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Heterogeneous effects of migration on child welfare: Empirical evidence from Viet Nam

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ADB Working Paper Series

**HETEROGENEOUS EFFECTS OF
MIGRATION ON CHILD WELFARE:
EMPIRICAL EVIDENCE FROM VIET NAM**

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and Long Q. Trinh

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Abstract

This study examines the heterogeneous effect of migration on left-behind children's education and labor in Viet Nam. Since decisions to attend school and to work are jointly determined, we use a simultaneous equation modelling approach to estimate the effect of migration on child education and labor. Since migration also affects household welfare, we also integrate household welfare into our system of equations. We use a unique household-level data set collected in 2012 and 2014 in rural Viet Nam. We find that migration of other family members does not affect a child's decision to attend school directly, but does so indirectly through an increase in time spent at work. However, migration might increase household income, and this may also have a positive effect on child education and reduce child labor. We also find some heterogeneous effects by type of migration (migration for education and migration for work purposes) as well as effects of sending money to migrants and receiving money from migrants on household income, child labor, and ultimately child education.

Keywords: child education, child labor, child welfare, migration, Viet Nam

JEL Classification: D01, D13, J13

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1. INTRODUCTION

There are many studies on the impact of migration on left-behind children in the context of domestic rural-to-urban or international migration. The major issue regarding migration is that its total effect on left-behind children is a priori unknown. Theoretically, the effects could be either positive or negative. While migration may improve the family's disposable income at home (Ellis 2003), migration of adult family members may result in an increase in child labor, especially household work, to compensate for the lack of adult labor, and, ultimately, may cause a reduction in children's total schooling or more restricted access to schooling. Empirical evidence has supported both views. For example, Antman (2012) found a statistically significant positive effect of (Mexican) parental US migration on educational attainment for girls. However, Antman (2012) could not find any effects of the absence of fathers on children's educational outcomes. McKenzie and Rapoport (2011) found evidence of a significant negative effect of migration of parents from Mexico to the US on children's school attendance and attainment. Furthermore, they also found that the absence of a parent results in the loss of parental attention and supervision over their children, which leads to poorer school performance. Meyerhoefer and Chen (2011) and Wen and Lin (2012) found that Chinese children whose parents had migrated to urban areas were worse off in terms of school enrollment and years of schooling than those whose parents had not migrated. However, as far as we know, there is little understanding of how children's welfare is affected by the different aspects of migration such as the type of migration (seasonal or permanent), the motives for migration (e.g., shock-induced migration), and the size and direction of remittances. The literature is also meager on how the effect of migration differs depending on the context and community in which the migrant's family lives. For example, if children are looked after by poorly educated grandparents who are unable to perform the roles of the parents in their absence, their welfare may be reduced (Biao 2007). This warrants further studies on the heterogeneous effects of migration on children's welfare.

This study examines whether the effect of parental migration on children's school performance is positive or negative, and investigates whether there are differences in the impact of migration on child welfare due to factors such as migration motives, migration types, and home family context (including the child's gender). To achieve this, we use data collected from the Viet Nam Access to Resources Household Survey (VARHS) in 2012 and 2014 to examine how migration has impacted the welfare of children and young people living in rural Viet Nam. The VARHS is jointly managed by the Department of Economics of the University of Copenhagen, Denmark, and two institutes in Viet Nam: the Central Institute for Economic Management (Ministry of Planning and Investment) and the Institute for Labor Studies and Social Affairs (Ministry of Labor, Invalid, and Social Affairs). In each survey wave, the sample included about 3,700 rural households. Besides the core parts of the questionnaire, which include questions similar to those in the World Bank's Living Standard Survey questionnaire (Brandt and Tarp 2017), the questionnaire also has questions aimed at collecting information on economic shocks, vulnerability, and migration (including reasons for migration, type of migration, and remittances).

In this paper, we follow the literature in modeling child welfare as a function of a household's characteristics (especially those of the household head), such as education level, age and migration indicators, and individual characteristics (age, gender). We use several welfare measures, including school attendance and child labor (i.e. engagement in agricultural production, household enterprise production, and wage employment). The variable indicating whether there is a household member that

has migrated is the variable of interest. We use several migration indicators to distinguish the effects of different kinds of migration, as well as remittances. It's possible that there are some unobservable factors either at the household level or the individual level that influence both the migration decision and child welfare. This will make the estimates biased. To mitigate this issue, we use the child fixed-effects estimator to estimate the impact of parental migration. The main advantage of the fixed-effects estimator is that it can control for all time-invariant variables, both observed and unobserved. We simultaneously model the decisions regarding child schooling, child labor, and household income.

The paper is structured as follows. We review the literature on child well-being and the effect of migration on it in Section 2. The empirical approach is presented in Section 3, followed by a brief data introduction and some descriptive analysis in Section 4. Section 5 reports our empirical results. Section 6 provides some concluding remarks and policy implications.

2. LITERATURE REVIEW: MIGRATION AND EFFECTS ON CHILD WELL-BEING

2.1 Migration and Child Well-being

Migration is an important household livelihood strategy. There has been an increasing trend toward migration in developing countries. Migration can have profound impacts on child welfare through several channels. First, migration can increase household income through remittances (McKenzie and Sasin 2007). Increased income can result in an increase in household spending on the health and education of children, as well as reducing child work, since a higher income can release children from the need to work. Children can spend more time on education and less time on work. However, if remittances reduce work incentives for recipients (Farrington and Slater 2006; Sahn and Alderman 1996), the welfare-enhancing effects of remittances may not be realized. Second, migration could influence child well-being through the reallocation of labor among those left behind. It's possible that the left-behind children may have to perform household work and even work that used to be performed by those who have migrated. Taking on the work previously done by household members who have migrated may reduce the time children can allocate to education and thus cause poor performance and possibly lead to dropping out of school.

