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Tran, Tuyen and Lim, Steven and Cameron, Michael P. and
Vu, Huong

University of Economics and Business, Vietnam National University,
Hanoi, Department of Economics, Waikato University, New Zealand

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Farmland loss and livelihood outcomes: A microeconomic analysis of household surveys in Vietnam

Tuyen Tran^{1a}, Steven Lim^b, Michael P. Cameron^b and Huong Vu^b

^aUniversity of Economics and Business, Vietnam National University, Hanoi

^bDepartment of Economics, Waikato University, New Zealand

ABSTRACT

Although there has been much discussion in the literature about the impacts of farmland loss (due to urbanization) on household livelihoods, no econometric evidence of these effects has been provided thus far. This paper, hence, is the first to quantify the effects of farmland loss on household livelihood outcomes in peri-urban areas of Hanoi, Vietnam. Our study found no econometric evidence for negative effects of farmland loss on either income or expenditure per capita. In addition, the results show that farmland loss has an indirect positive impact on household welfare, via its positive impact on the choice of nonfarm based-livelihoods.

¹Corresponding Author. Email: tuyentq@vnu.edu.vn

INTRODUCTION

The conversion of agricultural land to non-agricultural uses is a common way to provide space for infrastructure development, urbanization and industrialization and is, therefore, an almost unavoidable tendency during phases of economic development and population growth (Tan, Beckmann, Van Den Berg, & Qu, 2009). In Vietnam over the past two decades, escalated industrialization and urbanization have encroached on a huge area of agricultural land. Le (2007) calculated that from 1990 to 2003, 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.² In the period from 2000 to 2007, about half a million hectares of farmland were converted for nonfarm use purposes, accounting for 5 percent of the country's farmland. Consequently, 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 (VietNamNet/TN, 2009).

Increasing urban population and rapid economic growth, particularly in urban areas of large cities, have resulted in a great demand for urban land. Taking Hanoi as an example, according to its land use plan for 2000-2010, 11,000 hectares of land, mostly annual crop land in Hanoi rural, was taken for 1,736 projects related to industrial and urban development, and it was estimated that this farmland conversion caused the loss of agricultural jobs of 150,000 farmers (Nguyen, 2009a). Moreover, thousands of households have been anxious about a new plan of massive farmland acquisition for the expansion of Hanoi to both banks of the Red river by 2020. This plan will induce about 12,000 households to relocate and nearly 6,700 farms to be removed (Hoang, 2009).

In the setting of accelerating conversion of farmland for urbanization and industrialization in the urban fringes of large cities, a number of studies in Vietnam have addressed the question of how farmland loss has affected rural household livelihoods (Do, 2006; Le, 2007; Nguyen, Vu, & Philippe, 2011; Nguyen, Nguyen, & Ho, 2013; Nguyen, 2009b). In general, these studies indicate that while the loss of agricultural land causes the loss of traditional agricultural livelihoods and threatens food security, it can also bring about a wide range of new opportunities for households to diversify their livelihoods and sources of

² According to the current Land Law of Vietnam, the compulsory acquisition of land by the State is applied to projects that are served for national or public projects, for projects with 100 percent contributed by foreign funds (including FDI (Foreign Direct Investment) and ODA (Official Development Assistance), for the implementation of project with special economic investment such as building infrastructure for industrial and services zones, hi-tech parks, urban and residential areas (the World Bank (WB), 2011).

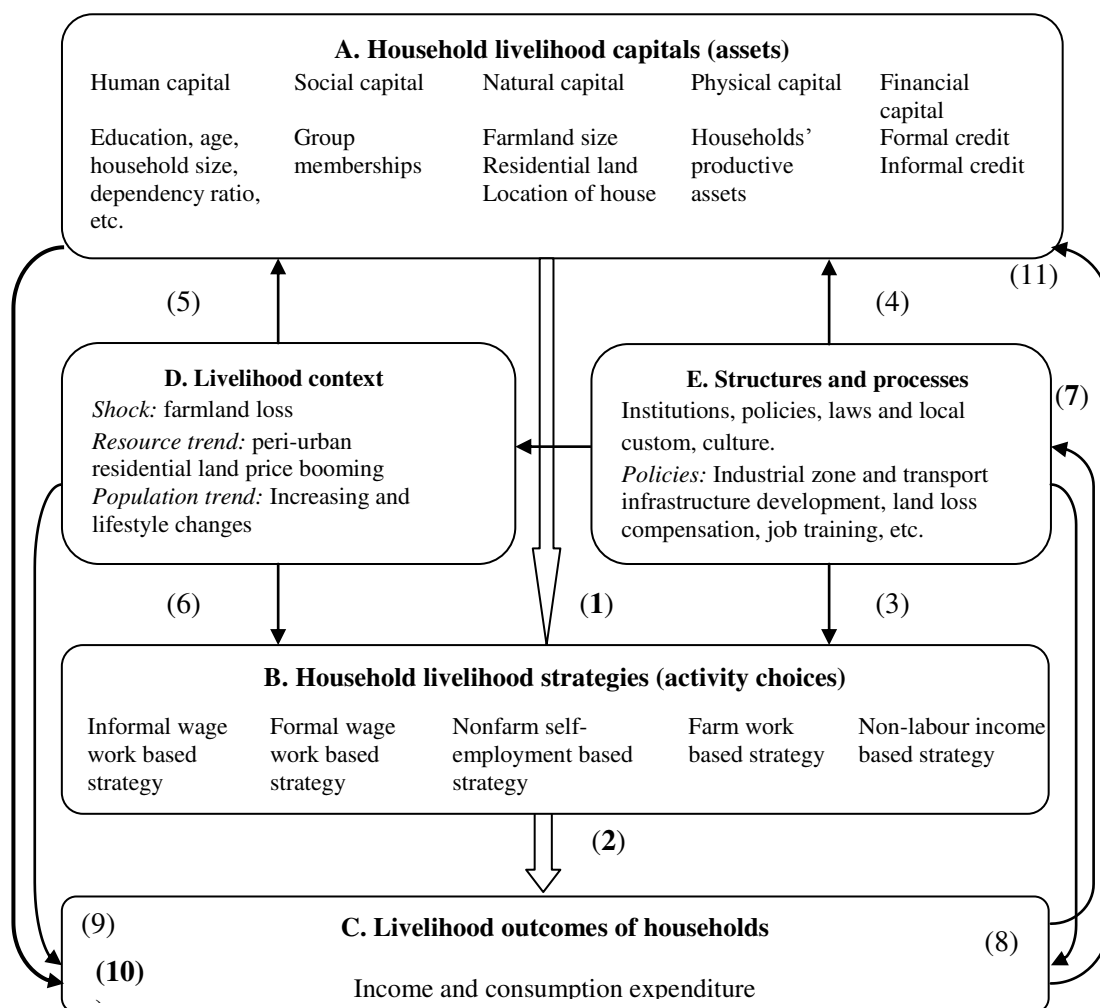
wellbeing. In addition, similar impacts of farmland loss have been found elsewhere. Examples include negative impacts in China (Chen, 2007) and India (Fazal, 2000). Nevertheless, other studies show positive impacts of farmland loss on rural livelihoods in China (Parish, Zhe, & Li, 1995) and Bangladesh (Toufique & Turton, 2002).

