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RESEARCH ARTICLE

Does migration affect the well-being of children under 5? Evidence from Vietnam

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Abstract

This study investigates the impact of migration on the well-being of children under 5 in Vietnam. For the purpose of this study migration is measured by the proportion of residents who moved from one province to another five years ago, while children's well-being is proxied by nutritional status, height and weight for age, education, and childcare. Our estimation results show that migration increases the probability of child access to food, improves their nutritional status, and enhances childcare. Interestingly, the effects of migration on the nutritional status of children under 5 tend to be greater for children who has already had a better nutritional status. We find that income is a channel through which migration affects the well-being of children. Our findings suggest that promoting migration can be an effective tool for improving the well-being of children in Vietnam.

Keywords

migration; quantile regression; income; well-being of children; Vietnam

JEL codes: 015; R23; J10; J13

1. Introduction

It is well established in literature that child development in the earliest years of life has a significant effect on the subsequent development. Dietary elements in particular play a key role in brain development of a child throughout the early years of life (Grantham-McGregor et al. 2007). Specifically, the period from conception to around 2 years of age (i.e., the first

1,000 days) is when nutrients have the greatest effect on a child's growth, cognitive capacity, academic achievement afterwards (Black et al. 2013) and even their later productivity (Maluccio et al. 2009; Nguyen 2016; Victora et al. 2010). Accordingly, this suggests that policymakers should focus on boosting catch-up growth and preventing stunting in a child's first few years of life in order to promote both their physical and intellectual development (Crookston et al. 2010).

In this study on Vietnam, we investigate whether the well-being of children under 5 is affected by a crucial contextual factor — migration. It is very evident that a key demographic element of migration is population diversity, which has emerged as a major factor affecting various socio-economic aspects of the host region (Bove & Elia 2017; Rodríguez-Pose & von Berlepsch 2019). While research on migration and child outcomes nexus in Vietnam (Morgan & Long 2020; Nguyen 2016) and several other countries (Antman 2012; Giannelli & Mangiavacchi 2010; Lee 2011; Liang & Chen 2010; Zhao et al. 2014) has often focused mainly on parental migration and children's health and education, no studies thus far have examined how migration affects children's well-being. The gap in the literature and the importance of the topic have inspired us to conduct the current research.

The main objective of the current study is to investigate how migration affects the well-being of children under 5. Children's well-being is measured by several indicators, ranging from nutritional status, weight and height for age, education[1] and childcare. We use micro data from the Vietnam Multiple Indicator Cluster Survey 2010-2011 and the 2009 Population and Housing Census. In our study, a fractionalization index, showing the percentage of the population who moved from another province five years ago, is used to describe migration. Various cultural backgrounds emerge as a result of migration in specific geographic areas. This diversity has been shown to improve local productivity, wages and economic growth (Bove & Elia 2017; Rodríguez-Pose & von Berlepsch 2019). Thus, we expect that the economic impact of migration may be reflected in the well-being of local children.

Our findings show a strong, positive relationship between migration and the well-being of children, including adequate food, nutritional status, and childcare. A 10-percentage point increase in migration indicators increases the probability of children's access to juice by 7.2%, yogurt by 9.6%, and infant formula by 2.7%. Furthermore, a 10-percentage point increase in migration raises the height for age Z-score by 0.14 standard deviation, weight for age Z-score by 0.18 standard deviation, and weight for height Z-score by 0.18 standard deviation. Similarly, we find that migration increases the likelihood of children attending early childhood education programs, including kindergarten or community childcare. Moreover, migration is negatively associated with the probability of a child being left in the care of another child. Interestingly, the effects of migration on the nutritional status of children under 5 are heterogeneous across quantiles and tend to be larger for children with better nutritional status. We also document the channel of income through which migration affects the well-being of children under 5. Migration improves the economic wellbeing of families living in provinces with higher levels of migration, which in turn enables them to better care for their children.

Our paper is organized as follows: Section 2 provides for theoretical and empirical evidence, followed by data and econometric method in Section 3. Section 4 reports on the em-

1 Education of children under 5 years old is reflected by the participation in early childhood education and hours of participating in early child education program.

pirical results on the impact of migration on the well-being of children. Section 5 concludes and offers some policy implications.

