Does Urbanization Help Poverty Reduction in Rural Areas?Evidence from a Developing Country

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Abstract

Urbanization and poverty have a two-way relationship. Using fixed-effects regression and panel data from household surveys, we estimate the effect of urbanization on income and consumption expenditure of rural households in Vietnam. Then we propose a simple estimate method to estimate the effect of urbanization on rural poverty. It is found that a one percent increase in urbanization leads to a 0.54 percent increase in per capita income and a 0.39 percent increase in per capita expenditure of rural households. In addition, a one percentage point increase in urbanization helps rural households decrease the poverty rate by 0.17 percentage point. However, we find an effect of urbanization on consumption of unhealthy goods: urbanization increases household expenditures on tobacco and wine.

Keywords: urbanization, household welfare, poverty, impact evaluation, household surveys, Vietnam, Asia.

JEL Classification: O18, I30, R11.

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1. Introduction

Urbanization is a key feature of economic development. Geographical agglomeration of people as well as firms leads to lower production costs and higher productivity (Krugman, 1991; Fujita et al., 1999; Quigley, 2008). Urbanization is not only a result but also a cause of economic development (Gallup et al., 1999). Together with the economic development, the proportion of urban population in the world increased from 30 percent in 1950 to around 50 percent in 2010 (United Nations, 2007). In many developed countries, around 80 percent of the population are living in urban areas. Urbanization is lower, but has been experienced a high growth rate in developing countries.[2]

Although there are a large literature on the relationship between urbanization and growth, there is little known about the effect of urbanization on rural poverty. Since urbanization can affect growth, it can also affect poverty. Overall, urban areas tend to have lower poverty, and as a result poverty tends to decrease as the urban population share increases (Ravallion et al., 2007). There are several channels through which urbanization can affect poverty of rural areas (Ravallion et al., 2007; Cali and Menon, 2009; Martinez-Vazquez et al., 2009). Firstly, there is a positive relationship between urbanization and economic growth (e.g., Fay and Opal, 2000; Bertinelli and Black, 2004). Economic growth is a prerequisite for poverty reduction (Demery and Squire, 1995; Ravallion and Chen, 1997; Dollar and Kraay, 2000). Urban development can have a positive effect on rural development through backward linkages (Cali and Menon, 2009). Urban economic growth can create more demands for commodities from rural areas, especially agricultural and labor-intensive commodities.

Secondly, urbanization often involves migration from rural to urban areas. Migration is expected to increase income of migrants as well as households sending migrants (Stark and Taylor, 1991; Stark, 1991). Migration can have numerous impacts on rural households. The most direct impact of migration is increased income, mainly through remittances (McKenzie and Sasin, 2007). Positive impacts of remittances on household welfare and poverty reduction are found in a large number of studies (e.g., Adams, 2004, 2006; Adams and Page, 2005; Acosta et al., 2007).

Thirdly, urbanization can increase wages of rural workers. Firms are agglomerated in cities and they attract not only workers inside the cities but also rural workers close to the cities. In addition, migration that is derived from wage differentials between urban and rural areas can reduce the rural labor supply, thereby increasing the rural wages. Households who are close to cities are more likely to have more non-farm employment activities (Berdegue et al., 2001; Fafchamps and Shilpi, 2005; Deichmann et al., 2008).

Finally, there can be spill-over effects or positive externalities of urban development on rural areas (Bairoch, 1988; Williamson, 1990; Allen, 2009). Through migration as well as other

[2] There are economic theories and empirical studies supporting an inverted U-shape relationship in which urbanization first increases to a peak, then decrease with economic development (see Henderson, 2003 for review).

interactive activities between urban and rural areas, urbanization can have positive effects on human capital such as transfers of information and advanced knowledge about production skills and technology (McKenzie and Sasin, 2007). Urbanization can lead to an increase in land prices in rural areas nearby cities. Higher land prices can help increase income of rural households through sale, lease or access to credit using land as collateral (Cali and Menon, 2009).

However, urbanization does not necessarily lead to rural poverty reduction. Urbanization is not always correlated with economic growth (Fay and Opal, 2000). Both economic theories and empirical studies argue that there is an inverted U-shape relationship in which urbanization first increases to a peak, then decrease with economic development (see Henderson, 2003). Thus in the second stage of development, urbanization can be negatively correlated with economic growth. Backward linkage effects as well as spill-over effects of urbanization on rural development can be negligible if the linkages between urban and rural economies are weak. Migration and remittances are not a panacea for poverty reduction. There are several empirical studies which do not find poverty reduction effects of migration (e.g., Yang, 2004; Azam and Gubert, 2006; Nguyen et al., 2010). Urbanization can lead to more landless or near landless households (Ravallion and van de Walle, 2008). Thus the effect of urbanization on rural poverty is unknown a priori.

Empirical questions on the effect of urbanization on rural poverty are of particular importance for developing countries where there is an increasing urbanization process but rural population still account for a large proportion. Yet, there are only a few empirical studies on the effect of urbanization on poverty reduction. In addition, there is no consistent evidence on the effect of urbanization on poverty reduction. Ravallion et al. (2007) find that urbanization helps poverty reduction, but the effect varies across regions. In Africa, urbanization is not associated with poverty reduction. Also using cross-country data Panudulkitti (2007) and Martinez-Vazquez et al. (2009) find a U-shape relation between the urbanization level and poverty indexes. It implies that poverty can be positively associated with urbanization for several countries. There is even less empirical evidence on urbanization and rural poverty at the country level. Probably, there has been only Cali and Menon (2009) examining the effect of urbanization on rural poverty in India. Cali and Menon (2009) find that urbanization helps surrounding rural areas reduce poverty strongly.

In this study, we examine the effect of urbanization on welfare and poverty of rural households in Vietnam. For several reasons, Vietnam is an interesting case to look at. Firstly, Vietnam has achieved high economic growth and remarkable poverty reduction during the past two decades. The poverty rate dropped dramatically from 58 percent in 1993 to 37 percent in 1998, and continued to decrease to 20 and 15 percent in 2004 and 2008, respectively.[3] Secondly, Vietnam remains a rural country with 70 percent of the population living in rural areas. The urbanization level is very similar to other developing countries (United Nations, 2007). Poverty is now a rural phenomenon in Vietnam, since around 97 percent of the poor live in rural areas. However, the urbanization process has been increasing remarkably during the past decade. The urban population share increased from around 24 percent in 2001 to 30 percent in 2009. It is not clear whether the urbanization process can contribute to the rural poverty reduction in Vietnam.

[3] According to Vietnam Household Living Standard Surveys in 1993, 1998, 2004 and 2008.

Using panel data from Vietnam Household Living Standard Surveys in 2006 and 2008, we will show that urbanization helps rural households increase their income and expenditure. We propose a simple method to measure the marginal effect of urbanization on the poverty rate, and we find that urbanization leads to a decrease in the poverty rate in Vietnam. Although the empirical analysis deals with Vietnam, we expect our results to be important for a wider group of emerging and developing economies where there are high urbanization rates but also high rural poverty rates.

This paper is structured into six sections. The second section presents the data sets used in this study. The third section overviews the urbanization process and rural poverty in Vietnam. Next, the fourth and fifth sections present the estimation method and the estimation results of the effect of urbanization on rural welfare and poverty, respectively. Finally, several conclusions are drawn in the sixth section.

2. Data set

This study relies on data from Vietnam Household Living Standard Surveys (VHLSS) in 2006 and 2008. The VHLSSs were conducted by the General Statistics Office of Vietnam (GSO) in 2006 and 2008. The surveys contain household and commune data. Data on households include basic demography, employment and labor force participation, education, health, income, expenditure, housing, fixed assets and durable goods, participation of households in poverty alleviation programs. Commune data include demography and general situation of communes, general economic conditions and aid programs, non-farm employment, agriculture production, local infrastructure and transportation, education, health, and social affairs. Commune data can be merged with household data. However, commune data are collected only for the rural areas. There are no data on urban communes.

Each of the VHLSSs covers 9,189 households. Information on commune characteristics is collected from 2,181 rural communes. The data are representative for urban/rural and eight geographic regions. It is helpful that the two surveys set up a panel data set of 4,090 households. In this study, we focus on the impact of urbanization on welfare of rural households. The number of rural households in the panel data is 3,082 (living in rural areas in the both surveys).

