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Impacts of migration on poverty reduction in Vietnam: A household level study

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Abstract:

This study investigates impacts of migration through remittances on poverty reduction in Vietnam by using the two most recent Vietnam Household Living Standard Surveys in 2014 and 2016. Results of a fixed-effect logit and a fractional logit model show that although both internal remittances and international remittances increase per capita income only internal remittances have positive impacts on poverty incidence and poverty intensity. In addition, by testing impacts of remittances on pushing a household jump above the poverty line and its effects on the depth of poverty, this study has revealed poverty reduction effect of remittances more fully. Based on the findings the study suggests that it is important to acknowledge the benefits of internal migration. For the purpose of poverty alleviation, policies that attract remittances should be given greater attention.

JEL Classifications: I32, J61

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1. Introduction

Human migration is a widespread phenomenon and plays an important role in survival in many developing countries. According to United Nations Department of Economic and Social Affairs (2013), there were about 232 million international migrants worldwide and the number of internal migrants was three times higher, about 763 million people in 2013. As a result, one in every 7 was a migrant in the world. Due to the popularity and huge impact of migration on the socio-economy, this issue has been attracting more and more attention from researchers.

In recent years, there have been many studies examining the impacts of remittances on poverty reduction. Many studies provide evidence that remittances contribute to poverty reduction for households and the receiving areas (Adams Jr, 2004; Edward, 2001; Adams & Cuecuecha, 2013). However, some studies indicate that remittances do not produce such results (Du, Park, & Wang., 2005; Larissa, Black, & Skeldon, 2007).

This paper examines the impacts of migration on poverty reduction through the remittances channel in the case of Vietnam for three main reasons. Firstly, Vietnam has been achieving many successes in poverty alleviation. The poverty headcount fell sharply from 37.4 percent to 5.8 percent in the period 1998-2016. Secondly, migration and remittances have been a widespread phenomenon in Vietnam but they have not been recorded fully. According to the data of World Development Indicators, international remittances in Vietnam from 2010 to 2016 accounted for about 6-7% of GDP. Statistics

on internal remittances are not common, but estimates from the *Vietnam Household Living* Standards Survey (VHLSS) show that more than 80% of households received internal remittances in 2014 and 2016. Thirdly, although many studies have examined the role of migration and remittances on poverty reduction in Vietnam, inconsistent results have been found. For example, seasonal migration has had positive impacts on poverty reduction in Vietnam (De Brauw & Harigaya, 2007). Nguyen, Van den Berg, & Lensink (2012) showed that the increasing international remittances did not reduce any of the three Foster-Greer-Thorbecke (*FGT*) indicators. Only internal remittances had small effect on poverty reduction, whereas international remittances had no effect (Nguyen & Linh, 2018).

Although this paper also estimates impacts of migration on poverty in Vietnam, it differs from many previous studies for two aspects. First, most of previous studies have often examined only international remittances or internal remittances. This approach causes to unable to compare the roles of the two remittance types on poverty reduction. Second, impacts of remittances usually focus on poverty incidence; this might ignore the effects of remittances on depth of poverty. To improve these limitations, this paper applies a logit model and a fractional logit model to investigate impacts of migration through remittances channel, including internal remittances and international remittances, on both probability of falling into poverty and poverty intensity. Besides, this paper uses panel data from the two most recent VHLSSs, 2014 and 2016, to provide further evidence of the impact of remittances on poverty reduction in Vietnam.

The paper is organized as follows. Section 2 reviews the relevant literature and hypothesis development. Section 3 presents empirical models. Section 4 describes data. Section 5 reports and discusses the empirical results. Section 6 provides some research limitations and conclusions are presented in Section 7.

