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Farmland loss, nonfarm diversification and inequality: A microeconometric analysis of household surveys in Vietnam

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Abstract:

The relationship between farmland loss, nonfarm diversification and inequality has been well-documented in the literature. However, no study has quantified this relationship. Using a dataset from a 2010 field survey involving 477 households, this study has contributed to the literature by providing the first econometric evidence about the impacts of farmland loss (due to urbanization and industrialization) on nonfarm diversification and income quality among households in Hanoi's peri-urban areas. Our results show that under the impact of farmland loss, households have actually diversified their income through various nonfarm activities, notably in informal wage work. In addition, while farmland loss has reduced the share of farm income, resulting in an increase in income inequality, it has also increased the share of informal wage income, leading to a decrease in income inequality.

Keywords: Farmland acquisition, formal wage income, fractional multinomial logit and Gini decomposition.

JEL: Q12, O15.

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1. Introduction

International experience indicates that rapid urbanization and economic growth often coincide with the conversion of land from the agricultural sector to industry, infrastructure and residential uses (Ramankutty, Foley, and Olejniczak, 2002). Over the past two decades in Vietnam, an immense area of farmland has beentakentoprovide space for urbanisation and industrialzation. According to Le (2007), 697,417 hectares of land were compulsorily acquired by the State for the construction of industrial zones, urban areas and infrastructure and other national use purposes from 1990 to 2003. Furthermore, in the period 2000-2007 it was estimated that approximately 500,000 hectares of agricultural land were converted for nonfarm use purposes, accounting for 5 percent of the country's land (Vietnam Net/TN, 2009).

Increasing urban population and rapid economic growth, particularly in urban areas of Vietnam's large cities, have resulted in a great demand for urban land. For example, almost 500,000 hectares of farmland was acquired for the use of urban, industrial, or commercial land in the period 1993–2008 (the World Bank (WB), 2011). In order to satisfy the rising land demand for urban expansion and economic development in the Northern key economic region, most farmland acquisitions have taken place in the Red River Delta, which has a large area of fertile agricultural land, a prime location and high population density (Hoang, 2008).[2]Consequently, farmland acquisition has a major effect on households in Vietnam's rural and peri-urban areas (the Asian Development Bank (ADB), 2007). In the period 2003-2008, it was estimated that the acquisition of agricultural land considerably affected the livelihood of 950,000 farmers in 627,000 farm households. About 25-30 percent of these farmers became jobless or had unstable jobs (VietNamNet/TN, 2009).

In the context of accelerating loss of farmland due to urbanization and industrialization in the urban fringes of large cities in Vietnam, we wonder how and to what extent farmland loss has affected household livelihood sources, which are measured as household income shares by source. The motivation to pursue this topic originates from two main reasons. First, while a number of studies have examined the impact of farmland loss on households' livelihood adaptation, their findings are mixed. Some studies indicate negative impacts of farmland loss because farmland loss may cause the loss of traditional agricultural livelihoods

[2]This key economic region includes Hanoi, Hai Phong, Vinh Phuc, Bac Ninh, Hung Yen, Quang Ninh, and Hai Duong.

and lead to food insecurity (e.g., Nguyen, 2009 in Vietnam, and Deng, Huang, Rozelle, and Uchida, 2006 in China). Nevertheless, other studies show positive impacts of farmland loss on rural livelihoods as farmland loss may offer a wide-range of nonfarm job oppertunities for local pepople (e.g., Nguyen, Nguyen, Ho, 2013). Similar observations have been also found in China (Chen, 1998; Parish, Zhe, and Li, 1995) and Bangladesh (Toufique and Turton, 2002). More importantantly,all above studies use either qualitative methods or descriptive statistics when investigating the impacts of farmland loss, possiblely because of the unavailablity of data, and this obviously limits our understanding. Using a dataset from a 2010 field survey, this study contributes to the literature by providing the first econometric evidence of the impact of farmland loss on household livelihood sources.

Another important contribution of this study is that we consider the indirect impact of farmland loss on income inequality. It has been found that income sources have a close association with income inequality in Vietnam (Adger, 1999; Cam and Akita, 2008; Gallup, 2002). Hence, if farmland loss affects household income shares by source, which in turn how it will cause changes in income inequality. Our results indicate that farmland loss has a significant impact on the household livelihood sources and it also has indirect mixed effects on income inequality.

The remainder of paper is structured as follows: Data and the methodology are mentioned in section 2. Results and discussions are reported in section 3. Conclusions and policy implications are made in the final section.

2. Data and Methodology

2.1 Study site and data collection

2.1.1 Study site

The data for this study was collected through our household survey in Hoai Duc, a peri-urban district of Hanoi.[3]The district is situated on the northwest side of Hanoi, 19 km from the Central Business District (CBD). Hoai Duc is an appropriate site for this research since it holds the biggest number of farmland-acquisition projects among districts of Hanoi (Huu Hoa, 2011). A huge area of agricultural land in the district has been taken for many projects in recent years. In the period from 2006 to2010, around 1,560 hectares of farmland have been

[3]Surveyed areas in administrative map of Hoai Duc District, Hanoi (see Appendix 1)

compulsorily acquired by the State for 85 projects (Ha Noi Moi, 2010).The district covers an area of 8,247 hectares of land, of which agriculture land accounts for 4,272 hectares and 91 percent of this area is used by households and individuals (Hoai Duc District People's Committee, 2010). Hoai Duc has 20 administrative units, including 19 communes and 1 town. There are around 50,400 households with a population of 193,600 people living in the district. In the whole district, the share of agricultural employment decreased by around 23 percent over the past decade. However, a considerable share of employment has still remained in agriculture, making up around 40 percent of the total employment in 2009 (Statistics Department of Hoai Duc District, 2010).