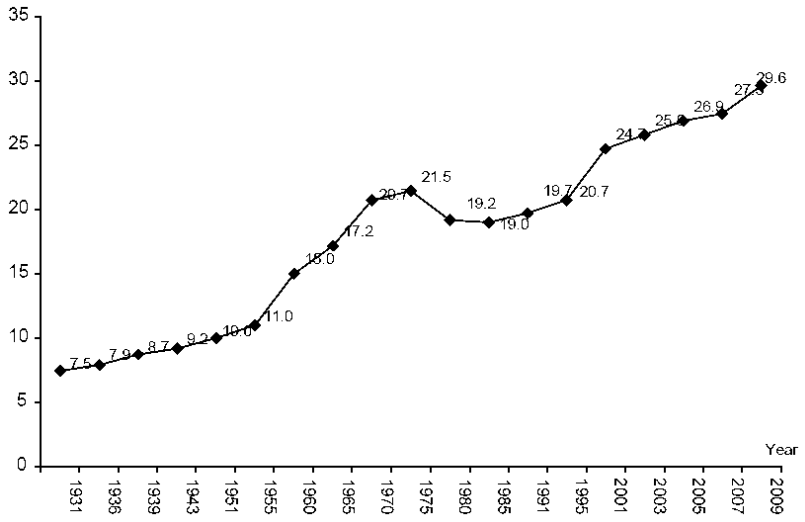
3. Urbanization and poverty reduction in Vietnam

Topographically, Vietnam is a very diverse country, with 8 well-defined agroecological zones. These regions range from the remote and poorly endowed zones of the Northern Mountains area bordering China and the North and South Central Coast regions, through the Central Highlands, to the fertile, irrigated regions of the Red River Delta in the North and the Mekong Delta in the

South. Currently, Vietnam is divided into 63 provinces. Each province is divided into districts and each district is further divided into communes. Communes are smallest administrative divisions Vietnam. In 2009, there are 684 districts and 11,112 communes (according to the Population Census 2009). Communes are classified into three types: rural communes, commune-level towns, the wards from urban districts. Urban areas consist of commune-level towns and wards. Basically, an urban area is classified as urban if it has a minimum population of 4,000 people and a minimum population density of 2000 people/km^2. The proportion of non-farm workers is required to be at least 65 percent (see Government of Vietnam, 2009). Currently, around 30 percent of people are living in 753 urban areas (commune-level towns and wards) throughout the country (GSO, 2011).

In Vietnam, the urbanization process has been occurring since the early 1900s (Figure 1). The urbanization process has been increasing remarkably since the year 2000. According to the definition of urban areas in Vietnam, there are two possible causes of urbanization in Vietnam. Firstly, rural-urban migration can increase the urban population. Around 16% of the urban population are migrants who moved from the rural to urban areas during 2004 and 2009 (GSO, 2011). Secondly, a rural area can become an urban area if it has higher population and more non-farm economic activities. During 2000-2009, the number of urban areas increased from 649 to 753 (GSO, 2011).

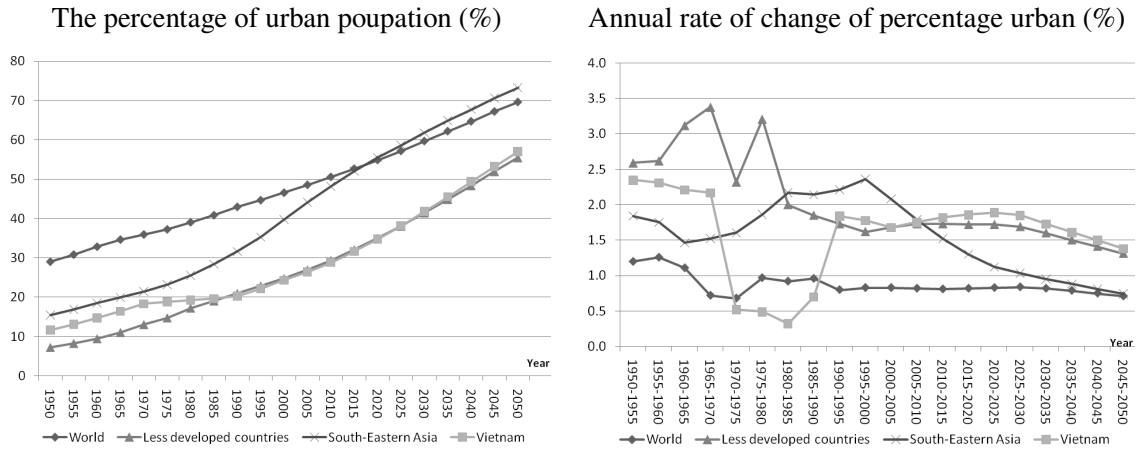
Figure 1. The percentage of urban population during 1931–2009



Source: GSO (2011)

The proportion of urban population of Vietnam is similar to that of other developing countries (Figure 2). Compared with the average urban share of the world and South-Eastern Asian countries, Vietnam has a much lower rate of urbanization. However, during the recent years, the annual rate of change of percentage urban is higher than the average rate of other developing countries as well as the South-Eastern Asian countries. The higher annual growth rate of the urban proportion of Vietnam is also projected for the future until the year 2050 (United Nations 2007).

Figure 2. Urbanization in Vietnam and other countries during 1950–2050



Source: Preparation using data from United Nations (2007)

There are a large variation in urbanization between regions and provinces in Vietnam (Table 1 and Figure 3). North West and North Central Coast are regions with low urban population. The delta regions tend to have a higher proportion of urban population than the mountains and highlands.

By provinces, the largest cities including Hanoi, Ho Chi Minh City, Hai Phong, Da Nang are located in Red River Delta, South Central Coast and South East regions. The proportion of urban population to total population of provinces ranges from 7 percent to 85 percent. The median of the proportion of urban population at the provincial level is around 16 percent. Two cities that have the proportion of urban population higher than 80 percent are Da Nang city (85 percent) and Ho Chi Minh city (83 percent). There are four provinces have the proportion of urban population less than 10 percent.

There is also a negative correlation between urbanization and poverty rate of rural people.[4] The North West is the poorest region that has the lowest urbanization rate, while the richest region is South East that has the highest urbanization rate.

[4] In this study, a household is classified as the poor if their per capita expenditure is below the expenditure poverty line. The expenditure poverty lines are 2560 and 3358 thousand VND for the years 2006 and 2008, respectively. These poverty lines are constructed by the World Bank and GSO. The poverty lines are equivalent to the expenditure level that allows for nutritional needs, and some essential non-food consumption such as clothing and housing.

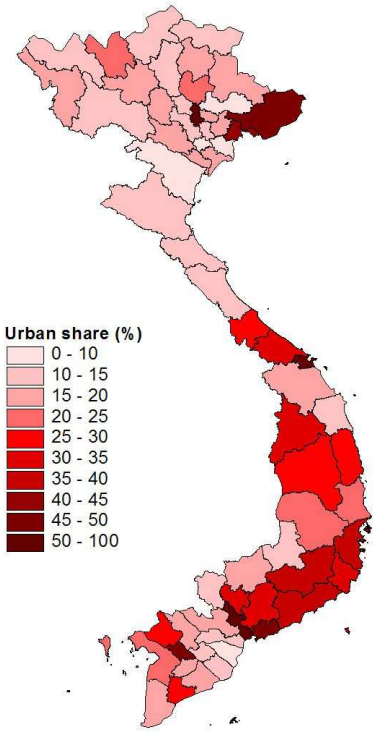
Table 1: Urbanization and rural poverty in 2006-2008

Region	The proportion of urban people (%)		Rural poverty rate (%)	
	2006	2008	2006	2008
Red River Delta	25.0	27.4	11.0	10.4
North East	19.8	20.4	29.9	29.3
North West	14.2	14.6	56.4	52.0
North Central Coast	14.8	15.4	33.1	25.9
South Central Coast	30.8	31.8	17.1	18.2
Central Highlands	27.4	27.6	34.4	31.4
South East	54.1	55.0	9.9	5.7
Mekong River Delta	20.8	21.5	11.8	13.6
Total	27.7	29.0	20.4	18.7
Number of observations			3,082	3,082

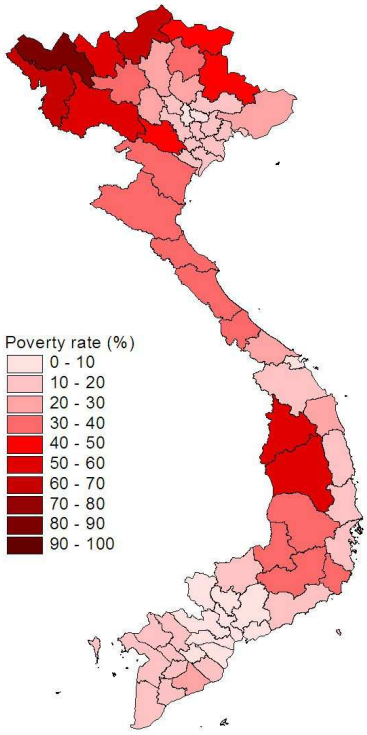
Source: The proportion of urban people is computed using data from Yearly Statistics from GSO. The poverty rate is estimated using VHLSSs 2006 and 2008. In this study, a household is classified as the poor if their per capita expenditure is below the expenditure poverty line. The expenditure poverty lines are 2560 and 3358 thousand VND for the years 2006 and 2008, respectively. These poverty lines are constructed by the World Bank and GSO. The poverty lines are equivalent to the expenditure level that allows for nutritional needs, and some essential non-food consumption such as clothing and housing.