More importantly, when investigating the impacts of farmland loss on household livelihoods, all above studies used qualitative methods or descriptive statistics, possibly due to the unavailability of data. Using a dataset from a 2010 field survey involving 477 households in Hanoi's peri-urban areas, this study, therefore, contributes to the literature by applying microeconomic methods to answer the key research question: *how, and to what extent, has farmland loss affected household livelihood outcomes in Vietnam?* Our study found no econometric evidence for negative effects of farmland loss on either income or consumption expenditure per capita. In addition, we found that farmland loss has an indirect positive impact on household welfare, via its positive impact on the choice of nonfarm based-livelihoods.

ANALYTICAL FRAMEWORK

Several studies have attempted to apply the sustainable livelihood framework, either quantitatively or qualitatively (Jansen, Pender, Damon, Wielemaker, & Schipper, 2006). Figure 1 displays an analytical framework that is adapted for the specific context of this study. In this paper, we focus on Box C: *household livelihood outcomes*, as well as their determinants. As presented in Figure 1, a household's livelihood choice to pursue a particular activity or a diversification of activities is determined by its endowment of or access to different types of assets (Box A). Moreover, other exogenous factors such as farmland loss (Box D) or local customs and culture and local infrastructure development (Box E) may have impacts on activity choice. The impacts may be direct, or indirect via their impact on livelihood assets. Consequently, such factors should be taken into account in the model of household activity choice. The resulting livelihood choices in turn generate livelihood outcomes such as food, income or expenditure (Box C). Moreover, a household's livelihood outcomes are also conditioned on its possession of or access to livelihood assets. Therefore, a household's asset endowment has both indirect (through its impact on livelihood choice) and direct impacts on livelihood outcomes. However, the exogenous factors affecting livelihood choices that are mentioned above also influence livelihood outcomes. As a result, livelihood outcomes are determined by a set of asset-related variables, livelihood choice and other factors.

Figure 1: Conceptual framework for analysis of Hanoi peri-urban household livelihoods



Source: Adapted from DFID's sustainable livelihood framework (DFID, 1999), IDS's sustainable rural livelihood framework (Scoones, 1998), and Babulo et al. (2008).

A household's livelihood outcomes in turn can affect its future livelihood capitals. For instance, better-off households tend to invest more in education and will therefore have a higher level of human capital in the future. Accordingly, livelihood capitals themselves are endogenously determined by outcome influences. The sustainable livelihood framework provides a conceptual description of dynamic and interdependent elements that together affect household livelihoods over time. Given data limitations, our empirical study only investigates the static impact of households' livelihood assets and strategy on their livelihood outcomes. In fact, such static models have been often used for quantifying factors determining household livelihood outcomes (Jansen, Pender, Damon, Wielemaker, et al., 2006; Pender & Gebremedhin, 2007). Following this approach, our study only examines the static

determinants of livelihood outcomes with a particular interest in the setting of farmland loss due to escalated urbanization in Hanoi's peri-urban areas.

BACKGROUND OF THE CASE STUDY

The study site

Our research was conducted in Hoai Duc, a peri-urban district of Hanoi. Of the districts of Hanoi, Hoai Duc has the largest number of farmland-acquisition projects and has been experiencing a massive conversion of farmland for nonfarm uses (Huu Hoa, 2011). Hoai Duc is located on the northwest side of Hanoi, 19 km from the Central Business District (CBD). The district has an extremely favourable geographical position, surrounded by various important roads namely Thang Long highway (the country's longest and most modern highway), National Way 32, and in close proximity to industrial zones, new urban areas and Bao Son Paradise Park (the biggest entertainment and tourism complex in North Vietnam). Consequently, in the period 2006-2010, around 1,560 hectares of farmland were compulsorily acquired by the State for 85 projects (Ha Noi moi, 2010).

Hoai Duc was merged into Hanoi City on 1 August 2008. The district occupies 8,247 hectares of land, of which agricultural 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). There are 20 administrative units under the district, including 19 communes and one town. Hoai Duc has around 50,400 households with a population of 193,600 people. In the whole district, employment in the agricultural sector dropped by around 23 percent over the past decade. Nevertheless, a significant proportion of employment has remained in agriculture, accounting for around 40 percent of the total employment in 2009. The corresponding figures for industrial and services sectors are 33 and 27 percent, respectively (Statistics Department of Hoai Duc District, 2010).

Compensation for land-losing households

As revealed by surveyed households, 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. Also, Ha Tay Province People's Committee issued the Decision 1098/2007/QĐ-UB and Decision 371/2008/QĐ-UB, which states that a plot of commercial land (*đất dịch vụ*) will be granted to households who lose more than 30 percent of their agricultural land. Each household receives an area of *đất dịch vụ* equivalent to 10 percent of the area of farmland that is taken for each project (Hop Nhan, 2008). *Đất dịch vụ* is

located close to industrial zones or residential land in urban areas (WB, 2009), thus it can be used as a business premise for non-farm activities such as opening a shop or a workshop, or for renting to other users. Thanks to this compensation with "land for land", households will have not only an extremely valuable asset but also a potential new source of livelihood, particularly for elderly land-losing farmers.³In the remainder of this paper, households whose farmland was lost partly or totally by the State's compulsory land acquisition will be referred to as "*land-losing households*".

