Hitotsubashi Journal of Economics 55 (2014), pp.189-206.

THE IMPACT OF FARMLAND LOSS ON INCOME DISTRIBUTION OF HOUSEHOLDS IN HANOI'S PERI-URBAN AREAS, VIETNAM*

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Received January 2014; Accepted March 2014

Abstract

This study has provided the first econometric evidence that the loss of land (due to urbanization and industrialization) has no impact on the probability of a household belonging to a particular income group (poor, middle class or rich) in Hanoi's peri-urban areas, Vietnam. The result also revealed that farmland holding was not statistically correlated with the likelihood of the household being in a given income group. Nevertheless, other factors, including households' education, access to credit, productive assets and notably their nonfarm participation before farmland loss, were found to increase the chances of the households moving up the income ladder.

Keywords: farmland loss, income distribution, multinomial logit, land acquisition, land-losing households
JEL Classification Codes: Q1, D1, D3

I. *Introduction*

Vietnam has undergone rapid urbanization and industrialization over the past two decades. One of outcomes of this process was that the government has compulsorily acquired a huge area of agricultural land from farmers for the development of industrial zones, infrastructure, urban areas and other public use purposes (Nguyen, 2009).[1] It was estimated that over the

* This paper was carried out as part of the author's PhD research, which had been completed in the Department of Economics, University of Waikato, New Zealand in May 2013 and financially supported by the Ministry of Education and Training of the Socialist Republic of Vietnam (Decision No. 3470/ QĐ-BGĐT) and University of Waikato. The author wishes to thank the funding organizations for helping to facilitate this research. The author also would like to thank colleagues for feedback on earlier draft versions of this paper. I am deeply grateful to anonymous referees for their constructive suggestions to improve the quality of this paper. I would also like to thank Vietnam National University, Hanoi and VNU University of Economics and Business for funding the publication of this paper.

[1] Compulsory land acquisition is applied to cases in which land is acquired for national or public projects; for projects with 100 percent contribution from foreign funds (including FDI (Foreign Direct Investment) and ODA (Official Development Assistance)); and for the implementation of projects with special economic investment such as building infrastructure for industrial and services zones, hi-tech parks, urban and residential areas and projects in the highest investment fund group (WB, 2011a).

period 1990-2003, the government had carried out the land acquisition of 697,417 hectares for the above use purposes (Le, 2007). Between 2001 and 2010, nearly one million hectares of agricultural land were acquired by the government for use in non-agricultural purposes, accounting for around 10 percent of the country's agricultural land (World Bank [WB], 2011b). In Vietnam, agriculture is the main source of livelihood for the majority of poor farming households (WB, 2012). Therefore, the government's land acquisition has had a considerable effect on the living of farming households (Asian Development Bank [ADB], 2007).

The loss of land has detrimental impacts on household livelihoods which largely or partially depend on farmland or other natural resources. Nevertheless, such negative effects are likely to be compensated by more new employment opportunities generated by urbanization and industrialization. However, not all local farmers have successfully taken advantage of these opportunities. A survey in several provinces of Vietnam revealed that approximately two thirds of land-losing households benefited from new jobs and improved local infrastructure; for the remaining households, land acquisition caused negative effects on their livelihoods, particularly if all productive land was lost or family members did not obtain educational qualification or vocational skills to find new jobs (ADB, 2007).[2] This suggests that land acquisition might have increased income inequality among households in Vietnam.

The main objective of my study is to test the hypothesis that farmland loss (due to urbanization and industrialization) affects the probability of a household belonging to a given income group (the poor, middle class and rich group). To the best of my knowledge, the existing empirical evidence for the impact of land loss on income distribution is limited and all based on qualitative methods or descriptive statistics. In a case study in a peri-urban village of Hanoi where about two thirds of farmland was taken away to build new urban areas and infrastructure, Nguyen (2009) found that many households have benefited from their proximity to universities and urban centres. Income earned from renting out boarding houses to students and migrant workers has become the most important source for the majority of households. However, a number of other households had precarious income because they did not have rooms for renting out and many landless farmers became jobless, particularly elderly and less educated farmers. As a result, there was a sign of increasing social differentiation among local households (Nguyen, 2009). Nguyen, Vu, and Philippe (2011) investigated livelihood adaptation and social differentiation among land-losing households in some communes of Hung Yen, where farmland of communes in the study declined by 70 percent due to farmland conversion for industrial zones and clusters in the period 2001-2006. Their research findings revealed that diversification in both farm and nonfarm activities emerged as the most common livelihood strategy among land-losing households. Among land-losing households, those with a farming background before losing land tend to be at a disadvantage in taking up high-return activities. The authors concluded that the difference in returns with different livelihood strategies was one of the main causes of rising social stratification among households.

As already mentioned, although there has been some discussion in the available literature about the impacts of land loss on income distribution, no econometric evidence of these impacts exists. Hence, using a unique dataset from a 2010 household survey and econometric methods, this study has made a significant contribution to the literature by providing the first

[2] In the remainder of this paper, land-losing households are those whose farmland was lost partly or totally by the State's compulsory land acquisition.

econometric evidence that the one and two-year effects of land loss on the probability of a household belonging to a specific income group are not statistically significant. These empirical findings, therefore, confirm that land loss has not affected income distribution among households in Hanoi's peri-urban areas. This result contrasts to the previous findings based on qualitative methods or descriptive statistics. In addition, the result showed that farmland holding was not statistically associated with the likelihood of households being in a given income group. However, other factors, including households' education, access to credit, productive assets and notably their nonfarm participation before land loss, were found to increase the chances of the households moving up the income ladder.