2.1.2 Data collection

Adapted from the General Statistical Office (GSO) (2006), De Silva et al. (2006), and Doan (2011), a household questionnaire was constructed to collect a quantitative data on household characteristics and assets, income-earning activities (working time allocation), and household economic welfare (income and consumption expenditure).[4]A disproportionate stratified sampling method was employed with two steps as follows: First, 12 communes that lost their farmland (due to the land acquisition by the State) were divided into three groups based on their employment structure. The first group consisted ofthree agriculture-based communes; the second one was represented by five communes that based on both agricultural and non-agricultural production while the third one included fournon-agriculture-based communes. From each group, two communes were randomly chosen. Second, from each of these communes, 80 households, including 40 households with farmland loss and 40 households without farmland loss, were randomly chosen, for a target of sample size of 480.The survey was implemented from April to June 2010. 477 households were successfully interviewed, among which 237 households lost some or all of their farmland. Due to some delays in the implementation of the farmland 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.

[4] More details for sampling frame, questionnaire and study site, see Tuyen (2013)

2.2 Model specification and estimation methods

2.2.1 The impacts of farmland loss on income shares by source

In order to consider the effect of farmland loss on income shares by source, our empirical specification is as below: [5]

$$Y_i = \varphi_0 + \varphi_1 X_i + \varphi_2 Z_i + \varphi_3 D_i + \varphi_3 FL_i + u_i$$

where dependent covariate (Y_i) is the income shares by various livelihoods sources. Based on our own fieldwork experience, survey data and thedefinition of the Vietnam informal sector introduced by Cling et al. (2010), five types of income sources are identified at the household level namely farm income (income from household agriculture, including crop and livestock production and other related activities); nonfarm self-employment income(income earned from own household businesses in nonfarm activities); informal wage income (income from wage work that is often casual, low paid and often requires no education or low education levels. Informal wage workers are often manual workers who work for other individuals or households without formal labour contracts); formal wage income (formal wage work that is regular and relatively stable in factories, enterprises, state offices and other organizations with formal labour contracts and often requires skills and higher levels of education); and finally other income (income from other sources such as remittances, rental, and pensions).

Among independent variables, farmland loss (FL) was considered as the variable of interest. The farmland acquisition by the State took place at different times; therefore, land-losing households were divided into two groups namely (i) those that lost their farmland in 2008 and (ii) those lost their farmland in 2009. The reason for this division is that the length of time since farmland acquisition was expected to be highly associated with the changes in income sources. In addition, the level of farmland loss was quite different among households. Some lost little, some lost part of their land while others lost all their land. As a consequence, the level of farmland loss, as measured by the proportion of farmland acquired by the State in 2008 and in 2009, was expected to capture the influence of farmland loss on households' income shares. In general, households with a higher level of land loss were hypothesized to have a lower share of farm income and conversely, were expected to raise the proportion of all other nonfarm incomes.

[5] Definitions and descriptive statistics of variables in the models (see Appendices 2, 3,4)

Second, livelihood strategies may change year to year but they always change slowly because of irreversible investments in human and social capital that are requirements for switching to a new income-generating strategy. Due to path dependence, past livelihood choices (Z_i) are thought to considerably determine the present livelihood choice (Pender and Gebremedhin, 2007). This implies that households' current income shares by source might be largely determined by their past livelihood strategy. Hence, we included thepast livelihood strategy variable as an important explanatory predictor that was expected to considerably affect income shares by source.

Finally, following the framework for micro policy analysis of rural livelihoods proposed by Ellis (2000), income shares by source were assumed to be determined by vector X_i including household livelihood assets (natural, physical, human, financial and social capital).Furthermore, commune dummies(D_i)were also included to control for the fixed commune effects. Such communal variables were expected to capture differences between communes in terms of farmland fertility, educational tradition, local infrastructure development and geographic attributes, and other unobserved community level factors that may affect households' income sources.

Since each of dependent variables (including the share of farm, informal wage, formal wage, nonfarm self-employment and other income) is a fraction lies between zero and one and the shares from this set of dependent variables for each observation add up to one, a fractional multinomial logit model (FMLM) proposed by Buis (2008) is employed. As Buis (2008) notes, the FMLM is a multivariate generalization of the fractional logit model developed by Papke and Wooldridge (1996) to deal with the case where the shares add up to one. Similar to the fractional logit model, the FMLM is estimated by using a quasi-maximum likelihood method, which in this case always implies robust standard errors (Buis, 2008). In fact, there are a growing number of studies applying the FMLM to handle models containing a set of fractional response variables with shares that add up to one (Barth, Lin, and Yost, 2011; Choi, Gulati, and Posner, 2012; Kala, Kurukulasuriya, and Mendelsohn, 2012; Winters, Essam, Zezza, Davis, and Carletto, 2010).

2.2.2 The relationship between income sources and income inequality

Another interest in this study is that we consider the indirect role of farmland loss in income inequality through investigating the linkage between income share by sources and inequality.Among the different ways of inequality measurement, according to López-Feldman

(2006), the Gini coefficient of total income inequality (G) is popularly used to measure the disparity in the distribution of income, consumption, and other welfare indicators and is denoted as:

$$G = \sum_{k=1}^{K} S_k \, G_k \, R_k \qquad (1)$$

where S_k represents for the share of income source k in total income, G_k is the Gini coefficient of the income distribution from source k, and R_k is the correlation coefficient between income from source k and with total income Y.

