The Impact of Agricultural Land on Poverty and Inequality in Rural Vietnam

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Abstract

This paper measures impact of agricultural land on household income and consumption expenditure, and subsequently assesses impact of agricultural land on poverty and inequality in rural Vietnam. It is found that agricultural land increases per capita consumption expenditure and income of the land holders by around 2.7 and 6.7 percent, respectively. As a result, agricultural land helps poverty reduction. Due to agricultural land, the headcount of poverty for land holders is reduced by around 1.2 percentage points. Agricultural land also decreases the poverty-gap and poverty-severity indexes for the land holders by around 5.6 and 6.6 percent, respectively. However, agricultural land increases rural inequality, albeit at very small magnitude.

Keywords: Agricultural land, poverty, inequality, welfare, impact evaluation, Vietnam.

JEL classification: Q15; D63; I32

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1. INTRODUCTION

Arable land has crucial role in agricultural production and poverty reduction. The agricultural production can contribute to economic growth and poverty reduction through different channels such as provision of food, employment generation, and exportation (e.g., see Johnston and Mellor, 1961; Ranis et al., 1990; Irz et al., 2001; Timmer, 2002, etc.). There is large literature on impact evaluation of land reform and land distribution policies (e.g., De Janvry, 1981; Boyce et al. 1998; Bobrow-Strain, 2004; Bardha and Mookherjee, 2006; Besley and Burgess, 2000; Deininger et al. 2007). However, there is little research on measurement of impact of current land distribution on household welfare, poverty and inequality.

Vietnam has been an agricultural country, with around 60 percent of the population involved in the agricultural production in 2006. Landless is often mentioned as one of the main causes for poverty in qualitative studies (World Bank, 2003). Yet, rapid economic development combined with urbanization and industrialization has resulted in the contraction of the agricultural sector and the reduction of production land for agricultural households. There is evidence of an increased tendency towards a concentration of landownership, favouring better-off, better-educated households, with stronger ties in the community (World Bank, 2003). The main objective of this paper is to measure impact of agricultural land on per pita income and consumption expenditure, and subsequently assesses the impact of agricultural land on poverty and inequality in rural Vietnam. The impact measurement can provide information on the importance of agricultural land in increasing income and expenditure and to which extent the current land distribution can help poverty and inequality reduction. Data used in this paper are from Vietnam Household Living Standard Surveys in 2002 and 2004.

There are six sections in this paper. The second section describes data sources used in this paper. The third section gives brief overview of poverty and agricultural land in Vietnam. Next,

the fourth and fifth sections present methodology and empirical findings on impact estimation, respectively. Finally, the sixth section concludes.

2. DATA SOURCES

The study relies on data from two Vietnam Household Living Standard Surveys (VHLSS), which were conducted by the General Statistics Office of Vietnam (GSO) with technical support from the World Bank (WB) in the years 2002 and 2004. The 2002 and 2004 VHLSSs covered 30000 and 9000 households, respectively. The samples are representative for the national, rural and urban, and regional levels. The 2002 and 2004 VHLSSs set up a panel of 4008 households, which are representative for the whole country, and for the urban and rural population.