Figure 3. Provincial urbanization and rural poverty in 2006

The proportion of urban people (%)



Poverty rate of rural people (%)



Source: Preparation by author using data on urban population from General Statistics Office of Vietnam (GSO) and poverty rate data from Nguyen et al. (2010).

Tables from 2 to 4 examine the association between rural household welfare and urbanization. The tables present income and expenditure of households living in provinces with the proportion of urban people below and above 16 percent (the median value). Rural households who live in provinces with higher urbanization have higher income and income growth during the period 2006-2008 than rural households in provinces with lower urbanization. The difference in income between these households is largely from the difference in wage. There is a strong and positive correlation between wages and urbanization.

Table 2. Provincial urbanization and income of rural households

	2006		2008	
	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%
Per capita income	6435.1	7395.5	7095.0	9289.6
Per capita income from:				
Wage	1520.6	2088.5	2062.8	3131.3
Income from non-farm	1034.7	1127.3	1558.3	1742.5
Private transfers	706.7	739.5	670.3	916.5
Income from other sources	3173.1	3437.7	2803.8	3499.4
Proportion of households having income from (%):				
Wage	59.6	65.1	60.0	67.3
Income from non-farm	35.5	34.5	34.1	33.2
Private transfers	86.8	92.5	82.3	92.6
Income from other sources	98.5	95.9	85.4	77.5
Number of observations	1,662	1,420	1,428	1,654

Note: The median of the proportion of urban population of provinces is approximately 16%.
Private transfers to households include internal and international remittances and any money sent to households by people outside households.
All income variables are in 'per capita', i.e.. equal to total annual household income divided by the household size. The income variables are in the price of Jan 2006.
Source: Author's estimation from panel data of VHLSSs 2006-2008.

There is a large difference in poverty rate and consumption expenditure between rural households in low urbanization areas and those in high urbanization areas (Table 3). Rural households in low urbanization areas have a much higher poverty rate, lower consumption expenditure, especially the non-food expenditure. However, there is only a small disparity in spending on health and education between these households.

Table 3. Provincial urbanization and consumption expenditure of rural households

	2006		2008	
	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%
Poverty rate (%)	22.4	17.7	24.1	14.1
Per capita aggregate expenditure (thousand VND)	4282.6	5063.5	4805.4	5747.2

	2006		2008	
	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%
Per capita expenditure on (thousand VND):				
Food	2101.8	2372.6	2196.2	2523.0
Education	242.7	237.1	278.8	295.3
Health	262.1	264.4	355.6	371.6
Other non-food items	1676.0	2189.4	1974.8	2557.3
Number of observations	1,662	1,420	1,428	1,654

Note: The median of the proportion of urban population of provinces is approximately 16%.
All expenditure variables are in 'per capita', i.e.. equal to total annual household expenditure divided by the household size. The expenditure variables are in the price of Jan 2006.
A household is classified as the poor if their per capita expenditure is below the expenditure poverty line. The expenditure poverty line is 2560 and 3358 thousand VND for the years 2006 and 2008, respectively.
Source: Author's estimation from panel data of VHLSSs 2006-2008.

Table 4 examines the consumption pattern of non-healthy goods of rural households. The non-healthy items include tobacco, alcohol drinks including wine and beer. More than 80 percent of households spend on tobacco in Vietnam. Vietnam is one of countries with leading smoking rates. Nearly half of men currently smoke (WHO, 2009). Wine and beer are also widely consumed in Vietnam. Rural households in provinces with higher urban population shares spend on tobacco and beer much more than those in provinces with lower urban population shares. The average spending on tobacco is even higher than the average spending on education.

Table 4. Provincial urbanization and consumption of non-healthy goods of rural households

	2006		2008	
	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%	Rural people in provinces with urban share equal and below 16%	Rural people in provinces with urban share above 16%
Proportion of households spending on (%):				
Tobacco and cigarette	84.4	80.3	81.5	83.2
Wine	95.6	92.1	94.5	91.3
Beer	44.3	42.9	47.6	54.7
Per capita expenditure on (thousand VND):				
Tobacco and cigarette	209.4	391.7	204.7	397.1
Wine	155.3	171.0	176.3	180.2
Beer	69.0	147.1	90.1	155.9
Number of observations	1,662	1,420	1,428	1,654

Note: The median of the proportion of urban population of provinces is approximately 16%.
All expenditure variables are in 'per capita', i.e.. equal to total annual household expenditure divided by the household size. The expenditure variables are in the price of Jan 2006.
Source: Author's estimation from panel data of VHLSSs 2006-2008.

4. Estimation methods

4.1. Fixed-effects regressions

To estimate the effect of urbanization on rural household welfare, we assume a welfare indicator of rural households is a function of household characteristics and the urbanization level as follows:

$$\ln(Y_{ikt}) = \alpha + \ln(U_{kt})\beta + T_t\gamma + X_{ikt}\theta + \eta_{ik} + \varepsilon_{ikt} \quad (1)$$

where Y_{ikt} is a welfare indicator of household *i* in province *k* at time *t* (year 2006 and 2008). U_{kt} is the indicator of urbanization. In this study, we measure urbanization by the percentage of urban population to total population of provinces. Thus, U_{kt} is the percentage of urban population in province *k* at the time *t*. We use the lagged urban population share, i.e., the urban population share in 2005 and 2007.[5] Although VHLSSs 2006 and 2008 were conducted in 2006 and 2008, respectively, they collected data on household welfare during the past 12 month. T_t is the dummy variable of year *t*. X_{ikt} is a vector of household characteristics. η_{ik} and ε_{ikt} are time-invariant and time-variant unobserved variables, respectively. The effect of urbanization on the welfare indicator is measured by β, which is interpreted as the elasticity of the welfare indicator of rural households to the proportion of urban population of provinces.

We estimate the effect of urbanization on a number of household welfare indicators including per capita income, per capita income from different sources, per capita consumption expenditure, and per capita expenditure on different consumption items. We use the same model specification as equation (1) for all the welfare indicators. In other words, we regress different dependent variables of household welfare on the same set of explanatory variables.

Estimating the impact of a factor is always challenging. There are two difficulties in estimating the effect of urbanization on rural households within a country. Firstly, the urbanization process has been involving all the people through the country. If urbanization is considered as a treatment, there are no clean treatment and control groups. In this study, we assume that urbanization at the provincial level affects only people within a province. There are no spill-over effects of urbanization of a province on rural people in other provinces. It is possible that rural households around the boundary of two provinces can be affected by the urbanization process of the two provinces. Since the proportion of households living around provincial boundaries is small, the spill-over effect is expected to be small compared with the main effect of urbanization. In addition, urbanization in Vietnam is mainly caused by rural-urban migration (GSO, 2011). The

[5] There are no data of urban population as well as population at the district level using 2005-2008. The urban population share is available for 2009 when there is the Population Census.

effect of urbanization can operate through the channel of migration of rural people, and this migration can have the diaspora effect mainly on the sending areas.

Urbanization is not a random process. The urbanization process cannot be fully observed. Thus, the second difficulty is the endogeneity of the urbanization variable in equation (1). The traditional method that deals with the endogeneity is instrumental variable regression. However, finding a valid instrument is very difficult. Using invalid instruments can produce more biased estimates than OLS.[6] Thus, in this study we use the fixed-effect regression to eliminate unobserved time-invariant variables (variable η_{ik} in the equation (1)) that can cause endogeneity bias. It is expected that the endogeneity bias will be negligible after the elimination of unobserved time-invariant variables and the control of observed variables.