DATA AND METHODS

Data

Adapted from the General Statistical Office (GSO) (2006) and Doan (2011), a household questionnaire was designed to gather a set of quantitative data on livelihood assets (human, social, financial, physical and natural capitals), economic activities (time allocation), and livelihood outcomes (income and expenditure). A disproportionate stratified sampling method was used with two steps as follows: First, 12 communes with farmland loss (due to the land acquisition by the State) were partitioned into three groups based on their employment structure. The first group included three agricultural communes; the second one was characterised by five communes with a combination of both agricultural and non-agricultural production while the third one represented four non-agricultural communes. From each group, two communes were randomly selected. Second, from each of these communes, 80 households, including 40 households with farmland loss and 40 households without farmland loss, were randomly selected, for a target sample size of 480.⁴The survey was carried out from April to June 2010. 477 households were successfully interviewed, among which 237 households lost some or all of their farmland. Among them, 113 households lost their farmland in early 2009 and 124 households had farmland loss in the first half of 2008.

³ The prices of *đất dịch vụ* in some communes of Hoai Duc District ranged from 17,000,000 to 35,000,000 VND per m² in 2011, depending on the location of *đất dịch vụ* (Minh Tuan, 2011) (1USD equated to about 20,000 VND in 2011). Note that farmers have already received the certificates which confirm that *đất dịch vụ* will be granted to them but they have not yet received *đất dịch vụ*. However, these certificates have been widely purchased (Thuy Duong, 2011).

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

Methods

Clustering livelihood strategies

We grouped households into distinct livelihood categories using partition cluster analysis. Proportions of time allocated for different economic activities before farmland acquisition were used as variables for clustering past livelihood strategies. Similarly, proportions of income by various sources were used as variables for clustering current livelihood strategies or livelihood strategies after farmland acquisition. A two-stage procedure suggested in Punj and Stewart (1983) was applied for cluster analysis. First, we performed the hierarchical method using Euclidean distance and Ward's method to identify the possible number of clusters. At this stage, the values of coefficients from the agglomeration schedule were used to seek the elbow criterion for defining the optimal number of clusters (Egloff, Schmukle, Burns, Kohlmann, & Hock, 2003) (see more in Tuyen (2013)). Then, the cluster analysis was rerun with the optimal number of clusters which had been identified using k-mean partition clustering.

Model specification for determinants of livelihood strategy choice

Once the whole sample was clustered into various groups of livelihood strategies, we applied econometric methods to quantify the impact of farmland loss on household activity choice and household welfare. Because the choice of livelihood strategies is a polychotomous choice variable, we used a multinomial logit model (MNLM) to quantify the determinants of households' activity choice (Train, 2003). Following Van den Berg (2010) and Jansen, Pender, Damon, Wielemaker, et al. (2006), we assumed that a household's livelihood choice is determined by fixed and slowly changing factors, including the household's natural capital, human capital, and location variables. In addition, other factors, in this case farmland loss and past livelihood strategies were included as regressors in the model. Other types of livelihood capitals such as social capital, financial capital and physical capital may be jointly determined with, even determined by, the livelihood choice (Jansen, Pender, Damon, & Schipper, 2006). Therefore, we minimised the potential endogeneity problem by excluding such types of livelihood assets from the model. Natural capital consists of the owned farmsize per adult (100 m² per adult) or "land-labour ratio" (more owned farmsize per adult stimulates farming activities), the size of residential land (10 m²) (can be used as a premise for household business), and the location of houses or residential land plots (a prime location can be used for

opening a shop or a workshop).⁵ Human capital is represented by household size and 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) (both reflect labour endowment), age and gender of the household head, the number of male working members (those aged 15 and over) (influences the engagement in wage work), average age of working members (younger members are more likely to work as wage earners), and average years of formal schooling of working members (requirements for formal wage work) were also included as explanatory variables.

Farmland loss is the variable of interest that was expected to have a significant impact on household livelihood choice. In this case study, the loss of farmland is an exogenous event as it is caused by the State's farmland acquisition policy (Wooldridge, 2013). Since the farmland acquisition took place at two different times, land-losing households were clustered into two groups: (i) households with farmland loss in 2008 and (ii) those with farmland loss in 2009. The rationale for this division is that the length of time since farmland acquisition may be related to the probability of livelihood change. Moreover, the level of farmland loss varies among households. Some lost little, some lost part of their land while others lost all their land. As a result, the levels of land loss in both years, as measured by the proportion of farmland acquired by the State in 2008 and 2009, were expected to reflect the impact of farmland loss on household activity choice.

In fact, a number of households did not change their livelihood choices after farmland acquisition, which indicates that their current livelihood strategies had been determined prior to the farmland acquisition. In such cases, current outcomes may be influenced by past decisions; current behaviours may be explained by inertia or habit persistence (Cameron & Trivedi, 2005). Therefore, we included past livelihood strategy variables as regressors in the model of household livelihood choice. Finally, commune dummies were included to account for commune fixed effects which capture differences in inter-commune fertility of farmland, development of infrastructure, cultural, historical and geographic communal level factors that may affect household livelihood strategies.

⁵ A prime location is defined as: the location of a house or of a plot of residential land is situated on the main roads of a village or at the crossroads or very close to local markets or to industrial zones, and to a highway or new urban areas. Such locations enable households to use their houses or residential land plots for opening a shop, a workshop or for renting.