2. Literature review and hypothesis development

Although migration may affect poverty in many ways, the background to examine impacts of migration through remittances on household welfare is intermediate-level migration theory, especially new economics of labor migration (NELM). This theory argues that the unit of migration research is not at an individual level but rather higher levels, especially at the household unit (Stark, Taylor, & Yitzhaki, 1986; Stark & Taylor, 1991). Because migration is a household strategy, migrants often maintain links with their families, notably through remittances. Therefore, migration and remittances change the structure of household income (Du et al., 2005; Nong & Luo, 2010; Nguyen et al., 2011). Moreover, household level is suitable to study the impact of migration on poverty because it is the most common level when analyzing poverty (De Haan & Yaqub, 2010).

Many scholars have found that remittances can help households escape poverty. Remittances improve household income and reduce poverty headcount (Adams Jr, 2004; Lokshin, Bontch- Osmolovski, & Glinskaya, 2010; Zhu & Luo, 2010 ; Adams & Cuecuecha, 2013). Besides, remittances may affect household consumption, savings and investment behavior. Remittances allow for covering the education costs and health expense of household members. This source of income improves living conditions such as housing and sanitation (Adams & Cuecuecha, 2013). These are all basic social services and the aspects of a multidimensional poverty approach. Moreover, remittances enable households to invest in both agricultural and non-agricultural production (Edward, Rozelle, & Brauw, 2003). Investing in machinery and equipment for agricultural

production is important because most of the poor in transitional economies work in the agricultural sector. Household investment increases productivity and household incomes. It can be seen that remittances are a "hit" that breaks the "vicious cycle of poverty". In the broader picture, if remittances increase income and investments, they will promote local economic growth. This results in improving overall living standards and enhancing the number of jobs for the poor. On the way, poverty is reduced.

However, some studies have provided opposite evidences. Du et al. (2005) show that impact of migration on poverty in China is modest, though having at least one migrant increases per capita income. The reason is that most of the poor do not migrate. In the case of Vietnam, international remittances do not reduce incidence of poverty (Nguyen et al., 2012; Nguyen & Linh, 2018). The authors doubt the role of international remittances in poverty alleviation in developing countries.

To investigate role of migration on the depth of poverty, some studies estimate impacts of remittances on poverty gap. Adams Jr (2004) predicts households' per capita income without remittances, calculates the poverty gap from the results. The difference between poverty gaps in this case and in the case of including remittances is the impact of remittances on poverty gap. In this study, both internal remittances and international remittances from USA reduce poverty gap in Guatemala. Nguyen et al. (2012) applies the average treatment effect on the treated (ATT) to calculate impact of international remittances on depth of poverty. The results show that international remittances do not affect poverty gap in Vietnam.

In general, current studies have showed mix evidence of the impacts of remittances on poverty alleviation. Besides, there are a few studies that investigate both internal remittances and international remittances on intensity of poverty. Moreover, the characteristic of poverty gap index that takes fractional value from 0% to 100% is ignored in these studies. Hence, exploiting this characteristic may provide an efficient estimation results.

Based on the theoretical framework and previous empirical studies, we propose the following hypotheses.

Hypothesis 1: Migration, internal remittances and international remittances have positive effects on incidence of poverty and the depth of poverty in Vietnam.

Hypothesis 2: The impact of internal remittances on poverty reduction is stronger than international remittances' effect.

3. Empirical models

Economic theories have no specific guidance on the model that should be used to estimate migration impacts. This study uses the model that is suggested by Nguyen & Linh (2018) to estimate the impact of migration and remittances on poverty.

3.1. Impact of migration and remittances on per capita income

Although the research purpose is to examine impacts of migration and remittances on poverty in Vietnam, their effects on per capita income will be tested to give some basic information. The estimation model is as below:

$$\ln(Y_{it}) = \alpha_0 + X_{it}\alpha_1 + \alpha_2 migr_{it} + c_i + u_{it} \quad (1)$$

Where, $\ln(Y_{it})$ is the natural logarithm of the income per capita of household i in year t; X_{it} is a vector of variables that reflects the household characteristics (described in Table 1); $migr_{it}$ is a dummy variable that reflects whether household i has at least one migrant in year t ($migr_{it} = 1$ if the household has at least one migrant, $migr_{it} = 0$ if the household does not have any migrants); c_i are unobserved factors that do not change over time and u_{it} is errors term in the model.