II. *Data and Methods*

1. Research Site

This study was carried out in Hoai Duc, a peri-urban district of Hanoi (see Appendix 1). The district is located on the northwest side of Hanoi City, about 20 km from the Central Business District. Hoai Duc has a very prime location that is surrounded by many important roads, namely Thang Long highway (the country's biggest and most modern highway) and National Way 32, and is in close proximity to new industrial zones, new urban areas and Bao Son Paradise Park (the largest complex of entertainment and tourism in North Vietnam). Of the districts of Hanoi, Hoai Duc has the most numerous projects of land acquisitions with a vast area of cultivated land having been acquired by the State for use in urban expansion and economic development in recent years (Huu Hoa, 2011). In the period 2006-2010, around 1,560 hectares of agricultural land were compulsorily acquired by the provincial government for 85 projects in the district (Ha Noi moi, 2010). As a result, the farmland acquisition has led to a considerable decline in the size of farmland per households in Hoai Duc. The average size of agricultural land per household in the district was about 840 m^2 in 2009 (Hoai Duc District People's Committee, 2010a) which was much lower than that in Ha Tay Province (1,975 m^2) and that of other provinces (7,600 m^2) in 2008 (Central Institute for Economic Management [CIEM], 2009).

Prior to 1st August 2008, Hoai Duc was a district of Ha Tay Province, a neighbouring province of Hanoi Capital, which was merged into Hanoi on 1st August 2008. The district occupies 8,247 hectares of land, of which farmland makes up 4,272 hectares with 91 percent of this area being used by households and individuals (Hoai Duc District People's Committee, 2010a). There are 20 administrative units in the district, including 19 communes and one town. Hoai Duc has around 50,400 households with a population of 193,600 people. Prior to its transfer to Hanoi, Hoai Duc was the richest district in Ha Tay Province (Nguyen, 2007). In 2009, HoaiDuc GDP per capita reached 15 million Vietnam dong (VND) per year (Hoai Duc District People's Committee, 2010b), which was less than half of Hanoi's average (32 million VND per year) (Kim Loan, 2010).[3]

[3] 1 USD equated to about 18,000 VND in 2009.

2. Data Collection

Adapted from the General Statistical Office of Vietnam [GSO] (2006), a household questionnaire was developed to obtain quantitative data on household characteristics, assets and income. A sample size set at 480 households from 6 communes, consisting of 80 households (40 with land loss and 40 without land loss) from each commune, was randomly selected for research purposes.[4] Therefore, 600 households were chosen, including 120 reserves, to achieve the target sample size of 480 households. A disproportionate stratified sampling method was conducted with two stages as follows: First, 12 land-losing communes were clustered into three groups based on their employment structure. The first group included three communes with livelihoods based mainly on agriculture; the second one represented five communes whose livelihoods based on both agricultural and non-agricultural production while the third one was characterized by four communes with nonfarm-based livelihoods. From each group, two communes were randomly chosen. Then, from each of these communes, 100 households (50 with land loss and 50 without land loss) including 20 reserves (10 with land loss and 10 without land loss) were randomly selected using Circular Systematic Sampling.[5]

The survey was conducted from the beginning of April to the end of June 2010, and the data were collected by means of face-to-face interviews with the head of a household in the presence of other household members. In total, 477 households were successfully interviewed, among which 237 households lost their farmland at different levels. Some lost little, some lost part of their land and others lost most or all of their land. Their farmland was compulsorily acquired by the government for a number of projects relating to the enlargement and improvement of Thang Long highway, the construction of industrial clusters, new urban areas and other non-farm use purposes (Ha Tay Province People's Committee, 2008). Due to some delays in the implementation of land acquisition, of the 237 land-losing households, 124 households had farmland acquired in the first half of 2008 and 113 households had farmland acquired in early 2009.

3. Analytical Models

First, the sample was spilt in three groups of equal size (N=159,159,159), selected by their household income per capita (low, middle and high income groups). Statistical analyses were then employed to compare the mean of household assets and household income across income groups. According to Gujarati and Porter (2009), there are many statistical methods that can be used for examining the differences in two or more mean values, which commonly have the name of analysis of variance. However, the same objective can be obtained using the framework of regression analysis. Therefore, regression analysis using Analysis of Variance (ANOVA) models was used to investigate the differences in the mean of household assets and income across the income groups.[6] In addition, a chi-square test was conducted to determine

[4] Six selected communes are Song Phuong, Lai Yen, Kim Chung, An Thuong, Duc Thuong and Van Con.

[5] For further details of household questionnaire and sampling frame, see Tuyen (2013).

[6] "ANOVA models are used to assess the statistical significance of the relationship between a quantitative regressand and qualitative or dummy regressors. They are often used to compare the differences in the mean values of two or more groups or categories..."(Gujarati and Porter, 2009, p. 298).

whether a statistically significant relationship existed between two categorical variables such as the income groups (poor, middle class and rich) and the gender of the heads of households.