2. Literature review

It is well-established that migration has economic consequences for both migrants and local people (Borjas 1994; Card 2005; de Haas 2010; Deshingkar 2006). Specifically, migration has been found to be an effective tool for poverty reduction and improving the economic wellbeing of migrants in numerous countries (Borjas 1994; Christiaensen et al. 2019; Deshingkar 2006). However, empirical evidence has consistently indicated that parental migration has adverse consequences for children's health and educational outcomes. For instance, a longer period of migration leads to a reduction in children's after-school study time and delays their grade progression in China (Meng & Yamauchi 2017; Meyerhoefer & Chen 2011). Likewise, in migrant households it is found that girls are heavily engaged in housework, and children's work hours in Mexico are longer (Antman 2011; McKenzie & Rapoport 2011). Parental migration also has a negative impact on the cognitive ability test scores of children in Vietnam (Nguyen 2016).

According to Rodríguez-Pose and von Berlepsch (2019), a key demographic factor of migration is population diversity. As formerly homogeneous communities become more diverse as migrants arrive, bringing with them their own cultures, traditions, ideas, skills, and experiences, the question whether more diverse societies foster, or stifle progress has grown increasingly prominent. Ager and Bruckner (2013) show that increasing the fraction of European immigrants increases economic growth across states in the United States. Similarly, Alesina et al. (2016) find a positive relationship between the share and diversity of immigrants and economic prosperity in the United States. Suedekum et al. (2014) report a positive effect from the diverse nationalities of foreign workers on local wages in the German labour market. Moreover, the ethnic diversity of employees has a positive effect on innovation in Germany and the Netherlands (Ozgen et al. 2014). While population diversity has been studied extensively, with a focus mostly on its economic impact in the developed countries, no studies to the best of our knowledge have examined how migration affects the well-being of children. In addition, most studies examine population diversity as the result of immigration and international migration, but few studies analyze the influence of population diversity resulting from internal migration.

Our study is the first attempt to investigate the impact of the diversity caused by internal migration on the well-being of children under 5 in Vietnam. The current study contributes to the literature in two respects. *First*, most research on migration and development has mainly focused on the developed countries and constructed population diversity based on the share of foreign-born people (e.g., Ager & Bruckner 2013; Alesina et al. 2016; Suedekum et al. 2014). Our study, however, looks at Vietnam, a developing country, and in particular we measure internal migration by the proportion of residents who migrated from other provinces five years ago. Following Alesina and La Ferrara (2005), in the current study, we expect that people born in different localities are likely to possess different productive skills because they have been exposed to different cultures, education, and value systems and therefore have different resources that enable them to solve problems differently. Such diversity within a province is expected to have a positive effect on economic development in general and children's well-being in particular. *Second*, while a large number of studies have in-

tensively analyzed the effect of migration on productivity, wages, and prosperity, no studies have looked at its impact on the well-being of children in the host region. *Finally*, our study clarifies the economic mechanisms through which migration influences the well-being of children. If migration improves the economic well-being of families in provinces with high migration levels, it may enable local households to provide better care for their children.

3. Data and method

3.1. Data

This study draws on the Vietnam Multiple Indicator Cluster Survey (MIC) 2010-2011, which was conducted by the General Statistics Office of Vietnam (GSO) with financial and technical support from the United Nations Children's Fund (UNICEF) and the United Nations Population Fund. Interviews for the MIC were carried out in November and December 2010, and in January 2011. The survey includes 3,678 observations for a module of children under 5 years of age.[2] The Red River Delta, Northern Midlands and Mountainous Areas, North Central Area and Central Coastal Area, Central Highlands, South East, and Mekong River Delta were the six regions of Vietnam that the sample design for the Vietnam MICS 2011 survey was focused on, producing statistically reliable estimates for. The sampling strata in each of the six regions were designated as urban and rural areas. A multi-stage, stratified cluster sampling method was employed to choose the survey sample. 2,050 households were produced as a result of this exercise, which is the required sample size for each region and results in a total of about 12,000 households. Based on a number of factors, including the design effect, the available budget, and the amount of time required per team to complete one cluster, the average number of households chosen for each cluster for the Vietnam MICS 2011 was determined to be 20 households. By dividing the total number of households by the number of sample households in each cluster, it was decided that 100 sample clusters would need to be chosen in each region. The data contains rich information about age, gender, ethnicity, and other socio-economic characteristics of children and their families.