Since VHLSS data can be used to extract data on internal and international remittances received by households, it is possible to estimate the impacts of both types of remittance through the following model:

$$\ln(Y_{it}) = \beta_0 + X_{it}\beta_1 + \beta_2 \ln(remit1_{it}) + \beta_3 \ln(remit2_{it}) + c_i + u_{it} \quad (2)$$

Where, $remit1_{it}$ and $remit2_{it}$ are international remittances and internal remittances received by household i in year t, respectively.

The log-log model is used to estimate the elasticity of household income to remittances. However, there are some households that do not receive remittances (the remittances value is zero), so there will be a problem when deriving the logarithm. To solve this problem, this study applies the method in Battese (1997) that allows the explanatory variable to receive the value 0 in the log-log function. According to Battese (1997), the alternative model (2 ') can be used to estimate model (2) above:

$$\ln(Y_{it}) = \beta_0 + X_{it}\beta_1 + \beta_2 \ln(remit1^*_{it}) + \beta_3 I[remit1_{it} = 0] + \\ + \beta_4 \ln(remit2^*_{it}) + \beta_5 I[remit2_{it} = 0] + c_i + u_{it} \quad (2')$$

Where, $I[remit1_{it} = 0]$ is an indicator variable, $I[remit1_{it} = 0] = 1$ if $remit1_{it} = 0$ and $I[remit1_{it} = 0] = 0$ if $remit1_{it} > 0$; $remit1^*_{it} = remit1_{it}$ if $remit1_{it} > 0$ and $remit1^*_{it} = 1$ if $remit1_{it} = 0$. The variables $I[remit2_{it} = 0]$ and $remit2^*_{it}$ are similarly defined.

This study will choose the appropriate model between a fixed-effect model (FEM) and a random-effect model (REM) through the Hausman test. This test is based on the H_0 hypothesis that c_i (time-independent factors reflecting individuality characters) does not correlate with the independent variable in the model (it means that REM is consistent).

3.2. Impacts of migration and remittances on household poverty

3.2.1. Impacts of migration and remittances on probability of poverty

Because the dependent variable now is the dummy variable that reflects household poverty (receiving a value of 0 or 1), the fixed effects logit model or random effects logit

model will be applied in this case. The Hausman test is also used to choose between these models.

The model to estimate effects of migration on probability of falling into poverty of households is as below:

$$P_{it} = Pr(poor_{it} = 1|Migr_{it}, X_{it}) = \frac{exp(\gamma_0 + X_{it}\gamma_1 + \gamma_2 migr_{it} + c_i + u_{it})}{1 + exp(\gamma_0 + X_{it}\gamma_1 + \gamma_2 migr_{it} + c_i + u_{it})} \quad (3)$$

Where, $poor_{it}$ is a dummy variable reflecting the poverty status of households, $poor_{it} = 1$ if the household i is expenditure poor in year t, $poor_{it} = 0$ if the household i is not poor in year t; the other variables in the model are similar to model (1) above.

Transforming the equation (3) into logit form, we have:

$$L_{it} = \ln\left(\frac{P_{it}}{1 - P_{it}}\right) = \gamma_0 + X_{it}\gamma_1 + \gamma_2 migr_{it} + c_i + u_{it} \quad (3')$$

The logit model to estimate the effects of remittances on probability of household poverty is as follows:

$$L_{it} = \ln\left(\frac{P_{it}}{1 - P_{it}}\right) = \theta_0 + X_{it}\theta_1 + \theta_2 \ln(remit1_{it}) + \theta_3 \ln(remit2_{it}) + c_i + u_{it} \quad (4)$$