4.2. Fixed-effects two-part models

In this study, we use different dependent variables of income and expenditure sub-components. For total income and consumption expenditure, we use the fixed-effect regression. However, several dependent variables of sub-components of income and expenditure such as wages or household spending on healthcare or education have zero values for a large number of households. Since there are zero values of the dependent variables, we should use a Tobit model. However, there are two problems with a tobit model in this case. Firstly, there are not available fixed-effects Tobit estimators due to a so-called incidental parameter problem in maximum likelihood methods (Greene, 2004).[7] Secondly, Tobit estimators are not consistent if the assumption on the normality and homoskedaticity of error terms is violated (Cameron and Trivedi, 2009). This assumption is very strong and often does not hold. In health economics, a two-part model is widely used to model a variable with a large number of zero values (Duan et al., 1983; Manning et al., 1987). In this study, we apply the two-part model in the context of fixed-effects panel data as follows:

$$D_{ikt} = \alpha_D + \ln(U_{kt})\beta_D + T_t\gamma_D + X_{ikt}\theta_D + \eta_{Dik} + \varepsilon_{Dikt}, \quad (2)$$

$$\ln(Y_{ikt})_{|Y_{ikt}>0} = \alpha_Y + \ln(U_{kt})\beta_Y + T_t\gamma_Y + X_{ikt}\theta_Y + \eta_{Yik} + \varepsilon_{Yikt}, \quad (3)$$

where D_{ikt} is a binary variable which equal 1 for $Y_{ikt} > 0$, and 0 if $Y_{ikt} = 0$. Subscript D and Y in parameters of equation (2) and (3) denote parameters in models of D_{ikt} and $\ln(Y_{ikt})$, respectively. Equation (2) is a linear probability model. Equation (3) is a linear model of $\ln(Y_{ikt})$ for households

[6] In this study, we tried historical urbanization variables such as the share of urban population five or ten years ago as instruments for the current share of urban population. However, these instrumental regressions produce very abnormal estimates, suggesting invalidity of instruments.

[7] Instead of fixed-effects Tobit models, one can use a random-effects Tobit model with available explanatory variables and group means of these explanatory variables to remove the time-invariant unobserved variables (Wooldridge, 2001).

with positive values of Y_{ikt}. Both equations (2) and (3) are estimated using the fixed-effects regressions.

It should be noted that although equation (2) is often estimated using a logit or probit model, we estimate equation (2) using a linear probability regression. Since we aim to estimate equation (2) by a fixed-effects estimator. Currently, there are no available fixed-effects probit estimators. A fixed-effects logit estimator can be used, however it is not efficient since it drops observations with fixed values of the dependent variable. Linear probability models are widely-used to estimate the marginal effect of an independent variables when there are no available non-linear probability models (e.g., Angrist, 2001; Angrist and Krueger, 2001)

The effect of urbanization on the welfare indicator is measured by β_D and β_Y, and each of these parameters can have its own interesting meaning. However, one is often interested in the marginal partial effect on the unconditional dependent variable, which can be easily computed as follows (for simplicity, subscripts *i, k* and *t* are dropped):

$$\begin{aligned}
&\frac{\partial E\left[\ln(Y)\middle|\ln(U),T,X,\eta\right]}{\partial \ln(U)} = \frac{\partial\left\{P\left(Y>0\middle|\ln(U),T,X,\eta\right)E\left[\ln(Y)\middle|Y>0,\ln(U),T,X,\eta\right]\right\}}{\partial \ln(U)} \\
&= \frac{\partial P\left(Y>0\middle|\ln(U),T,X,\eta\right)}{\partial \ln(U)} E\left[\ln(Y)\middle|Y>0,\ln(U),T,X,\eta\right] \\
&\quad + \frac{\partial E\left[\ln(Y)\middle|Y>0,\ln(U),T,X,\eta\right]}{\partial \ln(U)} P\left(Y>0\middle|\ln(U),T,X,\eta\right) \\
&= \beta_D E\left[\ln(Y)\middle|Y>0,\ln(U),T,X,\eta\right] + \beta_Y P\left(Y>0\middle|\ln(U),T,X,\eta\right).
\end{aligned} \tag{4}$$

The partial effect varies across the value of *U*, *T* and *X*. It should be noted that we can differentiate $\ln(Y)$ with respect to $\ln(U)$, since the fixed-effects model assumes that the time-invariant error term (η) is fixed and the time-invariant error term (ε) is uncorrelated with $\ln(U)$.

In this study, we can estimate the average partial effect of $\ln(U)$ on $\ln(Y)$ as follows (denoted by $A\hat{M}E$):

$$A\hat{P}E_Y = \hat{\beta}_D \frac{1}{n_Y}\sum_{ikt}\ln(Y_{ikt}) + \hat{\beta}_Y \frac{1}{n}\sum_{ikt} D_{ikt}\ , \tag{5}$$

where $\hat{\beta}_D$ and $\hat{\beta}_Y$ are estimates from the fixed-effects regressions of equations (2) and (3), n_Y is the number of observations with positive values of *Y*, *n* is the total number of observations in the panel data sample. $A\hat{P}E_Y$ measures the elasticity of *Y* with respect to U (the partial effect of $\ln(U)$ on $\ln(Y)$).

It should be noted that we can estimate the marginal effect of *U* on *Y* ($\partial Y/\partial U$) using simple algebraic manipulations. However, we use the formula (5), since are interested in the elasticity of *Y* with respect to *U*.

4.3. The effect on poverty rate

If the urbanization has an effect on the consumption expenditure, it can have an effect on poverty. In this study, we measure poverty by the expenditure poverty rate. A household is classified as the poor if their per capita expenditure is below the expenditure poverty line. We use a simple method to estimate the effect of urbanization on the poverty rate of rural households. Firstly, based on the expenditure model (1) the probability that household *i* is poor can be expressed as follows (Hentschel et al., 2000):

$$E[P \mid U, T, X, \eta] = \Phi\left[\frac{\ln z - (\alpha + \ln(U)\beta + T\gamma + X\theta + \eta)}{\sigma}\right] \quad (6)$$

We can rewrite (6) in a more simple expression:

$$E[P \mid U, T, X, \eta] = \Phi\left[\frac{\ln z - (\ln(Y) - \varepsilon)}{\sigma}\right] \quad (7)$$

where P is a variable taking a value of 1 if the household is poor and 0 otherwise, z is the poverty line, Φ is the cumulative standard normal function. Y is per capita expenditure of households (we drop the subscript *i*, *k* and *t* for simplicity). σ is the standard deviation of the error term ε in equation (1). It should be noted that in fixed-effects model, η is assumed to be fixed, while ε is assumed to be normally distributed with a zero-mean and variance of σ^2). Unlike Hentschel et al. (2000), we allow σ to vary across observations.

Since expenditure is positive for all the households, we estimate equation (1) using a fixed-effects regression instead of a fixed-effects two-part model. The partial effect of urbanization on the poverty probability is as follows:

$$\frac{\partial E[P \mid U, T, X, \eta]}{\partial U} = \phi\left[\frac{\ln z - (\ln(Y) - \varepsilon)}{\sigma}\right]\frac{\partial[-\ln(Y)]}{\partial U} = -\frac{\beta}{U}\phi\left[\frac{\ln z - (\ln(Y) - \varepsilon)}{\sigma}\right], \quad (8)$$

where ϕ is the probability density function of the standard normal distribution. The average partial effect of the urbanization variable on poverty rate can be estimated:

$$\hat{APE}_P = \frac{1}{M}\sum_{ikt} H_{ikt}\left(-\frac{\hat{\beta}}{U_{ikt}}\right)\phi\left[\frac{\ln z - (\ln(Y_{ikt}) - \hat{\varepsilon}_{ikt})}{\hat{\sigma}_{ikt}}\right] \quad (9)$$

where H_i is the size of household *i*, M is the total number of people in the data sample, which is equal to $\sum_{ikt} H_i$. The summation is taken over households in the two periods. $\hat{\beta}$, $\hat{\varepsilon}_{ikt}$ and $\hat{\sigma}_{ikt}$ are estimated from the fixed-effects regression of log of per capita expenditure. $\hat{APE}_P$ is interpreted as the change in the poverty rate as a result of a one percentage point change in the share of urban

population in provinces. We can estimate $\hat{APE}_p$ for each year, 2006 and 2008, to see how the effect of urbanization changes overtime.

The standard errors of the average partial effect estimators (in equations (5) and (8)) are calculated using non-parametric bootstrap with 500 replications.

5. Empirical results

5.1. Effects of urbanization on household income

The effect of urbanization on income and expenditure variables is estimated by regressing the income and expenditure variables on the urbanization variable and other explanatory variables. Earning variables depend on a set of household characteristics which can be grouped into five categories (Glewwe, 1991): (i) Household composition, (ii) Regional variables, (iii) Human assets, (iv) Physical assets, and (v) Commune characteristics. Thus, the explanatory variables include household demography, education of household head, lands, road in village. Variables such as regional dummies that are time-invariant are eliminated in fixed-effects regressions. It should be noted that explanatory variables should not be affected by the urbanization variable (Heckman, et al., 1999). Thus we limit to a small set of more exogenous explanatory variables. The summary statistics of the explanatory variables is presented in Table A.1 in Appendix.