So far, empirical evidence on the impact of migration on child well-being has been inconclusive on these issues. Numerous empirical studies find poverty-reducing effects of migration and remittances (e.g. Adams and Page 2005; Taylor et al. 2005; Acosta, Fajnzylber, and Lopez 2007). Citing findings in Guatemala, Pakistan, and Mexico, the UNDP-HDRO (2009) noted that families with migrants appear to be more likely to send their children to school, using cash from remittances to pay fees and other costs. Several studies find that migration and remittances help children increase education and reduce child labor (e.g., Yang 2008; Antman 2012; Alcaraz, Chiquiar, and Salcedo 2012; Binci and Giannelli 2012). Migration is also found to improve the health and nutrition of children (Hildebrandt et al. 2005; Macours and Vakis 2010; Anton 2010). Nevertheless, there are a number of studies that find negative effects of parental migration on children's education (e.g., McKenzie and Rapoport 2011; Lahaie et al. 2009; Giannelli and Mangiavacchi 2010; Robles and Oropesa 2011; Zhang et al. 2014) and on children's health (Cameron and Lim 2007; Gibson, McKenzie and Stillman 2011; De Brauw and Mu 2011). Several studies, such as McKenzie and Rapoport

(2011), Kiros and White (2004), Giannelli and Mangiavacchi (2010), and Wang (2014), found that children in migrating households have a lower educational attainment than those in nonmigrating households. In Kiros and White (2004), children in Ethiopia with migrant mothers were found to have less immunization coverage than children whose mothers had not migrated. Hence, the existing empirical studies show a wide diversity of empirical results, which calls for more empirical studies to enable a better understanding of the effect of parental absence, especially temporary absence for work, on children's outcomes.

2.2 Child Well-being and Migration Studies in Viet Nam

A number of studies have examined child education and child labor in Viet Nam. However, most recent research has focused on investigating these issues separately. Some studies, such as Edmonds and Turk (2002), Edmonds (2005), Edmonds and Pavcnik (2005), O'Donnell Rosati and Van Doorslaer (2005), and Beegle, Dehejia, and Gatti (2009), have investigated the effects of child labor on child education or health. Beegle, Dehejia, and Gatti (2009) use panel data from the Viet Nam Living Standard Surveys 1993/1994 and 1997/1998 and find that there were significantly negative impacts on children's school enrollment and grade attainment.

Some previous literature has examined the patterns of migration and the effect of migration on household welfare in Viet Nam. Nguyen, Raabe, and Grote (2008) showed that the emigration rate seems to be higher among those with higher education levels or among households engaged in wage employment. Nguyen, Raabe, and Grote (2015) and Gröger and Zylberberg (2016) found that migration is viewed as a risk-coping strategy of rural households. Regarding the effect of migration and remittances on household welfare, De Brauw and Harigaya (2007) showed that, during the 1990s, household expenditures among migrant-sending households were 5.2 percentage points higher than those of households without any migrants. Nguyen, Van den Berg, and Lensink (2011) estimated the impact of work migration and nonwork migration on some household welfare indicators, including income, expenditures, poverty, and inequality, in Viet Nam using the Viet Nam Household and Living Standard Surveys 2004 and 2006. They found that both types of migration have a positive impact on the expenditures of migrant-sending households. Furthermore, they found that nonwork migration contributes significantly to poverty reduction while the effect of work migration is much smaller.

Using the Viet Nam Living Standard Surveys 1992/3 and 1997/8, Binci and Giannelli (2012) found that internal remittances increased the school attendance and reduced the child work among children aged 6–15 years in Viet Nam. Booth and Tamura (2009) showed that parental absence caused sons (but not daughters) to do more paid work outside the household while the effects of parental absence on children's school attendance and household education expenditure were found to be negligible and not statistically significant. Nguyen and Vu (2016) used data from the Young Lives Surveys 2007 and 2009 to investigate the effect of parental migration on the time use of children aged 5–8. They showed that children whose parents are absent tend to spend less time on home study and more time on leisure and playing. They also found that children whose mothers are absent spend more time on home study, but also spend more time on housework than children whose fathers are absent.

Our study differs from previous research in several aspects. First, we not only examined the effect of child work on child education but we also investigated the impacts of migration, migration types, and remittances on child work and child education. This is an extension of Le and Homel's (2015) study, which does not examine the role of migration on child work. Second, similarly to Le and Homel (2015), we model the decision to work and to go to school simultaneously since there are unobservable factors that simultaneously affect child labor and child education. This distinguishes our study from that of Nguyen and Vu (2016), which examines the effect of parental absence on children's time allocation separately. Third, we also conjecture that migration does not affect the child education decision directly but rather indirectly through household income and the child work decision. Using simultaneous equation econometric modeling, we jointly estimate the effect of migration and type of migration on household income and child work decision and ultimately the effects of household income and the child work decision on child education. Furthermore, we also exploit the nature of our panel data to control for individual fixed effects in our estimations. This is a further extension of Le and Homel's (2015) study, which used only cross-sectional data.