The Gini decompositions are analytical tools used for investigating the linkage between income share by sources and inequality (Van Den Berg and Kumbi, 2006). First, Babatunde (2008) shows that $G_k R_k$ is known as the pseudo-Gini coefficient of income source k, while the share or contribution of income source k to total income inequality is expressed as:

$$S_k \, G_k R_k / G \qquad (2)$$

Beyond this, as shown by Stark, Taylor, and Yitzhaki (1986), the income source elasticity of inequality indicates the percent change in the overall Gini coefficient resulting from a one percent change in income from source$k$, is expressed as:

$$(S_k \, G_k R_k / G) - S_k \qquad (3)$$

Where G is the overall Gini coefficient prior to the income change. As noted by Van Den Berg and Kumbi (2006), Equation (3) is the difference between the share of source k in the overall Gini coefficient and its share of total income (Y). It should be noted that the sum of income source elasticities of inequality should be zero, which means that if all the income sources changed by same percentage, the overall Gini coefficient (G) would remain unchanged.

3. Empirical results

This section provides two sets of results. Sub-section 3.1 reports the impacts of farmland loss on income shares by source. Sub-section 3.2 presents the results from investigating the relationship between income sources and inequality using a Gini decomposition analysis.

3.1 Farmland loss and household livelihood source

Table 1: Fractional multinomial logit estimates for determinants of nonfarm income shares

Explanatory variables	Informal wage income		Formal wage income	
	RPRs	Coefficients	RPRs	Coefficients
Land loss 2009	4.984**	1.606**	4.309*	1.461*
	(3.177)	(0.638)	(3.365)	(0.781)
Land loss 2008	15.937***	2.769***	5.400***	1.686***
	(8.778)	(0.551)	(3.299)	(0.611)
Household size	0.788***	-0.238***	0.920	-0.084
	(0.059)	(0.075)	(0.087)	(0.095)
Dependency ratio	1.134	0.125	1.007	0.006
	(0.194)	(0.171)	(0.302)	(0.300)
Number of male working members	1.486***	0.396***	1.259	0.231
	(0.214)	(0.144)	(0.264)	(0.210)
Household head's gender	0.831	-0.185	0.714	-0.338
	(0.251)	(0.301)	(0.266)	(0.372)
Household head's age	0.999	-0.001	0.998	-0.002
	(0.011)	(0.011)	(0.015)	(0.015)
Age of working members	0.948***	-0.054***	0.949***	-0.052***
	(0.016)	(0.017)	(0.017)	(0.018)
Education of working members	1.009	0.009	1.339***	0.292***
	(0.064)	(0.063)	(0.090)	(0.067)
Social capital	1.034	0.033	1.148*	0.138*
	(0.081)	(0.078)	(0.092)	(0.080)
Farmland/adult	0.866***	-0.144***	0.879***	-0.128***
	(0.046)	(0.053)	(0.043)	(0.049)
Residential land size	1.002	0.002	1.006	0.006
	(0.006)	(0.006)	(0.011)	(0.011)
House location	0.805	-0.217	1.147	0.137
	(0.198)	(0.246)	(0.373)	(0.326)
Formal credit	0.906	-0.099	0.688	-0.373
	(0.214)	(0.236)	(0.211)	(0.306)
Informal credit	0.794	-0.231	0.598	-0.515
	(0.215)	(0.270)	(0.197)	(0.330)
Productive assets/working members	0.697***	-0.361***	0.711***	-0.341***
	(0.063)	(0.091)	(0.084)	(0.118)
Past livelihood A	6.605***	1.888***	2.812**	1.034**
	(1.819)	(0.275)	(1.360)	(0.483)
Past livelihood B	0.858	-0.153	13.329***	2.590***
	(0.499)	(0.582)	(4.959)	(0.372)
Past livelihood C	0.656	-0.422	1.994	0.690
	(0.301)	(0.460)	(1.105)	(0.554)
Commune dummies (included)				
Intercept	263.401***	5.574***	3.743	1.320
	(349.737)	(1.328)	(6.578)	(1.757)
Observations	457		457	
Wald chi2(96)	1185.30			
Prob> chi2	0.0000			

Note: Robust standard errors in parentheses. RPRs are Relative Proportion Ratios. Estimates are adjusted for sampling weights. *, **, *** mean statistically significant at 10%, 5 % and 1 %, respectively. The farm income share is the excluded category.

Table 1 (continued)

Explanatory variables	Non-farm self-employment income		Other income	
	RPRs	Coefficients	RPRs	Coefficients
Land loss 2009	1.889	0.636	8.283***	2.114***
	(1.251)	(0.662)	(6.688)	(0.807)
Land loss 2008	3.874***	1.354***	6.776**	1.913**
	(2.025)	(0.523)	(5.391)	(0.796)
Household size	0.937	-0.065	0.702***	-0.354***
	(0.086)	(0.092)	(0.075)	(0.107)
Dependency ratio	1.269	0.239	1.926***	0.655***
	(0.201)	(0.159)	(0.365)	(0.190)
Number of male working members	0.671**	-0.400**	0.416***	-0.876***
	(0.123)	(0.183)	(0.122)	(0.293)
Household head's gender	0.510**	-0.673**	0.592*	-0.524*
	(0.140)	(0.274)	(0.179)	(0.303)
Household head's age	1.002	0.002	1.036***	0.036***
	(0.012)	(0.012)	(0.012)	(0.011)
Age of working members	0.984	-0.016	1.013	0.013
	(0.015)	(0.015)	(0.021)	(0.021)
Education of working members	1.110**	0.104**	1.332***	0.287***
	(0.056)	(0.050)	(0.087)	(0.065)
Social capital	0.966	-0.035	1.062	0.060
	(0.075)	(0.078)	(0.108)	(0.102)
Farmland/adult	0.839***	-0.176***	0.923	-0.080
	(0.050)	(0.060)	(0.109)	(0.118)
Residential land size	0.987	-0.013	0.998	-0.002
	(0.009)	(0.009)	(0.007)	(0.007)
House location	2.936***	1.077***	0.980	-0.020
	(0.649)	(0.221)	(0.281)	(0.287)
Formal credit	1.524*	0.421*	1.211	0.191
	(0.372)	(0.244)	(0.381)	(0.315)
Informal credit	0.542**	-0.613**	0.587	-0.532
	(0.131)	(0.241)	(0.232)	(0.395)
Productive assets/working members	1.107	0.102	0.792**	-0.233**
	(0.114)	(0.103)	(0.094)	(0.118)
Past livelihood A	0.639	-0.448	2.149*	0.765*
	(0.221)	(0.346)	(0.939)	(0.437)
Past livelihood B	0.443**	-0.815**	5.965***	1.786***
	(0.179)	(0.403)	(2.624)	(0.440)
Past livelihood C	7.408***	2.002***	5.741***	1.748***
	(2.088)	(0.282)	(2.372)	(0.413)
Commune dummies (included)				
Intercept	0.757	-0.279	0.039*	-3.248*
	(1.006)	(1.329)	(0.076)	(1.962)
Observations	457		457	
Wald chi2(96)	1185.30			
Prob> chi2	0.0000			

