0.0136]	[0.0072]	[2.8]	[0.0089]	[0.0042]
North Central Coast	21.2	0.0588	0.0236	10.6	0.0255	0.0092
	[1.6]	[0.0059]	[0.0031]	[1.3]	[0.0038]	[0.0018]
South Central Coast	11.9	0.0296	0.0111	5.2	0.0114	0.0039
	[1.3]	[0.0039]	[0.0019]	[0.8]	[0.0023]	[0.0011]
Central Highlands	21.0	0.0644	0.0281	11.6	0.0312	0.0125
	[2.1]	[0.0075]	[0.0041]	[1.6]	[0.0050]	[0.0026]
South East	6.3	0.0158	0.0061	2.7	0.0063	0.0023
	[0.8]	[0.0023]	[0.0012]	[0.5]	[0.0015]	[0.0007]
Mekong River Delta	10.0	0.0226	0.0078	3.9	0.0076	0.0023
	[0.9]	[0.0025]	[0.0011]	[0.5]	[0.0014]	[0.0006]
All Vietnam	13.3	0.0345	0.0134	6.1	0.0141	0.0050
	[0.5]	[0.0016]	[0.0008]	[0.3]	[0.0010]	[0.0004]

Standard errors in bracket (Standard errors are calculated using bootstrap with 500 replications. Standard errors are corrected for sampling weights and cluster correlation).

Source: Estimation from VHLSSs 2002, 2004 and 2006.

Table 4 presents the prediction of poverty indexes for 2010 under an assumption that the economic growth of the period 2006-2010 is similar to that of the period 2002-2006. The overall poverty incidence is estimated at 9.5 percent. The poverty rates are 11.9 percent and 2.6 percent in rural and urban areas, respectively. The food poverty incidence of the country is reduced to 4.2 percent. This is higher than 3 percent as stated in MDG. However, in the statistical aspect, we cannot reject the hypothesis that the estimate of the food poverty incidence is equal to 3.

Table 4: Predicted poverty in 2010 based on panel data VHLSS 2002-2006: without economic stagnation

Areas	Overall poverty			Food poverty		
	P0 (%)	P1	P2	P0 (%)	P1	P2
<u>Rural/urban</u>						
Rural	11.9 [0.7]	0.0309 [0.0024]	0.0120 [0.0012]	5.4 [0.5]	0.0126 [0.0014]	0.0045 [0.0007]
Urban	2.6 [0.5]	0.0059 [0.0013]	0.0021 [0.0006]	1.0 [0.3]	0.0020 [0.0007]	0.0007 [0.0003]
<u>Region</u>						
Red River Delta	5.9 [0.9]	0.0132 [0.0024]	0.0046 [0.0010]	2.2 [0.5]	0.0044 [0.0012]	0.0014 [0.0005]
North East	14.5 [1.5]	0.0383 [0.0052]	0.0151 [0.0026]	6.8 [1.0]	0.0159 [0.0031]	0.0058 [0.0015]
North West	27.0 [4.5]	0.0789 [0.0164]	0.0329 [0.0082]	14.4 [3.2]	0.0361 [0.0098]	0.0135 [0.0044]
North Central Coast	14.0 [1.7]	0.0374 [0.0058]	0.0148 [0.0029]	6.7 [1.2]	0.0157 [0.0035]	0.0056 [0.0016]
South Central Coast	8.1 [1.3]	0.0199 [0.0040]	0.0075 [0.0019]	3.4 [0.8]	0.0077 [0.0023]	0.0028 [0.0011]
Central Highlands	14.6 [2.1]	0.0419 [0.0070]	0.0176 [0.0037]	7.5 [1.4]	0.0192 [0.0045]	0.0075 [0.0022]
South East	4.1 [0.8]	0.0099 [0.0022]	0.0037 [0.0010]	1.7 [0.4]	0.0038 [0.0012]	0.0013 [0.0006]
Mekong River Delta	7.9 [1.1]	0.0184 [0.0032]	0.0067 [0.0015]	3.2 [0.6]	0.0067 [0.0018]	0.0023 [0.0008]
All Vietnam	9.5 [0.5]	0.0242 [0.0018]	0.0093 [0.0009]	4.2 [0.4]	0.0098 [0.0011]	0.0035 [0.0005]

Standard errors in bracket (Standard errors are calculated using bootstrap with 500 replications. Standard errors are corrected for sampling weights and cluster correlation).