3. EMPIRICAL STRATEGY

3.1 Estimation Equations

Child Education Decision

Our first equation is the child education decision.

$$edu_{it} = \theta_{01}Migration_{it}^0 + \theta_1work_{it} + X'_{1it}\beta + u_{1it} \quad (1)$$

where edu_{it} is a binary variable that takes the value of one if child i attends school at time t ($t=2002$, and 2004) and zero otherwise; $work_{it}$ is child i 's time spent working (i.e., the share of working days in a year, equal to the ratio of total equivalent of 8-hour working days to 365 days); X'_{1it} is a vector of control variables including child's age, gender, and household characteristics such as per capita income, family size, share of children under 18 and retired adults, household head's education, gender, and age, province where child i lives, and year dummies. $Migration_{it}$ is a binary variable that takes the value of one if child i lives in a migrant-sending household and zero otherwise.

Child Labor Decision

In the first equation, $work_{it}$ determines whether a child goes to school or not. This variable in turn is determined in equation (2) as follows:

$$work_{it} = \alpha_0 + \alpha_{01}Migration_{it}^0 + X'_{2it}\alpha_2 + u_{3it} \quad (2)$$

where $work_{it}$ is the same as in equation (1). Similarly to equation (1), $Migration_{it}$ is a binary variable that takes the value of one if child i lives in a migrant-sending household and zero otherwise, and X'_{2it} is a vector of control variables. Our X'_{2it} is similar to X'_{1it} , except that we include a dummy variable that indicates whether or not the child's

household experienced at least one shock in the previous year.¹ The previous literature on child education includes this type of variable directly in the education outcome equation. However, we conjecture that the child education decision is not directly affected by household shock but rather by their time use (i.e. the time allocated to work) and by family income. In fact, when we include this variable in our first equation, it does not have a statistically significant effect on child education. This variable could be viewed as an “instrumental variable” for the endogenous variable $work_{it}$. Our parameter of interest in this specification is α_{01} .

Household Income

As mentioned above, the pathway through which migration has effects on child education is through income and the child labor decision. We model the household income per capita as follows:

$$Inc_{it} = \gamma_0 + \gamma_{01}Migration_{it}^0 + X'_{3it}\beta + u_{5it} \tag{3}$$

where Inc_{it} is per capita income of the household to which child i belongs. $Migration_{it}^0$ is either a dummy variable as in equations (1) and (2) or a set of alternative variables as described below. X'_{3it} is the vector of control variables including only household characteristics and provincial and year dummies.

Endogeneity of Migration Variable

Although the migration decision of other household members and the left-behind child’s decision to go to school and their labor may be independent,² they may potentially be correlated with factors at the household level that we are not able to observe. To mitigate this issue, we included the inverse Mills ratio in all estimation equations, which are calculated from a probit estimation equation as follows:

$$Pr (Migration_{it} = 1) = \delta_{it}MigrantDis_{dt} + X'_{1it}\delta + u_{1it} \tag{4}$$

in which $Migration_{it}$ is our migration variable defined earlier. $MigrantDis_{dt}$ is the share of migrants in the total population of the district where child i lives. This variable acts as the identification variable in our estimation. In fact, the prevalence of migrants at the district level may affect the migration decision of members of child i ’s family, but it may not affect child education and child labor at the household level.

3.2 Effect of Different Types of Migration on Child Education and Labor

We further explore the effects of different types of migration on children education and labor. For the child education decision, we estimate the following equation:

$$edu_{it} = \theta_{01}WorkM_{it} + \theta_{02}EduM_{it} + \theta_{03}OthM_{it} + \theta_1work_{it} + X'_{1it}\beta + u_{2it} \tag{5}$$

¹ The types of shock include flood, drought, pest infestation and crop diseases, avian flu, price shocks, job losses, land loss, crime, and other family shocks (death or illness of a household member). To check for robustness, we use another shock variable, which takes the value of one if the household experiences shocks including only flood, drought, pest infestation and crop diseases, avian flu, and price shocks, and zero otherwise. The results are not qualitatively different. The results are available upon request.

² The migration decision of a household member may indirectly affect a child’s education and labor through household income.

where $WorkM_{it}$ is a dummy variable that takes the value of one if child i lives in a household with at least one person who migrates to work and zero otherwise at time t ; $EduM_{it}$ is a dummy variable that takes the value of one if child i lives in a household with at least one person who migrates to study and zero otherwise at time t ; and $OthM_{it}$ is a dummy variable that takes the value of one if child i lives in a household with at least one person who migrates for other purposes, including marriage or family reunification, and zero otherwise at time t . Alternatively, instead of using binary values for each of the variables $WorkM_{it}$, $EduM_{it}$, and $OthM_{it}$, we use the share of each type of migration in the total number of family members.

Similarly, the child labor decision and household income can also be rewritten as follows:

$$work_{it} = \alpha_0 + \alpha_{01}WorkM_{it} + \alpha_{02}EduM_{it} + \alpha_{03}OthM_{it} + X'_{2it}\alpha_2 + u_{3it} \quad (6)$$

$$Inc_{it} = \gamma_0 + \gamma_{01}WorkM_{it} + \gamma_{02}EduM_{it} + \gamma_{03}OthM_{it} + X'_{3it}\beta + u_{5it} \quad (7)$$

We further examine the role of remittances by estimating the following equations:

$$edu_{it} = \theta_0^1 RemitIn_{it} + \theta_0^2 RemitOut_{it} + \theta_1 work_{it} + X'_{1it}\beta + u_{1it} \quad (8)$$

$$work_{it} = \alpha_0 + \alpha_0^1 RemitIn_{it} + \alpha_0^2 RemitOut_{it} + X'_{2it}\alpha_2 + u_{3it} \quad (9)$$

$$Inc_{it} = \gamma_0 + \gamma_0^1 RemitIn_{it} + \gamma_0^2 RemitOut_{it} + X'_{3it}\beta + u_{5it} \quad (10)$$

where $RemitIn_{it}$ is the share of total remittance that child i 's household received in his/her household's total income at time t , and $RemitOut_{it}$ is the share of total remittance that child i 's household sent out to their migrant members in total household income.