Similarly, the following alternative model (4 ') is used to estimate model (4):

$$L_{it} = \ln\left(\frac{P_{it}}{1 - P_{it}}\right) = \theta_0 + X_{it}\theta_1 + \theta_2 \ln(remit1^*_{it}) + \theta_3 I[remit1_{it} = 0] + \theta_4 \ln(remit2^*_{it}) + \theta_5 I[remit2_{it} = 0] + c_i + u_{it} \quad (4')$$

3.2.2. Impacts of migration and remittances on intensity of poverty

Because the dependent variable is poverty gap and its value ranges from zero to 100 percent, the fractional response model (FRM) is used to estimate impacts of migration and remittances on the poverty intensity. This method was suggested in Papke & Wooldridge (1996). After that, Papke & Wooldridge (2008) developed it for panel data.

FRM overcomes a lot of the limitations of linear models and provides a robust approach to solve the problem of the fractional dependent variable in the model. Specifically, this

study will combine the fractional logit model with the generalized estimating equation (GEE) approach when applied to panel data suggested by Papke & Wooldridge (2008).

The fractional logit model is as below:

$$E(povgap_{it}|Z_{it}) = \frac{exp(\varphi_0 + Z_{it}\varphi_1 + \overline{Z_{it}}\varphi_2 + c_i + u_{it})}{1 + exp(\varphi_0 + Z_{it}\varphi_1 + \overline{Z_{it}}\varphi_2 + c_i + u_{it})} \quad (5)$$

Where, $povgap_{it}$ is the poverty gap of the household i in year t, which is calculated by the formula below:

$$povgap_{it} = \frac{expenditure\ poverty\ line\ in\ year\ t - per\ capita\ expenditure\ of\ household\ i\ in\ year\ t}{expenditure\ poverty\ line\ in\ year\ t} \times 100$$

($0 \leq$ povgap $\leq 100\%$; povgap takes zero value for households that are not poor).

The model (5) above is separately estimated into 2 models:

- Model (5a) estimates the impact of migration on the depth of poverty, where Z_{it} is a vector of independent variables, including X_{it} in the model (1) and $migr_{it}$
- Model (5b) estimates the impact of remittances from migration on the depth of poverty, where Z_{it} is a vector of independent variables, including X_{it} in the model (1) and remittances variables in the model (4').

$\overline{Z_{it}}$ is a vector of average value of independent variables for fixed impact estimation (Papke and Wooldridge, 2008). The average values are calculated by the following formula:

$$\overline{Z_{it}} = mean(Z_{it})$$

In these models, the independent variables of interest are $migr$ and remittances variables. $migr$ variable is proxy for migration in general, it helps to cover the complex effects of migration on poverty. Remittance is a channel through which migration affects poverty. The remittances variables will help to estimate this direct effect.

4. Data

This study uses panel data from the VHLSS 2014 and 2016. The VHLSS 2014 and VHLSS 2016 are scaled nationwide. The sample covers 46,995 households (in which the income and expenditure survey and other indicators include 9,399 households and income survey forms and other indicators include 37,596 households), and over 3,133 communes/wards representing the whole country, regions, urban and rural areas and provinces. All of VHLSSs contain data on remittances that households receive both domestically and abroad. The VHLSSs collect information about household members

who are working away from home, but there is no information on the current residence location. This indicates that it is not possible to identify whether the migrants are internal or international.

TABLE 1. SUMMARY STATISTICS

VARIABLE	DESCRIPTION	MEAN	STD. DEV.	MIN	MAX
$\ln(Y)$	Logarithm of per capita income	10.090	0.736	7.110	13.613
$poor$	Expenditure poor status (poor =1, not poor = 0)	0.121	0.327	0	1
$povgap$	Poverty gap	0.032	0.107	0	0.773
$migr$	Household has at least a migrant (yes = 1, no = 0)	0.116	0.321	0	1
$ln(remit1^*)$	Logarithm of international remittances	0.419	2.033	0	13.334
$ln(remit2^*)$	Logarithm of internal remittances	6.136	3.226	0	12.528
$I[remit1 = 0]$	Not receiving international remittance (no = 1, yes = 0)	0.958	0.200	0	1
$I[remit2 = 0]$	Not receiving internal remittance (no = 1, yes = 0)	0.180	0.384	0	1
$hhsize$	Number of household members	4.088	1.471	1	13
$rdepend$	Dependency ratio [a]	60.231	63.600	0	600
$rfemale$	Proportion of female members in household	0.511	0.185	0	1
gen_head	Gender of household head (male = 1, female = 0)	0.797	0.402	0	1
edu_head	Number schooling years of household head	7.228	3.542	0	12
age_head	Age of household head	49.710	12.137	16	99
age_head2	Age of household head squared	2618.354	1298.630	256	9801