Because the dependent variable (income groups) is a polychotomous variable having three categories, a multinomial logit model was estimated in order to identify factors affecting the likelihood of a household being the poor, middle class or rich. As indicated by Cheng and Long (2007), the multinomial logit model (MLM) is probably the most frequently used model for nominal outcomes because of its easy estimation and straightforward interpretation. However, this model requires the independence of irrelevant alternatives (IIA), which implies that, holding all else equal, a decision maker's option between two alternative outcomes is not influenced by other available options (Hausman and McFadden, 1984). Unfortunately, Cheng and Long (2007) proved that the tests of the IIA assumption often provide conflicting and inconsistent results. These authors, therefore, recommended that researchers should refer to the best advice on IIA by going back to an early suggestion by McFadden (1974), who stated that the multinomial logit model should only be applied to cases where the outcomes can be reasonably hypothesized to be dissimilar. Similarly, Amemiya (1981) suggested that the MLM operates well when the outcomes are distinct. As earlier mentioned, income groups are distinct because they were classified into three groups that are mutually exclusive. The above discussion, therefore, implies that the choice of the MLM for quantifying factors affecting the likelihood of a household belonging to a given income group is plausible. There have been many studies applying the MLM to examine the effects of various variables on the probability of a households or an individual belonging to a specific income group (Borooah, 2005; Crespo, Moreira, and Simões, 2013; Diamond, Simon, and Warner, 1990; Do et al., 2001; García-Fernández, Gottlieb, and Palacios-González, 2013).

Let $P_{ij}(j=1, 2, 3)$ denote the probability of being in a given income group of a household i with: $j=1$ if the household belongs to the low income group; $j=2$ if the household falls into the middle income group; and, $j=3$ if the household is in the high income group. Then the multinomial logit model is given by

$$P_{ij}(j=k|X_i)=\frac{\exp(\beta_k X_i)}{\sum_{j=1}^{3}\exp(\beta_j X_i)}(j=1, 2, 3)$$

In order to make the model identified, β_j is set to zero for one of categories, and coefficients are then interpreted with respect to that category, called the reference category (Cameron and Trivedi, 2009). Thus, set β_j to zero for one of income groups (says the middle class), then the MNL model for each group can be rewritten as:

$$P_{ij}(j=k|X_i)=\frac{\exp(\beta_k X_i)}{1+\sum_{j=1}^{3}\exp(\beta_j X_i)}\ (j=1, 3) \text{ and } P_{ij}(j=2|X_i)=\frac{1}{1+\sum_{j=1}^{3}\exp(\beta_j X_i)}$$

which can be estimated using the method of maximum likelihood.

The probability of a household belonging to a given income group was assumed to be determined by the household's characteristics and assets. In addition, other factors, in this case the loss of farmland and household participation in nonfarm activities before farmland loss were included in the model of income distribution. Finally, five dummy commune variables were

also included in the model to control for fixed-commune effects. Table 1 describes the definition and measurements of variables included in the model of income distribution.

Households with larger sizes might reduce income per capita and therefore were expected to be in the low income group. Households with a higher dependency ratio might be indicative of labour shortage and thus might earn a lower level of total income, which in turn were expected to belong to the poor group. Households with working members that attained more years of formal schooling were expected to belong to the middle or rich class. However, the income distribution effect of the age of working members might be ambiguous. Households with younger working members might have more chances to undertake nonfarm jobs, which in turn might earn higher income and therefore more likely to be the middle or rich class. However, households with older working members tend to have more work experience, which might enable the households to earn higher income and thus might increase the likelihood of belonging to the middle or high income group.

Having more farmland per capita was expected to be correlated with higher chances of a household getting out of poverty and being rich. Owing more productive assets was expected to increase the probability of belonging to the middle or rich income group. The likelihood of being the middle or high income class was also expected to be positively associated with the household's access to formal or informal credit. Better-off households tend to have a higher number of group memberships in Vietnam rural (CIEM, 2009). Therefore, I included the number of formal and informal group memberships in the model. Having more formal or informal group memberships was expected to be positively related with the probability of belonging to the middle or high income group.

In rural Vietnam, households with nonfarm participation were found to be more likely to be the rich than farm households (Do et al., 2001). However, the inclusion of households' current nonfarm participation as an explanatory variable in the model might suffer from the potential endogeneity (Van de Walle and Cratty, 2004). This is because nonfarm participation has been found to be determined by household characteristics and assets (Van de Walle and Cratty, 2004) and other exogenous factors such as the loss of farmland and location variables (Tuyen, Lim, Cameron, and Huong, 2014). Nevertheless, in the current study, the households' nonfarm participations in different nonfarm activities in the past (before farmland acquisition) were predetermined and treated as exogenous variables.[7] Therefore, I included three dummy variables of past nonfarm participation variables as explanatory variables in the model of income distribution. Households with past participation in any nonfarm activity (informal wage jobs, formal wage jobs or nonfarm self-employment) were expected to have higher chances of being the middle class or rich.