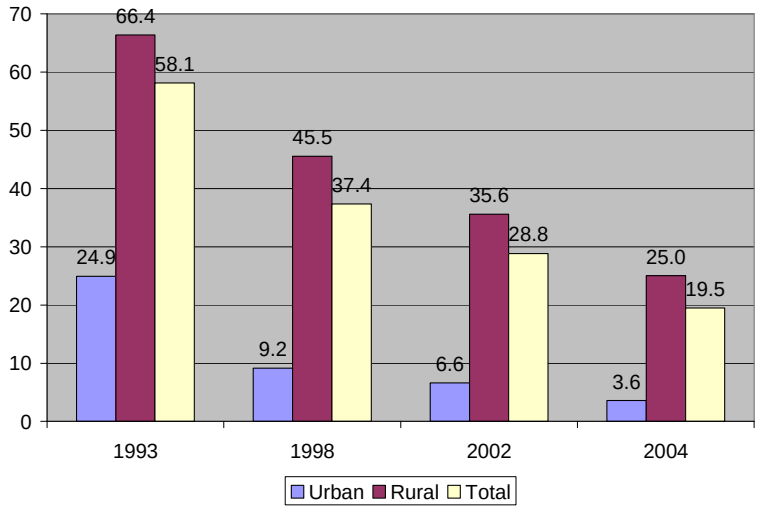
The surveys collected information through household and community level questionnaires. Information on households includes basic demography, employment and labor force participation, education, health, income, expenditure, housing, fixed assets and durable goods, and especially agricultural production. Data on expenditure and income were collected using very detailed questionnaires. Information on small and detailed expenditure and income categories was collected and then aggregated into expenditure and income per capita.

This study focuses on the rural population. The main reason is that commune variables are used in regression analysis, and there are only data on commune variables for rural areas in the 2004 VHLSS. In Vietnam, around 75 percent of the population and 80 percent of the agricultural population are living in rural areas. The number of households in the rural panel for 2002-2004 is 3099.

3. POVERTY AND AGRICULTURAL LAND IN VIETNAM

In this paper, a household is classified as poor if their per capita expenditure is below the poverty line which is set up by WB and GSO. The poverty line is equivalent to the expenditure level that allows for nutritional needs and some essential non-food consumption such as clothing and housing. This poverty line was first estimated in 1993. Poverty lines in the following years were estimated by deflating the 1993 poverty line using the consumer price index.[2] Figure 1 presents the poverty rates over the period 1993-2004.

Figure 1 Poverty rate over the period 1993-2004 (%)



Source: Estimation of VHLSS in 1993, 1998, 2002, and 2004

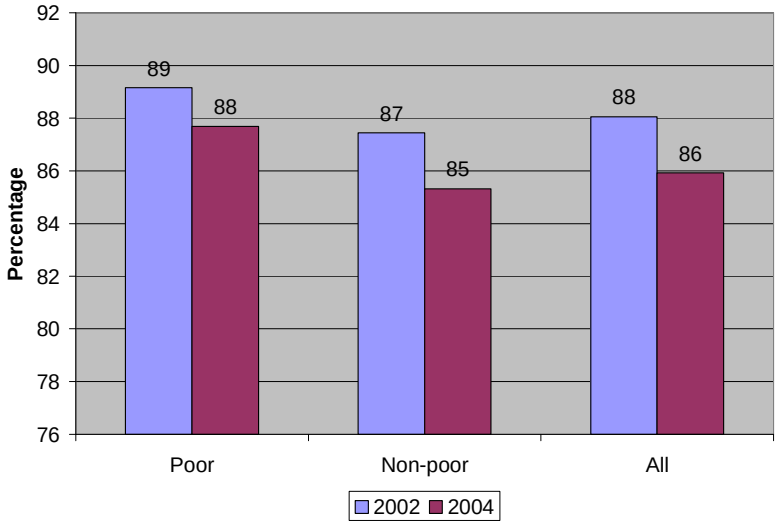
It shows that the proportion of people with per capita expenditure under the poverty line dropped dramatically from 58.1 percent in 1993 to 37.4 percent in 1998. The poverty rate continued to decrease to 28.9 and 19.5 percent in 2002 and 2004, respectively.[3] However, the poverty rate remained rather high in rural areas, at 25 percent in 2004. Together with reduction in poverty, inequality was increasing overtime, albeit at a moderate pace. The Gini index increased from 0.33 in 1993 to 0.37 in 2004.

[2] Regional price differences and monthly price changes over the survey period have been taken into account when the poverty lines are calculated.