Source: Estimation results from panel data VHLSS 2014 and 2016.
Note: Number of observations: 4,533. [a] Dependency ratio = [(number of children below 15 + number of elderly above 60)/number of people aged 15-60]*100.

5. Empirical results and discussions

5.1. Impact of migration and remittances on per capita income

The Hausman test indicates that FEM is appropriate (the results are presented at the Appendix - table A1 and A2).

Table 2 shows the effects of migration and remittances on per capita income.

TABLE 2. ESTIMATION RESULTS OF MODEL 1 AND MODEL 2' (FIXED-EFFECT)

VARIABLES	MODEL 1	MODEL 2'
$migr$	0.0732* (0.0425)	
$ln(remit2^*)$		0.0443*** (0.0095)
$ln(remit1^*)$		0.252*** (0.0408)
$I[remit2 = 0]$		0.246*** (0.0795)
$I[remit1 = 0]$		2.085*** (0.399)
$hhsize$	-0.0865***	-0.0793***

TABLE 2. ESTIMATION RESULTS OF MODEL 1 AND MODEL 2' (FIXED-EFFECT)

VARIABLES	MODEL 1	MODEL 2'
	(0.0148)	(0.0139)
$rdepend$	-0.0001	-0.000304
	(0.0003)	(0.0003)
$rfemale$	-0.0619	-0.0865
	(0.129)	(0.126)
gen_head	-0.0645	-0.0503
	(0.0934)	(0.0911)
edu_head	0.0289***	0.0306***
	(0.0083)	(0.0081)
age_head	0.0184	0.0244*
	(0.0142)	(0.0139)
age_head2	-0.000103	-0.00015
	(0.0001)	(0.0001)
Constant	9.669***	-0.0793***
	(0.416)	(0.0139)
R-squared	0.047	0.097
Number of observations	4533	4533
Number of households	3200	3200
Dependent variable: $\ln(Y)$		

Source: Authors' estimates from the VHLSS 2014, 2016.
Note: The standard deviation is in parentheses; *** p <0.01, ** p <0.05, * p <0.1.

Estimation results show that migration and remittances improve per capita income. The coefficient of $migr$ variable in model 1 is positive and statistically significant at 10% level. It implies that if a household has at least one migrant, it will have higher per capita income in compare with non-migrant households.

The estimation results from model 2' show that the coefficient of $ln(remit1^*)$ and $ln(remit2^*)$ variables are positive and statistically significant at 1% level, which means that receiving remittances increases per capita income of households. Especially, the impact of international remittances on per capita income is stronger than the impact of internal remittances. If the internal remittances and international remittances which are received by a household increase by 1%, per capita income of the household increases by 0.044% and 0.252%, respectively. Besides, the coefficients of $I[remit1 = 0]$ and $I[remit2 = 0]$ are also positive and significant. This means that if the household does not receive the remittances, per capita income will be lower. Because number of household members is controlled in the models, the results mean that remittances have overwhelmed reduction effects on income caused by migration.

Among the control variables that reflect the household characteristics in model 1 and model 2', the coefficients of $hhsize$ and edu_head are statistically significant in both models. In particular, the larger the household size, the lower the income per capita of the household; whereas if the number of schooling years of the household head increases, income per capita is improved. Age of the household head is only significant in the model 2' and the coefficient of squared age of the household head variable is not statistically significant. This implies that income per capita is positively related to the age of the household head.