Model specification for determinants of livelihood outcomes

We used consumption expenditure and income as indicators of household livelihood outcomes because they are both considered as the standard measures of household economic welfare (Deaton, 1997). The total annual income is constituted by different income sources (agriculture, animal husbandry, nonfarm self-employment, wage work and other income), whereas household expenditure comprises of total living expenses (food and non food, health care, education, housing, transportation, entertainment and other items). Note that both income and expenditure were measured accounting for own consumption of products produced by households. Figure 1 indicates that households' livelihood outcomes are dependent on their households' livelihood strategy and assets. As compared to the explanatory variables in the multinomial logit model, we added some more asset-related explanatory variables that potentially affect livelihood outcomes. In the context of a simple conceptual framework, social capital can be treated as one type of available assets of households which can generate income or make consumption possible (Grootaet, Narayan, Jones, & Woolcock, 2004). Many studies have used group memberships as a proxy for social capital and evaluate their relationship with household wellbeing such as income or expenditure (Haddad & Maluccio, 2003). Therefore, we included social capital in the form of number of group memberships as an exogenous capital like other capitals that can affect household income and expenditure. We also included the value of productive assets per working member or "*capital-labour ratio*" as a proxy for physical capital in the outcome models. Households with higher "*capital-labour ratio*" were expected to obtain higher wellbeing. Finally, we included dummy variables for financial capital in the form of access to formal and informal loan. Households who received formal or informal loans could use this resource for generating income or making consumption possible.

Since three dummy variables of current livelihood choice (informal wage work, formal wage work and nonfarm self-employment, with farm work as base group) in the outcome equations were suspected to be endogenous, ordinary least square (OLS) estimation of these models would be biased and inconsistent if these explanatory variables were correlated with the error term in the livelihood outcome models (Cameron & Trivedi, 2005). To control for this endogeneity, we employed the instrumental variable method (IV) estimator.

First, following Pender and Gebremedhin (2007), we selected the livelihood strategy choice that households pursued prior to farmland acquisition as a potentially instrumental variable for the current livelihood strategy variables. Second, we included the location of a

house (or a residential land plot), and the average age of working members as additional instruments. As previously mentioned, households owning a house or a residential land plot in a prime location are more likely to open a shop as their livelihood strategy while households with younger working members have greater opportunities to engage in wage work. However, using the past livelihood strategy variables as an instrument may fail to meet the assumption of instrument exogeneity because the lags from 1 to 2 years after farmland acquisition may be less distant lags that will increase any correlation between these instruments and the error term of the livelihood outcomes equations. In addition, the other instruments are likely to violate this assumption because these instruments may directly affect household livelihood outcomes. For instance, households that are endowed with a conveniently located house may gain greater income from lucrative household businesses. Similarly, households with younger workers may get higher income from their highly paid jobs. The above discussions imply that several necessary IV tests must be conducted to determine whether both requirements of instruments (relevance and exogeneity) are satisfied or at least using a set of invalid and weak instruments that generates imprecise estimates and misleading conclusions can be avoided.

In order to form an econometric foundation for instrumental variables, a series of specification tests were applied to the models. We used the formal weak instrument test proposed by Stock and Yogo (2005) using the value of test statistic that is the F-statistic form of the Cragg-Donald Wald F statistic (cited in Cameron & Trivedi, 2009). In both expenditure and income models, the values of Cragg-Donald Wald F statistic are 28.615, which greatly exceeds the reported critical value of 9.53, so we can say that our instruments are not weak and satisfy the relevance requirement. On the other hand, the validity requirement of instruments was checked using a test of overidentifying restriction with both two stage least squares (2SLS) and limited information maximum likelihood (LIML) estimates and the results came out similar. The Hansen J-statistics were not statistically significant in both income and expenditure models and thus confirmed the validity of the instrumental variables. Combined, the above specification tests indicated that the selected instruments are in fact good instruments.

Since the livelihood choice variables in both expenditure and income models were potentially endogenous, an endogeneity test of these variables was conducted. In both models, the results showed that the null hypothesis of exogenous regressors was rejected at the conventional level (5 percent), confirming that livelihood choice variables are endogenous. This result, therefore, indicated that the IV model is preferred to the OLS model.

RESULTS AND DISCUSSION

Description of household livelihood strategies

Table 1 presents the four types of labour income-based strategies (strategies A-D) that households pursued before and after farmland acquisition that were classified via cluster analysis. Cluster analysis also identified 21 households that pursued a non-labour income-based strategy (strategy E) after the farmland acquisition, as compared to 10 households followed this strategy before the farmland acquisition. As shown in Table 1, the number of households that followed a farm work-based strategy approximately halved. Concurrently, the number of households who pursue nonfarm-based livelihood strategies (A-C) considerably increased. A comparative look at two groups of households reveals that there is a more profound transition from the farm work-based strategy to the nonfarm work-based strategies among land-losing households than that among non-land-losing households. This suggests that the loss of farmland may have a considerable effect on the choice of household livelihood strategy.

Table 1: Households' past and current livelihood strategies

Livelihood Strategy	Changes in livelihood strategies of households					
	Whole sample		Land-losing households		Non-land-losing households	
	Past	Current	Past	Current	Past	Current
Informal wage work	99	125	46	77	53	48
Formal wage work	84	100	26	42	58	58
Nonfarmself-employment or nonfarm household business	73	128	27	62	46	67
Farm work	211	103	131	41	80	62
Non-labour income	10	21	7	15	3	6
Total	477	477	237	237	240	240

Note: 10 households that depend largely or totally on non-labour income were excluded from cluster analysis of the past livelihood strategy because they had very little or no time allocation to labour activities.

Table 2 describes how much different income sources contributed to total household income for all households as well as for each livelihood group. The results indicate that for the whole sample, farming activities remained the largest contribution to total household income, accounting for around 28 percent of total income. It is followed first by nonfarm self-employment (about 26 percent), and then by informal wage work (around 23 percent). Income from formal wage work accounted for approximately 17 percent of total income and non-labour income constituted of around six percent of total income.