Table 5 presents the effect of urbanization on per capita income and ratio of subcomponent incomes to the total income. Tables in this section present only the estimated coefficients of log of urbanization rate. Full regression results are presented in Tables in Appendix. Urbanization has a positive effect on per capita income of rural households. A one percent increase in the urban population share of provinces increases the per capita income of rural households by 0.54 percent. The effect of urbanization on shares of different incomes is very small not statistically significant.[8] A possible problem of fixed-effects regression is that it reduces the variation in variables, thereby increasing the standard error of estimates. As a result, we are more likely to find no significant effects in fixed-effects regressions.

[8] It should be noted that all the fraction variables are measured in percentage. In this case, a one percent increase in urbanization will increase or decrease the dependent variables by a percentage point that is approximately equal to the coefficient divided by 100.

Table 5. Fixed-effects regression of income and fraction of sub-income

Explanatory variables	Dependent variables				
	Log of per capita income	Fraction of wage in total income (%)	Fraction of non-farm income in total income (%)	Fraction of transfers in total income (%)	Fraction of other income in total income (%)
Log of urbanization rate	0.5444**	1.9125	4.5229	-5.3680	2.7718
	(0.2670)	(13.654)	(10.438)	(10.117)	(11.701)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	6,033	6,035	6,035	6,035	6,033
R-squared	0.123	0.109	0.010	0.047	0.104
Number of i	3,082	3,082	3,082	3,082	3,082

Urbanization rate is the percentage of urban population to total population of provinces.
The fraction of subcomponent income to total income is measured by percent.
Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1.
Source: Estimations from panel data VHLSSs 2006-2008.

Table 6 estimates the partial effect of urbanization on wages and non-farm incomes using fixed-effects two-part models. It shows that the effect of urbanization on unconditional observed wages as well as income from other non-farm works is not statistically significant. In addition, urbanization does not affect the probability of having wages for rural households. However, urbanization helps households who already have wages increase their wages. Interestingly, urbanization increases the proportion of households having income from non-farm employment (excluding wage employment). A one percent increase in the proportion of urban population in provinces increases the probability of having non-farm incomes by 0.0015 (equal to 0.1496/100). Possibly, urbanization increases local economic growth, creating more market and non-farm opportunities for rural people. However, the urbanization process does not have a significant effect on the non-farm income level of households.

Table 6. Fixed-effects regression of wage and non-farm income

Explanatory variables	Dependent variables					
	Having wage (yes=1, no=0)	Log of per capita wage for wage > 0	Average partial effect on log wage	Having non-farm income (yes=1, no=0)	Log of non-farm income for non-farm income > 0	Average partial effect on non-farm income
Log of urbanization rate	-0.2380	1.6570**	-0.8578	0.1496**	-0.2445	1.0441
	(0.2367)	(0.7050)	(1.9631)	(0.0690)	(1.1134)	(0.7356)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,035	3,535		6,035	1,980	
R-squared	0.058	0.183		0.010	0.142	
Number of i	3,082	2,140		3,082	1,232	

Average partial effect of log of urbanization on log of wage is equal to the average derivative of P(Wage>0)*E(log of wage|wage>0) with respect to log of urbanization. The average partial effect is computed using the formula in equation (5). Average partial effect of urbanization on non-farm incomes is estimated using a similar way.
Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1
Source: Estimations from panel data VHLSSs 2006-2008.

Table 7. Fixed-effects regressions of transfers and income other sources

Explanatory variables	Dependent variables					
	Receiving transfers (yes=1, no=0)	Log of per capita transfers for transfer > 0	Average partial effect on log of per capita transfers	Having other income (yes=1, no=0)	Log of other income for other income > 0	Average partial effect on log of other income
Log of urbanization rate	0.1242**	-0.7294	0.0060	0.2033	-0.8642	0.7798
	(0.0574)	(1.1504)	(1.0566)	(0.1936)	(0.5478)	(1.6613)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,035	5,307		6,035	5,442	
R-squared	0.010	0.060		0.158	0.056	
Number of i	3,082	2,937		3,082	3,016	

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1.
The average partial effect is computed using the formula in equation (5).
Source: Estimations from panel data VHLSSs 2006-2008.

Urbanization does not have a significant effect on private transfers received by households and incomes from other sources (Table 7). However, urbanization increases the probability of receiving transfers. Probably, there is increasing migration that leads to an increase in the proportion of rural households receiving remittances.

5.2. Effects of urbanization on household expenditure and poverty

Rural households living in provinces with a high proportion of urban population tend to have higher consumption expenditure (Table 8). A one percent increase in the urban population share increases per capita expenditure of rural households by 0.39 percent. The point estimate of the effect of urbanization on expenditure is lower than the point estimate of the effect on income. This implies that urbanization might increase saving of households.

Table 8. Fixed-effects regressions of expenditure and fraction of sub-items expenditure

Explanatory variables	Dependent variables				
	Log of per capita expenditure	Share of food expenditure (%)	Share of education expenditure (%)	Share of healthcare expenditure (%)	Share of other non-food expenditure (%)
Log of urbanization rate	0.3905**	-6.0087	-4.9389	-2.3734	13.3210*
	(0.1835)	(7.1146)	(3.5037)	(5.0309)	(7.4893)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	6,035	6,035	6,035	6,035	6,035
R-squared	0.180	0.053	0.017	0.018	0.052
Number of i	3,082	3,082	3,082	3,082	3,082

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.
The average partial effect is computed using the formula in equation (5).
Source: Estimations from panel data VHLSSs 2006-2008.

Urbanization does not have a significant effect on the share of expenditure on food, education and healthcare. However, it increases the share of non-food expenditures slightly (excluding education and healthcare). A one percent increase in the urban population share increases this non-food spending share by 0.133 percentage point. A one percent increase in the urban population share results in an increase of 0.8 percent in the non-food spending (Table 9).

There are no significant effects of urbanization on food, education and health spending of rural households (Table 9). Probably, food, education and healthcare are necessity goods that have a low income elasticity. This finding is also implied by the negative point estimates of the effect of urbanization on the proportion of expenditure on these goods.

Table 9. Fixed-effects regressions of food and non-food expenditure

Explanatory variables	Dependent variables				
	Log of per capita food expenditure	Log of per capita other non-food expenditure	Spending on education (yes=1; no=0)	Log of education spending for education spending > 0	Average partial effect on log of education spending
Log of urbanization rate	0.2724	0.7999**	-0.2868	0.2975	-1.3019
	(0.1880)	(0.3212)	(0.1826)	(0.5130)	(1.0137)
Control variables	Yes	Yes	Yes	Yes	Yes
Observations	6,035	6,035	6,035	4,012	
R-squared	0.120	0.169	0.102	0.096	
Number of i	3,082	3,082	3,082	2,274	

Note: Since all households have spending on food and non-food goods (excluding education and healthcare consumption), two-part models are not used for the model of food and non-food spending.
Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1.
The average partial effect is computed using the formula in equation (5).
Source: Estimations from panel data VHLSSs 2006-2008.

In Table 10, we find a negative externality of urbanization. It increases the spending on tobacco – a commodity causes harms to health. Urbanization also increases another unhealthy good which is wine (Table 11). The elasticity of tobacco and wine spending with respect to urbanization is larger than one. More specifically, a one percent increase in the proportion of urban population leads to an increase of 1.75 percent in the tobacco spending and an increase of 1.84 percent in the wine spending. However, there are no significant effects of urbanization on beer spending of rural households (Table 11).

Table 10. Fixed-effects regressions of healthcare spending and tobacco spending

Explanatory variables	Dependent variables					
	Spending on healthcare (yes=1; no=0)	Log of healthcare spending for health spending>0	Average partial effect on log of healthcare spending	Spending on tobacco (yes=1; no=0)	Log of per capita tobacco spending for tobacco spending>0	Average partial effect on log of tobacco spending
Log of urbanization rate	-0.1167	0.4420	-0.1269	0.1753	1.4181**	1.7496*
	(0.0773)	(0.8153)	(0.9699)	(0.2579)	(0.6124)	(1.0326)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,035	5,839		6,035	4,813	
R-squared	0.014	0.030		0.023	0.029	
Number of i	3,082	3,060		3,082	2,764	

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1.
The average partial effect is computed using the formula in equation (5).
Source: Estimations from panel data VHLSSs 2006-2008.