[3] The poor are classified based on the expenditure poverty line constructed by WB-GSO. The poverty lines in the years 1993, 1998, 2002, and 2004 are equal to 1160, 1790, 1917, and 2077 thousands VND, respectively. 1 USD is approximately equivalent to 16000 VND in January 2008.

Agricultural land is defined as land that can be used for annual and perennial crops in this paper. Households who own, mange or use agricultural land are called land holders. Figure 2 graphs the percentage of agricultural households who have agricultural land over two years, 2002 and 2004, by the poor and non-poor. The percentage of having agricultural land was a bit higher for the poor. The proportion of household with agricultural land was reduced slightly over the period 2002-2004.

Figure 2: Percentage of agricultural households having agricultural land, by the poor and non-poor

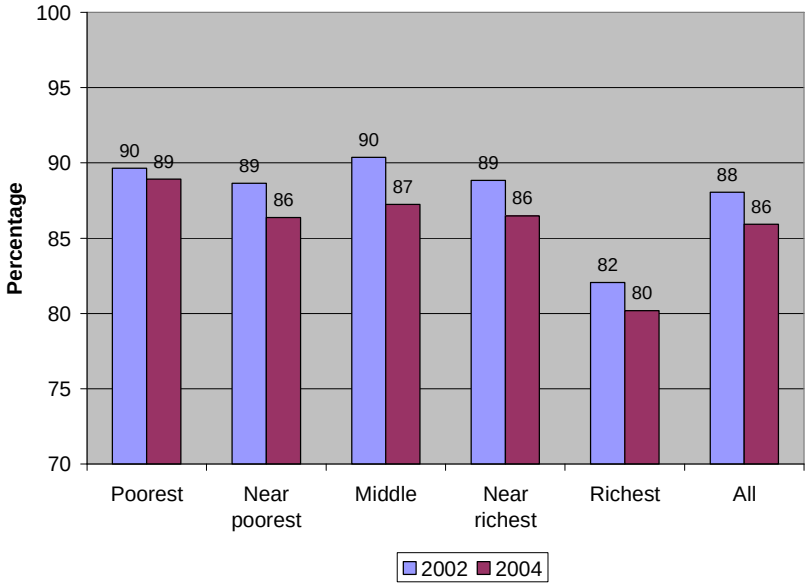


Source: Estimation from VHLSSs 2002 and 2004

Figure 3 presents the percentage of agricultural households with agricultural land by expenditure quintiles. The richest households were less likely to have agricultural land.

One reason why the percentage of agricultural households having land was higher in the poor quintiles than in the rich quintiles might be that the proportion of agricultural members in households was higher in the poor quintiles. A household in which most of working members work in the agricultural sector would need access to agricultural land. According to the 2004 VHLSS, the proportion of agricultural workers was 64 and 82 percents for the poor and non-poor households, respectively.

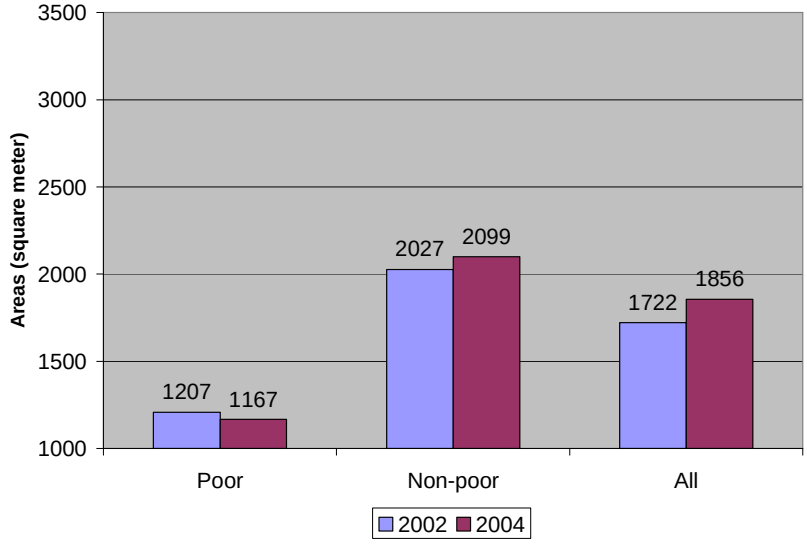
Figure 3: Percentage of agricultural households having agricultural land, by expenditure quintiles