In the present study, the loss of farmland is an exogenous variable, resulting from the compulsory land acquisition.[8] The government implemented the farmland acquisition at two different times; therefore, land-losing households were split into two groups: (i) those that had farmland acquired in 2008 and (ii) those that had farmland acquired in 2009. The rationale for

[7] According to Kennedy (2003), lagged values of endogenous variables are predetermined and treated as exogenous variables, because they are given constants for determination of the current time period's values of the endogenous variables.

[8] An exogenous event is often a change in the State's policy that affects the environment in which individuals and households operate (Wooldridge, 2013)

TABLE 1. DEFINITION AND MEASUREMENT OF VARIABLES INCLUDED IN THE MODEL

Included variables	Definition	Measurement
Independent variables		
Income groups	Whether the household is poor, middle class or rich (1=poor; 2=middle class; 3= rich)	Categorical
Explanatory variables		
Farmland loss		
Land loss 2009	The proportion of farmland that was compulsorily acquired by the government in 2009.	Ratio
Land loss 2008	The proportion of farmland that was compulsorily acquired by the government in 2008.	Ratio
Household characteristics		
Household size	Total household members.	Number
Dependency ratio	This ratio is calculated by the number of household members aged under 15 years and over 59 years, divided by the number of household members aged 15-59 years.	Ratio
Age of household head	Age of household head.	Years
Gender of household head	Whether or not the household head is male.	Male=1
Age of working members	Average age of members aged 15 and over who were employed in the last 12 months.	Years
Education of working members	Average years of formal schooling of members aged 15 and over who were employed in the last 12 months.	Years
Farmland per capita	The size of owned farmland per capita.	m^2
Productive assets	Total value of all productive assets.	Natural log
Formal group memberships	Total number of formal group memberships.	Number
Informal group memberships	Total number of informal group memberships.	Number
Formal credit	Receiving any loan from banks or credit institutions in the last 24 months.	(=1 if yes)
Informal credit	Receiving any loan from friends, relatives or neighbours in the last 24 months.	(=1 if yes)
Past nonfarm participation		Dummy
Formal paid jobs[a]	Whether or not the household took up formal paid jobs before farmland acquisition.	Yes=1; otherwise=0
Informal paid jobs[b]	Whether or not the household took up informal paid jobs before farmland acquisition.	Yes=1; otherwise=0
Nonfarm self-employment[c]	Whether or not the household took up nonfarm self-employment before farmland acquisition.	Yes=1; otherwise=0
Commune variables	The commune in which the household resided (Lai Yen Commune is the base group)	Dummy variable

Notes: [a] *Formal wage jobs* are paid jobs that are regular and relatively stable in factories, enterprises, state offices and other organizations with a formal labour contract and often require skills and higher levels of education. [b] *Informal paid jobs* includes paid jobs that are often casual, low paid and without a formal labour contract. These jobs often require no education or low education levels. [c] *Nonfarm self-employment* is self-employment in nonfarm activities.

this classification was that different lengths of time since the farmland acquisition were expected to have different impacts on income distribution. In addition, the level of farmland loss varies greatly among households because as already noted, some had lost little while others had lost all their land. Therefore, the level of land loss, as measured by the proportion of farmland acquired by the government in 2008 and in 2009, was used as the variable of interest. Farmland loss can affect the income rank of households through its effects on household income. On the one hand, the loss of farmland caused a loss of farm income, which reduced household income (Le, 2007). On the other hand, farmland loss motivated households to participate intensively in nonfarm activities, which in turn allowed them to earn much more income than before losing land (Nguyen, Nguyen, and Ho, 2013). This discussion suggests that in the former case, households with more land loss are more likely to be poor and less likely to be rich when the reference group is the middle class. Conversely, in the latter case, those with more land loss have lower chances of being poor and higher chances of becoming rich. Another possibility is that the loss of farmland was expected to have virtually no impact on income distribution at all. This might be explained by the fact that farmland loss does not affect household income possibly because its various effects on farm income, nonfarm income and other income might balance each other.

One might argue that compensation for land loss should be included as an explanatory variable in the model of income distribution.[9] This is because the compensation might have been invested in lucrative livelihood strategies, which in turn might have resulted in higher income. However, as revealed by the surveyed data, only a very small proportion of households used their compensation for income-generating activities.[10] Hence, in the current study, the compensation might have had little impact on income distribution. In addition, there is an extremely high correlation between the amount of compensation and the levels of land loss since those with more land loss received more compensation.[11] If both of these variables were included in the models, this would pose a serious multicollinearity problem. Therefore, the compensation was not included as an explanatory variable in the model of income distribution.

III. *Results and Discussion*

1. Household Assets and Income Sources, by Income Group

Table 2 provides some information about household characteristics, assets and past nonfarm participation for the whole sample as well as for each income group. There were statistical significant differences in the size of households, dependency ratio, and education of working members across the groups. On average, the rich and middle class had less family

[9] As revealed by the household survey, each household on average received a total compensation of 98,412,000 VND. The minimum and maximum amounts were 4,000,000 VND and 326,000,000 VND, respectively

[10] According to the surveyed data, about 60 percent of land-losing households used the compensation for daily living expenses, and about a quarter of them purchased furniture and appliances, while a similar proportion of land-losing households spent this money in repairing or building houses. By contrast, only 4 percent among them used this resource for investing in production.