Table 2: Mean and composition of household income and consumption expenditure, by livelihood strategy

Variables	Livelihood strategies					
	Whole sample	Informal wage work	Formal wage work	Nonfarm Self-employment	Farm work	Non-labour income
Total annual household income	60,642	49,245	84,179	66,254	51,357	28,414
SD	33,034	17,088	37,934	36,783	23,509	18,542
Monthly per capita income	1,126	885	1,395	1,310	916	1,210
SD	591	345	681	676	400	606
Percentage household income by source						
Farm work	27.69	17.28	11.77	13.67	77.68	7.55
SD	30.37	15.10	13.43	14.31	18.80	12.28
Informal wage work	23.20	74.78	2.95	3.83	6.98	18.21
SD	33.18	16.40	8.40	10.78	13.21	18.84
Formal wage work	16.95	0.83	75.47	2.71	4.50	1.24
SD	31.02	5.66	16.29	9.28	11.33	5.57
Nonfarm self-employment	25.74	3.72	3.61	76.34	9.15	2.55
SD	34.70	8.57	8.91	16.10	15.20	7.92
Non-labour income	6.41	3.40	6.20	3.44	1.70	70.45
SD	16.25	8.13	11.90	7.56	5.66	18.46
Total annual household expenditure	50,530	45,797	64,760	51,972	47,081	20,155
SD	22,097	16,156	21,597	23,427	19,417	10,488
Monthly per capita expenditure	938	823	1,073	1,028	840	858
SD	290	230	296	311	230	253
Monthly per capita food expenditure	484	443	541	523	431	470
SD	152	117	155	182	104	175
Monthly per capita non-food expenditure ^a	454	380	532	505	409	388
SD	187	151	208	181	167	140
Number of poor households	14	2	0	5	4	3
Number of households	477	125	100	128	103	21

Mean and SD (standard deviation) are adjusted for sampling weights.

Income, expenditure and their components in 1,000 Vietnam Dong (VND) (1 USD equated about to 18,000 VND in 2009). ^aThis includes daily and yearly non-food expenditure, health, education, electricity, water and housing expenditure.

The main features of household livelihood strategies according to their livelihood assets are presented in Table 3. Households pursuing livelihood A mainly derived income from manual labour jobs. The common kinds of such jobs were carpenters, painters, construction workers and other kinds of casual jobs. Such jobs typically offered low and unstable income, without formal labour contracts. Those who undertook these jobs had below-average education and were younger than those in livelihood D. The average farmland per adult in this livelihood group was quite small compared to that in all other livelihood groups. Moreover, households that followed this livelihood strategy also hold a smaller value of productive

assets than those in other livelihoods. Finally, the per capita income and expenditure in this livelihood group were much lower than those in nonfarm-based livelihood groups.

Livelihood B consisted of households who on average derived around 75 percent of their income from formal wage work. Formal wage earners were often employees who work in enterprises and factories, state offices or other organisations. Such jobs often offered high and stable income, with formal labour contracts. Working household members in this livelihood group had a much higher than average education level and were younger than those in all other livelihood groups. Households in this livelihood group also owned the second largest farmland per adult but income from farm work accounted for only around 12 percent of total income. Households adopting this strategy received the highest income, and had the highest expenditure per capita.

Regarding households in livelihood C, although about 40 percent of the household sample reported engaging in nonfarm household businesses, 29 percent of them depended on these activities as their main livelihood. Such businesses included small-scale trade or production units, using family labour with an average size of 1.7 jobs. Households' business premises were mainly located at their homes or residential land plots, where had a prime location for opening shop, a workshop or a small restaurant. Working household members in this livelihood group were somewhat older than those in group A and B, and attained the second highest level of education. Finally, those in this group had the second highest income and expenditure per capita, just after those in livelihood B.

Interestingly, while 83 percent of surveyed households maintained farm work, only about 21 percent among them pursued this work as the main livelihood strategy. Many households continued rice cultivation as a source of food supply while others produced vegetables and fruits to supply Hanoi's urban markets. The common types of crop plants consisted of cabbages, tomatoes, water morning glory and various kinds of beans, oranges, grapefruits and guavas, etc. Animal husbandry was mainly undertaken by pig or poultry breeding small-size farms or cow grazing households. These activities, however, have significantly declined due to the spread of cattle diseases in recent years. Households following livelihood D were endowed with higher than average farmland per adult but their working members were less well educated and older than those in other labour income-based livelihoods. Finally, these households had a quite low level of income and expenditure, just slightly higher than those in livelihood A.

Table 3: Summary statistics of household characteristics, livelihood assets and past livelihood choice, by livelihood strategy

Variables	Current Livelihood Strategies									
	The whole sample		Informal wage work		Formal wage work		Nonfarm self-employment		Farm work	
	M	SD	M	SD	M	SD	M	SD	M	SD
<i>Farmland loss</i>										
Land loss 2009	10.27	24.50	12.28	27.00	8.44	21.97	8.80	22.11	6.54	18.96
Land loss 2008	10.50	24.00	16.53	29.06	7.20	18.91	10.22	23.60	5.38	16.40
<i>Human capital</i>										
Household size	4.49	1.61	4.64	1.60	5.03	1.28	4.21	1.40	4.67	1.80
Dependency ratio	0.61	0.67	0.58	0.56	0.63	0.79	0.60	0.64	0.60	0.72
Number of male working members	1.25	0.69	1.38	0.71	1.50	0.77	1.10	0.52	1.24	0.66
Gender of household head	0.77	0.48	0.75	0.43	0.76	0.43	0.77	0.42	0.90	0.30
Age of household head	51.21	13.24	51.54	13.24	52.94	12.56	47.44	10.65	51.45	11.36
Age of working members	40.46	8.25	39.21	6.25	37.25	5.82	40.70	7.50	42.97	8.80
Education of working members	8.37	2.90	7.70	2.17	11.05	2.24	8.07	2.84	6.98	2.36
<i>Natural capital</i>										
Farmland per adult	3.37	2.70	2.48	1.80	3.16	2.71	3.01	2.10	5.11	3.30
Residential land size	21.88	14.62	20.88	13.64	26.18	18.27	19.53	13.65	22.32	12.88
House location	0.32	0.47	0.15	0.36	0.19	0.39	0.63	0.48	0.25	0.43
<i>Physical capital</i>	8.63	1.17	8.04	1.26	8.84	0.80	9.06	1.07	8.80	1.00
<i>Social capital</i>	3.43	2.09	2.95	1.75	5.43	2.43	2.88	1.73	3.04	1.42
<i>Financial capital</i>										
Formal credit	0.27	0.44	0.28	0.45	0.15	0.36	0.36	0.48	0.25	0.44
Informal credit	0.19	0.39	0.19	0.39	0.15	0.36	0.18	0.38	0.24	0.43
<i>Past livelihood choice</i>										
Informal wage work	0.22	0.42	0.64	0.48	0.13	0.34	0.06	0.24	0.06	0.25
Formal wage work	0.18	0.38	0.03	0.18	0.73	0.44	0.01	0.10	0.07	0.25
Nonfarm self-employment	0.19	0.39	0.01	0.10	0.01	0.10	0.61	0.49	0.005	0.07
Total	477		125		100		128		103	

Note: Means (M) and standard deviations (SD) are adjusted for sampling weights

The averages for dummy variables in all strategies as well as the whole sample serve as percentages; for example in livelihood A, a mean of 0.75 for the variable “Gender of household head” means that 75 percent of the households in this category are male headed and only 25 percent are female headed.