Source: Estimation from VHLSSs 2002 and 2004

Figure 4 shows that the land agricultural area of the non-poor was much higher than that of the poor. The gap in land areas between the poor and non-poor tended to increase over the period 2002-2004.

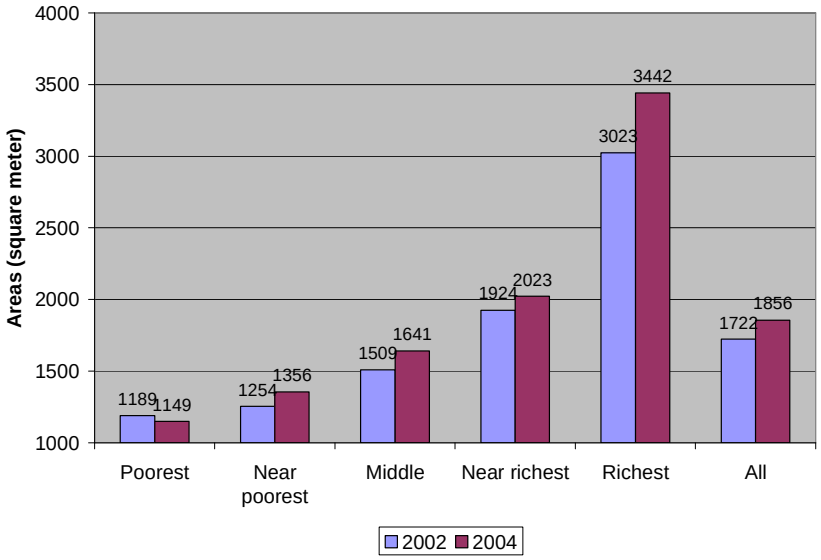
Figure 4: Average agricultural area per agricultural worker by the poor and non-poor



Source: Estimation from VHLSSs 2002 and 2004

The inequality in land areas is also reflected in the average area of agricultural land by expenditure quintiles (Figure 5). The land area of the richest was over three times as much as that of the poorest.

Figure 5: Average agricultural area per agricultural worker by expenditure quintiles



Source: Estimation from VHLSSs 2002 and 2004

4. IMPACT EVALUATION METHOD

4.1. Measurement of impact of agricultural land on household income and expenditure

To discuss the impact measurement, denote land area that a household have by D. Further let Y denote the observed value of outcome, i.e., household income and consumption expenditure in this paper, and let $Y_{(D)}$ denote potential outcome corresponding to the value of D. In this paper, the

parameter of interest is Average Treatment Effect on the Treated (ATT), which is the expected impact of land on the recipients:[4]

$$ATT = E(Y_{(D)} \big| D > 0) - E(Y_{(D=0)} \big| D > 0). \quad (1)$$

To measure impact of agricultural land, we assume that income or expenditure has the semi-log functional form as follows:

$$\ln(Y_i) = \alpha + X_i\beta + D_i\gamma + \varepsilon_i, \quad (2)$$

where X and ε are observed and unobserved household variables, respectively.

Once the coefficients of (2) are estimated, ATT can be estimated using the following simple formula:

$$\hat{ATT} = \hat{E}(Y_{i(D)} \mid D_i > 0) - \hat{E}(\hat{Y}_{i(D=0)} \mid D_i > 0) = \frac{1}{n_r}\sum_{i=1}^{n_p}\{Y_i - \exp[\ln(Y_i) - D_i\hat{\gamma}]\}, \quad (3)$$

where n_r is the number of households having land. The standard error of the estimates can be calculated using the Delta method or bootstrap technique.