We also use the 2009 Population and Housing Census. The data are taken from a 15% nationally representative sample of the population. This survey was conducted by the General Statistics Offices of Vietnam and provides information concerning the province where an individual lived 5 years previously. We rely on this information to construct internal migration at the provincial level. Finally, data on provincial GDP per capita are also used, which are taken from the General Statistics Offices of Vietnam.

3.2. Method

To investigate the impact of internal migration on children's well-being, we specify the estimation model as follows:

$$Y_{ip} = \alpha_1 + \alpha_2 P_p + \alpha_3 X_{ip} + \alpha_4 H_{jp} + \alpha_5 R + e_{ip} \quad (1)$$

2 Note that although the Vietnam Multiple Indicator Cluster Survey 2013-2014 is available, the Vietnam Multiple Indicator Cluster Survey 2010-2011 is more suitable, because it is close to the 2009 Population and Housing Census.

where Y_{ip} is outcomes of interest of a child i in province p, including childcare, food, access to books, and the nutritional status of children aged 0 to 5. P_p is migration in province p, defined by a fractionalization index. Specifically, $P_p = 1 - \sum_{j=1}^{n} s_{jp}^2$ where n is the number of provinces in Vietnam and s is the proportion of residents in province p who migrated from province j to province p 5 years ago.[3] This index ranges from 0 to 1. As the index approaches 0, migration falls, whereas heterogeneity increases as migration approaches one. To calculate migration P_p, we use the 2009 Population and Housing Census and then merge the data with data from the Vietnam Multiple Indicator Cluster Survey 2010-2011 to run regressions. Using migration at the provincial level enables us to cancel out reverse causality, suggesting that the individual-level outcomes of interest cannot affect the province-level migration. Meanwhile, migration lags 1 year because this variable, P_p, is calculated based on the 2009 Population and Housing Census. This implies that migration is relatively exogenous.

The regressions of Equation (1) also control for the characteristics of a child i in a province p, X_{ip}, including sex of the child, age of the child and age of the child squared. The mother's level of education can also affect the well-being of children, so we add the mother's education to the regressions. H_{jp} contains four dummy variables for the mother's level of education (i.e., incomplete primary education as a reference group, then primary education, lower secondary education, upper secondary education, and tertiary education), and a dummy variable for the ethnicity of the household head. R is region-level fixed effects, which include five dummy variables for the regions (Red River Delta as a reference group, Northern Midlands and Mountains, North Central and Central Coastal area, Central Highlands, Southeast and Mekong River Delta). The error term is reflected in e_{ip}. Table A1 of the Appendix provides the descriptive statistics of dependent and independent variables.

Valuable information could be missed if we examine only the mean effect as given in Equation (1). A mean approach using standard linear regression techniques (OLS estimators) examines an average relationship between migration and the well-being of children under 5. Quantile regression enables us to quantify the relationship between the well-being of children and migration across different quantiles of the conditional distribution of the dependent variable – the well-being of children. The magnitude of the coefficient of the effect of migration on the well-being of children increases by quantiles. This means that migration has a greater effect on children with better care.

In contrast, the decreasing effect of migration on the well-being of children suggests that migration has a greater effect on children with lower well-being. It is interesting to estimate the heterogeneous effects of migration on the well-being of children under 5. Specifically, our study utilizes the unconditional quantile regression (UQR) estimator developed by Firpo et al. (2009) because it is widely believed that the UQR estimator generates more policy-relevant information than the conditional quantile regression (CQR) estimator (Khanal et al. 2018; Maclean et al. 2014).