Livelihood E was a small group of households that were dependent mainly or entirely on non-labour income for their living. These households had a very small size and high

dependency ratio, consisting mainly of very old members with a very low education level. The per capita income and expenditure in this group were quite high. Most of them were land-losing elderly farmers, living separately from their children with income derived mainly from remittances and interest earnings. Even though the number of households in this livelihood group almost doubled after farmland acquisition, it accounted for just around four percent of the total sample. These households were excluded from the econometric analysis because of their small number. Such exclusion, nevertheless, is a limitation since changes in this group may reveal some important policy recommendations. Hence some discussion on this issue will be made in the conclusion section.

Determinants of livelihood strategies

Table 4 reports the estimation results from the Multinomial Logit Model. The results show that many explanatory variables are statistically significant at the 10 percent or lower level.

Farmland loss

Farmland loss in both years was hypothesised to positively affect the likelihood of households following strategies based on wage employment or nonfarm self-employment. However, only the farmland loss in 2008 is positively associated with the choice of the nonfarm-based strategies. Households who lost their farmland in 2008 may have had more time to respond to the shock of losing land than those with farmland loss in 2009 and therefore they had a higher chance of taking up an alternative livelihood based on nonfarm activities. As mentioned in Nkonya et al. (2004), changes in livelihood strategies usually require time and investment, such as time for learning new skills and attempts at developing market connections.

The results reveal some typical patterns of livelihood choices under the impact of farmland loss. A first pattern shows that households with more farmland loss in 2008 are much more likely to pursue a strategy based on manual labour jobs. Under the impact of farmland loss, the most common livelihood choice is informal wage work. This is in line with the previous finding in a case study of Hanoi's peri-urban village by Do (2006), who found that the majority of land-losing households engaged in informal wage work soon after losing land. On the one hand, this is indicative of high availability of informal wage work in Hanoi's urban and peri-urban areas. On the other hand, for a number of land-losing households, the easy switch-over from farming to informal wage work reflects a very low entry barrier to the paid jobs in the informal sector. According to Cling et al. (2010), the informal sector in Hanoi

offers the main job opportunity for most unskilled workers. Such job opportunities are also often found in Hanoi's rural and peri-urban areas (Cling, Razafindrakoto, & Roubaud, 2011).

Table 4: Multinomial Logit estimation with relative risk ratio for households' livelihood strategy choices

Explanatory variables	Informal wage work vs farm work		Formal wage work vs farm work		Nonfarm farm self- employment vs farm work	
	Coef	SE	Coef	SE	Coef	SE
<i>Farmland loss</i>						
Land loss 2009	6.98	(11.142)	4.12	(6.266)	3.49	(4.935)
Land loss 2008	147.58***	(203.876)	19.55**	(27.415)	16.16**	(21.981)
<i>Human capital</i>						
Household size	0.69**	(0.101)	0.77	(0.124)	0.73*	(0.128)
Dependency ratio	1.05	(0.348)	0.89	(0.420)	1.25	(0.421)
Number of male workingmembers	2.20**	(0.787)	1.74	(0.725)	0.85	(0.296)
Household head's gender	0.53	(0.407)	0.36	(0.301)	0.34	(0.224)
Household head's age	1.02	(0.026)	1.03	(0.028)	0.99	(0.025)
Age of working members	0.91**	(0.035)	0.93**	(0.034)	0.97	(0.035)
Education of working members	0.97	(0.100)	1.36***	(0.139)	1.12	(0.113)
<i>Natural capital</i>						
Owned farmsize per adult	0.79*	(0.099)	0.78**	(0.081)	0.74**	(0.115)
Residential land size	1.00	(0.014)	1.03	(0.019)	1.01	(0.018)
Location of house	0.28**	(0.167)	0.97	(0.556)	2.92**	(1.454)
<i>Past livelihood strategies</i>						
Informal wage work	32.42***	(27.440)	18.71***	(16.668)	1.67	(1.297)
Formal wage work	1.55	(1.709)	53.58***	(45.382)	0.44	(0.464)
Nonfarm self-employment	9.55*	(12.254)	15.85**	(22.178)	360.38***	(329.755)
<i>Commune dummy (included)</i>						
Intercept	131.54**	(311.206)	0.54	(1.412)	21.13	(47.160)
Wald chi2				355.93		
Prob> chi2				0.0000		
Pseudo R2				0.5695		
Observations				451		

Note: *, **, *** mean statistically significant at ten percent, five percent and one percent, respectively. Estimates are adjusted for sampling weights and robust standard errors (SE) in parentheses.

A second pattern of activity choice is an income-earning strategy that is dependent on self-employment in nonfarm activities. The probability of pursuing this strategy increases with the farmland loss level in 2008. Unlike informal wage work, nonfarm self-employment may require more capital, managerial skills and other conditions. Consequently, for land-losing households, their probability of choosing this strategy is lower as compared to that of pursuing the informal wage work-based strategy, with the corresponding relative risk ratios

being 1.32 and 1.65, given a 10 percentage point-increase in land loss 2008. Hence, this may imply that land-losing households face a relatively high entry for this strategy.

With respect to the third pattern of livelihood choice, households with more farmland loss in 2008 are more likely to undertake a strategy based on formal wage work. However, the probability of adopting this strategy is less than that of pursuing the informal wage work-based strategy. This phenomenon may stem from some main reasons. First, the farmland has been largely converted for the projects of construction of highways, urban areas and housing development rather than industrial zones and factories, which may generate few jobs for local people. Secondly, it normally takes investors a few years or longer to complete the construction of an industrial zone, a factory or an office. Hence, local people may only be recruited after the completion of construction, which suggests that the impacts of farmland acquisition on local labour may be insignificant in the short-term but more significant in the long-term.