Source: Estimation from VHLSSs 2002, 2004 and 2006.

To assess the accuracy of the prediction method, we use panel data from VHLSSs 2002 and 2004 to predict the poverty indexes in 2006. Then, we compare these estimates with the estimates based on the 2006 VHLSS. Table 5 presents the poverty estimates based on panel data of VHLSSs 2002-2004. It can be seen that these poverty estimates are very close to those estimated directly from the 2006 VHLSS (in Tables 1 and 2).

Table 5: Predicted poverty in 2006 based on panel data VHLSS 2002-2004

Areas	Overall poverty			Food poverty		
	P0 (%)	P1	P2	P0 (%)	P1	P2
<u>Rural/urban</u>						
Rural	20.3 [0.8]	0.0576 [0.0030]	0.0238 [0.0015]	10.4 [0.6]	0.0258 [0.0019]	0.0097 [0.0009]
Urban	3.3 [0.4]	0.0073 [0.0012]	0.0025 [0.0005]	1.2 [0.3]	0.0025 [0.0007]	0.0008 [0.0003]
<u>Region</u>						
Red River Delta	9.1 [0.9]	0.0208 [0.0026]	0.0072 [0.0011]	3.6 [0.6]	0.0071 [0.0014]	0.0022 [0.0005]
North East	25.8	0.0756	0.0315	13.8	0.0346	0.0130

Areas	Overall poverty			Food poverty		
	P0 (%)	P1	P2	P0 (%)	P1	P2
	[1.6]	[0.0059]	[0.0032]	[1.2]	[0.0039]	[0.0019]
North West	38.0	0.1220	0.0538	22.5	0.0607	0.0237
	[3.2]	[0.0140]	[0.0078]	[2.8]	[0.0097]	[0.0047]
North Central Coast	28.1	0.0861	0.0374	15.6	0.0417	0.0164
	[2.0]	[0.0078]	[0.0043]	[1.6]	[0.0053]	[0.0027]
South Central Coast	13.7	0.0349	0.0133	6.2	0.0139	0.0048
	[1.4]	[0.0043]	[0.0021]	[0.9]	[0.0026]	[0.0012]
Central Highlands	23.8	0.0768	0.0349	13.8	0.0394	0.0164
	[2.2]	[0.0090]	[0.0052]	[1.7]	[0.0065]	[0.0034]
South East	5.2	0.0134	0.0053	2.3	0.0056	0.0021
	[0.7]	[0.0022]	[0.0012]	[0.5]	[0.0014]	[0.0008]
Mekong River Delta	12.5	0.0300	0.0109	5.3	0.0110	0.0036
	[1.1]	[0.0034]	[0.0015]	[0.7]	[0.0018]	[0.0007]
All Vietnam	15.8	0.0442	0.0181	7.9	0.0196	0.0073
	[0.6]	[0.0022]	[0.0012]	[0.4]	[0.0014]	[0.0007]

Standard errors in bracket (Standard errors are calculated using bootstrap with 500 replications. Standard errors are corrected for sampling weights and cluster correlation).

Source: Estimation from VHLSSs 2002, 2004 and 2006.

The findings mean that Vietnam can achieve the first objective of MDG on reduction of overall poverty by 2008 if there are not high inflation and economic stagnation. However, there is not strong evidence whether Vietnam can achieve the second MDG objective on reduction of food poverty incidence to 3 percent by 2010. This is because the food poverty incidence is quite low and the standard errors of the estimates are not small enough to have clear conclusion on whether the estimate of the food poverty incidence is smaller or higher than 3 percent.