A potential problem in estimating coefficients of variables in (2) is the correlation between land and the error term. It is possible that households who have advantageous conditions or motivation for higher income are more likely to have more lands. To solve the endogeneity, I apply the fixed-effect regression to remove time-invariant errors which can be correlated with agricultural land area. This assumption can be plausible in a short period 2002-2004. Since land is a large asset which is not changed quickly overtime, and temporary factors might not have strong effects on land holdings.

[4] There are other parameters such as average treatment effect (ATE), local average treatment effect, marginal treatment effect, or even effect of "non-treatment on non-treated, etc (see Heckman et al. 1999 for review).

4.2. Measurement of land impact on household income and expenditure

In this paper, poverty and inequality are analyzed based on consumption expenditure. If agricultural land can have impact on expenditure, it can also have impact on poverty and inequality. Poverty is often measured by three Foster-Greer-Thorbecke poverty indexes which can all be calculated using the following formula (Foster, Greer and Thorbecke, 1984):

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - Y_i}{z}\right]^\alpha , \quad (4)$$

where Y_i is a welfare indicator (consumption expenditure per capita in this paper) for person i, z is the poverty line, n is the number of people in the sample population, q is the number of poor people, and α 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 have the poverty gap PG which measures the depth of poverty, and the squared poverty gap P_2 which measures the severity of poverty, respectively.

To measure the inequality, we use three common measures of inequality: the Gini coefficient, Theil's L index of inequality, and Theil's T index of inequality. The Gini index can be calculated from the individual expenditure in the population as follows:

$$G = \frac{1}{2n(n-1)\overline{Y}}\sum_{i=1}^{n}\sum_{j=1}^{n}\left|Y_i - Y_j\right| \quad (5)$$

where $\overline{Y}$ is the average per capita expenditure.

The value of the Gini coefficient varies from 0 when everyone has the same expenditure to 1 when one person has everything. The closer a Gini coefficient is to one, the more unequal is the expenditure distribution.

The Theil L index of inequality is calculated as follows:

$$Theil\_L = \frac{1}{n}\sum_{i=1}^{n} \ln\left(\frac{\bar{Y}}{Y_i}\right), \quad (6)$$

The Theil L index ranges from 0 to infinity, and the higher the value of Theil L, the higher the inequality is.

The Theil T index of inequality is calculated as:

$$Theil\_T = \frac{1}{n}\sum_{i=1}^{n} \frac{Y_i}{\bar{Y}} \ln\left(\frac{Y_i}{\bar{Y}}\right) \quad (7)$$

The Theil T index ranges from 0 (lowest inequality) to ln(N) (highest inequality).

Impact of agricultural land on an index of poverty of the land holders is expressed as follows:

$$\Delta_P = P(D>0, Y) - P(D>0, Y_{(D=0)}), \quad (8)$$

where the first term in the left-hand side of (8) is the measure of poverty in the presence of land. This term is observed and can be estimated directly from the sample data. However, the second term in the left-hand side of (8) is the counterfactual measure of poverty, *i.e.*, poverty indexes of the land holders if they had not had the land. This term is not observed directly, and it is estimated using predicted expenditure from the fixed-effect regression.

Regarding to inequality, we measure the impact of land on inequality of the whole rural population. The impact on an inequality index is expressed:

$$\Delta_I = I(Y) - I(Y_{(D=0)}) \quad (9)$$

where $I(Y)$ is observed inequality which is calculated using the observed expenditure data. $I(Y_{(D=0)})$ is inequality in the absence of agricultural land, which is estimated using predicted counterfactual expenditure in the absence of agricultural land.

