DOI: 10.1111/ecot.12246

ORIGINAL ARTICLE

ECONOMICS of TRANSITION and INSTITUTIONAL CHANGE WILEY

Are children an *incentive* or a *disincentive* for migration? Evidence from Vietnam

Cuong Nguyen[1,2] | **Anh Tran**[3]

[1]Mekong Develoment Research Institute, Hanoi, Vietnam

[2]Thang Long Institute of Mathematics and Applied Sciences, Thang Long University, Hanoi, Vietnam

[3]Paul H. O'Neill School of Public and Environmental Affairs, Indiana University Bloomington, Indiana, USA

Abstract

This study analyzes the influence of children on household migration decisions using data on current internal movement in Vietnam a country that has experienced significant rural–urban migration in the recent years. Families with children usually have three migration choices: move together, stay together or send only one parent to work afar. Using an instrumental variable approach, we show that having an additional child reduces the probability of household migration by 0.0115, while it increases the likelihood of fathers' migration by 0.0121. These effects suggest that households with more children may be less mobile but may have a greater economic need for migration.

KEYWORDS

children, father, household, migration, mobility

JEL CLASSIFICATIONS

O15; R23; J12

1 | INTRODUCTION

Each year, millions of people decide to migrate while many others do not. This phenomenon has prompted a large amount of research into the causes of migration.[1] Two major economic frameworks have been helpful for this purpose. The first is the Neoclassical Theory of Migration, which has provided insight into individual workers' economic incentives.[2] The second is the New Economics

[1]There is also an extensive literature on the impact on migration (e.g., McKenzie and Sasin, 2007; Adams and Page, 2005; Acosta et al., 2007) that we will not discuss here. Some studies also look at the effect of migration on fertility and children (Rindfuss, 1976).

[2]Piore (1979), Borjas (1989), Massey et al. (1993), Massey & Capoferro (2004), Bauer and Zimmermann (1995).

Theory of Migration, which suggests that workers make migration decisions from within their social contexts, of which the most important are their families, spouses and children.[3] The key proposition of this second framework is that individuals' economic incentives do not adequately explain their migration choices. Despite this conceptual proposition, however, there have been few good empirical studies on the relationship between family and migration choice. Strikingly, we have not seen any causal evidence that children are taken into account in family migration choices.

Our paper aims to show the influence of children on migration, and so fill a gap in the New Economic Theory of Migration. We measure the effect of the number of children in a household on both the mobility of the household and the mobility of the parent. Further, we show that the strength of the effect of children in a family actually depends on the economic conditions in the district where the household is located. This demonstrates how social factors interact with economic incentives, highlighting the interplay between the New Economic and Neoclassical frameworks of migration.

For a long time, theoretical works have pointed to a conundrum that households with children may face when considering migration. On the one hand, more children usually entail higher costs of moving to and settling down in a new place, which discourages household migration (Mincer, 1978). Indeed, as early as 1885, Ravenstein made the argument that families are less likely to make international moves than young adults. On the other hand, raising children requires significant resources (Becker & Lewis, 1973; Becker & Tomes, 1976; Blake, 1989; Downey, 1995). This implies that households with more children may have a greater need to migrate in order to gain better income or access to education and healthcare for their children. The empirical question of which of these two effects is dominant has never been properly addressed. To our knowledge, two recent studies consider this issue, and their findings are mixed. Sarma and Parinduri (2015) show that having more children encourages women in Sri Lanka to work aboard. However, Bratti, Fiore, and Mendola (2019) do not find empirical evidence that fertility drives migration in Mexico.

The reasons for the lack of causal evidence on children and migration are well-known. First, how many children to have and whether to migrate are both endogenous choices for a household. Detangling the effect of one choice on the other requires sorts of exogenous sources that are rare in practice. Second, only a small proportion of the population migrates each year: seeking quantitative evidence would require either a very large survey or a surging migration period, the latter of which takes place only during urbanization booms, social conflicts and climate changes. Third, defining and measuring migration has always been a challenge; the same is true of collecting data on children in families that migrate and in those that do not (Roberts, 2002; Rossi, 2008; Scharping, 2001).

Our paper attempts to overcome these challenges and identify the first piece of evidence on the effect of children on migration. First, to address the endogeneity of family size, we use the presence of twins and the gender of the first child as instrument variables to predict the number of children in a household. These two instruments have been used in a number of well-known studies.[4] The assignment of twins and first child's gender to households is a natural and random experiment that helps us start detangling the effect of children on migration.

Second, we exploit the recent economic boom in Vietnam, which has been accompanied by massive urbanization and rural-urban migration. Migration is known to accelerate during certain periods of economic development and diminish in others. For example, the Great Migration in the US took

[3]Stark and Bloom (1985) and Stark (1991).

[4]For example see Angrist, Lavy and Schlosser, 2010; Black et al., 2005; Cáceres- Delpiano, 2005; De Haan, 2010; Lee, 2008; Rosenzweig and Wolpin, 1980.

place during a period of industrialization from the 1910s to the 1970s. During the past 10 years, migration has decreased in both developed and developing countries (Bell & Muhidin, 2011; Brockerhoff, 1999). The two countries that have not followed this pattern are Vietnam and China. In Vietnam, the share of the population living in urban areas increased from 22% to 30% during the 1998–2010 period.[5] Around 8.5% of the population changed their place of residence during 2004–2009.[6,7] Vietnam is also one of the world's most populous countries, with nearly 86 million people. Unlike China, Vietnam has never had a one-child-per-family policy; as a result, its population has been growing at more than double the rate of China.[8] This period of high population growth and booming migration presents a rare opportunity to study the effect of children on migration.

Lastly, the Vietnam General Statistical Bureau recently released data from the 2009 Population and Housing Census, which includes a series of questions that are useful for studying the children–migration relationship. The Census's questionnaire asked about: (i) the number of children in the household and their dates of birth, (ii) the address of the current residence, (iii) the address of the previous residence if the household had moved during the past five years; (iv) if the father is currently away from the household, and (v) other household characteristics. Having this detailed information from 3 million households allows us to use the above-mentioned instrumental variable approach to identify the role of children in the migration choices of households.