#### 4.2. Poverty Estimation under Assumption of High Inflation in 2008 and Economic Stagnation

##### *Methodology*

To estimate the effect of high inflation on poverty in 2008, we follow the following steps:

- (i) Estimate the nominal income of households by:

$$\hat{Y}_{i(2008)}^N = \hat{Y}_{i(2008)}^R \frac{CPI_F Y_{i(2006)-A} + CPI_{NF} Y_{i(2006)-NA} + Y_{i(2006)-W}}{Y_{i(2006)}}, \quad (6)$$

Where:  $\hat{Y}_{i(2008)}^N$  and  $\hat{Y}_{i(2008)}^R$  are nominal and real per capita income of household  $i$ , respectively.  $\hat{Y}_{i(2008)}^R$  is estimated in section 4.1. Subscript “2006” and “2008” refer to the years 2006 and 2008, respectively.  $CPI_F$  and  $CPI_{NF}$  are CPIs of food and non-

food in 2008, which are equal to around 1.36 and 1.13, respectively.<sup>3</sup>  $Y_{i(2006)_A}$  and  $Y_{i(2006)_NA}$  are income from agricultural and non-agricultural productive activities of the household  $i$ .  $Y_{i(2006)_W}$  are wages/salaries, subsidy, remittances and other income sources. Equation (6) assumes several assumptions. Firstly, it assumes households who produce agricultural and non-agricultural products can increase their income by the same rate of CPI. In other words, the ratio of the change in consumer's price to the change in producer's price is equal one. This assumption is also invoked in many studies, e.g., Deaton (1989). Secondly, wage, subsidy, remittances and other income sources are assumed to be fixed during the short period. In most studies, people who receive wage/salary are assumed to be most affected by inflation. Thirdly, equation (6) assumes that the structure of income sources of households in 2008 is the same as that in 2006.

- (ii) Estimate the nominal per capita expenditure as follows:

$$\hat{C}_{i(2008)}^N = \hat{Y}_{i(2008)}^R \frac{C_{i(2006)}}{Y_{i(2006)}}, \quad (7)$$

where  $\hat{C}_{i(2008)}^N$  and  $C_{i(2006)}$  are nominal per capita expenditure in 2008 and per capita expenditure in 2006 of household  $i$ , respectively.

- (iii) Estimate the real per capita expenditure:

$$\hat{C}_{i(2008)}^R = \hat{C}_{i(2008)}^N \frac{C_{i(2006)_F}/CPI_F + C_{i(2006)_NF}/CPI_{NF}}{C_{i(2006)}}, \quad (8)$$

where  $C_{i(2006)_F}$  and  $C_{i(2006)_NF}$  are per capita expenditure on food and non-food consumption of household  $i$  in 2006, respectively.

- (iv) Poverty indexes are estimated using the predicted per capita expenditure from step (iii).

It should be noted that equations (7) and (8) assume that the ratio of expenditure to income and the ratio of food expenditure to total expenditure are unchanged during 2006-2008. Because of high inflation, household can increase the ratio of expenditure to income and ratio of food items in total consumption. If so, the realized poverty will be lower than the estimated poverty based on the above procedure.

In addition, the paper assumes that inflation does not have macroeconomic impacts such as unemployment or decreases in demand and supply. This is reasonable assumption, since high

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<sup>3</sup> More accurately, these are CPIs in the first 9 month of 2008. Since the CPI was not increased in October, we use these CPIs as estimates of CPI for the whole year. The CPIs are almost the same in rural and urban areas.

inflation has happened in the first six months of 2008, and most of studies mention that the main reason for high inflation is the excess of money supply.<sup>4</sup>

Finally, to project poverty in 2010 in the case of economic stagnation, the paper assumes that economic growth rate during 2008-2009 is half of that during 2006-2007. If the annual economic growth rate is around 8 percent, the growth rate for four years is around 36 percent. If we assume that the annual economic growth rate during 2008-2009 is around 4 percent, the economic rate for the four years period will be 26 percent.<sup>5</sup> Thus, per capita income in the presence of economic stagnation for 2010 is approximately per capita income in the absence of economic stagnation for 2010 multiplied by (26/36). Per capita income in the absence of economic stagnation is projected in section 4.1. Then per capita expenditure and poverty indexes are predicted based on this projected per capita income.