The coefficient of $rdepend$ variable is negative but not statistically significant. The estimation results from the VHLSS 2014 and VHLSS 2016 show that nearly 30% of households have a zero dependency ratio and approximately 87% of households have an under 100% dependency ratio. As a result of low dependency ratios, the dependency ratio may not affect household income clearly.

The gender of the household head does not affect household income in both models 1 and 2'. Possibly, the role of men and women in generating income has become more equal in Vietnamese households.

5.2. Impact of migration and remittances on household poverty

Tables 3 and Table 4 present the estimation results from the fixed-effect logit model and fractional logit model. The fixed-effects model only concerns within-subject variability, hence data from 3,558 households that were always poor or not poor in both the 2014 and 2016 surveys are excluded (corresponding to 5,045 observations). Therefore, the number of observations in the model is 326 observations (corresponding to 163 households).

TABLE 3. ESTIMATION RESULTS FROM FIXED-EFFECT LOGIT MODEL, ODDS RATIO

VARIABLES	MODEL 3'	MODEL 4'
$migr$	0.7723 (0.4248)	
$ln(remit2^*)$		0.6816*** (0.0916)
$ln(remit1^*)$		6.2261 (3366.1520)
$I[remit2 = 0]$		0.0976** (0.0939)
$I[remit1 = 0]$		1 (omitted)
$hhsize$	1.9860*** (0.3809)	1.9158*** (0.3769)
$rdepend$	0.9993 (0.0042)	1.0003 (0.0043)
$rfemale$	1.8197 (2.8758)	1.8306 (2.9914)
gen_head	0.6877 (0.7158)	1.0580 (1.1452)
edu_head	0.8085** (0.0726)	0.8218** (0.0728)
age_head	0.3764*** (0.1118)	0.4025*** (0.1176)
age_head2	1.0077*** (0.0027)	1.0071*** (0.0027)
Number of observations	326	326
Number of households	163	163

Source: Authors' estimates from the VHLSS 2014, 2016.
Note: The standard deviation is in parentheses; *** p <0.01, ** p <0.05, * p <0.1.

TABLE 4. ESTIMATION RESULTS FROM FRACTIONAL LOGIT MODEL

VARIABLES	MODEL (5A)		MODEL (5B)	
	Coefficient	Marginal effect	Coefficients	Marginal effect
$migr$	-0.0347	-0.0009		
	(0.665)	(0.0165)		
$ln(remit2^*)$			-0.245*	-0.0060*
			(0.129)	(0.0031)
$ln(remit1^*)$			-0.504	-0.0122
			(1.312)	(0.0318)
$I[remit2 = 0]$			-1.659*	-0.0403*
			(0.990)	(0.0241)
$I[remit1 = 0]$			-4.359	-0.1058
			(12.42)	(0.3014)
$hhsize$	0.370**	0.0092**	0.327**	0.0079**
	(0.162)	(0.0040)	(0.164)	(0.0040)
$rdepend$	0.00178	0.0000	0.00231	0.0001
	(0.0034)	(0.0001)	(0.0038)	(0.0001)
$rfemale$	-0.293	-0.0073	-0.186	-0.0045
	(1.706)	(0.0423)	(1.734)	(0.0421)
gen_head	0.215	0.0053	0.295	0.0072
	(1.066)	(0.0265)	(1.194)	(0.0290)
edu_head	-0.0941**	-0.0023**	-0.0767**	-0.0019**
	(0.0410)	(0.0010)	(0.0311)	(0.0008)
age_head	-0.322**	-0.0080**	-0.363**	-0.0088**
	(0.137)	(0.0034)	(0.154)	(0.0038)
age_head2	0.00296**	0.0001**	0.00330**	0.0001**
	(0.0013)	(0.0000)	(0.00149)	(0.0000)
Constant	-0.232		0.640	
	(1.137)		(9.545)	
Number of observations	5,371	5,371	5,371	5,371
Number of households	3,721		3,721	

Source: Authors' estimates from the VHLSS 2014, 2016.
Note: The standard deviation is in parentheses; *** p <0.01, ** p <0.05, * p <0.1.