5. IMPACT ESTIMATION RESULTS

The results of fixed-effect regression of per capita expenditure and income are presented in Table 1. Explanatory variables include agricultural land area, household composition, characteristics of household head, education of head and head's spouse, household assets, and characteristics of communes and villages. It shows that land area has positive and statistically significant estimates of impact on both expenditure and income. An increase of 1000 m^2 in agricultural land helps households increase per capita expenditure and per capita income by approximately 0.28 and 0.83 percent, respectively. The point estimate of impact on per capita income is higher than that on per capita expenditure, which implies that land might also increase households saving and investment.

Table 1: Fixed-effect regression of per capita expenditure and income

Explanatory variables	**Per capita expenditure**		**Per capita income**	
	Coef.	Std. Err.	Coef.	Std. Err.
Area of agricultural land (1000 m2)	0.00284***	0.00104	0.00830***	0.00186
Ratio of members younger than 16	-0.35422***	0.05959	-0.40750***	0.07077
Ratio of members who older than 60	-0.36735***	0.06838	-0.53026***	0.08271
Head age	0.02733***	0.00838	0.02676***	0.00899
Head age squared	-0.00022***	0.00008	-0.00021**	0.00009
Household size	-0.13033***	0.02306	-0.14935***	0.02619
Household size squared	0.00467**	0.00187	0.00548***	0.00200
Head less than primary school	Omitted			
Head primary school	0.03031	0.02445	0.01853	0.02769
Head lower secondary school	0.06232**	0.03138	0.05362	0.03753
Head upper secondary school	0.09614**	0.04558	0.10218*	0.05421
Head technical degree	0.13790***	0.04085	0.13664***	0.05177
Head post secondary school	0.14076**	0.06478	0.16116*	0.08659
Head without spouse	Omitted			
Head's spouse less than primary school	-0.05875	0.04151	0.00297	0.04638
Head's spouse primary school	-0.0253	0.04106	0.05159	0.04741
Head's spouse lower secondary school	0.00992	0.04397	0.02421	0.05159
Head's spouse upper secondary school	-0.01461	0.06259	0.00267	0.07751

Explanatory variables	Per capita expenditure		Per capita income	
	Coef.	Std. Err.	Coef.	Std. Err.
Head's spouse technical degree	0.14553**	0.06070	0.10641	0.06851
Head's spouse post secondary school	0.24796***	0.08794	0.1081	0.08824
Ratio of household members working in agriculture	-0.16455***	0.02843	-0.33265***	0.03212
Log of living areas	0.06955***	0.01804	0.08667***	0.02170
Living in permanent house	0.10571***	0.02990	0.14796***	0.03882
Living in semi-permanent house	0.06401***	0.01889	0.08446***	0.02355
Living in temporary house	Omitted			
Pension (thousand VND)	0.00002***	0.00000	0.00004***	0.00000
Social allowance (thousand VND)	0.00003***	0.00001	0.00006***	0.00001
Foreign remittances (thousand VND)	0.00000**	0.00000	0.00001***	0.00000
Domestic remittances (thousand VND)	0.00002***	0.00000	0.00003***	0.00000
Commune having non-farm activities	-0.04167**	0.02035	-0.03567	0.02446
Distance to nearest town (km)	0.00102	0.00119	0.00021	0.00124
Distance to nearest road (km)	0.00304	0.00530	0.00039	0.00889
Distance to nearest daily market (km)	-0.00016	0.00112	0.00219	0.00150
Distance to nearest periodic market (km)	-0.0009	0.00118	-0.00175	0.00141
Distance to nearest post (km)	-0.00386***	0.00125	-0.00366**	0.00179
Distance to nearest primary school (km)	0.01184**	0.00514	0.02531***	0.00758
Distance to nearest lower secondary school (km)	-0.00389*	0.00213	-0.00793**	0.00319
Distance to nearest upper secondary school (km)	0.00446***	0.00115	0.00312*	0.00171
Constant	7.52197***	0.23627	7.79947***	0.25021
Observations	6198		6198	
Number of households in panel data	3099		3099	
R-squared	0.453		0.421	

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

Source: Estimation from VHLSSs 2002 and 2004.