While the purpose of OLS regression is to minimize the differences between the observed values and the model's fitted values, quantile regression weights the differences between the observed values and the predicted values differently and then attempts to minimize the

3 This study includes all migrants aged 5 years and above. In the Population Census, we only have information on migration which occurred 5 years ago. This kind of migration reflects a long-term migration, so it is very suitable for the context of our study.

weighted differences (Buchinsky 1994; Koenker 2005; Lê Cook & Manning 2013). Since its introduction, UQR has become a common tool for finding and evaluating distributional effects on outcomes in terms of changes in the observed attributes.

The marginal effects of the unconditional quantile estimator can be determined by averaging the Recentered Influence Function with respect to the change in the distribution of the explanatory variables (Firpo et al. 2009). The coefficients of an unconditional quantile estimator can be interpreted similarly to those of an OLS estimator. The unconditional quantile estimator uses the same explanatory variables in Equation (1).

$$\text{Quantile}\left(Y_{ip}\right)_{\theta} = \alpha_{1\theta} + \alpha_{2\theta}P_p + \alpha_{3\theta}X_{ip} + \alpha_{4\theta}H_{jp} + \alpha_{5\theta}R + e_{ip} \quad (2)$$

4. Empirical results and discussion

4.1. Background on migration in Vietnam

In the 1980s, the Vietnamese government has organized migration programs from more populated to less densely settled regions while discouraging migration from rural to urban areas, especially to major cities like Hanoi, Haiphong, and Ho Chi Minh. The government provided free transportation, housing and basic necessities for migrants at their destinations (Dang 1999). However, this migration policy was not successful due to financial and practical problems (Banister 1993). Since 1989, Vietnam has shifted from a centrally planned to a market economy. Cooperative agricultural land was allocated to individual households. In the 1990s, the markets have been gradually liberalized and in the 2000s, Vietnam got integrated into the world market and attracted a significant inflow of foreign direct investment. These factors have led to an apparent shift from organized to spontaneous migration in Vietnam. The number of inter-district migrants increased by more than half, from about 1.1 million in 1999 to 1.7 million people in 2009 (General Statistics… 2011).

Figure 1 presents a map of migration by province. We find that migration is concentrated in South Vietnam and is the highest in Binh Duong province. Binh Duong province has many industrial parks, attracting people from other provinces to work out there. Ho Chi Minh City also features considerable migration, ranking second in the country. The reason is that Ho Chi Minh City is Vietnam's economic and financial center, accounting for one-third of the Vietnam's GDP.

4.2. Descriptive statistics

Table 1 provides descriptive statistics, showing that the percentage of children under 5 fed with juice, yogurt and formula is higher for those whose mother has attained higher levels of education. For instance, children who have access to juice account for 2.4%, 9.9%, 21%, 26.8%, and 39.8% of those whose mother's primary education is incomplete, who have completed primary education, lower secondary education, upper secondary education, and tertiary education, respectively. Also, we find that the nutritional status of children under 5, including the height for age Z-score, weight for age Z-score, and weight for height Z-score, is positively correlated with the level of the mother's education. A higher percentage of the children of a mother with a higher level of education attend early childhood education programs, including kindergarten or community childcare, and a lower percentage of her children are left in the care of another child. The percentage of children with access to books