Note: Robust standard errors in parentheses. RPRs are Relative Proportion Ratios. Estimates are adjusted for sampling weights. *, **, *** mean statistically significant at 10%, 5 % and 1 %, respectively. The farm income share is the excluded category.

As indicated in Table 1, the coefficients of land loss in both years are statistically significant and positive; suggesting that land loss is positively associated with every share of all nonfarm incomes except for the case of nonfarm self-employment income in 2009. Among nonfarm sources, land loss is found to be most positively related to the share of informal wage income. Possibly, this is also indicative of high availability of manual labour jobs in Hanoi's peri-urban areas. According to Cling et al. (2010), the informal sector in Hanoi offers the most job opportunity for unskilled workers. Such job opportunities are also often found in Hanoi'srural and peri-urban areas and those working in this sector have much a lower level of education than those in other sectors(Cling, Razafindrakoto, and Roubaud, 2011).Holding all other variables constant, a 10 percentage-point increase in the land loss in 2009 and in 2008 corresponds with around a 17 percent and 32 percent increase respectively in the relative proportion of the informal wage income share. For the case of the share of nonfarm self-employment income, only the land loss in 2008 is statistically significant with a 14 percent increase in the relative proportion. This implies that there may be some potentially high entry barriers to adopting formal wage work and nonfarm self-employment, and simultaneously easier access to informal wage work, which makes this type of employment the most popular choice among land-losing households. A similar trend was also observed in a peri-urban village of Hanoi by Do (2006) and in some urbanizing communes in Hung Yen, a neighboring province of Hanoi by Nguyen et al. (2011).

To complement the above results, we also quantify the impact of farmland loss on the farm income share (see appendix 5). The results indicate that a higher level of land loss is closely linked with a lower percentage of farm income in the total household income. Holding all other variables constant, if the land loss in 2009 and land loss in 2008 rises by 10 percentage-points the relative proportion of farm income share decreases 12 percent and 18 percent, respectively.

Farmland per adult has a negative association with every share of nonfarm labour income. While the size of residential land is not related to any change in the income shares by source; the house location is positively associated with the percentage of nonfarm self-employment income. The relative proportion of the share of nonfarm self-employment income is around 3 times higher for households with a house in a prime location than those without it, holding all other variables constant. This implies that having a house in a prime location might allow many households to actively seize lucrative nonfarm opportunities. A

similar phenomenon was also observed in a peri-urban Hanoi village by Nguyen (2009) and in some rapid urbanizing areas of Hung Yen Province by Nguyen et al. (2011) where houses with a suitable location were utilised for nonfarm businesses such as restaurants, small shops, bars, coffee shops or beauty salons, etc.

Schooling years of working members are negatively associated with the share of farm income but positively correlated with that of nonfarm self-employment income and formal wage income. As indicated by Reardon, Taylor, Stamoulis, Lanjouw, and Balisacan (2000), better education may shift households away from farming and the most lucrative nonfarm opportunities often require higher educational qualifications. Male headed households tend to have a lower share of nonfarm self-employment income, suggesting that female-headed households are likely to be more active than male-headed households in nonfarm self-employment activities. This is because the majority of nonfarm self-employment activities were small trades and the provision of local services which were possibly more suitable for women. This finding is consistent with that of Pham et al. (2010), who found that in rural Vietnam women are more likely than men to engage in nonfarm self-employed jobs but men are more likely to be wage earners in nonfarm activities.

Access to financial capital is related to shares of farm income and nonfarm self-employment income, whereas each share of other income sources is found unrelated to financial capital. However, there are some interesting points to note. Access to formal credit has a positive association with the percentage of nonfarm self-employment income but a similar relationship it is not observed for the case of farm income share. In addition, while access to informal credit is positively linked with the farm income share, it is negatively related to the nonfarm self-employment income share. Possibly this is because formal loans tended to be used for nonfarm production rather than farm production, whereas informal loans were more used for farm production than nonfarm production[6].

Physical capital has a positive relationship with farm income share but that is not the case for nonfarm self-employment income share. This may be because the majority of nonfarm self-employment activities were made of small-scale units, specializing in small

[6]As revealed by the surveyed households, about 45 percent of borrowing households said that one of their purposes of their borrowing formal loans was for nonfarm production while the corresponding figure for farm production was only about 10 percent. By contrast, 40 percent answered that one of the purposes of borrowing informal loans was for farm production and the corresponding figure for nonfarm production was only around 12 percent.

trades and provision of local services, which possibly did not require a large amount of memberships, is positively associated with the formal wage income share but a similar association is not found for other income shares. Possibly, a higher share of formal wage income is often contributed by formal wage workers who tended to have more memberships in groups and associations.