Table 11. Fixed-effects regressions of wine spending and beer spending

Explanatory variables	Dependent variables					
	Spending on wine (yes=1; no=0)	Log of per capita wine spending for wine spending>0	Average partial effect on log of wine spending	Spending on beer (yes=1; no=0)	Log of per capita beer spending	Average partial effect on log of beer spending
Log of urbanization rate	0.1137	1.6125**	1.8371**	0.0922	1.4951	0.9752
	(0.1217)	(0.6578)	(0.8142)	(0.2750)	(1.0452)	(1.1490)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,035	5,552		6,035	2,672	
R-squared	0.011	0.047		0.031	0.072	
Number of i	3,082	2,960		3,082	1,754	

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1.
The average partial effect is computed using the formula in equation (5).
Source: Estimations from panel data VHLSSs 2006-2008.

Finally, we estimate the effect of urbanization on rural poverty using equation (9) (Table 12). Since urbanization increases household expenditure, it can help reduce the expenditure poverty rate. It is found that a one percentage point increase in the proportion of urban population of provinces results in a 0.167 percentage point reduction in the expenditure poverty rate. The effect of urbanization on the poverty rate for 2008 is smaller than the effect for 2006, since the poverty rate is lower in 2008 than in 2006.

Table 12: Impacts of urbanization on the poverty rate of rural households

Both years	Year 2006	Year 2008
-0.167*	-0.196*	-0.138*
(0.091)	(0.106)	(0.075)

Robust standard errors in parentheses. The standard error is calculated using non-parametric bootstrap with 500 replications.
The poverty rate and the urbanization level are both measured in percentage.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Estimations from panel data VHLSSs 2006-2008.

6. Conclusions

In both theories and empirical studies, there is no consensus on the direction of the urbanization effect on household welfare and poverty. In Vietnam, urbanization has been increasing remarkably during the past 20 years. The proportion of urban population increased from 19 percent in 1991 to 30 percent in 2009. This paper examines the effect of urbanization on income, expenditure and poverty of rural households in Vietnam using panel data from VHLSSs 2006 and 2008.

It is found that urbanization has a positive effect on per capita income of rural household. A one percent increase in the share of urban population of provinces helps rural households increase their per capita income by around 0.54 percent. Urbanization increases wages of wage earners. However, the effect of urbanization on the probability of having wages is not statistically significant. Interestingly, urbanization increases the probability of having non-farm employment activities (excluding wage employment) and the probability of receiving transfers.

Rural households in provinces with a higher level of urbanization are more likely to have higher consumption expenditure. More specifically, a one percent increase in the share of urban population at the provincial level leads to a 0.39 percent increase in per capita expenditure of rural households. Similar to the case of India (Cali and Menon, 2009), we find that urbanization helps reduce the expenditure poverty in rural Vietnam. A one percentage point increase in the proportion of urban population of provinces results in a 0.167 percentage point reduction in the poverty rate.

Although urbanization has a positive effect on income, expenditure and poverty reduction of rural households, it has an unexpected effect on rural households' spending on unhealthy goods. Rural households living in a province of a high urbanization level tend to have higher spending on tobacco and wine.

Overall, our analysis suggests that urbanization can be an important factor in increasing income and consumption expenditure and reducing poverty of rural households in Vietnam. This finding can provide important implications for poverty reduction policies, especially when the poverty reduction pace is slow in the recent years. In addition to poverty reduction programs

targeted at the poor, policies and programs that stimulate the urbanization process and the linkages between urban and rural development can be effective measures to reduce overall as well as rural poverty. Also for other developing countries, especially for some Asian developing countries, such as the Philippines, Indonesia, Lao, and Cambodia, with a similar economic structure as Vietnam, urbanization can also play an important role in rural poverty reduction.

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Appendix

Table A.1. Summary statistics of variables

Explanatory variables	Type	2006		2008	
		Mean	Std. Dev.	Mean	Std. Dev.
Household size	Discrete	4.272	1.669	4.136	1.690
Proportion of children below 15	Continuous	0.226	0.210	0.203	0.206
Proportion of elderly above 60	Continuous	0.127	0.257	0.141	0.270
Proportion of female member	Continuous	0.520	0.197	0.523	0.205
Age of household head	Discrete	48.900	13.717	50.318	13.508
Head less than primary school	Binary	0.292	0.455	0.281	0.449
Head primary school	Binary	0.272	0.445	0.275	0.447
Head lower secondary school	Binary	0.281	0.450	0.278	0.448
Head upper secondary school	Binary	0.071	0.256	0.064	0.246
Head technical degree	Binary	0.073	0.261	0.089	0.285
Head post secondary school	Binary	0.011	0.105	0.013	0.111
Annual land areas (1000m2)	Continuous	3.922	7.960	4.057	10.429
Perennial land areas (1000m2)	Continuous	1.121	5.161	1.299	6.588
Village having a car road	Binary	0.796	0.403	0.819	0.385
Observations		3082		3082	

Source: Estimations from panel data VHLSSs 2006-2008.

Table A.2. Fixed-effects regressions of income and fraction of sub-income

Explanatory variables	Dependent variables				
	Log of per capita income	Fraction of wage in total income (%)	Fraction of non-farm income in total income (%)	Fraction of transfers in total income (%)	Fraction of other income in total income (%)
Log of urbanization rate	0.5444**	1.9125	4.5229	-5.3680	2.7718
	(0.2670)	(13.6541)	(10.4382)	(10.1167)	(11.7010)
Household size	-0.0996***	5.2740***	0.5232	-3.0421***	-2.6703***
	(0.0103)	(0.6216)	(0.3720)	(0.4613)	(0.5477)
Proportion of children below 15	-0.2183**	-23.0405***	-0.3330	18.3753***	7.5522*
	(0.0924)	(4.4251)	(3.0844)	(3.7645)	(4.3253)
Proportion of elderly above 60	-0.3688***	-24.4095***	-3.9492	9.3569*	21.0900***
	(0.0902)	(5.0914)	(3.2703)	(5.4073)	(5.5738)
Proportion of female member	-0.0316	-10.3500*	1.5070	10.4703**	-2.6068
	(0.1046)	(5.6395)	(2.9998)	(5.1971)	(5.3147)
Age of household head	0.0030	0.0074	0.0343	0.0482	-0.1006
	(0.0025)	(0.0893)	(0.0635)	(0.0914)	(0.1009)
Head less than primary school	Omitted				
Head primary school	0.0509	1.4826	0.8355	-0.8987	-0.9721
	(0.0339)	(1.7552)	(2.0932)	(2.0954)	(1.6437)
Head lower secondary school	0.0782*	1.0066	2.9564	-1.6348	-1.9435
	(0.0456)	(2.1968)	(2.1894)	(2.1730)	(2.0683)
Head upper secondary school	0.1264*	4.8305	3.3292	0.0678	-8.7211***
	(0.0673)	(3.1729)	(2.7382)	(2.6708)	(3.1645)
Head technical degree	0.1175*	1.3568	4.7381*	-0.6403	-5.3426**
	(0.0613)	(2.7820)	(2.6291)	(2.4293)	(2.7100)
Head post secondary school	0.1326	7.3582*	3.2284	-9.2331	-2.8315
	(0.0920)	(4.2326)	(6.0095)	(5.7917)	(4.6312)
Annual land areas (1000m2)	0.0100***	-0.1235**	-0.0522*	-0.0310	0.2188**
	(0.0014)	(0.0565)	(0.0312)	(0.0278)	(0.0893)
Perennial land areas (1000m2)	0.0039*	-0.1889**	0.0285	-0.0011	0.1660
	(0.0020)	(0.0919)	(0.0348)	(0.0398)	(0.1026)
Village having a car road	0.0062	0.4648	-0.6570	-1.1665	1.3447
	(0.0259)	(1.3490)	(0.7674)	(0.9745)	(1.4697)
Dummy year 2008	0.0997***	4.8038***	1.1778**	0.8677	-7.7452***
	(0.0159)	(0.7492)	(0.5886)	(0.6067)	(0.7422)
Constant	7.3792***	11.4030	-4.8207	27.3558	54.7333
	(0.7680)	(39.1949)	(29.6407)	(29.2586)	(33.7805)
Observations	6,033	6,035	6,035	6,035	6,033
R-squared	0.123	0.109	0.010	0.047	0.104
Number of i	3,082	3,082	3,082	3,082	3,082

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1
Source: Estimations from panel data VHLSSs 2006-2008.