The results show that the sign of the coefficients and significance levels are similar in the model 3'and model 5a, model 4' and model 5b. This implies that factors that change the probability of falling into poor status will also change the poverty intensity of households.

The coefficients of $migr$ variable in models 3' and 5a are not statistically significant. Although model 1's results show that per capita income increases if the household has at least one migrant, the migration does not affect the poverty status of the households, including probability and depth of poverty. The reason may be that migrant households are mostly not poor, whereas only a very small proportion of poor households have migrants. According to the estimation results from VHLSSs 2014 and 2016, the number of poor households having migrants accounts for only 3.4% - 3.6% of total migrant households.

The odds ratio of $ln(remit2^*)$ variable in model 4' is 0.68 and statistically significant. If the remittances from internal migration increase by 1%, the probability of becoming a poor household is multiplied by 0.68. This means that the probability of falling into poverty of the household decreases. Meanwhile, the model 5b estimation results show that if remittances from domestic migrants received by a household increase by 1%, the

poverty gap of this household decreases by 0.006 percentage point. For some households, internal remittances may not push them out of poverty but this type of remittances mitigates their basic needs shortage.

The results from the fixed-effect logit model and fractional logit model show that the coefficients of international remittances variables are not statistically significant. Although the impact of remittances from international migration on per capita income is stronger than internal remittances' effect, they do not reduce the poverty status of households. This can be explained by the fact that remittances from international migration cover a small portion of poor households. The estimation results from the VHLSSs 2014, 2016 show that, although 56.2% of households received remittances from overseas migrants, only 0.54% of poor households received this remittance type (corresponding to 2 out of 371 poor households). Meanwhile, remittances from internal migration have a larger coverage of households. More than 90% of households and 78.2% of poor households received internal remittances.

The coefficients of *hhsize* and *edu_head* variables are statistically significant in all models. The results imply that if the household size increases, the probability of falling into poverty and the poverty gap rises. On the other hand, if the number of schooling years of the household head increases, the probability of becoming poor and the poverty intensity of households decreases. This can be explained by that increase in the number of household members tends to reduce the average level of expenditure of each member. Meanwhile, if the schooling years of householders increase, their probability of falling into poverty decreases. The reason is that the rise of the householder's educational level does not improve their income only but also generate more other economic activities for them to earn a living. This result reconfirms the role of adult education in poverty reduction.

The coefficients of *age_head* and *age_head2* variables in these models are statistically significant. However, the results also show that the age of household head has diminishing effects. Although the probability of households falling into poverty and the poverty gap are reduced if age of household head increases, this effect will be reversed after a certain threshold: the probability of falling into poverty and the poverty gap of the household will rise if age of household head increases.

6. Research limitations

Although the study has reached its main aims, it has some limitations. First, this research has pay much attention on impacts of remittances on poverty reduction while migration may affect poverty through many channels. Second, because the study is at the household level, it has ignored the spillover effects of remittances on poverty. However, Edward (2001) and Taylor & Dyer (2009) suggest that these effects are huge and important. In the future, research on this topic should examine these indirect effects and exploit other channels that migration may affect poverty.

7. Conclusion

Based on the two most recent Vietnam Household Living Standard Surveys in 2014 and 2016, this paper has examined the impacts of migration and remittances on poverty reduction in Vietnam. The results from a fixed-effect logit model and a fractional logit

model have revealed the effects of migration and remittances on the incidence of poverty and poverty gap.

Although migration and remittances improve household per capita income, not all of these factors affect poverty status. Specifically, having at least one migrant and receiving international remittances do not reduce both poverty incidence and poverty gap, whereas they improve per capita income. Besides, while international remittances do not affect poverty, remittances from internal migration play an active role in reducing the probability of falling into poverty and the depth of poverty.