[11] The correlation coefficient between the amount of compensation in 2008 and the level of land loss in 2008 is 0.86. The corresponding figure for the case of compensation in 2009 and the level of land loss in 2009 is 0.89.

TABLE 2. SUMMARY STATISTICS OF HOUSEHOLD CHARACTERISTICS, ASSETS AND INCOME, BY INCOME GROUP

Variables	All households		Poor		Middle class		Rich	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Farmland loss (%)								
Land loss 2009	10.27	24.50	11.00	25.70	12.17	25.05	8.00	22.80
Land loss 2008**	10.50	24.00	12.57	25.08	12.80	27.08	6.60	19.01
Household characteristics/assets								
Household size ***	4.49	1.61	5.24	1.70	4.35	1.50	3.95	1.55
Dependency ratio ***	60.58	66.78	75.90	76.05	63.00	65.30	48.82	51.16
Gender of household head	0.77	0.42	0.77	0.42	0.80	0.40	0.76	0.43
Age of household head	51.21	12.34	52.65	12.70	50.82	12.45	50.27	11.85
Age of working members	40.46	8.25	41.65	9.36	41.87	9.80	40.40	7.07
Education of working members***	8.37	2.90	7.31	2.65	7.78	2.80	9.50	3.24
Farmland per capita ***	267	230	225	186	225	226	326	268
Productive assets***	22,081	20,089	14,631	13,210	20,241	17,648	30,357	23,939
Formal group memberships	2.47	1.56	2.26	1.38	2.57	1.55	2.57	1.71
Informal group memberships***	0.96	1.03	0.65	0.74	0.85	0.91	1.34	1.23
Formal credit	27.03	44.46	26.00	44.00	26.00	44.00	29.00	45.50
Informal credit***	18.63	39.00	28.00	45.00	16.40	37.14	12.32	33.00
Past nonfarm participation (%)								
Formal wage jobs***	25.53	43.07	15.00	35.80	19.65	40.00	37.41	48.54
Informal wage jobs**	33.55	47.27	36.15	48.20	41.00	50.00	24.63	43.22
Nonfarm self-employment***	34.03	47.43	26.62	44.33	25.80	44.00	48.03	50.12
Number of households	477		159		159		159	

Notes: Productive assets measured in 1,000 VND. 1 USD equated to about 18,000 VND in 2009. Means and standard deviations (SD) are adjusted for sampling weights. *, **, ** * mean statistically significant at 10%, 5 % and 1 %, respectively. The poor were used as the reference group in ANOVA models.

members, a lower dependency ratio and a higher education level of working members than the poor. However, the differences across the groups in the gender and age of households head, and average age of working members were found not to be statistically significant. The rich owned a larger area of farmland per capita than the poor. There were statistically differences in the total value of productive assets across the groups. Specifically, the rich owned approximately twice as much the total value of productive assets as the poor did. The middle class also hold an amount of productive assets with the total value that was about 5.6 billion VND higher than the poor. While there was no difference across the groups in the number of formal group memberships, the difference in the number of informal group memberships between the groups was found to be statistically significant.

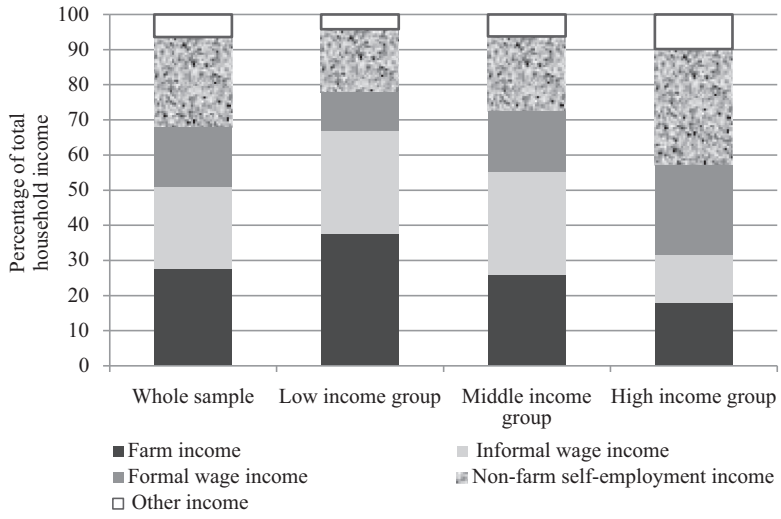
The results show that a statistically significant relationship existed between the income rank of households and their participation in the informal credit market. However, a similar association was not found for the case of the formal credit market. The low income group tended to participate more frequently in the informal credit market than the middle and high income group. In addition, the results indicate that the income rank of households is statistically associated with their past nonfarm participation. The proportion of households that had taken up formal paid jobs before farmland loss increased significantly from the poor to the middle class

TABLE 3. TOTAL INCOME AND ITS SOURCES BY INCOME GROUP

Income sources	All		Poor		Middle class		Rich	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Farm work	14,432	16,169	15,167	13,887	14,180	16,050	14,004	18,116
Informal wage work*	11,559	17,703	10,111	13,969	16,159	21,154	8,721	16,517
Formal wage work*	14,431	29,762	5,121	12,115	10,363	22,080	26,361	40.926
Nonfarm self-employment*	16,811	27,803	7,779	11,646	11,908	19,865	29,225	37,931
Other income*	3,409	8,676	1,124	3,210	2,036	5,026	6,672	12,720
Total household income *	60,642	33,034	39,321	13,180	54,644	19,109	84,983	39,191
Annual income per capita*	13,513	7,091	7,507	1,889	12,567	1,315	21,536	6,751
Number of households	477		159		159		159	

Notes: Income and its sources measured in VND. 1 USD equated to about 18,000 VND in 2009. Means and standard deviations (SD) are adjusted for sampling weights. * indicates means statistically significantly different between the income groups ($p<0.05$). The poor were used as the reference group in ANOVA models.