Table A.3. Fixed-effects regressions of wage and non-farm income

Explanatory variables	Dependent variables			
	Having wage (yes=1, no=0)	Log of per capita wage	Having non-farm income (yes=1, no=0)	Log of non-farm income
Log of urbanization rate	-0.2380	1.6570**	0.1496**	-0.2445
	(0.2367)	(0.7050)	(0.0690)	(1.1134)
Household size	0.0794***	0.0014	0.0215***	-0.1224***
	(0.0103)	(0.0262)	(0.0081)	(0.0353)
Proportion of children below 15	-0.3520***	-0.7816***	-0.0306	-0.3378
	(0.0770)	(0.2087)	(0.0643)	(0.3322)
Proportion of elderly above 60	-0.3358***	-0.7264*	-0.0737	-0.4158
	(0.0837)	(0.3808)	(0.0655)	(0.4851)
Proportion of female member	-0.1890**	0.1956	-0.0077	0.2596
	(0.0887)	(0.2980)	(0.0677)	(0.4614)
Age of household head	-0.0012	0.0093	-0.0020	0.0174*
	(0.0020)	(0.0066)	(0.0015)	(0.0095)
Head less than primary school	0.0195	-0.0569	0.0074	0.2157
	(0.0272)	(0.0929)	(0.0330)	(0.1528)
Head primary school	Omitted			
Head lower secondary school	0.0333	-0.0616	-0.0074	0.4611**
	(0.0376)	(0.1082)	(0.0375)	(0.2069)
Head upper secondary school	0.1711***	0.0446	0.0319	0.4163
	(0.0564)	(0.1777)	(0.0502)	(0.2577)
Head technical degree	0.0722	0.0874	0.0327	0.5435**
	(0.0485)	(0.1580)	(0.0469)	(0.2629)
Head post secondary school	0.0923*	0.2287	-0.0291	0.9407
	(0.0550)	(0.1692)	(0.0746)	(0.7333)
Annual land areas (1000m2)	-0.0020*	-0.0077	0.0007	0.0070
	(0.0012)	(0.0055)	(0.0007)	(0.0047)
Perennial land areas (1000m2)	0.0006	-0.0175**	-0.0002	0.0050*
	(0.0014)	(0.0083)	(0.0007)	(0.0027)
Village having a car road	-0.0018	0.0530	0.0037	-0.0991
	(0.0261)	(0.0691)	(0.0196)	(0.1016)
Dummy year 2008	0.0198	0.2458***	-0.0172	0.2867***
	(0.0134)	(0.0376)	(0.0115)	(0.0637)
Constant	1.1863*	2.4975	-0.0683	8.7739***
	(0.6809)	(2.0729)	(0.5948)	(3.1955)
Observations	6,035	3,535	6,035	1,980
R-squared	0.058	0.183	0.010	0.142
Number of i	3,082	2,140	3,082	1,232

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1
Source: Estimations from panel data VHLSSs 2006-2008.

Table A.4. Fixed-effects regressions of transfers and other income

Explanatory variables	Dependent variables			
	Receiving transfers (yes=1, no=0)	Log of per capita transfers	Having other income (yes=1, no=0)	Log of other income
Log of urbanization rate	0.1242**	-0.7294	0.2033	-0.8642
	(0.0574)	(1.1504)	(0.1936)	(0.5478)
Household size	-0.0052	-0.4220***	-0.0058	-0.1892***
	(0.0061)	(0.0557)	(0.0073)	(0.0202)
Proportion of children below 15	0.1909***	1.3804***	0.0267	-0.2711
	(0.0621)	(0.4024)	(0.0615)	(0.1969)
Proportion of elderly above 60	0.0801	0.5401	0.1350**	0.1729
	(0.0606)	(0.3896)	(0.0664)	(0.2013)
Proportion of female member	0.0078	0.3148	-0.0416	0.0509
	(0.0576)	(0.4159)	(0.0661)	(0.2119)
Age of household head	-0.0004	0.0001	-0.0015	0.0007
	(0.0012)	(0.0079)	(0.0014)	(0.0043)
Head less than primary school	Omitted			
Head primary school	-0.0232	0.1583	0.0088	-0.0025
	(0.0255)	(0.1546)	(0.0230)	(0.0991)
Head lower secondary school	0.0151	0.0354	0.0021	-0.0328
	(0.0326)	(0.1965)	(0.0297)	(0.1371)
Head upper secondary school	0.0747	0.5065*	-0.0592	-0.0573
	(0.0515)	(0.2892)	(0.0485)	(0.1806)
Head technical degree	0.0572	0.4622*	-0.0380	-0.2391
	(0.0425)	(0.2505)	(0.0419)	(0.1655)
Head post secondary school	0.0246	-0.6857	-0.0016	0.0324
	(0.1086)	(0.6753)	(0.1043)	(0.2339)
Annual land areas (1000m2)	-0.0001	-0.0008	0.0017***	0.0154***
	(0.0006)	(0.0054)	(0.0006)	(0.0033)
Perennial land areas (1000m2)	0.0007	-0.0016	0.0015**	0.0092**
	(0.0016)	(0.0071)	(0.0007)	(0.0042)
Village having a car road	-0.0147	-0.0128	-0.0140	0.0526
	(0.0181)	(0.1177)	(0.0158)	(0.0423)
Dummy year 2008	-0.0179*	0.0714	-0.1670***	-0.0444
	(0.0096)	(0.0675)	(0.0115)	(0.0365)
Constant	0.5368	11.3340***	0.5019	10.7837***
	(0.4824)	(3.3357)	(0.5550)	(1.5649)
Observations	6,035	5,307	6,035	5,442
R-squared	0.010	0.060	0.158	0.056
Number of i	3,082	2,937	3,082	3,016

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1
Source: Estimations from panel data VHLSSs 2006-2008.

Table A.5. Fixed-effects regressions of expenditure and fraction of sub-expenditure

Explanatory variables	Dependent variables				
	Log of per capita expenditure	Share of food expenditure (%)	Share of education expenditure (%)	Share of healthcare expenditure (%)	Share of other non-food expenditure (%)
Log of urbanization rate	0.3905**	-6.0087	-4.9389	-2.3734	13.3210*
	(0.1835)	(7.1146)	(3.5037)	(5.0309)	(7.4893)
Household size	-0.0997***	0.2309	0.6185***	0.4521**	-1.3015***
	(0.0087)	(0.3159)	(0.1329)	(0.2117)	(0.3154)
Proportion of children below 15	-0.1307*	1.2434	-0.7736	0.5197	-0.9895
	(0.0679)	(2.2984)	(0.9706)	(1.5671)	(2.1222)
Proportion of elderly above 60	-0.1447*	5.5666*	-1.2228	6.8982***	-11.2420***
	(0.0862)	(2.9739)	(0.7815)	(2.1728)	(3.3232)
Proportion of female member	0.0162	1.6670	-0.8527	-6.6059***	5.7916*
	(0.0831)	(3.0368)	(1.1376)	(2.1310)	(2.9950)
Age of household head	0.0006	-0.0552	0.0094	0.0282	0.0176
	(0.0018)	(0.0539)	(0.0108)	(0.0312)	(0.0511)
Head less than primary school	Omitted				
Head primary school	0.0093	-1.3577	0.4765	-0.1910	1.0722
	(0.0308)	(0.9291)	(0.3190)	(0.7343)	(0.8787)
Head lower secondary school	-0.0057	-0.5117	-0.0858	-0.8510	1.4485
	(0.0399)	(1.2920)	(0.4274)	(1.0878)	(1.1231)
Head upper secondary school	0.0144	-0.2936	-0.3413	0.8156	-0.1807
	(0.0591)	(1.8283)	(0.9587)	(1.3236)	(1.8420)
Head technical degree	-0.0001	1.2446	-0.6794	-1.0910	0.5258
	(0.0507)	(1.6260)	(0.6446)	(1.2220)	(1.5429)
Head post secondary school	-0.0243	-0.7687	-3.1219	0.4006	3.4900
	(0.0925)	(3.0310)	(2.1638)	(2.0452)	(3.2489)
Annual land areas (1000m2)	0.0026*	-0.0010	-0.0039	-0.0397**	0.0447
	(0.0014)	(0.0412)	(0.0108)	(0.0157)	(0.0362)
Perennial land areas (1000m2)	0.0032**	-0.0296	-0.0109	-0.0125	0.0530
	(0.0013)	(0.0419)	(0.0211)	(0.0231)	(0.0356)
Village having a car road	0.0330	-1.2536*	-0.0726	0.5952	0.7309
	(0.0225)	(0.7438)	(0.2951)	(0.6034)	(0.6667)
Dummy year 2008	0.1239***	-2.9637***	0.2655	0.7910***	1.9072***
	(0.0122)	(0.4073)	(0.1798)	(0.2836)	(0.3961)
Constant	7.6114***	71.3340***	16.4290	11.3531	0.8840
	(0.6168)	(20.6493)	(10.0057)	(14.5694)	(21.6461)
Observations	6,035	6,035	6,035	6,035	6,035
R-squared	0.180	0.053	0.017	0.018	0.052
Number of i	3,082	3,082	3,082	3,082	3,082

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1
Source: Estimations from panel data VHLSSs 2006-2008.