We find that a family having more than one child decreases their probability of having migrated over the past 5 years by 0.0115, or around 27% of the proportion of the migration rate. This effect is more pronounced for long- than short-distance migration, suggesting that moving costs play a significant role in the migration decisions of families. Further, households with more children tend to choose migration for the father only instead of the whole family: having an additional child actually increases the probability of the father living in a different location by 0.0121, or 33% of the rate of paternal migration. The effects of children on paternal migration are more profound in better-off households and areas. This suggests that wealthier families have higher income and can afford more children. As a result, fathers in these families do not have to migrate to earn more income to finance their families and children.

The remainder of the paper is organized as follows. Section 2 discusses a theoretical framework and outlines the existing literature. Section 3 presents data and patterns of household migration in Vietnam. Section 4 discusses our estimation methodology. Section 5 presents the estimation results of the impact of number of children on migration. Finally, we draw conclusions in Section 6.

2 | THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Migration has long been an important livelihood strategy for those in low- and middle-income countries. According to the New Economics Theory of Migration, migration is decided by not only migrants but also their family members. As such, characteristics of not only migrants but also their families play important roles in migration decisions. The main incentives and motivations for migration are better

[5]Based on our estimates from the Vietnam Living Standard Surveys in 1998 and 2010.

[6]Based on our calculations from the 2009 Population and Housing Census.

[7]Some studies argue that the main motivations for economic migration in Vietnam are better employment and higher wages (e.g., Dang et al., 1997; Dang et al., 2003) De Brauw and Harigaya, 2007;. Other studies, such as De Brauw & Harigaya (2007) and Nguyen et al. (2011), find that internal migration helps increase consumption expenditures and reduce poverty.

[8]For example, in 2009 the Vietnamese population grew by 1.23% while the Chinese rate was only 0.52%.

employment opportunities and higher income in the destination areas (e.g. Molloy, Smith, & Wozniak, 2011; Stark & Bloom, 1985; Stark & Taylor, 1991). Depending on the projected costs and benefits of migration, households decide to move the whole family or just send individual members.

The number of children in a family can affect migration through several channels. First, raising more children requires significant resources (Becker & Lewis, 1973; Becker & Tomes, 1976; Blake, 1989; Downey, 1995). An exogenous increase in number of children causes a decrease in per capita income. Migration can be a coping strategy to deal with this negative shock. This implies that households with more children may have a greater need to migrate in order to have higher income.

Second, parents spend more time caring for their children and less time working than those without children. Because of the need for childcare, parents might be less likely to migrate. A large number of studies find that mothers are more likely to participate in labour markets when their children attend preschool child (see reviews in Akgunduz & Plantenga, 2018, and Blau & Currie, 2006; Dang, Hiraga, & Nguyen, 2019). Nguyen (2016), meanwhile, shows that although parental migration can increase household income, it reduces health and cognitive ability scores of children in Vietnam. In Vietnam, it is common for grandparents to take care of their grandchildren. According to the 2009 VPHC, grandparents lived with their children in around 20% of households. Lack of childcare from grandparents in destination areas might reduce migration chances for the whole family but not for individual parents. Estimates from the 2009 VPHC show that around 5% of children were living solely with grandparents, since their parents had migrated.

Thirdly, households can move to new areas with better healthcare and education opportunities for their children. Migrants not only seek better employment, but also access to improved public services in destination areas (McKenzie & Sasin, 2007; Zaiceva & Zimmermann, 2008). Ackah and Medvedev (2012) show that in communities with poor public services, people are likely to migrate regardless of their relatively disadvantaged education backgrounds or other inherent characteristics that are not favourable for migration. Lee and Roseman (1999) find that state expenditure for elementary and secondary schools, parks and recreation, and welfare is an important pull factor for migration. In this case, having more children can increase the probability that the whole family rather than individual parents will migrate.

In summary, the direction of the effect of number of children on migration for either the whole family or individual parents is ambiguous. Although there are many empirical studies on the trade-off between quantity and quality of children (see the review from Mont, Nguyen, & Tran, 2019), for example and the effect of children on parental employment (see reviews from Akgunduz & Plantenga, 2018), and Blau & Currie, 2006 , there is little empirical evidence on the effect of children on migration. Moreover, the limited empirical evidence that exists offers only mixed conclusions. Sarma and Parinduri (2015) show that having more children increases the probability that Sri Lankan women will migrate aboard, while Bratti et al. (2019) do not find significant effects of family size on out-migration in Mexico. The limited evidence calls for more empirical studies on the topic, and this motivates our study on the case of Vietnam.

3 | DATA AND DESCRIPTIVE ANALYSIS

This study uses the data from the 15% sample of the Vietnam Population and Housing Census (VPHC). The census was conducted by the General Statistics Office of Vietnam with technical support from the United Nations Population Fund (UNFPA).[9] The 2009 VPHC was conducted nationwide from 1 to 15 April 2009, collecting data on basic demographic and housing characteristics. In addition to the full

[9]UNFPA assisted in: planning the census; designing the questionnaires; testing, piloting, training and monitoring the process; and supporting its publicity campaign.

census, the 2009 VPHC contains a special module used to collect more detailed data on households and individuals from a random sample of 15% of the population. This sample contains data for each household on basic demographics, migration, education, employment, housing conditions and basic assets. The sample covered 3,692,042 households with 14,177,590 individuals.

The 2009 VPHC collected data on household migration by asking where the household was located in 5 years prior. Respondents had five choices: (i) the same commune, (ii) a different commune within the same district, (iii) a different district within the same province, (iv) a different province, or (v) another country. Based on this VPHC question, this study defines three types of household migration: migration outside of the commune but within the same district; migration outside of the district but within the same province; and migration outside of the province. This migration is defined as the mobility of the whole family over the past 5 years.

A limitation of this definition is that it cannot capture mobility within the 5-year period. If a migrant moved several times during the past 5 years, the data would not capture this intra-period mobility. Moreover, there are no data on whether the previous residences of migrating families were rural or urban. Thus, we cannot model the effect of children on rural–urban migration in this study.

In this study, number of children in a family is defined as the number of children having the same biological mother. In the 2009 VPHC, women aged 15–49 years were asked about the total number of children they had, including those not currently living with them. To determine the number of children in a household, the sample is first restricted to households with at least one woman 15–49 years of age and at least one child. Number of children was then defined as the number of children currently living with the woman. Households having any children living elsewhere were excluded from the sample.[10]

It should be noted that we are only able to measure migration during the past 5 years (based on the questionnaires).[11] To avoid reverse causality, we focus on the effect of the number of children born before 2004, that is, born at least 5 years before 2009. Therefore, the variable for number of children is equal to the total number of children in the household minus the number of children born during the past 5 years. Households who do not have children older than 5 years are dropped from the sample. Eighteen percent of the sample is dropped. Families with small children are more likely to be younger. Thus, the empirical results from this study should not be interpreted for young families with small children.