3.3 Estimation Strategy

In this paper, we use several approaches to examine the effect of migration on child well-being.

- (i) We estimate separately two child outcome equations. For education equations (1, 5, and 8), we use a probit estimator and include various control variables indicating migration and the inverse Mills ratio calculated from equation (4). Due to the nature of the dependent variable, Tobit estimation is used to estimate the child labor decision in equations 2, 6, and 9.
- (ii) We jointly estimate two equations regarding child education and child labor and assume that per capita income is exogenous to both child education and child labor decisions as indicated in Figure 1.
- (iii) We jointly estimate equations relating to child education, child labor decisions, and per capita income as in Figure 2:

Figure 1: Simultaneous Equation Model 1

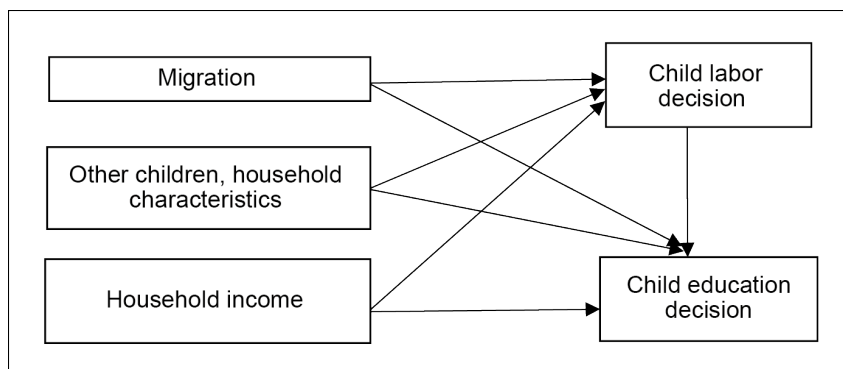
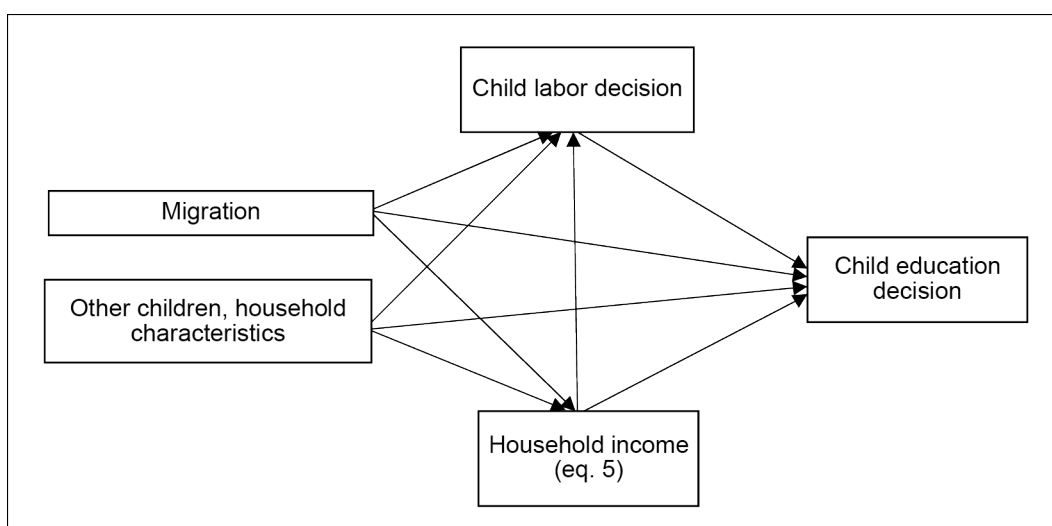


Figure 2: Simultaneous Equation Model 2



4. DATA AND DESCRIPTIVE STATISTICS

In this study, we use data from the Viet Nam Agricultural Rural Household Survey (VARHS), which is jointly managed by the Department of Economics of the University of Copenhagen, Denmark; and two institutes in Viet Nam, the Central Institute for Economic Management (Ministry of Planning and Investment) and the Institute for Labor Studies and Social Affairs (Ministry of Labor, Invalid, and Social Affairs), in the 2006, 2008, 2010, 2012, 2014, and 2016 (currently under embargo) waves. The initial sample size (collected in 2006) is 2,300 rural households in 12 provinces (Dak Lak, Dak Nong, Dien Bien, Ha Tay, Khanh Hoa, Lai Chau, Lam Dong, Lao Cai, Long An, Nghe An, Phu Tho, and Quang Nam). It is a representative sample of rural areas in these provinces in 2006. The sample size increased to 3,200 in 2008 and 2010, then to about 3,700 rural households in 2012 and 2014 to ensure better representativeness of the rural population in these provinces. The core part of the survey instrument is quite similar to that used for the World Bank’s Living Standard Survey, which has detailed information on household demographics, household production, and household members’ education, health, occupation, etc. Moreover, the survey instrument has separate modules relating to economic shocks and vulnerability. In 2012, a migration

module with information on reasons for migration, type of migration, and remittances was introduced.

For the purpose of this study, we limit our sample to children who live in households whose head is either their mother or father. (There are some children who live in households whose household head is their grandparent, which makes it difficult for us to identify the child's parents among the household members when there are several related families living in the same house and registered as a single household.) To maintain the panel nature of our data, the children in our sample are those whose ages ranged from 6 to 16 in 2012 and consequently from 8 to 18 in 2014. Finally, we have about 5,154 children in our sample (i.e. about 2,577 children in each year), living in 1,459 households in each year. Among these children, our sample includes 1,370 children living in households that do not have other siblings in the sample. The other 3,784 children live in households with at least one sibling in the sample.