FIG. 1. HOUSEHOLD INCOME STRUCTURE BY GROUP



and the rich. Informal paid work appeared to be a popular job choice for the poor and the middle class, while nonfarm self-employment seemed to be a common job choice for the rich. These findings suggest that the households' past participation in some type of nonfarm jobs was expected to be closely associated with their probability of belonging to a given income group. Finally, the level of land loss in 2008 was found to be lower for the rich than the poor and the middle class but a similar difference was not found for the case of land loss in 2009. [12]

Table 3 compares the differences in the mean of total household income and its sources between income groups. There was no statistically significant difference in farm income across the groups. However, the middle class earned a much higher amount of informal wage income

[12] Statistic summary of the area of acquired farmland available in Appendix 2.

than the poor. The middle class and the rich also earned a much higher income from formal paid jobs than the poor. Specifically, the high income group earned approximately five times as much formal wage income as the low income group did. The rich also had a much higher level of other income than the middle class and the poor. In terms of total income, the high income group obtained more than twice as much the total income as the low income group did. There was also a huge income gap between the rich and the middle class.

Figure 1 indicates how much various income sources contribute to total household income in the sample. Of different income sources, farm income and informal wage income represented a large proportion of total income for not high income groups, accounting for around 67 percent of total income for the low income group and 55 percent of total income for the middle income group. However, formal wage income and nonfarm self-employment income became the most important income sources for rich households. Combined together, these income sources constituted 58.60 percent of their total income. The above observations suggest that income gaps between the rich and the rest might stem from the differences in income sources between the groups.

2. Determinants of Income Distribution

Table 4 reports the results from multinomial logit estimates of income groups, which are presented in the form of coefficients and relative risk ratios (RRRs). Note that each of these RRRs show how many percent does the likelihood of occurrence of a given outcome is expected to change when there is a unit change in the explanatory variable, while holding all other variables in the model constant. The estimation results indicate that many explanatory variables are statistically significant at the 10 percent or lower level, with their signs as expected. In addition, the Pseudo-R^2 =0.35 and is highly significant, suggesting that this model has a strong explanatory power.[13]

Surprisingly, the coefficients on land loss in 2008 and 2009 are not statistically significant, indicating that farmland loss has no impact on the probability of a household belonging to a given income group. The findings, therefore, confirm that the loss of farmland has not affected income distribution of households in Hanoi's peri-urban areas. This can be explained by two possible reasons. Firstly, the loss of farmland had no impact on income distribution, possibly due to the fact that only a small amount of income that was contributed by agricultural production was lost due to the area of acquired farmland.[14] Secondly, as already discussed, farmland loss did not affect income distribution possibly because its various impacts on farm income and nonfarm income might have balanced each other. This explanation is well supported by the econometric findings in our paper (Tuyen et al., 2014), which indicated that while farmland loss had a negative impact on farm income; it had a positive effect on nonfarm participation. As a result, farmland loss has had no impact on household income possibly because the loss of farm income due to land loss might have been compensated by extra

[13] An extremely good fit of the model is confirmed if the value of the Pseudo-R^2 ranges from 0.2 to 0.4 (Louviere, Hensher, and Swait, 2000).

[14] According to the survey data, on average, annual crop income per one sào (360 m^2) was estimated at around 3.7 million VND (1USD equated to about 18, 000 VND in 2009). The corresponding figures for income from rice cultivation were extremely low; just around 1.5 million VND.