The total number of households used in this study is 1,243,509. Among these households, around 36.2% have one child. About 44.9% have two children, and 13.8% have three. The proportion of households having four children is 3.9%, while only 1.3% have more than four children.

As mentioned, around 8.5% of the population moved across communes and wards during 2004–2009.[12] The proportion of households with children is remarkably lower, at around 4.3%. Table 1 shows a negative correlation between migration and number of children. Families with one or two children are more likely to migrate than families with more children. The negative correlation happens for all three types of migration: 'migration outside commune (or ward) but within district', 'migration outside district but within province' and 'migration outside province'. The proportion of all households with children who moved at all (any of the three migration types) during the past 5 years is 4.28%. This proportion for households with one or two children is 6.2% and 3.5%, respectively. The corresponding proportion for households with six children or more is around 1.9%.

[10]We will use twins as an instrument for number of children. For households who have children living elsewhere, we do not have information on the birth dates of these children, and cannot identify twins for these households.

[11]There is no information on migration that happened before 2004.

[12]The corresponding figure for the period 1994–1999 is 6.5% (Dang et al., 2003).

TABLE 1 Proportion of migrating households (%)

	Household migration			
Number of children	Outside commune within district	Outside district within province	Outside province	Any of three migration
1	2.36	1.96	1.87	6.20
	(0.05)	(0.07)	(0.06)	(0.12)
2	1.34	1.10	1.10	3.53
	(0.04)	(0.05)	(0.03)	(0.08)
3	0.89	0.72	0.90	2.51
	(0.04)	(0.05)	(0.04)	(0.08)
4	0.83	0.54	0.87	2.24
	(0.07)	(0.06)	(0.06)	(0.12)
5	0.86	0.37	0.62	1.85
	(0.14)	(0.07)	(0.10)	(0.19)
6 and above	0.51	0.66	0.73	1.90
	(0.13)	(0.17)	(0.15)	(0.27)
Total	1.62	1.33	1.34	4.28
	(0.04)	(0.05)	(0.04)	(0.08)
Number of observations	1,243,509	1,243,509	1,243,509	1,243,509

Note: Standard errors in parentheses.

Sources: Authors' estimation from the 2009 VPHC.

Table 2 presents the proportion of migration by different household characteristics. Families with younger and more educated mothers are more likely to migrate. Kinh (Vietnamese) households tend to have a higher proportion of migration than ethnic minority households. Households in urban areas and rich regions such as the Red River Delta and the South East are more likely to relocate than those in rural areas and poorer regions. It should be noted that the urban/rural and regional variables are defined based on the origin location of households, not their destination after migration.[13]

4 | EMPIRICAL STRATEGY

In this study, we aim to measure the effect of number of children on household migration. Let us assume a household's decision to migrate depends on number of children and household characteristics as follows:

$$Migrate_i = \alpha + Children_i\beta + X_i\gamma + \varepsilon_i, \quad (1)$$

where $Migrate_i$ is a dummy variable indicating whether household i is a migrating household in the current areas. $Children_i$ is the number of children in household i. X_i and ε_i are observed and unobserved characteristics of household i, respectively.

[13]In the 2009 VPHC, household members were asked about district and provinces five years prior - that is, their location before migration as defined in this study.

TABLE 2 Proportion of migrating households by different demographic variables (%)

Groups	Household migration			
	Outside commune within district	Outside district within province	Outside province	Any of three migration
Age of mother (years)				
15–25	2.04	1.11	1.94	5.09
	(0.13)	(0.11)	(0.14)	(0.22)
26–35	1.83	1.35	1.53	4.71
	(0.04)	(0.05)	(0.04)	(0.09)
36–45	1.48	1.28	1.20	3.96
	(0.04)	(0.06)	(0.04)	(0.09)
46+	1.33	1.46	1.08	3.88
	(0.06)	(0.08)	(0.05)	(0.13)
Education grade of mother				
0–5	1.84	1.53	1.37	4.74
	(0.05)	(0.07)	(0.05)	(0.11)
5–9	1.22	0.91	1.27	3.40
	(0.03)	(0.04)	(0.04)	(0.07)
10 +	2.42	2.26	1.52	6.20
	(0.07)	(0.10)	(0.06)	(0.16)
Urban/Rural				
Rural	1.02	0.56	1.41	2.98
	(0.03)	(0.02)	(0.05)	(0.06)
Urban	3.16	3.29	1.16	7.60
	(0.10)	(0.15)	(0.04)	(0.20)
Total	1.62	1.33	1.34	4.28
	(0.04)	(0.05)	(0.04)	(0.08)
Number of obs.	1,243,509	1,243,509	1,243,509	1,243,509

Note: Standard errors in parentheses.

Sources: Authors' estimation from the 2009 VPHC.

There are two main challenges involved in estimating model (1). The first is the endogeneity of number of children. There may be unobserved variables that affect both number of children and the household's decision regarding migration. In this study, we use an instrumental variable regression to obtain an unbiased estimate of the effect relative to number of children. The greatest challenge in the instrumental variable regression is to find a valid instrument that affects the outcome through only the endogenous variable. In this study, we use the presence of first-born twins as the exogenous shock for number of children within a household. In the literature of child quantity–quality, the presence of twins is widely used as an instrument for number of children (Angrist, Victor, & Analia, 2010; Black, Devereux, & Salvanes, 2005; Cáceres-Delpiano, 2005; Rosenzweig & Wolpin, 1980).

Twins can be regarded as a random source increasing the predicted number of children in a family.[14]

The first-stage regression is expressed as follows:

$$Children_i = \gamma + Twin_i\delta + X_i\theta + u_i, \quad (2)$$

where $Children_i$ and X_i are defined as in Equation (1), and $Twin_i$ is a dummy variable equal to 1 for families with first-born twin children, and 0 otherwise. Twins include all children of multiple births from twins to triplets and so on. Based on information on month and year of births from the dataset, we define twin children as those who have the same month and year of birth.