In our sample, 12.0% of the children live in households with at least one member who has migrated (10.4% in 2012 and 13.7% in 2014). Among migrants, 31% migrated to work or seek jobs (in both 2012 and 2014) and 42% of migrants in 2012 and 52% of migrants in 2014, respectively, migrated for education purposes. The remaining migrants migrated for other purposes such as family unification and marriage.

Table 1 presents a descriptive analysis of our sample.

Table 1: Descriptive Statistics

	Whole Sample		Migrated Households		Nonmigrated Households	
	Mean	Sta. Dev.	Mean	Sta. Dev.	Mean	Sta. Dev.
% go to school	84.0%		87.0%		84.0%	
Total working days per year	22.97	38.97	23.23	37.67	22.93	39.15
Age	12.32	3.29	13.3	3.22	12.19	3.28
Male (%)	51.0%		50.0%		51.0%	
Income per capita ('000 VND)	15,113	21,688	17,353	25,497	14,807	21,098
Family size	5.48	1.78	5.62	1.79	5.46	1.78
Experienced shock in last year	52.0%	0.5	50.0%	0.5	52.0%	0.5
Under 18 years old (%)	51.0%	0.14	44.0%	0.15	52.0%	0.13
Retired people (%)	3.0%	0.08	4.0%	0.09	3.0%	0.08
Household head age	41.24	7.19	45.29	6.56	40.69	7.1
Household head is male	92%		92%	0.26	92%	0.27
Household head education level	5.64	4.11	6.68	4.03	5.5	4.1
No. of family members migrated	0.14	0.41	1.16	0.47		
Share of migrants	3.0%	0.08	22.0%	0.09		
Work migration	1.0%	0.05	7.0%	0.12		
Migration for education purpose	1.0%	0.05	10.0%	0.11		
Migration for other purpose	1.0%	0.04	5.0%	0.1		
Total remittances ('000 VND)	338.96	5,445.15	2,817.78	15,486.4		
Remittances share (over income)	0%	4.0%	0.03	0.1		
Total money sent ('000 VND)	842.12	4,628.31	7,000.46	11,625.19		
Money sent share (over income)	2.0%	0.19	14.0%	0.53		

Source: Authors' calculation.

5. EMPIRICAL RESULTS

5.1 Child Education and Labor: Single-Equation Approach

Table 2 reports the effects of migration on child education (columns 1 and 2) and child labor decision (columns 4, 5, and 6). In columns 2, 4, and 5, we include the inverse Mills ratio, calculated from probit equation (4), which examines the probability of living in a household with migrants, to control for the endogeneity bias that may arise due to the potential endogeneity of the migration decision.³ In column 5, we follow the methodology of Mundlak (1978) and Chamberlain (1984) by including the mean of time-varying covariates in our specification to estimate a quasi-fixed-effects Tobit regression. The results in column 1 indicate that living in a household with migrants is positively correlated with a child's decision to go to school, but this correlation is not statistically significant. However, we find that the more days a child works, the lower the probability of attending school. Children living in households with a higher per capita income, a more educated household head, a younger household head, and a smaller family size seem to have a higher probability of going to school than other children. Living in households where the father is the household head also improves a child's school attendance. We also find that most of the coefficients in column 2 are not much different from those in column 1, indicating that the potential bias of "Living in household with migrants" does not affect our estimation results. This is also confirmed by the lack of statistical significance from the inverse Mills ratio variables. The empirical results also indicate that a child's demographic characteristics such as gender and age do not affect their education decision. Per capita household does not influence children's schooling decision either. Living in a large family may reduce their chance of going to school, however the chance of going to school is higher among those families that have more children under 18 years old. We also find that the education level of the household head has a positive and statistically significant effect on the child education decision. The chance of going to school is also higher for children who live in male-head households, although this effect is quite weak.

Columns 3, 4, and 5 report our results regarding the child labor decision. Similarly to the case of the child education decision, the empirical results show that migration does not have any effect on the total time a child spends working. The empirical results indicate that child age is positively correlated with the time spent working. However, we do not see any significant effect of child gender and per capita income on the time a child worked. While a child living in a bigger family tends to work less, he/she has to work more if living in a family with a higher share of retired members. A child who lives in a household with a household head with a higher level of education tends to work less than other children. However, if the family experienced a shock in the previous year it increases the time the child worked. Our empirical results also suggest that the results obtained from RE Tobit regression (column 4) are not qualitative, in contrast to those obtained from quasi-FE Tobit regression (column 5).

³ Please refer to Appendix 1 for our probit estimation results regarding the probability of a child living in a household with migrants.