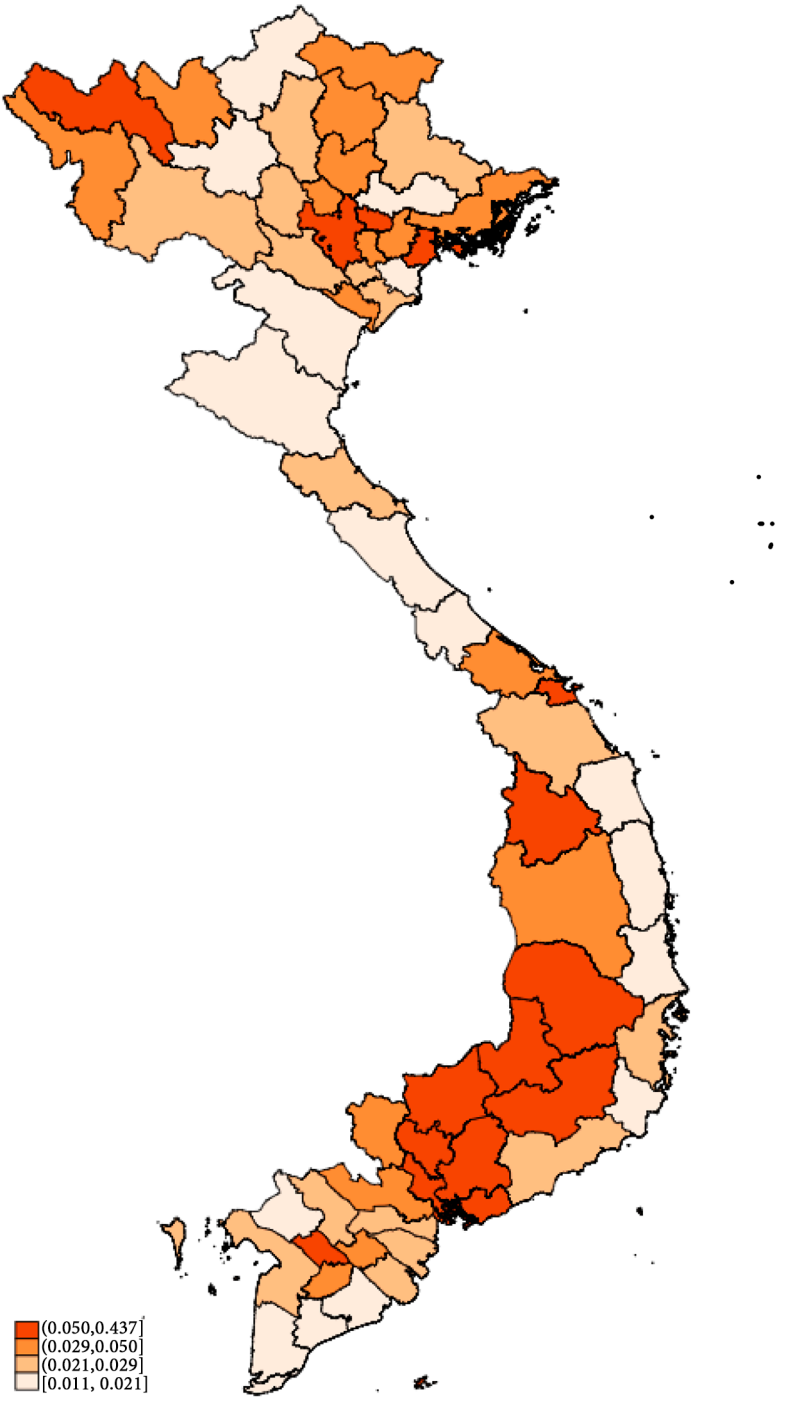

Figure 1. Provincial migration within the mainland Vietnam. *Source*: authors' own calculation from the Vietnam MICS 2010-2011. *Notes*: The Paracel Islands and Spratly Islands are not included in the map because data are unavailable.

Table 1. Descriptive statistics

Variables	Mother's education				
	Primary education incomplete	Primary education completed	Lower secondary education completed	Upper secondary education completed	Tertiary education completed
Dummy variable for access to juice	0.024	0.099	0.210	0.268	0.398
Dummy variable for access to yogurt	0.047	0.148	0.231	0.286	0.386
Dummy variable for access to infant formula	0.010	0.078	0.134	0.184	0.197
Height for age Z-score	-1.791	-1.389	-1.214	-0.828	-0.488
Weight for age Z-score	-1.298	-0.998	-0.807	-0.488	-0.050
Weight for height Z-score	-0.361	-0.295	-0.186	-0.012	0.301
Dummy variable for early childhood education	0.179	0.233	0.287	0.287	0.310
Hours a child attends early education program	5.571	8.092	11.199	11.774	12.898
Dummy variable for remaining in the care of another child	0.206	0.123	0.076	0.036	0.023
Number of days left with another child	0.701	0.470	0.255	0.127	0.062
Access to books	0.027	0.084	0.175	0.335	0.504
Number of books	0.084	0.365	0.889	2.151	3.735

and the number of books they have are higher for those whose mothers have a better level of education. These results suggest that the well-being of children under 5 is better for those whose mothers have a higher level of education.