The second issue in estimating Equation (1) is defining the dependent variable. Based on the dataset's migration questions, we can define different types of migration or mobility of households, such as 'no migration', 'migration outside communes within a district', 'migration outside district within a province' and 'migration outside provinces', respectively. We can consider the dependent variable as a multinomial response variable, and so can use a multinomial response model (e.g. ordered logit or multinomial logit model) to model migration decisions. However, there are no available estimators for a multinomial response-dependent variable model with an endogenous count repressor.[15] To address this issue, we use a number of binary dependent variables as the dependent variables. We first estimate the effect of number of children on households' decisions to migrate out of their communes, regardless of whether the destination communes are in the same district (provinces) or not. Then we estimate the effect of number of children on 'migration outside communes but within a district', 'migration outside district within a province' and 'migration outside provinces'. Thus, there are four binary dependent variables. We apply a two-stage least squares (2SLS) regression to estimate the linear probability model, as there are no available estimators for a nonlinear probability model (such as probit or logit) with endogenous count variables. 2SLS estimators are consistent and can be applied for the binary model with count endogenous variables (e.g. see Angrist, 2001; Angrist & Krueger, 2001; Angrist et al., 2010; Cáceres-Delpiano, 2005).

5 | ESTIMATION RESULTS

5.1 | Effect of children on migration of households

For 2SLS estimators, the first stage is the model of number of children using the instrumental variables and other explanatory variables. The instrument is the presence of first-born twins. The explanatory variables are age and mother's and father's education. Explanatory variables should not be affected by

[14]In several studies, the genders of the first two children are used as an instrument for number of children (Angist et al., 2010; Black et al., 2005; Cáceres-Delpiano, 2005;). In this study, we do not use children's gender as an instrument, since people tend to prefer boys to girls in Vietnam, and there is evidence of selection based on children's gender (see Guilmoto, 2012; Hoang and Nguyen, 2014).

[15]An estimation method treats the number of children as a continuous variable and uses the control function approach of Rivers and Vuong (1988). Using this approach, we first regress number of children on the instruments and other explanatory variables using OLS, and then estimate residuals from this regression. Next we estimate an ordinal logit model of migration choice using number of children, predicted residuals, and other explanatory variables. Although this control function is widely applied for continuous and binary dependent variables, it is not certain that it can provide consistent estimates for this case of a multiple response model with endogenous count variables (Wooldridge, 2015).

the endogenous variable, or the number of children in our case (Angrist & Pischke, 2008; Heckman, Lalonde, & Smith, 1999). Lists of the explanatory variables are presented in Table A1 in Appendix A.

The first-stage regressions of number of children are presented in Table A2 in Appendix A. We will use three different models that vary in their number of explanatory variables to examine the sensitivity of the estimates to control variables. The first model does not have any control variables. The second model controls for age and mothers' education. The third model controls for age and mothers' and fathers' education. The three models give very similar estimates of the effect of the first-born twins on the number of children. The presence of twins increases the predicted total number of children strongly. Having twins at the first birth increases the sibship size by 0.6. The Cragg-Donald weak identification test is very high, indicating very strong instruments.[16]

Although the instrument is very strongly correlated with number of children, it may not satisfy the exclusion restriction. Bhalotra and Clarke (2018) find a correlation between maternal health and twin births. To test the exclusion restriction, we run a regression of twin birth on the explanatory variables using the whole sample, urban samples and rural samples. Column (2) of Table A3 in Appendix A shows that none of the explanatory variables are statistically significant at the 5% level. Only maternal age in the rural sample is statistically significant at the 10% level. There may also be a concern that fertility techniques such as artificial insemination and in-vitro maturation can lead to the presence of twins. However, these techniques are expensive and not popular in Vietnam, especially before 2004.

The second stage of 2SLS regressions of migration is presented Table 3. This table reports the effect of number of children on the probability of households migrating out of their communes. The proportion of these migrating households is 4.28% (the last column in Table 1). Table 3 shows that OLS and 2SLS regressions produce very similar estimates of the effect of number of children on migration.[17] The results are also very similar between models with different control variables. According to model 2 of the 2SLS estimator (column (6) in Table 3), having an additional child reduces the probability of migration outside communes by around 0.0115. Since the proportion of migrating households is 4.28%, the relative effect of an additional child on the probability of migration is equivalent to around 27%.

The negative effect of children on households' mobility means that having more children increases the cost of migration of the whole family to a new area. Children require care from adults. For the case of Vietnam, Dang et al. (2019) found a strong and positive effect of childcare attendance on maternal employment. In Vietnam, it is common for grandparents to provide care for their grandchildren. Moving to a new area requires additional childcare costs. Moreover, the access to social services such as healthcare and education in a new area can be limited due to the household registration system (so-called 'ho khau') in Vietnam (Le et al., 2011). For households without *ho khau* registration in an area, it is more difficult to access public healthcare and education. As a result, having more children lowers the probability of household migration to new areas.

In Table 4, we examine the effect of number of children on different types of migration. We report results from OLS and 2SLS regressions controlling for age and mother's education (for instance, model 2 in Table 3).We use the 2SLS results for interpretation. The effect of number of children on migration outside communes but within a district is negative but not statistically significant at the conventional levels. The effect on migration across districts as well as across provinces is significant at the 1% level. Having an additional child reduces the probability of 'migration outside district but within province' by 0.0038, and the probability of 'migration outside province' by 0.006. Since the proportion of households with these three types of migration is 1.33% and 1.34% (see Table 1), the relative effect of an additional

[16]As a rule of thumb, if an *F*-statistic is under 10, the instruments might be weak (Staiger and Stock, 1997).

[17]The hypothesis of the exogeneity of number of children is not rejected by the Wald test of exogeneity.