### *Estimation Results*

Table 6 presents the structure of income and consumption expenditure for the poor and non-poor in 2006. The poor have a larger ratio of agricultural income than the non-poor. Income from agricultural production and business accounted for 30.8 percent and 53.4 percent of the total income for the non-poor and the poor, respectively. On the contrary, the ratio of non-agricultural income in total income of the poor was smaller than that of the non-poor. It implies that inflation can increase the nominal income by a larger rate for the poor than for the non-poor. However, the poor tended to have larger expenditure on food consumption. The share of food consumption in total consumption was 46.4 percent and 65 percent for the non-poor and poor, respectively.

Table 6: Structure of income and consumption by the poor and non-poor in 2006

In percent	Non-Poor	Poor	Total
<u>Structure in income</u>			
Wage	31.9	29.5	31.5
Agricultural activities	30.8	53.4	34.4
Non-agricultural activities	37.3	17.1	34.1
Sub-Total	100	100	100
<u>Structure in consumption</u>			
Food	46.4	65.0	49.3
Non-food	53.6	35.0	50.7
Sub-Total	100	100	100
Ratio of consumption expenditure to income	78.5	72.1	77.5
Source: estimation from VHLSS 2006			

<sup>4</sup> For example, the money supply (M1) of Vietnam increased by 46 percent in 2007. Source: [http://www.bbc.co.uk/vietnamese/vietnam/story/2008/03/080303\\_finterviewnguyentandung.shtml](http://www.bbc.co.uk/vietnamese/vietnam/story/2008/03/080303_finterviewnguyentandung.shtml)

<sup>5</sup> For the year 2008, the GDP growth rate is estimated at 6 percent. Source: <http://www.vietnamnet.vn/chinhtri/2008/10/808767>

Table 7 presents the estimates of poverty indexes in 2008 in the presence of high inflation. It shows that high inflation increases the poverty indexes (see also Table 3). High inflation increases the overall poverty incidence by 2.1 percentage point from 13.3 percent to 15.4 percent. The overall poverty incidences for the rural and urban areas are also increased to 19.1 percent and 5.1 percent, respectively. The food poverty incidence is increased by the inflation from 6.1 percent to 7.3 percent. Poverty indexes in the case of high inflation are rather similar to poverty indexes in 2006. In other words, high inflation in 2008 almost fades the effect of income growth on poverty reduction during 2006-2008. However, Vietnam might still achieve the first objective of MDG to reduce the poverty incidence to 16 percent by 2008.

At the regional level, all regions also have increased poverty due to inflation. The increase in the overall and food poverty incidences is very similar across the regions.

Table 7: Predicted poverty in 2008 based on panel data VHLSS 2004-2006: with high inflation in 2008

Areas	Overall poverty			Food poverty		
	P0 (%)	P1	P2	P0 (%)	P1	P2
<u>Rural/urban</u>						
Rural	19.1	0.0525	0.0228	9.3	0.0228	0.0113
	[0.6]	[0.0023]	[0.0020]	[0.5]	[0.0015]	[0.0027]
Urban	5.1	0.0114	0.0040	1.9	0.0039	0.0012
	[0.5]	[0.0015]	[0.0007]	[0.3]	[0.0008]	[0.0004]
<u>Region</u>						
Red River Delta	11.5	0.0268	0.0094	4.7	0.0094	0.0030
	[0.9]	[0.0027]	[0.0012]	[0.6]	[0.0015]	[0.0006]
North East	19.3	0.0514	0.0202	9.2	0.0214	0.0077
	[1.4]	[0.0048]	[0.0024]	[1.0]	[0.0029]	[0.0013]
North West	36.0	0.1121	0.0485	20.6	0.0543	0.0209
	[3.4]	[0.0137]	[0.0073]	[2.8]	[0.0090]	[0.0043]
North Central Coast	23.2	0.0664	0.0273	12.0	0.0298	0.0110
	[1.6]	[0.0063]	[0.0033]	[1.3]	[0.0041]	[0.0020]
South Central Coast	14.6	0.0373	0.0142	6.6	0.0148	0.0052
	[1.5]	[0.0045]	[0.0021]	[0.9]	[0.0026]	[0.0012]
Central Highlands	22.1	0.0694	0.0308	12.6	0.0346	0.0140
	[2.1]	[0.0078]	[0.0043]	[1.6]	[0.0053]	[0.0028]
South East	8.2	0.0219	0.0088	3.8	0.0094	0.0036
	[0.9]	[0.0027]	[0.0014]	[0.6]	[0.0018]	[0.0009]
Mekong River Delta	12.9	0.0331	0.0189	5.5	0.0139	0.0155
	[1.0]	[0.0031]	[0.0059]	[0.6]	[0.0019]	[0.0096]
All Vietnam	15.4	0.0415	0.0178	7.3	0.0178	0.0086
	[0.5]	[0.0017]	[0.0015]	[0.4]	[0.0011]	[0.0020]