Table 2 presents the well-being of children under 5 by degree of migration: low, average and high migration; this categorical variable contains categories corresponding to the three quantiles. We find that a higher percentage of children living in provinces exposed to greater migration have access to juice, yoghurt, and infant formula. In similar vein, children living in provinces with higher exposure to migration have better nutritional status, including height for age Z-score, weight for age Z-score, and weight for height Z-score. Children living in provinces more exposed to migration have a better opportunity to attend early childhood education programs and a lower probability of being left in the care of another child. Finally, the percentage of children with access to books and the number of books they have is higher for those living in provinces with higher migration.

Table 2. Well-being of children under 5 years of age by migration

Variables	Low migration	Average migration	High migration
Dummy variable for access to juice	0.128	0.179	0.363
Dummy variable for access to yogurt	0.169	0.174	0.385
Dummy variable for access to infant formula	0.117	0.130	0.158
Height for age Z-score	-1.264	-1.164	-0.829
Weight for age Z-score	-0.860	-0.796	-0.383
Weight for height Z-score	-0.200	-0.192	0.102
Dummy variable for early childhood education	0.287	0.254	0.278
The number of hours a child attends early education	10.420	9.942	11.484
Dummy variable for remaining in the care of another child	0.092	0.103	0.037
Number of days left with another child	0.267	0.415	0.124
Access to books	0.191	0.202	0.321
Number of books	1.112	1.175	2.200

Source: authors' calculations

4.3. The effects of migration on children's well-being

The estimation results of migration on food and nutritional status of children under 5 are reported in Table 3 and are based on Equation (1). We establish that a 10-percentage point increase in migration increases the probability of children having access to juice by 7.2%, yogurt by 9.6%, and infant formula by 2.7% (Columns 1 to 3). Likewise, migration is statistically highly significant for the height for age Z-score, weight for age Z-score and weight for height Z-score at the 1% level (Columns 4 to 6). A 10- percentage point increase in migration raises the height for age Z-score by 0.14 standard deviation, weight for age Z-score by 0.18 standard deviation, and weight for height Z-score by 0.18 standard deviation. Those estimation results suggest that migration increases the probability of access to food and improves nutritional status of children under 5 years.

We also find that mother's education plays an important role in improving access to food and nutritional status of children. Specifically, children whose mothers have a higher level of education are more likely to have access to foods like juice, yogurt, and infant formula (Columns 1, 2 and 3). Also, a mother's education is positively associated with the nutritional status of children, such as the height for age Z-score, weight for age Z-score, and weight for height Z-score. Children living in households whose heads belong to Kinh/Chinese groups have better access to food and better nutritional status compared to those living in households whose heads belong to other ethnic groups.

Table 3. The Effect of Migration on Food and Nutritional Status of Children under 5 Years