TABLE 3 Regressions of household migration on number of children

Explanatory variables	OLS: dependent variable is migration out of commune (yes = 1, no = 0)			2SLS: dependent variable is migration out of commune (yes = 1, no = 0)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of children	−0.0151***	−0.0125***	−0.0112***	−0.0106**	−0.0115***	−0.0116***
	(0.0011)	(0.0011)	(0.0010)	(0.0042)	(0.0041)	(0.0041)
Mother's age		−0.0001	−0.0009***		−0.0001	−0.0008***
		(0.0001)	(0.0001)		(0.0003)	(0.0002)
Mother's education (in years)		0.0029***	0.0014***		0.0030***	0.0014***
		(0.0005)	(0.0003)		(0.0006)	(0.0004)
Living with father (yes = 1, no = 0)			−0.0671***			−0.0672***
			(0.0058)			(0.0058)
Living with father (yes = 1, no = 0) × Father's age			0.0006***			0.0006***
			(0.0001)			(0.0001)
Living with father (yes = 1, no = 0) × Father's education (in years)			0.0025***			0.0024***
			(0.0003)			(0.0003)
Constant	0.0720***	0.0486***	0.1079***	0.0633***	0.0485***	0.1080***
	(0.0047)	(0.0047)	(0.0062)	(0.0087)	(0.0048)	(0.0062)
Observations	1,243,509	1,243,509	1,243,509	1,243,509	1,243,509	1,243,509
R^2	0.004	0.007	0.009	0.004	0.007	0.009

Note: Robust standard errors in parentheses. Standard errors are corrected for sampling weight and cluster correlation.

*Significant at 10%;

**Significant at 5%;

***Significant at 1%.

Source: Authors' estimation from the 2009 VPHC.

child on the probability of these two types of migration is equivalent to 28% and 45%, respectively. This is a very strong effect, implying a high cost of migration induced by children. The effect on ,migration outside province, is largest and more significant than the effect on the other two migration types. This implies that additional children increase the costs of migration, which can quickly outweigh its benefits; these costs are further compounded as the distance of migration increases.

5.2 | Effect of children on migration of fathers

In this section, we aim to estimate the effect of number of children on the probability of individual parents migrating. We can estimate the effect of number of children on the migration of fathers but not mothers, since we have defined the number of children based on the presence of mothers in the household. One difficulty in identifying paternal migration is that the 2009 VPHC does not include questions on migrating household members, so we use an indirect method. We determine that a family has a

TABLE 4 Regressions of different migration types on number of children

	OLS			2SLS		
Explanatory variables	**Dependent variable is migration to a different commune within a district (yes = 1, no = 0)**	**Dependent variable is migration to a different district within a province (yes = 1, no = 0)**	**Dependent variable is migration to a different province (yes = 1, no = 0)**	**Dependent variable is migration to a different commune within a district (yes = 1, no = 0)**	**Dependent variable is migration to a different district within a province (yes = 1, no = 0)**	**Dependent variable is migration to a different province (yes = 1, no = 0)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
The number of children	−0.0044***	−0.0036	−0.0044***	−0.0018	−0.0038***	−0.0060***
	(0.0003)	(0.0024)	(0.0006)	(0.0027)	(0.0006)	(0.0021)
Mother's age	−0.0002***	−0.0002	0.0002***	0.0001	−0.0001**	0.0000
	(0.0000)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Mother's education (in years)	0.0013***	0.0014***	0.0017***	0.0018***	−0.0001	−0.0003
	(0.0002)	(0.0002)	(0.0003)	(0.0004)	(0.0002)	(0.0002)
Constant	0.0205***	0.0204***	0.0017	0.0014	0.0264***	0.0266***
	(0.0017)	(0.0018)	(0.0023)	(0.0024)	(0.0029)	(0.0029)
Observations	1,243,509	1,243,509	1,243,509	1,243,509	1,243,509	1,243,509
R^2	0.003	0.003	0.005	0.004	0.001	0.001

Note: Robust standard errors in parentheses. Standard errors are corrected for sampling weight and cluster correlation.

*Significant at 10%;

**Significant at 5%;

***Significant at 1%.

Source: Authors' estimation from the 2009 VPHC.

TABLE 5 2SLS regressions of paternal migration on the number of children

	Dependent variable is migration of fathers (yes = 1, no = 0)		
Explanatory variables	**The whole sample**	**Sample of urban households**	**Sample of rural households**
(1)	**(2)**	**(3)**	**(4)**
Number of children	0.0121***	0.0049	0.0251***
	(0.0041)	(0.0039)	(0.0091)
Mother's age	0.0002	0.0002	−0.0002
	(0.0003)	(0.0003)	(0.0005)
Mother's education (in years)	0.0071***	0.0045***	0.0092***
	(0.0004)	(0.0003)	(0.0006)
Constant	−0.0468***	−0.0220***	−0.0503***
	(0.0032)	(0.0023)	(0.0059)
Observations	1,243,509	305,631	937,878
R^2	0.010	0.007	0.004

Note: Robust standard errors in parentheses. Standard errors are corrected for sampling weight and cluster correlation.

*Significant at 10%;

**significant at 5%;

***significant at 1%.

Source: Authors' estimation from the 2009 VPHC.

migrating father if the mother reports that she is married, but there are no data on the father. According to the 2009 VPHC's definition, no data collected for a household member means that this member is currently living abroad or is expected to be away from their home for more than 6 months as of the date of the census.

Thus, we interpret the effect of number of children on migration in this situation as the effect on the long-term migration of fathers. According to the 2009 VPHC, around 3.6% of families who have at least one child have a long-term migrating father.

Since we use the absence of fathers as a proxy for their migration, our definition of migration may be subject to a measurement error. To examine the accuracy of our definition of paternal migration, we use the Vietnam Household Living Standard Survey (VHLSS) 2012 to compute the proportion of families reporting the absence of a father and the proportion of families with a migrating father. VHLSSs are conducted by the General Statistics Office of Vietnam every 2 years. The 2012 VHLSS is unique insofar as it contains a module on migration. The results show that 96% of families who did not report fathers as household members (not because of divorces or death) also report paternal migration. Among families with at least one child, the proportion of families having a migrating father was 3.3%. This estimate is very similar to the estimate based on the 2009 VPHC.

Table 5 presents the effect of number of children on paternal migration as estimated using the 2SLS regressions. Interestingly, number of children has a positive effect on the long-term migration of fathers. Having an additional child is estimated to increase the probability of fathers migrating by around 0.0121. This is quite a large effect, since only 3.6% of families have migrant fathers. The effect is equal to around 33% of the proportion of households with migrant fathers.

Fathers migrate mainly for work. In Vietnam, people tend to move from rural to urban areas for non-farm-based employment. We run a separate regression of paternal migration on children for urban and rural areas (columns (3) and (4) in Table 5). The effect of number of children on paternal migration tends to be larger in rural than urban areas. The effect is statistically significant in rural but not in urban areas. This finding suggests that having more children can bring pressure on parents to earn more income, and migration is one strategy for gaining higher income. Migration of the whole family to urban areas is costly, but sending a household member to urban areas is more feasible. Our findings are consistent with findings from Sarma and Parinduri (2015), who find that having more children encourages women in Sri Lanka to work abroad.