In general, the result indicates that the more farmland per adult a household owns the less likely it is to engage in wage work or nonfarm self-employment as its livelihood strategy. This result is in accordance with the previous findings in rural Vietnam by Van de Walle and Cratty (2004), in some Asian countries by Winters et al. (2009). While the size of residential land is not related to activity choice; the prime location of a house or a plot of residential land is positively associated with the probability of a household pursuing the nonfarm self-employment-based strategy. Households who own a house (or a plot of residential land) with a prime location are more likely to take up household businesses such as opening a shop or a workshop. This implies that many households have actively seized emerging market opportunities in a rapidly urbanising area. Such a similar trend was also observed in a peri-urban village of Hanoi by Nguyen (2009b) and in some urbanising communes in Hung Yen, a neighbouring province of Hanoi by Nguyen et al. (2011) where houses or residential land plots with a prime location were used as business premises for opening shops, restaurants, bars, coffee shops or for rent.

Regarding the role of human capital in activity choice, the result reveals that, all else being equal, households with older working members are less likely to undertake paid jobs as the main income-generating strategy, which implies that there are some potential barriers had prevented elderly farmers from taking up these jobs. Better education of working members increases the probability of households pursuing a strategy based on formal wage work,

meaning that households with low education levels will be hindered from adopting this strategy. Nonetheless, human capital is found not to be related to nonfarm self-employment and informal wage work, suggesting that in terms of formal education, there has been relative ease of entry into these activities.

Determinants of livelihood outcomes

Table 5: Determinants of household livelihood outcomes

(Livelihood outcomes: monthly income and consumption expenditure per capita in natural logarithms)

Explanatory variables	Income (IV regression)		Expenditure (IV regression)	
	Coef	SE	Coef	SE
<i>Livelihood strategy</i>				
Informal wage work	0.2011*	(0.120)	0.2925***	(0.094)
Formal wage work	0.4526***	(0.126)	0.3983***	(0.094)
Nonfarm self-employment	0.2899**	(0.113)	0.3283***	(0.075)
<i>Farmland acquisition</i>				
Land loss 2009	0.1397	(0.085)	0.1842***	(0.070)
Land loss 2008	0.0560	(0.091)	0.0011	(0.057)
<i>Human capital</i>				
Household size	-0.1452***	(0.015)	-0.0508***	(0.012)
Dependency ratio	-0.0802**	(0.034)	-0.0989***	(0.029)
Number of male working members	0.0630**	(0.030)	0.0095	(0.026)
Household head's gender	0.0199	(0.049)	0.0604*	(0.034)
Household head's age	0.0010	(0.002)	0.0012	(0.001)
Education of working members	0.0338***	(0.011)	0.0140*	(0.008)
<i>Natural capital</i>				
Owned farmland size per adult	0.0368***	(0.010)	0.0278***	(0.007)
Size of residential land	0.0004	(0.001)	0.0011	(0.001)
<i>Physical capital</i>				
Values of productive assets per working members in Ln	0.1123***	(0.020)	0.0982***	(0.015)
<i>Social capital</i>				
Number of group memberships	0.0149	(0.012)	0.0124	(0.009)
<i>Financial capital</i>				
Formal credit	0.1043**	(0.048)	0.0625**	(0.031)
Informal credit	-0.0541	(0.047)	0.0245	(0.030)
<i>Commune dummies (included)</i>				
Intercept	5.6921***	(0.237)	5.4576***	(0.174)
Centered R2	0.528		0.456	
Uncentered R2	0.997		0.999	
Observations	451		451	

Note: Coefficients and standard errors (SE) are adjusted for sampling weights.

*, **, *** mean statistically significant at ten percent, five percent and one percent, respectively.

Livelihood strategy

Table 5 reports the estimation results from the IV regression of the expenditure and income models using 2SLS estimation. Both sets of results confirm that household wellbeing is greatly affected by the choice of livelihood strategy. In general, households that follow nonfarm-based livelihoods have higher wellbeing than those pursuing a farm work-based strategy. More specifically, households with ‘formal wage work’ achieve the highest income level, followed first by ‘nonfarm self-employment’ and then by ‘informal wage work’, and lastly by ‘farm work’. In addition, this ranking is also similar to the choice of expenditure per capita as an indicator of household welfare. Such wellbeing disparities across various livelihood strategies imply that the livelihood choice is a crucial factor affecting household livelihood outcomes. Also, it suggests that moving out of agriculture may be a way to improve household welfare. The result is partly consistent with previous findings in rural Vietnam. For instance, Van de Walle and Cratty (2004) found that households who farm only are poorer than all those who combine farming with some type of nonfarm employment. Moreover, as estimated in Pham, Bui, and Dao (2010), on average and *ceteris paribus*, the shift of a household from pure agriculture to pure non-agriculture raises expenditure per capita, and this outcome tends to steadily increase over time.

Farmland loss

Farmland loss in 2009 is positively associated with expenditure. Nevertheless, a similar impact is not statistically significant for the case of farmland loss in 2008. This may be because households with land loss in 2009 partly used their compensation money for household expenses while those with land loss in 2008 might have used up their compensation money in 2008. As shown by the survey, 61 percent of land-losing households reported using part of their compensation money for daily expenses. For some households, the compensation money for farmland loss might be used to deal with the shock of farmland loss while other households might use this for additional expenditure to improve their wellbeing.