TABLE 4. MULTINOMIAL LOGIT ESTIMATES OF INCOME GROUPS

Explanatory variables	Poor vs middle class		Rich vs middle class	
	Coefficient	RRRs	Coefficient	RRRs
Land loss 2009	-0.40	0.67	1.17	3.24
	(0.850)	(0.571)	(0.760)	(2.460)
Land loss 2008	-0.57	0.57	-0.74	0.48
	(0.764)	(0.434)	(0.897)	(0.429)
Household size	0.83***	2.30***	-0.98***	0.37***
	(0.208)	(0.478)	(0.189)	(0.071)
Dependency ratio	-0.07	0.93	-0.53*	0.59*
	(0.244)	(0.227)	(0.312)	(0.184)
Household head's gender	-0.75*	0.47*	-0.07	0.93
	(0.389)	(0.185)	(0.454)	(0.423)
Household head's age	0.01	1.01	0.03	1.03
	(0.017)	(0.017)	(0.018)	(0.019)
Age of working members	0.04	1.04	-0.04	0.96
	(0.027)	(0.028)	(0.026)	(0.025)
Education of working members	-0.03	0.97	0.24**	1.27**
	(0.082)	(0.080)	(0.101)	(0.128)
Farmland per capita	-0.00	1.00	0.00	1.00
	(0.001)	(0.001)	(0.001)	(0.001)
Productive assets	-0.47***	0.62***	0.47**	1.60**
	(0.164)	(0.102)	(0.187)	(0.299)
Informal group memberships	-0.24*	0.78*	-0.09	0.92
	(0.125)	(0.098)	(0.132)	(0.121)
Formal group memberships	-0.43**	0.65**	0.39**	1.48**
	(0.209)	(0.135)	(0.182)	(0.269)
Formal credit	-0.80*	0.45*	0.39	1.48
	(0.461)	(0.208)	(0.407)	(0.604)
Informal credit	0.22	1.25	-0.62	0.54
	(0.366)	(0.456)	(0.513)	(0.275)
Nonfarm self-employment	-0.53	0.59	1.67***	5.33***
	(0.471)	(0.278)	(0.456)	(2.434)
Informal paid jobs	-0.79*	0.45*	0.33	1.39
	(0.441)	(0.200)	(0.404)	(0.562)
Formal paid jobs	-0.47	0.63	1.18**	3.25**
	(0.525)	(0.330)	(0.480)	(1.557)
Song Phuong	0.24	1.27	1.61**	5.01**
	(0.550)	(0.701)	(0.656)	(3.285)
Kim Chung	-1.75**	0.17**	1.06*	2.88*
	(0.865)	(0.150)	(0.543)	(1.565)
An Thuong	-0.59	0.56	0.33	1.39
	(0.527)	(0.293)	(0.627)	(0.872)
Duc Thuong	-1.31**	0.27**	-0.66	0.52
	(0.524)	(0.141)	(0.578)	(0.300)
Van Con	-0.56	0.57	0.44	1.55
	(0.600)	(0.341)	(0.677)	(1.053)
Constant	1.92	6.81	-3.86*	0.02*
	(2.196)	(14.955)	(2.237)	(0.047)
Wald chi2(44)		148.98		
Prob > chi2		0.0000		
Pseudo R2		0.3477		
Observations		460		

Note: Estimates are adjusted for sampling weights. Robust standard errors are in parentheses. RRRs (relative risk ratios) *, **, ** * mean statistically significant at 10%, 5 % and 1 %, respectively.

income from nonfarm jobs.[15] Furthermore, previous evidence from a large-scale survey also revealed that although households had a reduction in farm income after land loss, they earned a much higher level of nonfarm incomes than before losing land (Le, 2007).

Additional family members increase the probability of a household being poor and diminish that of the household being rich. Having a higher dependency ratio also reduces the probability of the household being rich. In general, these findings are in line with expectation. While the age of the head of the household is not statistically associated with the likelihood of belonging to any income group, the male-headed household was found to be less likely to belong to the poor group. The gender evidence suggests that the probability of remaining in poverty falls by 53 percent when the head of the household is male, assuming that the remaining variables in the model are held constant. This finding is also consistent with the previous finding in rural Vietnam by Do et al. (2001). Education of working members was found to be positively associated with the chance of their households moving from the middle class to the rich. An additional average year in formal schooling of working members increases the probability of their households being rich by 27 percent, holding all other factors in the model constant. A similar finding was also found in rural Vietnam where household heads with better education were more likely to be rich than to be the middle class (Do et al., 2001).

Regarding the contribution of household assets to income inequality, the results reveal that farmland per capita was not statistically related to the likelihood of a household belonging to any income group. In accordance with previous finding in Vietnam by Nguyen (2008), the present study found that access to formal credit increases the probability of getting out of poverty and being the middle class. The probability of belonging to the middle class rises by 45 percent if the household has access to formal credit, while holding all other variables in the model constant. A similar relationship, however, was not found for the case of informal credit. The results show that having more productive assets increases the chance of moving from the poor to the middle class and then to the rich. This finding is partly in line with that of Nghiem, Coelli, and Rao (2012) who found that ownership of assets has a positive effect on poverty reduction in Vietnam. Interestingly, holding more group memberships in both informal and formal groups has a positive link with the probability of being the middle class. However, only having more formal group memberships is closely related to higher chances of being rich.

Looking at the role of past nonfarm participation in income distribution, the results show that households with past participation in informal wage work are more likely to shift out of poverty and become the middle class. The likelihood of belonging to the middle class increases by 55 percent if the households had participated in informal wage work before farmland acquisition. While the likelihood of being rich was not affected by the households' past participation in informal wage work, it was greatly increased by their past participation in formal wage work and nonfarm self-employment. Specifically, if the households had past participation in formal wage work and nonfarm self-employment, the chance of becoming rich rises by 225 percent and 433 percent, respectively. In overall, the above findings are in line with that of Do et al. (2001) who found that in Vietnam, nonfarm households are more likely to

[15] As reported by surveyed households, on average a manual labourer earned about 2.1 million VND per month. Accordingly, suppose one family member moves out of farming activities to engage as a wage earner in the informal sector in 6 months, he or she would earn 12.6 million VND - a greater amount than the annual crop income from 3 sào (1,080 m^2) of agricultural land.

be rich and less likely to be poor than farm households when the reference group is the middle class.