5.3 | Heterogeneous effects of children on migration

To examine how the effect of number of children on migration differs across various groups, we include interactions between number of children, and age and education of mothers. It should be noted that there are no data on whether the previous areas of migrating households are rural or urban. Thus, we cannot include an interaction between an urban dummy and number of children. However, we can compute the proportion of households with motorbikes within districts as an indicator of household welfare and urbanization. This district variable is computed from household data in the 2009 VPHC, and it is calculated for households' origin districts rather than their destination districts after migration. The instrumental variables for these interactions are the interactions between the instrument (first-born twins) and the characteristics variables.

Table 6 reports results from the 2SLS regressions. In the left panel of this table, the dependent variable is any type of household migration, that is, migration outside communes regardless of district or province boundaries. We combine all three types of migration to increase efficiency. In addition, as shown in the previous analysis, the effect of number of children is negative and quite similar for all the three migration types. In this panel, only the interaction between maternal age and number of children is statistically significant at the 10% level. The negative effect of number of children on household migration is lessened when mothers are older. This means that the effect tends to be larger for families with younger mothers. Although younger people are more likely to migrate (e.g. Borjas, 2005), they tend to have lower incomes than older people. Possibly, young families are less likely to be able to afford migration costs with children. As a result, their migration is more affected by number of children.

In the right panel of Table 6, the dependent variable is paternal migration. All the interaction terms are negative and statistically significant at the 1% level. The effect of number of children on paternal migration is lower for families with higher maternal age and education. As mentioned, economic motives can be a main channel through which having more children increases paternal migration. Families with older and highly educated mothers tend to have higher incomes. They can afford more children, and so fathers in those families do not have to migrate to earn more income.

The effect of number of children on paternal migration is also lower in better-off districts (which have a higher proportion of motorbikes). This is consistent with the lower effect of children on paternal migration found in urban areas (presented in Table 5). People tend to move from low- to high-income areas. In addition, households in high-income areas are more likely to have higher incomes, and fathers in these households are less likely to migrate just in order to finance their children.

TABLE 6 2SLS regressions of migration on number of children with interaction variables

Explanatory variables	Dependent variable is household migration (yes = 1, no = 0)			Dependent variable is paternal migration (yes = 1, no = 0)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of children	−0.0754*	−0.0118	−0.0746	0.1496***	0.0564***	0.2325***
	(0.0390)	(0.0142)	(0.0576)	(0.0345)	(0.0118)	(0.0604)
Mother's age × Number of children	0.0017*			−0.0037***		
	(0.0009)			(0.0008)		
Mother's education (in years) × Number of children		0.0001			−0.0058***	
		(0.0017)			(0.0014)	
District proportion of households with motorbike × Number of children			0.0861			−0.3025***
			(0.0746)			(0.0774)
Mother's age	−0.0032**	−0.0001	−0.0003	0.0068***	−0.0002	−0.0003
	(0.0015)	(0.0003)	(0.0003)	(0.0013)	(0.0003)	(0.0004)
Mother's education (in years)	0.0031***	0.0029	0.0017***	0.0067***	0.0184***	0.0067***
	(0.0005)	(0.0034)	(0.0005)	(0.0003)	(0.0027)	(0.0003)
District proportion of households with motorbike			0.0102			0.6333***
			(0.1415)			(0.1514)
Constant	0.1587**	0.0490**	0.0592	−0.2836***	−0.1222***	−0.4884***
	(0.0621)	(0.0225)	(0.1007)	(0.0538)	(0.0182)	(0.1085)
Observations	1,243,509	1,243,509	1,243,509	1,243,509	1,243,509	1,243,509
R^2	0.006	0.007	0.014	0.006	0.001	0.032

Note: Robust standard errors in parentheses. Standard errors are corrected for sampling weight and cluster correlation.

*Significant at 10%;

**significant at 5%;

***significant at 1%.

Source: Authors' estimation from the 2009 VPHC.

6 | CONCLUSIONS

The face of our world today is being transformed by unprecedented urbanization, which has been associated with two driving factors: migration and population growth. We have yet to learn how these two factors complement or mitigate one another. In this study on Vietnam, we suggest a correlation between population growth and migration. We find that when the number of children in a family increases, the family will be less likely to move but may instead choose to send the father to migrate for work. As the number of children increases, households have more incentives to increase their income. However, having more children raises the costs of household migration. A strategy employed by some families is to migrate only one member of the household, since migration for an individual is less costly than migration for the whole family.

The positive effect of children on paternal migration provides an explanation for the fact that in Vietnam, 5% of children live solely with their grandparents. This raises concerns about the health and education of children left behind in rural areas when their parents migrate to urban areas for work (Nguyen, 2016). Household migration is costly, and access to public services in destination areas is limited due to the registration system in Vietnam. Thus, the government should institute policies to support migrants in their destination areas, especially migrant children and older migrants in need of public services.

Interestingly, as general household living conditions improve, the effect of children on paternal migration becomes even stronger. Development experience indicates that the population in a region would grow more slowly as the average income increases. An implication of the findings in this paper is that smaller families would be more likely to move together instead of sending one parent away. This is a good thing for children, among other benefits of regional development.

ACKNOWLEDGEMENT

We thank an anonymous referee from the *Economics of Transition and Institutional Change* and Alexandra Roulet, an Editor of the journal, for their very useful comments on our study.

REFERENCES

McKenzie, D. and Sasin, M. (2007). Migration, remittances, poverty, and human capital: Conceptual and empirical challenges, Policy Research Working Paper No. 4272, The World Bank.

Le, D., Linh, T. G. and Thao, N. T. P. (2011). Social protection for rural-urban migrants in Vietnam: Current situation, challenges and opportunities, CSP Research Report No. 08, Institute of Development Studies (IDS), Sussex, UK.

Hoang, T. H., and Nguyen, V. C. (2014). Do parents choose the sex of their children? Evidence from Vietnam, MPRA Paper No. 70151, University Library of Munich, Germany.

Dang, H. A. H., Hiraga, M. and Nguyen, C. V. (2019). Childcare and Maternal Employment: Evidence from Vietnam, Policy Research Working Paper No. WPS 8856, World Bank Group, Washington, DC.