Standard errors in bracket (Standard errors are calculated using bootstrap with 500 replications. Standard errors are corrected for sampling weights and cluster correlation).

Source: Estimation from VHLSSs 2002, 2004 and 2006.

Table 8 presents the estimation of poverty indexes when there is economic stagnation but no high inflation during 2008-2009. The paper assumes that in the long-run, people can adjust real income to ensure real consumption, and the effect of inflation will be mitigated. The incidences of the overall poverty can be 11.1 percent in 2010. It means that economic stagnation

can increase the poverty incidence by around 1.6 percentage points (see Table 4). If there is high inflation, the poverty incidence can be around 13 percent. This figure is still smaller than the MDG's target of 16 percent.

Economic stagnation can also increase the food poverty incidence in 2010 from 4.2 percent to 5.2 percent. The point estimate of the food poverty incidence is higher than the MDG's target of 3 percent. However, since the associated standard error is rather high, we cannot reject hypothesis that the food poverty incidence in 2010 is equal to 3 percent. Thus it is not clear evidence whether Vietnam can achieve the MDG of food poverty reduction. Again, these results should be used with great caution since there are few observations in the panel data 2002-2006 the regression analysis.

Table 8: Predicted poverty in 2010 based on panel data VHLSS 2002-2006: with economic crisis

Areas	Overall poverty			Food poverty		
	P0 (%)	P1	P2	P0 (%)	P1	P2
<u>Rural/urban</u>						
Rural	14.0 [0.8]	0.0373 [0.0027]	0.0148 [0.0013]	6.6 [0.5]	0.0157 [0.0016]	0.0057 [0.0008]
Urban	3.3 [0.5]	0.0074 [0.0015]	0.0026 [0.0007]	1.3 [0.3]	0.0026 [0.0008]	0.0009 [0.0003]
<u>Region</u>						
Red River Delta	7.3 [1.0]	0.0166 [0.0028]	0.0059 [0.0012]	2.8 [0.6]	0.0058 [0.0014]	0.0019 [0.0006]
North East	16.9 [1.7]	0.0460 [0.0058]	0.0185 [0.0029]	8.2 [1.2]	0.0197 [0.0035]	0.0073 [0.0017]
North West	30.4 [4.7]	0.0923 [0.0182]	0.0395 [0.0093]	16.9 [3.5]	0.0439 [0.0111]	0.0168 [0.0051]
North Central Coast	16.3 [1.8]	0.0448 [0.0064]	0.0181 [0.0033]	8.0 [1.3]	0.0194 [0.0040]	0.0071 [0.0019]
South Central Coast	9.7 [1.5]	0.0244 [0.0045]	0.0094 [0.0022]	4.3 [0.9]	0.0097 [0.0026]	0.0035 [0.0013]
Central Highlands	16.7 [2.2]	0.0493 [0.0077]	0.0211 [0.0041]	8.9 [1.6]	0.0233 [0.0050]	0.0092 [0.0025]
South East	4.9 [0.9]	0.0122 [0.0025]	0.0046 [0.0012]	2.1 [0.5]	0.0048 [0.0014]	0.0017 [0.0007]
Mekong River Delta	9.5 [1.2]	0.0229 [0.0037]	0.0084 [0.0018]	3.9 [0.7]	0.0085 [0.0020]	0.0030 [0.0010]
All Vietnam	11.1 [0.6]	0.0293 [0.0021]	0.0115 [0.0010]	5.2 [0.4]	0.0122 [0.0012]	0.0044 [0.0006]

Standard errors in bracket (Standard errors are calculated using bootstrap with 500 replications. Standard errors are corrected for sampling weights and cluster correlation).