**Table 2: Effects on Child School and Child Labor Decisions:
Single-equation Approach**

	(1)	(2)	(3)	(4)	(5)
	Education Decision	Education Decision	Labor Decision	Labor Decision	Labor Decision
Living in HH with migrants	0.089 [0.090]	0.097 [0.091]	-0.003 [0.005]	-0.002 [0.005]	-0.002 [0.005]
% working day/year	-2.382*** [0.288]	-2.385*** [0.288]			
Child age	0.019 [0.012]	0.020* [0.012]	0.029*** [0.001]	0.029*** [0.001]	0.030*** [0.001]
Child is male	-0.020 [0.061]	-0.022 [0.061]	0.001 [0.006]	0.001 [0.006]	0.001 [0.006]
Per capita income	0.094** [0.042]	0.096** [0.042]	-0.001 [0.003]	-0.001 [0.003]	0.005 [0.003]
Family size	-0.075*** [0.019]	-0.073*** [0.020]	-0.003 [0.002]	-0.002 [0.002]	-0.006** [0.003]
Share of family members under 18	0.103 [0.266]	0.040 [0.299]	0.003 [0.020]	-0.004 [0.021]	-0.032 [0.026]
Share of family members retired	-0.310 [0.371]	-0.364 [0.384]	0.095*** [0.034]	0.091*** [0.034]	0.102* [0.055]
Household head education	0.041*** [0.009]	0.042*** [0.010]	-0.003*** [0.001]	-0.003*** [0.001]	-0.002** [0.001]
Household head age	-0.014*** [0.005]	-0.014*** [0.005]	-0.001 [0.001]	-0.001 [0.001]	-0.000 [0.001]
Household head is male	0.250** [0.114]	0.245** [0.114]	0.007 [0.010]	0.007 [0.010]	0.006 [0.010]
Experience shocks			0.011*** [0.004]	0.011*** [0.004]	0.011*** [0.004]
Province dummies	Yes	Yes	Yes	Yes	Yes
Year=2014	0.046 [0.044]	0.048 [0.044]	-0.054*** [0.003]	-0.054*** [0.003]	-0.058*** [0.004]
Inverse Mills ratio		0.042 [0.089]		0.004 [0.005]	0.003 [0.005]
Intercept	0.593 [0.557]	0.479 [0.607]	-0.371*** [0.043]	-0.382*** [0.045]	-0.241** [0.094]
Number of observations	5,154	5,154	5,154	5,154	5,154

Source: Authors' calculation.

Table 3 reports the effects of different types of migration and shares of remittances on child education (columns 1, 3, and 5) and child labor (columns 2, 4, and 6). We included the inverse Mills ratio in all specifications to mitigate the potential endogeneity problem. The empirical results show that a child living in a household with at least one member who has migrated for work significantly reduces the probability of going to school, while living in a household with at least one member who has migrated for education significantly increases that probability. This pattern is also observed when we use the share of each type of migrant in the total number of family members. This suggests that children living in households with working migrants tend to have to leave

school and may follow other household members who have already migrated to work. However, as shown in column 5, remittances received or sent out do not affect the child education decision.

Table 3: Types of Migration, Remittances, Child Education, and Child Labor

	(1)	(2)	(3)	(4)	(5)	(6)
	Education Decision	Labor Decision	Education Decision	Labor Decision	Education Decision	Labor decision
% working day/year	-2.387*** [0.288]		-2.400*** [0.289]		-2.386*** [0.289]	
Work migration	-0.264* [0.139]	-0.009 [0.009]				
Studying migration	0.298** [0.137]	-0.005 [0.008]				
Migration for other purposes	0.147 [0.177]	0.004 [0.009]				
% work migrants			-1.218** [0.543]	-0.031 [0.040]		
% studying migrants			1.776*** [0.666]	-0.004 [0.035]		
% other migrants			0.639 [0.779]	0.052 [0.038]		
Remittances/HH income					-0.591 [0.703]	0.023 [0.056]
Sending money/HH income					0.088 [0.158]	0.002 [0.007]
Child age	0.019* [0.012]	0.029*** [0.001]	0.019* [0.012]	0.029*** [0.001]	0.019 [0.012]	0.029*** [0.001]
Child is male	-0.018 [0.061]	0.001 [0.006]	-0.018 [0.061]	0.001 [0.006]	-0.021 [0.061]	0.001 [0.006]
Per capita income	0.093** [0.042]	-0.001 [0.003]	0.092** [0.042]	-0.001 [0.003]	0.100** [0.042]	-0.001 [0.003]
Family size	-0.076*** [0.019]	-0.002 [0.002]	-0.076*** [0.019]	-0.002 [0.002]	-0.074*** [0.019]	-0.003 [0.002]
Share of family members under 18	0.138 [0.266]	0.000 [0.020]	0.158 [0.266]	0.002 [0.020]	0.078 [0.264]	0.004 [0.019]
Share of family members retired	-0.272 [0.371]	0.095*** [0.034]	-0.248 [0.371]	0.095*** [0.034]	-0.323 [0.370]	0.096*** [0.034]
Household head education	0.040*** [0.009]	-0.003*** [0.001]	0.040*** [0.009]	-0.003*** [0.001]	0.041*** [0.009]	-0.003*** [0.001]
Household head age	-0.014*** [0.005]	-0.001 [0.001]	-0.014*** [0.005]	-0.001 [0.001]	-0.014*** [0.005]	-0.001 [0.001]
Household head is male	0.258** [0.114]	0.007 [0.010]	0.257** [0.114]	0.008 [0.010]	0.248** [0.114]	0.007 [0.010]
HH experience shocks		0.011*** [0.004]		0.011*** [0.004]		0.011*** [0.004]
Province dummies	0.000	0.000	0.000	0.000	0.000	0.000
Year=2014	0.046 [0.044]	-0.054*** [0.003]	0.044 [0.044]	-0.054*** [0.003]	0.047 [0.044]	-0.054*** [0.003]
Intercept	0.576 [0.557]	-0.369*** [0.043]	0.578 [0.557]	-0.371*** [0.043]	0.534 [0.561]	-0.373*** [0.043]
Number of observations	5,154	5,154	5,154	5,154	5,154	5,154

Source: Authors' calculation.

With regard to time spent on labor, we do not see a significant effect of having household members who have migrated for any purpose on a child's working time. The share of money the household receives from migrants (if any) or the share of money sent to migrants (if any) does not affect the time a child works.