Table A.6. Fixed-effects regressions of expenditure and fraction of sub-expenditure

Explanatory variables	Dependent variables					
	Log of per capita food expend.	Log of per capita other non-food expend.	Spending on education (yes=1; no=0)	Log of spending on education	Spending on healthcare (yes=1; no=0)	Log of spending on healthcare
Log of urbanization rate	0.2724	0.7999**	-0.2868	0.2975	-0.1167	0.4420
	(0.1880)	(0.3212)	(0.1826)	(0.5130)	(0.0773)	(0.8153)
Household size	-0.0922***	-0.1296***	0.0691***	-0.0921***	-0.0001	-0.0018
	(0.0075)	(0.0136)	(0.0085)	(0.0305)	(0.0040)	(0.0323)
Proportion of children below 15	-0.1208*	-0.1968**	0.4252***	-0.0300	0.0456	-0.0167
	(0.0656)	(0.0948)	(0.0662)	(0.1903)	(0.0342)	(0.2683)
Proportion of elderly above 60	-0.0279	-0.4749***	-0.1567**	-0.2941	0.0497	0.7624***
	(0.0670)	(0.1476)	(0.0639)	(0.3702)	(0.0337)	(0.2738)
Proportion of female member	0.0419	0.1409	-0.2600***	0.2507	-0.0494	-0.5359
	(0.0717)	(0.1285)	(0.0839)	(0.3098)	(0.0457)	(0.3334)
Age of household head	-0.0009	0.0011	-0.0023	0.0041	0.0000	0.0030
	(0.0014)	(0.0026)	(0.0014)	(0.0039)	(0.0006)	(0.0056)
Head less than primary school	Omitted					
Head primary school	-0.0126	0.0486	-0.0047	0.0937	0.0057	-0.0592
	(0.0284)	(0.0394)	(0.0243)	(0.0863)	(0.0095)	(0.1037)
Head lower secondary school	-0.0052	0.0451	0.0055	-0.0043	0.0060	-0.1389
	(0.0338)	(0.0514)	(0.0322)	(0.1027)	(0.0143)	(0.1439)
Head upper secondary school	0.0102	0.0161	-0.0198	-0.0519	0.0233	0.1372
	(0.0502)	(0.0825)	(0.0503)	(0.1589)	(0.0270)	(0.2125)
Head technical degree	0.0354	0.0069	-0.0061	-0.1197	0.0079	-0.0366
	(0.0441)	(0.0712)	(0.0402)	(0.1223)	(0.0142)	(0.1762)
Head post secondary school	-0.0130	0.0517	-0.0705	-0.6975*	0.0593	-0.0936
	(0.0971)	(0.1211)	(0.1122)	(0.3590)	(0.0525)	(0.3397)
Annual land areas (1000m2)	0.0024***	0.0035**	-0.0009	-0.0047	-0.0006	-0.0069**
	(0.0009)	(0.0017)	(0.0007)	(0.0049)	(0.0004)	(0.0031)
Perennial land areas (1000m2)	0.0027**	0.0044***	0.0003	0.0024	0.0003	0.0045
	(0.0011)	(0.0017)	(0.0010)	(0.0047)	(0.0007)	(0.0044)
Village having a car road	0.0047	0.0498	-0.0093	-0.0341	-0.0027	0.0493
	(0.0192)	(0.0317)	(0.0201)	(0.0559)	(0.0116)	(0.0956)
Dummy year 2008	0.0617***	0.1727***	0.0110	0.2168***	0.0287***	0.2203***
	(0.0110)	(0.0174)	(0.0112)	(0.0351)	(0.0062)	(0.0484)
Constant	7.3077***	5.4406***	1.3755***	4.5481***	1.3551***	3.4841
	(0.5421)	(0.9302)	(0.5292)	(1.5045)	(0.2212)	(2.3421)
Observations	6,035	6,035	6,035	4,012	6,035	5,839
R-squared	0.120	0.169	0.102	0.096	0.014	0.030
Number of i	3,082	3,082	3,082	2,274	3,082	3,060

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1
Source: Estimations from panel data VHLSSs 2006-2008.

Table A.7. Fixed-effects regressions of expenditure and fraction of sub-expenditure

Explanatory variables	Dependent variables					
	Spending on tobacco (yes=1; no=0)	Log of per capita spending on tobacco	Spending on wine (yes=1; no=0)	Log of per capita spending on wine	Spending on beer (yes=1; no=0)	Log of per capita spending on beer
Log of urbanization rate	0.1753	1.4181**	0.1137	1.6125**	0.0922	1.4951
	(0.2579)	(0.6124)	(0.1217)	(0.6578)	(0.2750)	(1.0452)
Household size	0.0301***	-0.1335***	0.0136**	-0.1873***	0.0198**	-0.1344***
	(0.0094)	(0.0343)	(0.0059)	(0.0290)	(0.0086)	(0.0470)
Proportion of children below 15	-0.1525*	-0.2226	-0.0245	-0.3591	-0.0695	-0.0580
	(0.0788)	(0.2974)	(0.0509)	(0.2464)	(0.0806)	(0.3865)
Proportion of elderly above 60	-0.2198***	0.4658	-0.0863	-0.2604	-0.2298***	-0.3193
	(0.0786)	(0.3157)	(0.0610)	(0.2514)	(0.0848)	(0.4138)
Proportion of female member	-0.1934**	-1.0851***	-0.0059	-0.1968	-0.0004	-0.1099
	(0.0907)	(0.3653)	(0.0598)	(0.2550)	(0.0832)	(0.4233)
Age of household head	-0.0013	-0.0012	-0.0022*	0.0053	0.0010	-0.0011
	(0.0020)	(0.0076)	(0.0013)	(0.0061)	(0.0021)	(0.0088)
Head less than primary school	Omitted					
Head primary school	0.0179	-0.1554	-0.0022	-0.0135	-0.0074	-0.1978
	(0.0360)	(0.1159)	(0.0189)	(0.1055)	(0.0331)	(0.1890)
Head lower secondary school	-0.0113	-0.3247**	0.0053	-0.0584	-0.0118	-0.4068*
	(0.0430)	(0.1533)	(0.0208)	(0.1285)	(0.0442)	(0.2227)
Head upper secondary school	0.0155	-0.4750**	0.0669*	0.1200	-0.0359	-0.2290
	(0.0679)	(0.2308)	(0.0365)	(0.1703)	(0.0625)	(0.2751)
Head technical degree	0.0370	-0.4757**	-0.0067	0.1507	-0.0692	-0.4964**
	(0.0536)	(0.1995)	(0.0257)	(0.1583)	(0.0553)	(0.2299)
Head post secondary school	0.0712	-0.6164**	0.0236	0.0425	-0.1110	-0.2961
	(0.1223)	(0.2935)	(0.0294)	(0.3603)	(0.1549)	(0.4880)
Annual land areas (1000m2)	0.0042***	0.0073	0.0001	0.0052	0.0016	0.0003
	(0.0010)	(0.0070)	(0.0005)	(0.0044)	(0.0014)	(0.0095)
Perennial land areas (1000m2)	0.0010	0.0091**	0.0001	0.0014	0.0023	-0.0055
	(0.0018)	(0.0046)	(0.0005)	(0.0040)	(0.0018)	(0.0066)
Village having a car road	-0.0336	0.0245	0.0048	-0.0570	0.0308	0.0624
	(0.0232)	(0.0951)	(0.0128)	(0.0691)	(0.0250)	(0.1182)
Dummy year 2008	-0.0185	-0.0525	-0.0105	0.0657	0.0766***	0.1646**
	(0.0138)	(0.0571)	(0.0085)	(0.0427)	(0.0154)	(0.0719)
Constant	0.4046	0.2714	0.6604*	-0.7542	0.0511	-0.0020
	(0.7370)	(3.0169)	(0.3487)	(1.8835)	(0.7871)	(3.0201)
Observations	6,035	4,813	6,035	5,552	6,035	2,672
R-squared	0.023	0.029	0.011	0.047	0.031	0.072
Number of i	3,082	2,764	3,082	2,960	3,082	1,754

Heteroskedasticity robust standard errors in parentheses (also corrected for sampling and cluster correlation).
*** p<0.01, ** p<0.05, * p<0.1
Source: Estimations from panel data VHLSSs 2006-2008.