Source: Estimation from VHLSSs 2002, 2004 and 2006.

## 5. Conclusion

This paper uses the three recent Vietnam Household Living Standard Surveys in 2002, 2004 and 2004 to forecast poverty in 2008 and 2010 to examine whether Vietnam can achieve its MDG on

poverty reduction. The forecasts take into account high inflation in 2008 and economic stagnation during 2008-2009. It is found that high inflation can reduce the overall poverty rate in 2008 by around 2.1 percentage points. However, Vietnam can be able to achieve its MDG on reduction of the overall poverty by 2008, since the projected poverty incidence in 2008 is 15.4 percent in the presence of high inflation. If Vietnam can control inflation and maintain the economic growth rate during 2008-2009 equal to half of the growth rate during 2006-2007, the overall poverty incidence can be around 11.1 percent in 2010. The MDG objective on reduction of food poverty might not be achieved, since the point estimates of the food poverty incidence are higher than the targeted rate of 3 percent.

Of course, if high inflation together with economic crisis happen during the period 2008-2009, Vietnam might not achieve the MDG on both overall and food poverty reduction. In this case, income redistribution can be important measure to maintain the poverty reduction.



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## Appendix 1: Poverty indexes

We calculate poverty by three Foster-Greer-Thorbecke poverty indexes, which can all be calculated using the following formula (Foster, Greer and Thorbecke, 1984):

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left[ \frac{z - Y_i}{z} \right]^{\alpha}, \quad (\text{A.1})$$

where  $Y_i$  is a welfare indicator for person  $i$ . We use consumption expenditure per capita as the welfare indicator, since, as is well known, consumption is a better proxy for well-being than income.  $Z$  is the expenditure poverty line,  $n$  is the number of people in the sample population,  $q$  is the number of poor people, and  $\alpha$  can be interpreted as a measure of inequality aversion.

When  $\alpha = 0$ , we have the headcount index  $H$ , which measures the proportion of people below the poverty line. When  $\alpha = 1$  and  $\alpha = 2$ , we obtain the poverty gap  $PG$ , which measures the depth of poverty, and the squared poverty gap  $P_2$  which measures the severity of poverty, respectively.

## Appendix 2: Data description and regression results

Table A.1. Variable description

Variables	Type	Mean and standard error		
		2002	2004	2006
Logarithm of per capita income (in price of 2006)	Continuous	8.347 [0.007]	8.560 [0.013]	8.738 [0.010]
Per capita income (thousand VND) (in price of 2006)	Continuous	5571.3 [70.3]	6843.6 [120.9]	7992.1 [100.7]
Per capita income (thousand VND) (in price of 2006)	Continuous	4315.5 [43.3]	5170.4 [82.9]	5846.9 [79.2]
Ratio of members working in agriculture to the total number of members between 14 and 61	Continuous	0.552 [0.005]	0.504 [0.007]	0.479 [0.007]
Ethnic minorities (not Kinh/Chinese) (yes = 1)	Binary	0.126 [0.004]	0.126 [0.005]	0.135 [0.006]
Household size	Discrete	5.124 [0.020]	5.014 [0.025]	4.868 [0.027]
Ratio of children under 15 years old in household	Continuous	0.291 [0.002]	0.266 [0.003]	0.241 [0.003]
Ratio of people over 60 years old in household	Continuous	0.087 [0.001]	0.093 [0.002]	0.097 [0.002]
Ratio of female members in household	Continuous	0.505 [0.001]	0.505 [0.002]	0.510 [0.002]
Head managers	Binary	0.017 [0.001]	0.024 [0.002]	0.026 [0.002]