5.2 Child Education and Labor: Simultaneous Equation Model Approach

Table 4 shows our estimation results using the simultaneous equation approach. In column 1, we estimated a child's school attendance and time spent working jointly while in column 2 we considered per capita income as an endogenous variable and estimated school attendance, time worked, and per capita income simultaneously. For child education, similarly to the results obtained from the single-equation approach (Table 2), we see that more time spent working reduces school attendance. However, the estimated coefficient is smaller in magnitude, indicating an upward bias in the effect of working time on child education when we considered child education and child labor separately. Meanwhile, other factors such as the child's own characteristics, family characteristics, and household head's characteristics have quite similar effects on child school attendance, except for the variable indicating the share of household members who were retired.

For child labor, our SEM estimation results indicated that children living in households with migrants have to spend more time working, suggesting a downward bias in the effect of migration on child labor compared with the results when we estimated child labor separately (Table 2). The downward pattern is also observed in the variable indicating whether the child lives in a household that experienced a shock in the previous year or not. While most other variables behave similarly to the single-equation approach, per capita income has a significant effect on a child's time spent working. Children living in households with a higher per capita income tend to work fewer days than children living in households with lower per capita income.

Regarding household income, we find a significant effect of migration on per capita income. This implies a higher correlation between per capita income and migration. The results also indicate that a bigger family size, more educated household head, and male-headed households tend to have a higher per capita income while households with a higher share of children aged under 18 or retired people tend to have a lower per capita income. Similarly, households that experienced a shock in the previous year also tend to have a lower per capita income.

Table 5 presents our estimation results using the simultaneous equation approach. We considered two alternative sets of indicators for migration: one indicating whether a child lived in a household with at least one member migrating for work, for education, or for other purposes (column 1); and another set of indicators indicating the share of remittances his/her household received (in total household income) from migrants and the share of money his/her household sent to migrants (in total household income) (column 2). Similarly to column 2 in Table 4, we assumed per capita income to be an endogenous variable and estimated school attendance, time worked, and per capita income simultaneously.

**Table 4: Migration, Child Education, Child Labor, and Household Income:
Simultaneous Equation Approach**

	(1)		(2)		Family Income (per capita)
	Education Decision	Labor Decision	Education Decision	Labor Decision	
Living in HH with migrants		0.002*** [0.000]	0.111 [0.102]	0.002*** [0.000]	0.046*** [0.014]
Working time	-1.979*** [0.069]		-1.982*** [0.041]		
Child age	0.004 [0.125]	0.027*** [0.000]	0.009 [0.129]	0.027*** [0.000]	
Child is male	-0.022* [0.013]	0.002 [0.002]	-0.019 [0.012]	0.002 [0.002]	
Per capita income	0.001 [0.023]	0.004 [0.013]	0.091** [0.035]	0.004 [0.013]	
Family size	0.057 [0.070]	-0.005 [0.005]	-0.062*** [0.007]	-0.005 [0.005]	0.072*** [0.003]
Share of family members under 18	1.371** [0.579]	-0.029 [0.076]	-0.028 [0.198]	-0.029 [0.076]	-0.894*** [0.010]
Share of family members retired	0.289 [1.048]	0.085 [0.174]	-0.262** [0.103]	0.085 [0.174]	-0.559*** [0.069]
Household head education	0.025* [0.014]	-0.003*** [0.000]	0.032** [0.013]	-0.003*** [0.000]	0.054*** [0.005]
Household head age	-0.014*** [0.004]	-0.000*** [0.000]	-0.012*** [0.004]	-0.000*** [0.000]	0.002 [0.003]
Household head is male	0.204*** [0.007]	0.006* [0.003]	0.196*** [0.019]	0.006* [0.003]	0.088** [0.036]
Experience shocks		0.023*** [0.005]		0.023*** [0.005]	-0.155*** [0.010]
Inverse Mills ratio	0.060*** [0.010]	0.005*** [0.001]	0.021 [0.022]	0.005*** [0.001]	
Household head is a veteran					-0.039*** [0.006]
Intercept	0.766 [1.359]	-0.265*** [0.013]	0.423 [1.444]	-0.265*** [0.013]	10.856*** [0.008]
Var (time worked)		0.019*** [0.000]		0.019*** [0.000]	
Var (family income pc)					0.441*** [0.049]
Number of observations	5,154	5,154	5,154	5,154	5,154

Source: Authors' calculation.

Table 5: Heterogeneous Effects of Migration on Child Education, Child Labor, and Household Income: Simultaneous Equation Approach