Ackah, C., & Medvedev, D. (2012). Internal migration in Ghana: Determinants and welfare impacts. *International Journal of Social Economics*, *39*(10), 764–784.

Acosta, P., Calderon, C., Fajnzylber, P., & Lopez, H. (2007). What is the impact of international remittances on poverty and inequality in Latin America? *World Development*, *36*(1), 89–114.

Adams, R., & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries? *World Development*, *33*, 1645–1669.

Akgunduz, Y. E., & Plantenga, J. (2018). Child care prices and maternal employment: a meta-analysis. *Journal of Economic Surveys*, *32*(1), 18–133.

Angrist, J. D. (2001). Estimation of limited dependent variable models with dummy endogenous regressors: Simple strategies for empirical practice. *Journal of Business & Economic Statistics*, *29*(1), 1–28.

Angrist, J. D., & Krueger, A. B. (2001). Instrumental variables and the search for identification: From supply and demand to natural experiments. *Journal of Economic Perspectives*, *15*(4), 69–85.

Angrist, J., Lavy, V., & Schlosser, A. (2010). Multiple experiments for the causal link between the quantity and quality of children.*Journal of Labor Economics*, *28*(4), 773–824.

Angrist, J. D., & Pischke, J. S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton, NJ: Princeton University Press.

Angrist, J. D., Victor, L., & Analia, S. (2010). Multiple experiments for the causal link between the quantity and quality of children. *Journal of Labor Economics*, *28*(4), 773–823.

Bauer, T., & Zimmermann, K. F. (1995). Modeling international migration: Economic and econometric issues. In R. Van der Erf, & L. Heering (Eds.), *Causes of international migration* (pp. 95–115). Luxembourg: Office for Official Publications of the European Communities.

Becker, G., & Lewis, H. (1973). On the interaction between the quantity and quality of children. *Journal of Political Economy*, *81*, 279–288.

Becker, G., & Tomes, N. (1976). Child endowments and the quantity and quality of children. *Journal of Political Economy*, *84*, 398–419.

Bell, M., & Muhidin, S. (2011). Comparing internal migration between countries using Courgeau's k. *Population Dynamics and Projection Methods: Understanding Population Trends and Processes*, *4*, 141–164.

Bhalotra, S., & Clarke, D. (2018). Twin birth and maternal condition. *Review of Economics and Statistics*, https://doi.org/10.1162/rest_a_00789

Black, S., Devereux, P. J., & Salvanes, K. G. (2005). The more the merrier? The effect of family composition on children's education. *Quarterly Journal of Economics*, *120*(2), 669–700.

Blake, J. (1989). *Family Size and Achievement*. Berkeley, CA: University of California Press.

Blau, D., & Currie, J. (2006). Preschool, daycare, and after-school care: Who is minding the kids? In E. A. Hanushek, & F. Welch (Eds.), *Handbook of the Economics of Education*, Vol. *2* (pp. 1163–1278). North Holland, the Netherlands: Elsevier.

Borjas, G. J. (1989). Economic theory and international migration. *International Migration Review*, *23*(3), 457–485.

Borjas, G. J. (2005). *Labor Economics (3rd ed.)*. New York: McGraw Hill/Irwin.

Bratti, M., Fiore, S., & Mendola, M. (2019). The impact of family size and sibling structure on the great Mexico-US migration. *Journal of Population Economics*, https://doi.org/10.1007/s00148-019-00754-5

Brockerhoff, M. (1999). Urban growth in developing countries: A review of projections and predictions. *Population and Development Review*, *25*(4), 757–778.

Cáceres-Delpiano, J. (2005). Impacts of family size on investment in child quality. *The Journal of Human Resources*, *41*(4), 738–754.

Dang, A., Goldstein, S., & McNally, J. W. (1997). Internal migration and development in Vietnam. *International Migration Review*, *31*(2), 312–337.

Dang, H., Hiraga, M., & Nguyen, C. (2019). *Childcare and Maternal Employment: Evidence from Vietnam.* IZA Discussion Papers 12814, Institute of Labor Economics (IZA).

Dang, N. A., Tackle, C., & Hoang, X. T. (2003). *'Migration in Vietnam: A review of Information on Current Trends and Patterns, and their Policy Implications'*. Paper presented at the Regional Conference on Migration, Development and Pro-Poor Policy Choices in Asia, 22–24 June 2003. Dhaka, Bangladesh.

De Brauw, A., & Harigaya, T. (2007). Seasonal migration and improving living standards in Vietnam. *American Journal of Agricultural Economics*, *89*(2), 430–447.

De Haan, M. (2010). Birth order, family size and educational attainment. *Economics of Education Review*, *29*(4), 576–588.

Downey, D. B. (1995). When bigger is not better: Family size, parental resources, and children's educational performance. *American Sociological Review*, *60*, 746–761.

Guilmoto, C. Z. (2012). Son preference, sex selection, and kinship in Vietnam. *Population and Development Review*, *38*(1), 31–54.

Heckman, J., Lalonde, R., & Smith, J. (1999). The economics and econometrics of active labor market programs. In A. Ashenfelter, & D. Card (Eds.), *Handbook of Labor Economics*, Vol. *3*. Amsterdam: Elsevier Science.

Lee, J. (2008). Sibling size and investment in children's education: an Asian instrument. *Journal of Population Economics*, *21*(4), 855–875.

Lee, S., & Roseman, C. C. (1999). Migration determinants and employment consequences of white and black families, 1985–1990. *Economic Geography*, *75*(2), 109–133.

Massey, D. S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A., & Taylor, J. E. (1993). Theories of international migration: a review and appraisal. *Population and Development Review*, *19*(3), 431–466.

Massey, D. S., & Capoferro, C. (2004). Measuring undocumented migration. *International Migration Review*, *38*(3), 1075–1102.

Mincer, J. (1978). Family migration decisions. *Journal of Political Economy*, *86*(5), 749–773.

Molloy, R., Smith, C. L., & Wozniak, A. (2011). Internal migration in the United States. *The Journal of Economic Perspectives*, *25*(3), 173–196.

Mont, D., Nguyen, C. V., & Tran, A. (2019). The effect of sibship size on children's outcomes: Evidence from Vietnam. *Child Indicators Research*, *13*(1), 147–173.

Nguyen, C. V. (2016). 'Does parental migration really benefit left-behind children? Comparative evidence from Ethiopia, India, Peru and Vietnam. *Social Science & Medicine*, *153*, 230–239.