Variables	Type	Mean and standard error		
		2002	2004	2006
Head professionals/technicians	Binary	0.035 [0.002]	0.041 [0.003]	0.043 [0.002]
Head clerks/service workers	Binary	0.031 [0.001]	0.038 [0.002]	0.038 [0.002]
Head agriculture/forestry/fishery	Binary	0.515 [0.005]	0.474 [0.008]	0.471 [0.007]
Head skilled workers/machine operators	Binary	0.096 [0.003]	0.103 [0.004]	0.117 [0.004]
Head unskilled workers	Binary	0.162 [0.004]	0.163 [0.005]	0.166 [0.005]
Head not working	Binary	0.143 [0.003]	0.156 [0.005]	0.138 [0.004]
Head without education degree	Binary	0.316 [0.005]	0.289 [0.006]	0.263 [0.006]
Head with primary school degree	Binary	0.244 [0.004]	0.245 [0.005]	0.253 [0.005]
Head with lower-secondary school	Binary	0.265 [0.004]	0.248 [0.005]	0.265 [0.006]
Head with upper secondary school	Binary	0.084 [0.003]	0.075 [0.003]	0.078 [0.003]
Head with technical degree	Binary	0.055 [0.002]	0.100 [0.004]	0.098 [0.004]
Head with post-secondary school	Binary	0.036 [0.002]	0.043 [0.003]	0.044 [0.003]
Ratio of members with lower secondary school	Continuous	0.201 [0.002]	0.205 [0.003]	0.216 [0.003]
Ratio of members with upper secondary school	Continuous	0.079 [0.001]	0.086 [0.002]	0.094 [0.002]
Ratio of members with technical degree	Continuous	0.031 [0.001]	0.058 [0.002]	0.067 [0.002]
Ratio of members with post secondary school	Continuous	0.024 [0.001]	0.032 [0.002]	0.034 [0.002]
Area of house (m2)	Discrete	58.8 [0.5]	63.0 [0.6]	66.1 [0.6]
Permanent house	Binary	0.168 [0.004]	0.208 [0.006]	0.234 [0.006]
Semi-permanent house	Binary	0.598 [0.005]	0.596 [0.007]	0.611 [0.007]
Temporary house	Binary	0.234 [0.005]	0.196 [0.006]	0.156 [0.005]
Tap water	Binary	0.168 [0.005]	0.189 [0.007]	0.223 [0.008]
Clean water	Binary	0.593 [0.007]	0.643 [0.008]	0.642 [0.009]
Other water	Binary	0.239 [0.005]	0.168 [0.006]	0.135 [0.005]
Area of annual crop land (m2)	Continuous	0.664 [0.014]	0.669 [0.018]	0.696 [0.020]
Area of perennial crop land (m2)	Continuous	0.229	0.202	0.238

Variables	Type	Mean and standard error		
		2002	2004	2006
		[0.009]	[0.015]	[0.014]
Area of forestry land (m2)	Continuous	0.220	0.195	0.214
		[0.021]	[0.022]	[0.026]
Area of aquaculture water surface (m2)	Continuous	0.060	0.059	0.062
		[0.006]	[0.006]	[0.008]
Distance from village to the nearest market (km)	Continuous	2.183	2.198	2.345
		[0.096]	[0.095]	[0.101]
Village with road (yes = 1)	Binary	0.667	0.912	0.907
		[0.006]	[0.005]	[0.005]
Household in urban areas	Binary	0.232	0.258	0.267
		[0.002]	[0.010]	[0.010]
Red River Delta	Binary	0.219	0.218	0.216
		[0.002]	[0.007]	[0.007]
North East	Binary	0.119	0.114	0.115
		[0.001]	[0.004]	[0.004]
North West	Binary	0.027	0.030	0.032
		[0.001]	[0.002]	[0.002]
North Central Coast	Binary	0.134	0.129	0.132
		[0.002]	[0.006]	[0.006]
South Central Coast	Binary	0.085	0.086	0.085
		[0.001]	[0.005]	[0.005]
Central Highlands	Binary	0.058	0.056	0.060
		[0.001]	[0.004]	[0.005]
South East	Binary	0.146	0.159	0.159
		[0.002]	[0.009]	[0.008]
Mekong River Delta	Binary	0.212	0.208	0.201
		[0.002]	[0.007]	[0.007]
Number of observations		29533	9188	9189