Finally, the inclusion of past livelihood strategies as explanatory variables in the model helps explain that each type of current income share is closely correlated with its corresponding past livelihood strategy. For example, households following a past informal wage work-based strategy are much more likely to have a higher share of informal wage income share than those pursuing past farm work-based strategy.

3.2 The relationship between income sources and inequality

Figure 1 presents the distribution of income sources by income quintile. As compared to households in the higher income quintiles (4 and 5), the lower income quintile households (1 and 2) had a higher share of farm income, whereas those in the richer groups had a higher share of nonfarm self-employment and formal wage income. This suggests that income shares by source are closely associated with the income distribution; specifically there is a positive association between the nonfarm self-employment income share, formal wage income share and per capita income, but a negative correlation between the farm and informal wage income shares and per capita income.

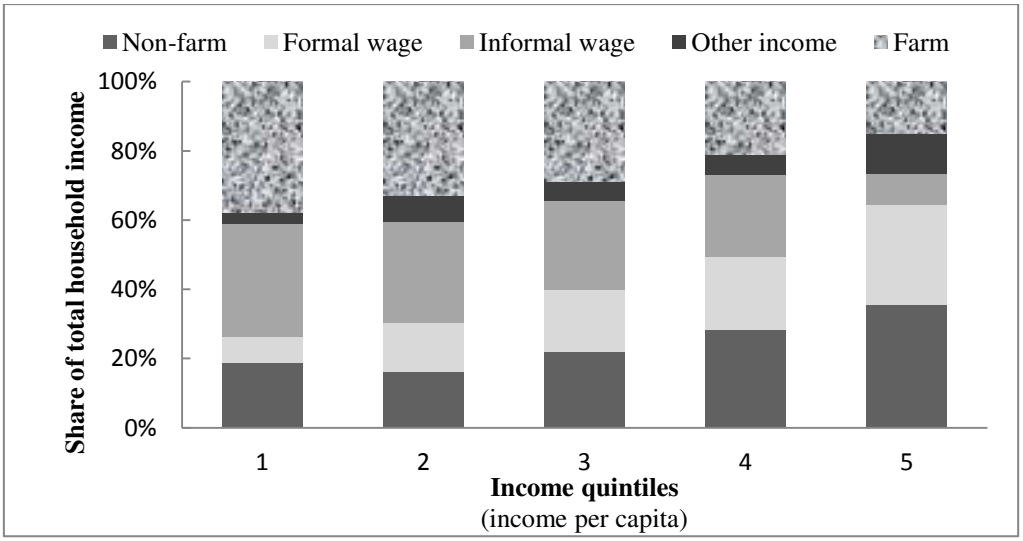


Figure 1.Income shares by source and income quintiles

Figure 2 shows the distribution of income sources over farmland holdings. As revealed in this figure, households in the higher landholding stratums had a much higher percentage of farm income but had a lower share of nonfarm self-employment, formal wage incomes and other income. By contrast, the lower landholding stratum households received more income from nonfarm self-employment and manual labour jobs, which implies that households with limited farmland might be pushed into these activities as a way to complement their income. Finally, the share of formal wage income appears not to be correlated with the distribution of farmland, suggesting that this income source may be associated with other factors, such as education, rather than farmland holdings.

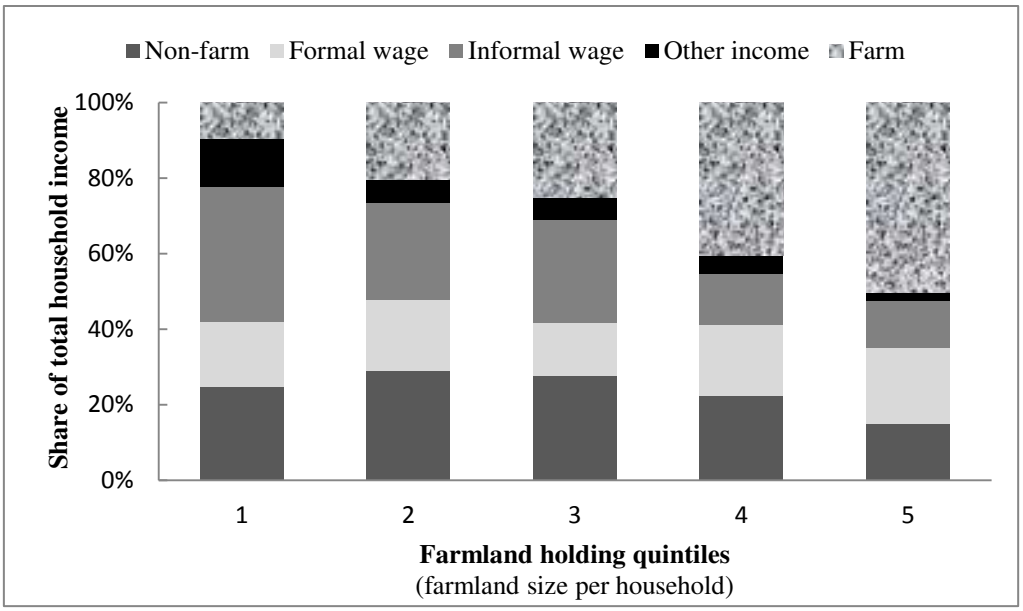


Figure 2.Income shares by source and farmland holding quintiles

Table 2 presents the Gini decomposition of income inequality by income source. The overall Gini coefficient for the sample households was 0.267, which is much lower than the Gini coefficient of 0.434 for the whole country and 0.411 for the Red River Delta reported by GSO (2008). This indicates a quite low degree of income inequality among the sample households. This reduced inequality at the district level compared tolarger areas was also found in Vietnam by Minot, Baulch, and Epprecht (2006), who explained that, similar to other measurements of inequality, there is a trend toward smaller Gini coefficients for smaller regions, such as provinces or districts, than for the country as a whole. This is due to the fact that households in a small region are likely to have more similarities than households across the whole country.