Table 2 presents impact estimates of agricultural land measured by ATT. It shows that holding agricultural land increases per capita expenditure and income of the holders by around 2.7 and 6.7 percent, respectively.[5] The table also presents the estimates of the impact on poverty of agricultural land on poverty of the households having lands and inequality of the rural population.

[5] 3 ≈ 87*100/3215; and 7 ≈ 293*100/4419.

It shows that agricultural land decreases poverty. The estimates are rather small but statistically significant. Agricultural land reduces the headcount of poverty for land holders by around 1.2 percentage points (or 4.5 percent). Agricultural land also decreases the poverty-gap and poverty-severity indexes for the land holders by around 5.6 and 6.6 percent, respectively.

However, agricultural land does increase inequality, albeit at small magnitude. Due to agricultural land, the Gini index is increased by around 0.8 percent, while the Theil T and Theil L indexes are increased by around 1.5 percent. This is not a very surprising result, since the non-poor households tend to have larger area of agricultural land than the poor.

Table 2: Impact of agricultural land

Outcome	With land	Without land	Effect of land
Household welfare (VND thousand)[6]			
Per capita expenditure	3123.9***	3215.2***	87.3***
	(44.0)	(39.3)	(26.9)
Per capita income	4126.3***	4418.9***	292.6***
	(70.0)	(58.2)	(62.7)
Poverty			
Poverty incidence (P0)	0.2674***	0.2796***	-0.0122**
	(0.0097)	(0.0108)	(0.0054)
Poverty gap index (P1)	0.0661***	0.0700***	-0.0039***
	(0.0034)	(0.0037)	(0.0012)
Poverty severity index (P2)	0.0240***	0.0257***	-0.0017***
	(0.0017)	(0.0018)	(0.0005)
Inequality			
Gini	0.2900***	0.2878***	0.0023***
	(0.0046)	(0.0046)	(0.0008)
Theil L	0.1384***	0.1363***	0.0020***
	(0.0046)	(0.0045)	(0.0007)
Theil T	0.1445***	0.1423***	0.0022**
	(0.0059)	(0.0059)	(0.0009)

* significant at 10%; ** significant at 5%; *** significant at 1%
Figures in parentheses are standard errors.
Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 200 replications.
Outcomes with land are calculated using observed expenditure and income, while outcomes without land are estimates of counterfactual expenditure and income.
Source: Estimation from VHLSSs 2002 and 2004.

6. CONCLUSIONS

[6] 1 USD is approximately equivalent to 16000 VND in January 2008.

This paper uses data from VHLSSs 2002 and 2004 to evaluate the impacts of agricultural land on household income, consumption expenditure, poverty and inequality in rural Vietnam. It is found that the percentage of the poor having agricultural land is slightly higher than the non-poor. However, the average land area per agricultural labor of the poor is much lower than that of the non-poor. In addition, the gap in the land area between the poor and non-poor tends to increase overtime.

Regarding to impacts, agricultural land increases per capita expenditure and income of the holders by around 2.7 and 6.7 percent, respectively. These findings confirm the importance role of agricultural land in increasing household income and expenditure in Vietnam. As a result, agricultural land helps poverty reduction. More specifically, agricultural land reduces the headcount of poverty for land holders by around 1.2 percentage points (or 4.5 percent). Agricultural land also decreases the poverty-gap and poverty-severity indexes for the land holders by around 5.6 and 6.6 percent, respectively. However, current distribution of agricultural land does increase inequality, albeit at the very small magnitude. Due to agricultural land, the Gini index is increased by around 0.8 percent, while the Theil T and Theil L indexes are increased by around 1.5 percent. This is not a very surprising result, since the non-poor households tend to have larger area of agricultural land than the poor.

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