	Dummy variable for access to juice	Dummy variable for access to yogurt	Dummy variable for access to infant formula	Height for age Z-score	Weight for age Z-score	Weight for height Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
Migration	0.717***	0.957***	0.273**	1.443***	1.811***	1.808***
	(0.138)	(0.136)	(0.108)	(0.454)	(0.407)	(0.429)
Sex of child	-0.008	-0.016	-0.009	-0.015	0.045	0.038
	(0.013)	(0.012)	(0.010)	(0.041)	(0.037)	(0.039)
Age of child	0.090***	0.162***	-0.289***	-0.753***	-0.240***	0.130***
	(0.016)	(0.016)	(0.013)	(0.052)	(0.047)	(0.049)
Age of child squared	-0.015***	-0.032***	0.047***	0.140***	0.026**	-0.037***
	(0.004)	(0.004)	(0.003)	(0.012)	(0.011)	(0.012)
Mother's education (reference group is below primary education)						
Primary education	-0.001	-0.027	0.034	0.158	0.098	-0.027
	(0.032)	(0.031)	(0.025)	(0.104)	(0.093)	(0.097)
Lower secondary education	0.078**	0.079***	0.080***	0.182*	0.128	-0.008
	(0.031)	(0.031)	(0.024)	(0.101)	(0.091)	(0.095)
Upper secondary education	0.146***	0.152***	0.102***	0.491***	0.401***	0.142
	(0.033)	(0.033)	(0.026)	(0.109)	(0.097)	(0.102)
Tertiary education	0.279***	0.250***	0.111***	0.803***	0.801***	0.433***
	(0.033)	(0.033)	(0.026)	(0.110)	(0.098)	(0.103)
Dummy for ethnicity of the household head (=1 for Kinh/Chinese groups, 0 otherwise)	0.068***	0.065***	0.060***	0.279***	0.403***	0.362***
	(0.023)	(0.023)	(0.018)	(0.075)	(0.068)	(0.071)

	Dummy variable for access to juice	Dummy variable for access to yogurt	Dummy variable for access to infant formula	Height for age Z-score	Weight for age Z-score	Weight for height Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy variables for regions (reference group is Red River Delta)						
Northern Midlands and Mountains	-0.120***	-0.014	0.026	-0.170**	0.050	0.218***
	(0.023)	(0.023)	(0.018)	(0.075)	(0.067)	(0.071)
North Central and Central Coastal area	-0.109***	0.046**	0.021	-0.154**	-0.034	0.105*
	(0.020)	(0.020)	(0.016)	(0.066)	(0.060)	(0.063)
Central Highlands	-0.070**	0.109***	0.033	-0.180*	-0.056	0.105
	(0.030)	(0.029)	(0.023)	(0.097)	(0.087)	(0.092)
Southeast	0.061**	0.202***	-0.006	0.275***	0.305***	0.125
	(0.027)	(0.027)	(0.021)	(0.090)	(0.081)	(0.085)
Mekong River Delta	0.008	0.265***	0.023	0.148**	0.089	0.002
	(0.021)	(0.021)	(0.017)	(0.070)	(0.063)	(0.066)
Constant	-0.043	-0.207***	0.283***	-1.044***	-1.181***	-0.773***
	(0.037)	(0.037)	(0.029)	(0.123)	(0.110)	(0.116)
N	3678	3678	3678	3563	3601	3561
adj. R^2	0.156	0.197	0.235	0.160	0.147	0.055

Source: authors' calculations

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4 provides estimates of the effect of migration on childcare and access to books. The results show that migration increases the likelihood of children attending early childhood education programs, including kindergarten or community childcare. The result remains consistent when we use the hours a child attends early education as a dependent variable. Putting it differently, a 10-percentage point increase in migration results in an increase in the number of hours a child attends early education by 1.2 (Column 2). We also find that migration is negatively associated with the probability of a child being left in the care of another child. A 10-percentage point increase in migration reduces the likelihood of a child being left in the care of another child by 2.8% (Column 3). Similarly, higher migration decreases the number of days a child is left for more than an hour with another child of less than 10 years (Column 4). Finally, we find that higher migration increases access to books for a child and increases the numbers of books available to them. Those findings are consistent with the ones of Binci and Giannelli (2012) who show that migration increases schooling and reduces child labor through remittances in Vietnam.

The estimation results show that a mother's education improves childcare and access to books. A mother with a higher level of education increases the probability of her children attending early childhood education programs and the hours of their attendance in such programs. We find that a mother's education is negatively associated with the likelihood of children being left in the care of another child and with the number of days they are left. Children living in households whose heads belong to the Kinh/Chinese group spend more hours attending early education programs, are less likely to be left in the care of another child, and spend fewer days left with another child than those living in households whose heads belong to another ethnic group.

To run unconditional quantile regressions, we need a dependent variable with continuous values. Accordingly, we use the nutritional status of children, including height for age Z-score, weight for age Z-score, and weight for height Z-score to analyze the impact of migration across different quantiles. Table 5 reports on the estimation results for unconditional quantile regressions, showing that the effects of migration on the nutritional status of children under 5 are heterogeneous across quantiles and tend to be higher for children with better nutritional status.