Table 2.Gini decomposition of income inequality by income sources

Income source	Income share	Gini	Correlation with the distribution of total income	Pseudo-Gini	Share to total income inequality	Source elasticity of total inequality
	Sk	Gk	Rk	GkRk	(RkGkSk)/G	(RkGkSk)/G-Sk
Farm	0.232	0.606	0.121	0.073	0.064	-0.168
Nonfarm Self-employment	0.271	0.757	0.534	0.404	0.409	0.138
Informal wage	0.197	0.727	0.012	0.009	0.007	-0.191
Formal wage	0.219	0.818	0.572	0.468	0.383	0.164
Other income	0.082	0.876	0.518	0.454	0.138	0.057
Total	1.000	**0.267**			1.000	

Note: Estimates are based on annual per capita incomes. N=477.

In previous studies on the decomposition of income inequality in Vietnam, household income is often disaggregated into various sources, including wage income, nonfarm self-employment income, agricultural income and other income (Adger, 1999; Cam and Akita, 2008; Gallup, 2002). Going beyond the conventional classification, the paper further breaks down wage income into two sub-categories, namely informal wage income and formal wage income. By decomposing the total household income inequality into various income sources, the results reveal that nonfarm self-employment, formal wage income and other income are the major contributors to overall income inequality among the sample households. Taken together, they accounted for 93 percent of the total income inequality. By contrast, farm income and informal wage income reduced the inequality; the pseudo-Gini coefficients of these income sources are much lower than the total Gini coefficient, whereas the pseudo-Gini coefficients for nonfarm self-employment income, formal wage income and other income are much higher. Specifically, a 10 percent increase in income from farm and informal wage activities will lead to a 1.7 percent and 1.9 percent decline in the overall income inequality, respectively. Whereas, the same increase in nonfarm self-employment, formal wage income and other income will result in a 1.4 percent, 1.6 percent and 0.57 percent increase in the overall income inequality, respectively.

Looking at the third and fourth column in Table 5, the results show that the inequality of farm and informal wage incomes among households is lower than the inequality of nonfarm self-employment, formal wage income and other income among households. In addition, as

compared to nonfarm self-employment income, formal wage income and other income, farm and informal wage incomes each have a much lower correlation with the distribution of total income. Consequently, the incomes from farm and informal wage work had an equalizing effect on the income distribution. This finding is partly in accordance with Gallup (2002) and Cam and Akita (2008), who found that while agricultural income actually reduced the inequality of income distribution, nonfarm self-employment income and other income sources mainly contributed to inequality in Vietnam.

4. Conclusions and policy implications

The linkages between farmland loss, nonfarm diversification and inequality have been documented in previous studies by using qualitative analysis and descriptive statistics. Going beyond the literature, we have quantified such linkages by using a household-level dataset from a 2010 field survey and quantitative tools. This study offers main findings as below.

First, under the impact of farmland loss due to urbanisation and industrialization, land-losing households diversified into various nonfarm activities. Among sources of nonfarm income, the income share from informal wage work is found to be most positively associated with land loss, which suggests that such low skilled paid jobs have been emerging as the most common choice of land-losing households in or near Hanoi's peri-urban areas. Consequently, such job opportunities might allow many land-losing households to supplement a shortfall of income with an informal wage income, which in turn might mitigate the negative effects of land loss and improve household welfare.

Second, the results confirm the role of natural capital in shaping peri-urban livelihoods. While farmland is associated positively with farming but negatively with nonfarm activities, a house or a plot of residential land in a prime location is emerging as a crucial livelihood asset that enables households to take up nonfarm household businesses. This suggests that the government may provide a new source of livelihood for land-losing households by granting them a plot of non-agricultural land in a prime location for doing business. For instance, Ha Tay Province People's committee have promulgated a new compensation policy for land-losing households, which states that households who lose more than 30 percent of their farmland by the State's land acquisition will be granted a plot of commercial land (*đất dịch vụ)*equivalent to 10 percent of the area of acquired farmland(Hop Nhan, 2008).*Đất dịch vụ* is located near industrial zones or residential land in urban areas(WB, 2009); therefore it can be used as business premises for nonfarm activities such as opening a shop or for rent. This