The results have implied that poverty reduction benefits from migration and remittances should be recognized, especially internal migration. There should be more policies that enhance the migration ability of the poor and assist migrants. Since remittances improve income and reduce poverty, migration-related policies need to be paid higher attention.

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Appendix

TABLE A1. RESULT OF THE HAUSMAN TEST, MODEL 1

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
$migr$	0.0732	0.0563	0.0169	0.0318
$hhsize$	-0.0865	-0.0607	-0.0257	0.0129
$rdepend$	-0.0001	-0.0008	0.0008	0.0003
$rfemale$	-0.0619	-0.2741	0.2122	0.1153
gen_head	-0.0645	-0.0852	0.0207	0.0889
edu_head	0.0289	0.0706	-0.0417	0.0077
age_head	0.0184	0.0507	-0.0323	0.0132
age_head2	-0.0001	-0.0004	0.0003	0.0001

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 53.11
Prob>chi2 = 0.0000

TABLE A2. RESULT OF THE HAUSMAN TEST, MODEL 2'

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
$ln(remit2^*)$	0.0443	0.0609	-0.0166	0.0072
$ln(remit1^*)$	0.2519	0.2766	-0.0247	0.0299
$I[remit2 = 0]$	0.2459	0.3234	-0.0775	0.0607
$I[remit1 = 0]$	2.0847	2.3035	-0.2188	0.2844
$hhsize$	-0.0793	-0.0536	-0.0257	0.0121
$rdepend$	-0.0003	-0.0012	0.0009	0.0003
$rfemale$	-0.0865	-0.2809	0.1944	0.1127
gen_head	-0.0503	-0.0753	0.0250	0.0869
edu_head	0.0306	0.0666	-0.0360	0.0075
age_head	0.0244	0.0450	-0.0207	0.0129
age_head2	-0.0002	-0.0003	0.0002	0.0001

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 48.26
Prob>chi2 = 0.0000

TABLE A3. RESULT OF THE HAUSMAN TEST, MODEL 3'

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
$migr$	-0.2584	-0.6453	0.3869	0.4460
$hhsize$	0.6861	0.5888	0.0973	0.1793
$rdepend$	-0.0007	0.0045	-0.0053	0.0040
$rfemale$	0.5987	0.3385	0.2602	1.5053
gen_head	-0.3745	0.0800	-0.4544	1.0158
edu_head	-0.2126	-0.4279	0.2153	0.0829
age_head	-0.9772	-0.2806	-0.6967	0.2940
age_head2	0.0076	0.0020	0.0056	0.0027

b = consistent under Ho and Ha; obtained from xtlogit
B = inconsistent under Ha, efficient under Ho; obtained from xtlogit
Test: Ho: difference in coefficients not systematic
chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 22.68
Prob>chi2 = 0.0038

TABLE A4. RESULT OF THE HAUSMAN TEST, MODEL 4'

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
$ln(remit2^{*})$	-0.3832	-0.5904	0.2072	0.1172
$ln(remit1^{*})$	1.8288	-0.5009	2.3297	540.6508
$I[remit2 = 0]$	-2.3266	-3.6305	1.3039	0.8321
$hhsize$	0.6501	0.5437	0.1064	0.1860
$rdepend$	0.0003	0.0065	-0.0062	0.0041
$rfemale$	0.6046	0.3203	0.2844	1.5654
gen_head	0.0563	-0.0302	0.0865	1.0594
edu_head	-0.1963	-0.3827	0.1864	0.0826
age_head	-0.9100	-0.2395	-0.6705	0.2894
age_head2	0.0070	0.0018	0.0053	0.0026

b = consistent under Ho and Ha; obtained from xtlogit
B = inconsistent under Ha, efficient under Ho; obtained from xtlogit
Test: Ho: difference in coefficients not systematic
chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 18.20
Prob>chi2 = 0.0198