Finally, with respect to the communal level factors that affect income distribution, the results show that holding all other variables constants, households will have a probability of being poor, which falls by 73 percent and 83 percent if they live in Duc Thuong and Kim Chung, respectively. Also, living in Song Phuong increases the relative probability of the households being rich by 401 percent while the corresponding percentage in Kim Chung is 188 percent. These findings suggest that income inequality may be affected by many factors at the village-level such as the quality of land, access to markets, level of local infrastructure development, population density and opportunities for nonfarm employment.

IV. *Conclusion and Policy Implications*

The relationship between farmland loss (due to urbanization and industrialization) and income distribution has been examined in previous studies using qualitative analysis or descriptive statistics. Going beyond the literature, I conducted an econometric analysis of this relationship using a unique dataset from a 2010 household survey. The current study has provided the first econometric evidence that the land loss in 2009 and 2008 was not statistically associated with the probability of a household belonging to a specific income group. These results, therefore, confirm that farmland loss has not had impacts on income distribution of households in Hanoi's peri-urban areas.

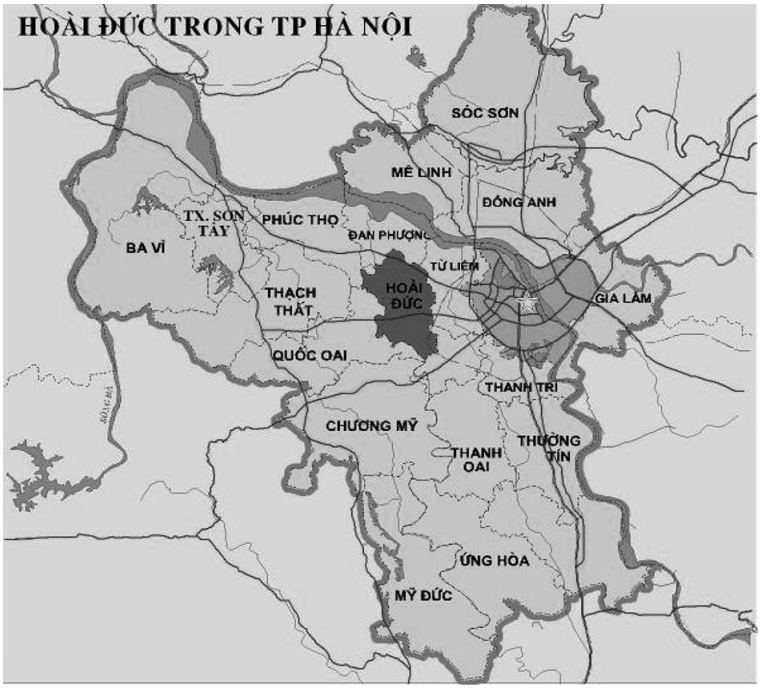
While farmland holding had no impact on the probability of a household belonging to a given income group, the household's participation in nonfarm activities before farmland loss was found to have a very strong increasing-impact on the likelihood of being the middle class or the rich. As noted by CIEM (2009), the main reason for income disparities between the rich and the poor in rural Vietnam originates from variations in income from nonfarm sources rather than from differences in farmland. In addition, Ravallion and Van de Walle (2008) provided econometric evidence that the rise of landlessness did not increase poverty, and that nonfarm employment played an increasing role in rural livelihoods in Vietnam. The above discussion suggests that nonfarm participation is of very importance to increase the probability of households moving up the income ladder. A possible policy implication here is that if the government wants to improve household income and reduce income gaps between the groups, promoting rural nonfarm activities and facilitating households' access to these activities can be effective ways.

The results of the current study showed that some asset-related variables are statistically associated with income distribution. Households' education, productive assets and access to formal credit all have a positive relationship with the probability of belonging to the middle class or the rich. It is possible to suggest that government assistance in facilitating local poor households' access to formal credit can help them have more financial resources and accumulate more productive assets, these, in turn, enable them to get out of poverty and increase their income rank. Encouraging and supporting parent's investment in their children's education might help the next generation have higher chances of moving up the income ladder.

Given the budget and time constraints, several limitations are acknowledged in the present study. First, the collected sample is somewhat small in size and conducted in only one peri-

urban district of Hanoi, which was unable to reflect the country's population as a whole. Second, due to the limitation of cross sectional data, the current study might not capture unobservable factors that might affect income distribution. Therefore, with finance, time and resources availability, suggested future researches should have the samples with panel data to be collected in all other peri-urban areas of Vietnam.

Appendix 1. Location of Hoai Duc Peri-urban District



Appendix 2. Loss of and Decline in Farmland Size Among Land-losing Households

	Mean	SD	Min	Max	Mean	SD
The area of acquired farmland in 2009 (m^2/household). N = 113	744	389	24	1,880	767	394
Proportion of farmland loss (%/household). N = 113	56.50	25.40	1.96	100	58.00	25.00
The area of acquired farmland in 2008 (m^2/household). N = 124	765	435	120	2,520	709	390
Proportion of farmland loss (%/household). N = 124	54.00	24.00	12.20	100	54.23	24.40
Farmland size before losing land (m^2/household). N = 237	1,484	706	280	4,860	1,430	658
Current farmland size (m^2/household). N = 237	729	599	0	3,600	693	556

Note: SD: standard deviation. Estimates in the last two columns are adjusted for sampling weights.

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