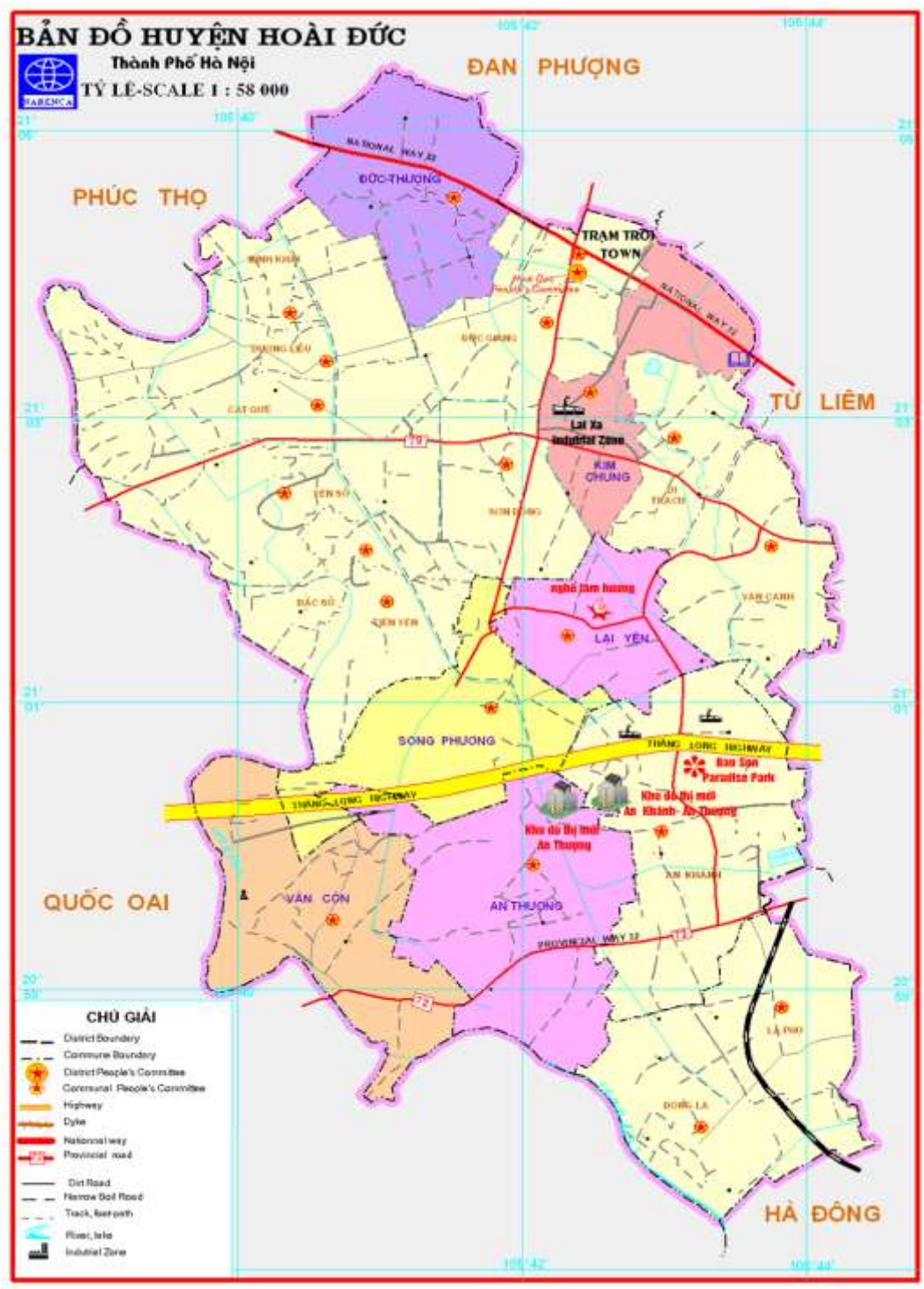
implies that speeding up the implementation of this policy can be one of the prerequisites to facilitate livelihood transitions of land-losing households in Hanoi's peri-urban areas.

Finally, econometric results indicate that farmland loss has a negative effect on farm income share and a positive impact on informal income share. In addition, Gini decomposition analysis shows that increasing inequality has a negative linkage with farm income share, but is positively related with informal wage income. The above findings suggest that land loss has indirect mixed impacts on the income distribution. The inequality - decreasing effect of informal wage income implies that there is no or a low entry barrier to manual labour jobs and thus everyone can undertake these jobs. In contrast, the inequality-rising effect of other nonfarm income sources, namely nonfarm self-employment and formal wage incomes, suggests that there are some relatively high entry barriers that hinder everyone from participating in these high return activities.[7]Our findings, therefore, support Adger's hypothesis (1999) that income diversification into nonfarm activities results in either greater income inequality if opportunities for these activities are skewed towards to the better-off; or in less income inequality if such opportunities are accessible to the poorer parts of the population. Hence, improving households' access to lucrative nonfarm activities is expected not only to have a positive effect on welfare but also to have an equalizing effect on income distribution.

[7]Formal wage work and nonfarm self-employment offer much higher levels of income per hour compared to those of farm work and informal wage work. More details, see column 1, Appendix 2

Appendices

Appendix 1: Surveyed areas in administrative map of HoaiDuc District, Hanoi include DucThuong, Kim Chung, An Thuong, Lai Yen, Song Phuong.



Source: Narenca, 2011

Appendix 2: Descriptive statistics of dependent variables and income-earning activities

	Income per working hour	Annual income per household	Annual income per capita	Share of total Income (%)	Participation rate (%)
Total income	14.22	60,642	13,513		
SD	*9.50*	*33,034*	*7,091*		
Farm income (D)	11.25	14,432	3,216	27.69	83.04
SD	*7.30*	*16,169*	*3,621*		
Nonfarm income	12.80	42,801	9,537	65.90	90.00
SD	*7.12*	*33,571*	*7,140*		
A. Informal wage income	10.06	11,559	2,576	23.20	40.35
SD	*4.10*	*17,703*	*3,973*		
B. Formal wage income	14.70	14,431	3,216	16.95	27.30
SD	*8.60*	*29,762*	*6,232*		
C. Nonfarm self-employment	14.52	16,811	3,746	25.74	43.28
SD	*8.57*	*27,803*	*6,231*		
Non-labour income (E)		3,409	760	6.41	31.88
SD		*8,676*	*2,410*		

Note: SD (standard deviations). Estimates in columns 3-6 are adjusted for sampling weights. N= 477.