Nguyen, V. C., Van den Berg, M., & Lensink, R. (2011). The impact of work and non-work migration on household welfare, poverty and inequality. *Economics of Transition*, *19*(4), 771–799.

Piore, M. J. (1979). *Birds of Passage: Migrant Labor in Industrial Societies*. Cambridge, UK: Cambridge University Press.

Ravenstein, E. G. (1885). The laws of migration. *Journal of the Statistical Society of London*, *48*(2), 167–235.

Rindfuss, R. R. (1976). Fertility and migration: the case of Puerto Rico. *International Migration Review*, *10*(2), 191–203.

Rivers, D., & Vuong, Q. H. (1988). Limited information estimators and exogeneity tests for simultaneous probit models. *Journal of Econometrics*, *39*, 347–366.

Roberts, K. D. (2002). Female labour migrants to Shanghai: Temporary 'floaters' or settlers? *International Migration Review*, *36*(2), 492–519.

Rosenzweig, M. R., & Wolpin, K. I. (1980). Testing the quantity-quality fertility model: The use of twins as a natural experiment. *Econometrica*, *48*(1), 227–240.

Rossi, A. (2008). *'The impact of migration on children in developing countries: Existing evidence and data', paper presented at the 2nd Global Forum on Migration and Development*. Manila.

Sarma, V. J., & Parinduri, R. A. (2015). Children and maternal migration: Evidence from exogenous variations in family size. *Applied Economics Letters*, *22*(15), 1184–1187.

Scharping, T. (2001). Hide-and-seek China's elusive population data. *China Economic Review*, *12*(4), 323–332.

Staiger, D., & Stock, J. H. (1997). Instrumental variables regression with weak instruments. *Econometrica*, *65*(3), 557–586.

Stark, O. (1991). *The migration of labour*. Cambridge, MA: Harvard University Press.

Stark, O., & Bloom, D. E. (1985). The new economics of labor migration. *American Economic Review*, *75*(2), 173–178.

Stark, O., & Taylor, J. (1991). Migration incentives, migration types: the role of relative deprivation. *The Economic Journal*, *101*, 1163–1178.

Wooldridge, J. M. (2015). Control function methods in applied econometrics. *Journal of Human Resources*, *50*(2), 420–445.

Zaiceva, A., & Zimmermann, K. (2008). Scale, diversity, and determinants of labour migration in Europe. *Oxford Review of Economic Policy*, *24*(3), 427–451.

How to cite this article: Nguyen C, Tran A. Are children an *incentive* or a *disincentive* for migration? Evidence from Vietnam. *Econ Transit Institut Change*. 2020;00:1–19. https://doi.org/10.1111/ecot.12246

APPENDIX A

TABLE A1 Summary statistics of variables

(1)	Mean (2)	SD (3)	Min (4)	Max (5)
Number of children	1.897	0.893	1	11
Presence of the first-born twins	0.0041	0.0642	0	1
Mother's age	36.973	6.090	22	49
Mother's education (in years)	7.4247	3.6747	0	16
Father living in household	0.9083	0.2886	0	1
Father's age	39.514	6.450	18	91
Father's education (in years)	7.7656	3.5720	0	16
District proportion of households with motorbike	0.7209	0.1392	0.1005	0.9559
Population of district (million people)	0.1764	0.1064	0.0050	0.7010
Urban (urban = 1; rural = 0)	0.2815	0.4497	0	1

Source: Authors' estimation from the 2009 VPHC.

TABLE A2 OLS first-stage regressions of number of children

	Dependent variable is number of children		
Explanatory variables	**Model 1**	**Model 2**	**Model 3**
(1)	**(2)**	**(3)**	**(4)**
Having twins at the first birth	0.6138***	0.6189***	0.6202***
	(0.0119)	(0.0104)	(0.0106)
Mother's age		0.0603***	0.0502***
		(0.0008)	(0.0007)
Mother's education (in years)		−0.0585***	−0.0461***
		(0.0016)	(0.0013)
Living with father (yes = 1, no = 0)			−0.1384***
			(0.0254)
Living with father (yes = 1, no = 0) × Father's age			0.0160***
			(0.0006)
Living with father (yes = 1, no = 0) × Father's education (in years)			−0.0223***
			(0.0008)
Constant	1.8931***	0.0966***	0.0878***
	(0.0093)	(0.0265)	(0.0231)
Observations	1,243,509	1,243,509	1,243,509
R^2	0.004	0.212	0.232
Cragg-Donald weak identification test	5,083	6,531	6,727

Note: This table reports the first-stage result, in which the dependent variable is the number of children and the instrumental variable is the presence of twins.

Robust standard errors are in parentheses.

*Significant at 10%;

**Significant at 5%;

***Significant at 1%.

Source: Authors' estimation from the 2009 VPHC.

TABLE A3 OLS regressions of the presence of first-born twins

	Dependent variable is the presence of first-born twins (yes = 1, no = 0)		
Explanatory variables	**All sample**	**Urban sample**	**Rural sample**
(1)	**(2)**	**(3)**	**(4)**
Mother's age	0.00003	−0.00005	0.00006*
	(0.00003)	(0.00006)	(0.00003)
Mother's education (in years)	0.00004	0.00007	0.00000
	(0.00003)	(0.00006)	(0.00004)
Living with father (yes = 1, no = 0)	0.00094	0.00053	0.00161
	(0.00135)	(0.00286)	(0.00150)
Father's age	−0.00003	−0.00005	−0.00003
	(0.00003)	(0.00006)	(0.00003)
Father's education (in years)	0.00004	0.00008	0.00003
	(0.00004)	(0.00007)	(0.00004)
District proportion of households with motorbike	0.00021	−0.00046	−0.00031
	(0.00076)	(0.00199)	(0.00082)
Population of district (million people)	−0.00001	−0.00023	−0.00058
	(0.00123)	(0.00164)	(0.00178)
Constant	0.00732***	0.01205***	0.00622***
	(0.00142)	(0.00321)	(0.00152)
Observations	1,243,509	305,631	937,878
R^2	0.000	0.000	0.000

Note: Robust standard errors in parentheses. Standard errors are corrected for sampling weight and cluster correlation.

*Significant at 10%;

**Significant at 5%;

***Significant at 1%.

Source: Authors' estimation from the 2009 VPHC.