	(1)			(2)		
	Education Decision	Labor Decision	Family Income (per capita)	Education Decision	Labor Decision	Family income (per capita)
Working time	-1.995*** [0.044]			-2.034*** [0.210]		
Work migration	-0.824 [1.205]	0.012 [0.023]	-0.012 [0.431]			
Studying migration	1.736*** [0.223]	-0.048*** [0.018]	0.446*** [0.135]			
Migration for other purposes	0.486** [0.197]	0.136** [0.061]	0.027 [0.123]			
Remittances/HH income				-0.496 [0.426]	0.052*** [0.020]	0.337 [0.767]
Sending money/HH income				0.134*** [0.036]	0.002 [0.002]	-0.480*** [0.017]
Child age	0.009 [0.129]	0.027*** [0.000]		0.015 [0.108]	0.027*** [0.000]	
Child is male	-0.016 [0.012]	0.003 [0.002]		-0.020* [0.011]	0.003 [0.002]	
Per capita income	0.088** [0.038]	-0.008** [0.004]		0.097** [0.040]	-0.008** [0.004]	
Family size	-0.064*** [0.012]	-0.001*** [0.000]	0.072*** [0.003]	-0.062*** [0.009]	-0.002*** [0.000]	0.075*** [0.004]
Share of family members under 18	0.052 [0.102]	0.007 [0.016]	-0.878*** [0.008]	-0.040 [0.160]	0.013 [0.018]	-0.959*** [0.001]
Share of family members retired	-0.186*** [0.021]	0.082*** [0.003]	-0.547*** [0.075]	-0.262** [0.104]	0.085*** [0.005]	-0.613*** [0.087]
Household head education	0.031** [0.012]	-0.003*** [0.000]	0.054*** [0.005]	0.032** [0.013]	-0.003*** [0.000]	0.055*** [0.005]
Household head age	-0.012*** [0.004]	-0.001*** [0.000]	0.002 [0.003]	-0.011*** [0.004]	-0.001*** [0.000]	0.004* [0.002]
Household head is male	0.203*** [0.024]	0.008*** [0.001]	0.089** [0.038]	0.191*** [0.009]	0.007*** [0.000]	0.081** [0.036]
Experience shocks		0.023*** [0.003]	-0.156*** [0.010]		0.023*** [0.004]	-0.155*** [0.013]
Household head joined army			-0.038*** [0.005]			-0.043*** [0.006]
Intercept	0.469 [1.425]	-0.280*** [0.086]	10.847*** [0.006]	0.341 [1.191]	-0.280*** [0.083]	10.829*** [0.009]
Var (time worked)		0.019*** [0.000]			0.019*** [0.000]	
Var (per capita HH income)			0.440*** [0.050]			0.433*** [0.042]
Number of observations		5,154			5,154	

Source: Authors' calculation.

The estimation results are interesting. Children living in households with migrants who migrated for education are more likely to attend school and work less than children who live in households without any migrants. Children who live in households with migrants who migrated to work do not significantly differ in terms of school and work time from those who live in households without any migrants. This suggests that households that send their family members to be educated in other areas tend to care about their children's education more than do other households. This is confirmed by the

results we obtained when using variables indicating the share of money received from, and sent to, migrants in total household income. Children living in households that sent a higher share of their income to migrants are more likely to attend school than those who live in households that did not send money to migrants. Meanwhile, children living in households receiving more from migrants tend to work more. As regards a household's per capita income, sending money to migrants reduced household per capita income while receiving remittances from migrants did not increase household income.

6. CONCLUDING REMARKS

Using a unique data set collected in Viet Nam in 2012 and 2014, this study examines the heterogeneous effects of migration on left-behind children's education and child labor in Viet Nam. Since child education and child labor decisions are jointly determined, a simultaneous equation model approach is adopted to estimate the effect of migration on child education and child labor. Because migration not only affects a child's welfare but also household income, we further integrate household income into our system of equations. There are some major findings from our empirical results. First, migration does not appear to directly affect children's schooling decision, but might negatively affect their time spent working, which ultimately affects their schooling decision. Migration, however, may also positively affect household per capita income in some respects. Since family income has a significant effect on children's education and their working time, migration also indirectly affects child education and child labor.

We find that the total effects of migration on child education and child labor are negligible. This finding is different from other studies, including Binci and Giannelli (2012), which found that migration tends to increase school attendance and reduce child work. However, in contrast to our study, the previous literature examines the effect of migration on child education and child labor separately. Therefore, it appears to have ignored the negative relationship between child labor and child education as found in our study and in Le and Homel (2015).

Second, different types of migration have different effects on child schooling and labor. While children living in households with migrants who migrated for work are not found to be different in terms of school time from those living in households without any migrants, children living in households with migrants who migrated for education or other purposes tend to have a higher probability of attending school, although this relationship could be viewed as a correlation between migration and children's education rather than a causal effect. Third, children living in households with a higher share of inward remittances tend to work more. This may imply that such children may live in poorer households that send their household members to work in other areas and make left-behind children work more. Fourth, children living in households with education migration seem to attend school more and work less, but, at the same time, school time could be negatively affected by the income factor since households with education migration who have to send money to those migrants tend to have a lower per capita income.

The study has several limitations. First, due to the data availability, we could not provide adequate evidence on the effects of parental migration on child welfare. Parental migration may have a stronger effect on left-behind children than migration of other household members. Second, migration may have long-term effects on child outcomes. However, our data could only provide the contemporaneous effects of migration on child outcomes. These limitations are open for further studies.

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APPENDIX 1: PROBABILITY OF LIVING IN A HOUSEHOLD WITH A MIGRANT

	(1)	(2)	(3)
	Year 2012	Year 2014	Years 2012–2014
Share of migrants in total population	7.358*** [1.235]	5.652*** [1.169]	6.722*** [0.952]
Experience shocks	0.092 [0.088]	0.100 [0.078]	0.083 [0.061]
Child age	0.001 [0.013]	0.009 [0.012]	0.008 [0.009]
Child is male	-0.207*** [0.077]	0.029 [0.069]	-0.077 [0.056]
Per capita income	0.077 [0.061]	0.065 [0.047]	0.064 [0.039]
Family size	0.068*** [0.025]	0.077*** [0.022]	0.082*** [0.018]
Share of family members under 18	-2.101*** [0.320]	-1.938*** [0.285]	-2.162*** [0.237]
Share of family members retired	-1.246*** [0.451]	-1.682*** [0.426]	-1.546*** [0.339]
Household head education	0.033*** [0.012]	0.011 [0.011]	0.021** [0.009]
Household head age	0.042*** [0.006]	0.028*** [0.006]	0.035*** [0.005]
Household head is male	-0.378*** [0.143]	0.039 [0.128]	-0.160 [0.103]
Number of observations	2,577	2,577	5,154

Source: Authors' calculation.