Income and its components inVND 1,000;US$ 1 equated to about VND 18,000 in 2009. Nonfarm income = (A+B+C).

Appendix 3: Definitions and measurements of explanatory variables of fractional logit and fractional multinomial logit models

Explanatory variables	Definition	Measurement
Farmland loss		
Land loss 2009	Proportion of farmland compulsorily acquired by the State in 2009	Ratio
Land loss 2008	Proportion of farmland compulsorily acquired by the State in 2008	Ratio
Natural capital		
Farmland per adult	Owned farmsize per member aged 15 and over	100 m^2
Residential land size	The total size of residential land	10^2
House location	Whether or not households have a house a plot of residential land with a prime location.	Dummy (=1 if yes)
Human capital		
Household size	Number of household members	Number
Dependency ratio	This ratio is calculated by the number of household members aged under 15 and over 59, divided by the total members aged 15-59	Ratio
Number of male working members	Number of male adult members who were employed in the last 12 month	Number
Household head's gender	Whether or not the household head is male	Dummy (=1 if yes)
Household head's age	Age of household head	Years
Education of working members	Average years of formal schooling of adult members who were employed in the last 12 months	Years
Age of working members	Average age of adult members who were employed in the last 12 months	Years
Social capital		
Group memberships	Number of memberships in formal and informal groups and organizations	Number
Financial capital		Dummy
Formal credit	Received any loan from banks or credit institutions in the last 24 months	(=1 if yes)
Informal credit	Received any loan from friends, relatives or neighbours in the last 24 months	(=1 if yes)
Physical capital		
Productive assets	Value of all productive assets per working member	Natural logarithms
Past livelihood strategy (Included)	The livelihood strategy that households followed before farmland acquisition	Dummy
Commune dummies (Included)	The commune in which households live	Dummy

Appendix 4: Summary statistics of explanatory variables of the fractional logit and fractional multinomial logit models

Explanatory variables	**M**	**SD**	Mean	SD	Min	Max
Farmland acquisition						
Land loss 2009 (%)	10.27	*24.50*	13.00	*27.00*	0.00	1.00
Land loss 2008 (%)	10.50	*24.00*	14.00	*26.00*	0.00	1.00
Human capital						
Household size	4.49	*1.61*	4.50	*1.61*	1	11
Dependency ratio	0.61	*0.67*	0.60	*0.65*	0.00	3.00
Number of male working members	1.25	*0.69*	1.26	*0.72*	0.00	4
Gender of household head*	0.77	*0.48*	0.78	*0.41*	0	1
Age of household head	51.21	*13.24*	51.35	*12.60*	21	96
Age of working members	40.46	*8.25*	40.04	*8.07*	21.50	78.00
Education of working members	8.37	*2.90*	8.32	*2.80*	0	16
Natural capital						
Owned farmland size per adult (100 m^2)	3.43	*2.80*	2.92	*2.41*	0	18.13
Residential land size (10^2)	21.88	*14.62*	22.43	*15.24*	0	125
House location*	0.32	*0.47*	0.30	*0.46*	0	1
Physical capital	8.63	*1.17*	8.60	*1.15*	4.94	11.25
Social capital	3.43	*2.09*	3.42	*2.06*	0	11
Financial capital						
Formal credit*	0.27	*0.44*	0.26	*0.44*	0	1
Informal credit*	0.19	*0.39*	0.20	*0.40*	0	1
Past livelihood						
Informal wage work*	0.22	*0.42*	0.21	*0.41*	0	1
Formal wage work*	0.18	*0.38*	0.18	*0.38*	0	1
Nonfarm self-employment *	0.19	*0.39*	0.16	*0.36*	0	1
Commune (included)						

Estimates in the second and third columns, including mean (**M**) and standard errors (**SD**) are adjusted for sampling weights.

*denotes dummy variables. N=477.

Appendix 5: Fractional logit estimates for determinants of farm income share

Explanatory variables	Farm income share			
	RPRs	SE	Coefficients	SE
Land loss 2009	0.2780**	(0.147)	-1.278**	(0.530)
Land loss 2008	0.132***	(0.055)	-2.024***	(0.419)
Household size	1.172***	(0.067)	0.159***	(0.058)
Dependency ratio	0.816	(0.108)	-0.204	(0.132)
Number of male working members	0.939	(0.101)	-0.063	(0.108)
Household head's gender	1.580**	(0.309)	0.457**	(0.195)
Household head's age	0.995	(0.008)	-0.005	(0.008)
Age of working members	1.036***	(0.012)	0.035***	(0.012)
Education of working members	0.876***	(0.031)	-0.133***	(0.035)
Social capital	0.965	(0.050)	-0.036	(0.052)
Farmland per adult	1.149***	(0.047)	0.139***	(0.041)
Residential land size	1.001	(0.005)	0.001	(0.005)
House location	0.627***	(0.100)	-0.468***	(0.160)
Formal credit	0.943	(0.163)	-0.059	(0.173)
Informal credit	1.470**	(0.286)	0.385**	(0.195)
Productive assets/working members (Ln)	1.180**	(0.084)	0.165**	(0.071)
Past informal wage work livelihood	0.303***	(0.069)	-1.193***	(0.227)
Past formal wage work livelihood	0.283***	(0.072)	-1.261***	(0.254)
Past nonfarm self-employment livelihood	0.174***	(0.042)	-1.751***	(0.243)
Commune dummy (included)				
Intercept	0.053***	(0.050)	-2.930***	(0.942)
Observations	457			
Log pseudolikelihood	-10409.86357			

Note: Estimates are adjusted for sampling weights. RPRs are relative proportion ratios.

SE: robust standard errors. *, **, *** mean statistically significant at 10%, 5 % and 1 %, respectively

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