Standard errors in bracket (Standard errors are corrected for sampling weights and cluster correlation).  
Sources: Estimations from VHLSSs 2002, 2004 and 2006

Table A.2. Regressions of log of per capita income

Independent variables	Dependent variable of 2004 and independent variables of 2002: Data are from panel data 2002-2004	Dependent variable of 2006 and independent variables of 2004: Data are from panel data 2004-2006	Dependent variable of 2006 and independent variables of 2002: : Data are from panel data 2002-2006
Logarithm of per capita income	0.476*** [0.019]	0.529*** [0.018]	0.428*** [0.027]
Ratio of members working in agriculture to the total number of members between 14 and 61	-0.094*** [0.024]	-0.084*** [0.023]	-0.213*** [0.045]
Ethnic minorities (not Kinh/Chinese) (yes = 1)	-0.166*** [0.025]	-0.155*** [0.024]	-0.172*** [0.038]
Household size	-0.014*** [0.005]		
Ratio of children under 15 years old in household	-0.175*** [0.044]	-0.132*** [0.049]	-0.165** [0.078]
Ratio of people over 60 years old in household	-0.138*** [0.042]	-0.100*** [0.039]	-0.137* [0.072]
Ratio of female members in household	-0.076* [0.040]		
Head professionals/technicians		0.086** [0.037]	
Head without education degree	-0.120*** [0.024]	-0.050* [0.027]	-0.420*** [0.071]
Head with primary school degree	-0.093*** [0.022]	-0.042* [0.026]	-0.347*** [0.070]
Head with lower-secondary school			-0.340*** [0.073]
Head with upper secondary school	-0.084** [0.034]	-0.078** [0.034]	-0.363*** [0.079]
Head with technical degree			-0.255*** [0.076]
Ratio of members with lower secondary school		0.090** [0.045]	0.207*** [0.079]
Ratio of members with upper secondary school	0.282*** [0.064]	0.269*** [0.063]	0.344*** [0.093]
Ratio of members with technical degree		0.238*** [0.064]	
Ratio of members with post secondary school	0.420*** [0.079]	0.487*** [0.072]	
Area of house (m2)	0.001*** [0.000]	0.001*** [0.000]	
Permanent house	0.083*** [0.031]	0.099*** [0.027]	0.168*** [0.047]
Semi-permanent house	0.075*** [0.021]	0.043** [0.018]	0.086*** [0.031]
Tap water	0.127*** [0.033]		

Independent variables	Dependent variable of 2004 and independent variables of 2002: Data are from panel data 2002-2004	Dependent variable of 2006 and independent variables of 2004: Data are from panel data 2004-2006	Dependent variable of 2006 and independent variables of 2002: : Data are from panel data 2002-2006
Clean water	0.048** [0.022]		
Area of perennial crop land (m2)	0.033*** [0.007]	0.027*** [0.008]	
Area of annual crop land (m2)		0.016*** [0.006]	
Distance from village to the nearest market (km)		-0.006*** [0.001]	
Household in urban areas	0.106*** [0.025]		
Red River Delta	-0.070** [0.028]	-0.131*** [0.022]	-0.184*** [0.041]
North East	-0.109*** [0.026]		-0.107*** [0.040]
North West			-0.127** [0.060]
North Central Coast	-0.196*** [0.031]	-0.091*** [0.024]	-0.150*** [0.044]
South Central Coast	-0.096*** [0.029]	-0.084*** [0.025]	-0.137*** [0.042]
South East	0.089*** [0.029]		
Constant	4.647*** [0.172]	4.184*** [0.161]	5.575*** [0.259]
Observations	4008	4216	1872
R-squared	0.54	0.57	0.44

Robust standard errors in brackets (Standard errors are corrected for sampling weights and cluster correlation).  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%  
Source: Estimation from VHLSSs 2002, 2004 and 2006.