A surprising result was that farmland loss in both years has no impact on income. Possibly, this implies that only a small amount of income that was contributed by agricultural production was lost due to the area of acquired farmland.⁶ However, it should be noted that there is also an indirectly positive effect of farmland loss on household welfare (through its

⁶ According to the survey data, on average, annual crop income per one sào (360 m²) was estimated at around 3.7 million Vietnam Dong (VND) and 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.

positive effect on the choice of nonfarm-based strategies). As previously discussed, higher levels of land loss in 2008 increase the likelihood of households adopting nonfarm-based strategies, which are much more lucrative than a farm work-based strategy. Although households with land loss in 2009 had not changed their livelihood strategies, their household members have moved out of farming to do some nonfarm jobs in order to supplement their income with nonfarm income (Tuyen & Huong, 2013). As a consequence, households might derive more income from nonfarm jobs, which might offset or even exceed the amount of farm income lost by farmland loss.⁷ This explanation is also supported by the survey results findings obtained by Le (2007), who found that after losing land, households' income from agriculture significantly declined but their income from various nonfarm sources considerably increased. In addition, Nguyen et al. (2013) found that households with higher levels of land loss have higher rates of job change and their income from new jobs is much higher as compared to that before losing land and that of those with lower levels of land loss.

Livelihood assets

More owned farmland is linked with higher household wellbeing. However, farmland has an indirectly negative (via its negative impact on the choice of nonfarm-based strategies) impact on household welfare. The education of working members has a positive effect on household wellbeing. There is also an indirectly positive effect through the livelihood strategy because a higher education level increases the probability of a household following a formal wage work-based strategy, which is closely linked with a higher income and expenditure level. There was statistical evidence for a positive association between access to formal credit and income and expenditure per capita. Similar evidence was not found in the case of informal credit. This phenomenon may be partly explained by the fact that the purpose of informal loans was mainly for non-production rather than production, which might generate little or no economic return.⁸ This explanation is partly in accordance with that of Pham and Izumida (2002) who

⁷ 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 of agricultural land.

⁸ According to the survey, 46 percent of households said that one of the purposes of borrowing informal loans was for consumption; around 30 percent reported that one of the informal loan's purposes was for building or repairing houses and about 42 percent answered that one of the informal loan's purposes was for production. Conversely, about 55 percent of surveyed households reported that one of their formal loans' purposes was for production, and only around 10 percent and 8 percent among them said that one of the purposes of borrowing formal loans was for consumption and building or repairing their houses, respectively.

found that in rural Vietnam, one of the purposes of borrowing informal loans was for consumption (mainly for smoothing consumption at critical times). Finally, the "*capital-labour ratio*" was positively associated with household wellbeing. The elasticity of per capita income and expenditure to higher values of "*capital-labour ratio*" was around 0.11 and 0.10, respectively.

CONCLUSION AND POLICY IMPLICATIONS

Given the loss of agricultural land due to urbanization and industrialization in Hanoi's peri-urban areas, a number of land-losing households have actively adapted to the new context by pursuing nonfarm-based livelihood strategies as ways to mitigate their dependence on farmland. Among choices of activities, informal wage work appears to be the most popular livelihood choice. The availability of job opportunities in the informal sector not only helps farm households mitigate negative consequences of land loss but also open a new chance for them to change and diversify their livelihoods. However, as previously discussed, farmland loss in 2009 is not associated with any choice of nonfarm-based livelihood strategies. Possibly, one year was not time enough for a number of land-losing households to switch to alternative livelihoods. Consequently, the short-term effect of farmland acquisition may be detrimental to land-losing households, especially to those whose main income was derived from farming.

However, this study found no econometric evidence for negative effects of farmland loss on either expenditure or income per capita. For many land-losing households whose living based on farm work, their compensation money was used to cover daily household expenses, suggesting this financial resource enabled them to temporarily smooth consumption when facing income shortfalls caused by the loss of farmland. In addition, higher levels of farmland loss are closely associated with more participation in nonfarm activities. Some land-losing households might be 'pushed' into casual wage work or nonfarm self-employment in response to income shortfalls. For other land-losing households, they might be 'pulled' into nonfarm activities because of attractive income sources from these activities. Thus, an implication here is that having no farmland or farmland shortage should not be seen as an absolutely negative factor because it can improve household welfare by motivating households to participate in nonfarm activities.

As previously discussed, changes in livelihood choice towards nonfarm activities may be a way to raise rural household welfare. Nevertheless, changes in livelihood strategies are determined by asset-related variables and other exogenous conditions. In particular, land (farmland and the location of houses or residential land plots), and education are crucial

factors that are closely associated with more participation in nonfarm activities. As a result, state intervention in these factors can improve household wellbeing through providing favourable conditions for livelihood transition and diversification. There are some policies that may help land-losing households to intensively engage in nonfarm activities. For instance, government policy can support the household livelihood transition by providing land-losing households with a plot of land in a prime location for doing businesses. Encouraging parents' investment in their children's education is likely to give the next generation a better chance to get remunerative jobs. A better transportation and road system will result in a closer connection between land-losing communes and urban centres, which in turn generates more opportunities in nonfarm activities for local people.

Although the current number of households whose living based on non-labour income sources accounted for a small proportion, this figure is projected to rapidly rise as a result of the massive agricultural conversion for urban expansion in the near future. This suggests that a large number of land-losing households will be forced to find alternative sources of livelihoods. This, however, is not an easy task for elderly farmers. Fortunately, as previously mentioned, households who lose more than 30 percent of their farmland will be compensated with a non-agricultural land parcel (*đất dịch vụ*) that can be used as a premise for household businesses such as opening a shop, a workshop, or for rental accommodation. Accordingly, *đất dịch vụ* is a new source of livelihoods for land-losing households, particularly elderly family members, to switch from agricultural production to lucrative nonfarm activities in Hanoi's peri-urban areas. In this sense, *đất dịch vụ* also plays a role as insurance for unemployed farmers and old-age landless farmers. However, this policy has been slowly implemented in the study district (Ha Noi moi, 2010). Therefore, speeding up the implementation of this policy is likely to be one of the prerequisites to facilitate the livelihood transitions of land-losing households in Hanoi's peri-urban areas. Such a compensation policy has been piloted in Vinh Phuc Province since 2004 where land loss households utilised *đất dịch vụ* to open a shop or provide accommodation leases for workers in industrial zones (the Asian Development Bank (ADB), 2007). As noted by ADB (2007), this initially successful experience, therefore, should be worth considering by other localities. The above discussion implies that the rising conversion of farmland for urbanization and industrialization, coupled with the compensation with land as mentioned above, can be seen as a positive factor that enables land-losing households to change their livelihoods and improve their welfare.

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