Table 5 shows that holding all other factors constant, a 10-percentage point increase in migration leads to a 0.141, 0.142, and 0.194 rise in standard deviation in the height for age Z-score at the 25th, 50th and 75th quantiles, respectively. The results are not statistically significant for the height for age Z-score at the 10th and 95th quantiles. Similarly, we find that a 10-percentage point increase in migration increases the weight for age Z-score by 0.124 standard deviation at the 50th quantile, 0.196 standard deviation at the 75th quantile, and 0.443 standard deviation at the 95th quantile. We find no evidence of the impact of migration on the weight for age Z-score at the 10th and 25th quantiles. Also, a 10-percentage point increase in migration raises the weight for height Z-score by 0.127, 0.322 and 0.529 standard deviation at the 50th, 75th, and 95th quantiles, respectively. The estimation results are not statistically significant for the weight for height Z-score at the 10th and 25th quantiles. These findings suggest that migration plays a greater role for children with better nutritional status, which can be explained by the fact that better-off households have more resources and benefit more from migration.

Table 4. The Effect of Migration on Childcare and Access to Books

	Dummy variable for early childhood education	Hours a child attends early education program	Dummy variable for being left in the care of another child	Number of days left with another child	Access to books	Number of books
	(1)	(2)	(3)	(4)	(5)	(6)
Migration	0.177*	11.587**	-0.285***	-1.122***	0.233*	2.971***
	(0.103)	(4.708)	(0.092)	(0.357)	(0.131)	(0.970)
Sex of child	-0.015	-0.282	-0.006	-0.046	0.001	0.040
	(0.009)	(0.430)	(0.008)	(0.033)	(0.012)	(0.089)
Age of child	-0.067***	-2.132***	0.041***	0.130***	0.129***	0.750***
	(0.012)	(0.546)	(0.011)	(0.041)	(0.015)	(0.113)
Age of child squared	0.075***	2.792***	-0.005**	-0.017*	-0.004	-0.005
	(0.003)	(0.130)	(0.003)	(0.010)	(0.004)	(0.027)
Mother's education (reference group is below primary education)						
Primary education	0.105***	3.722***	-0.035*	-0.103	0.029	0.079
	(0.024)	(1.079)	(0.021)	(0.082)	(0.030)	(0.222)
Lower secondary education	0.163***	6.486***	-0.071***	-0.287***	0.117***	0.508**
	(0.023)	(1.054)	(0.021)	(0.080)	(0.029)	(0.217)
Upper secondary education	0.186***	7.833***	-0.121***	-0.411***	0.267***	1.774***
	(0.025)	(1.129)	(0.022)	(0.086)	(0.031)	(0.233)
Tertiary education	0.224***	9.304***	-0.121***	-0.424***	0.463***	3.466***
	(0.025)	(1.143)	(0.022)	(0.087)	(0.032)	(0.236)
Dummy for ethnicity of the household head (=1 for Kinh/Chinese groups, 0 for other)	0.010	1.767**	-0.046***	-0.234***	0.031	0.153
	(0.017)	(0.790)	(0.015)	(0.060)	(0.022)	(0.163)

	Dummy variable for early childhood education	Hours a child attends early education program	Dummy variable for being left in the care of another child	Number of days left with another child	Access to books	Number of books
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy variable for regions (reference group is Red River Delta)						
Northern Midlands and Mountains	0.019	-0.047	-0.015	-0.087	-0.141***	-1.050***
	(0.017)	(0.779)	(0.015)	(0.059)	(0.022)	(0.161)
North Central and Central Coastal area	-0.067***	-4.020***	0.079***	0.162***	-0.142***	-0.934***
	(0.015)	(0.691)	(0.014)	(0.052)	(0.019)	(0.142)
Central Highlands	-0.084***	-4.057***	0.028	0.193**	-0.109***	-0.857***
	(0.022)	(1.013)	(0.020)	(0.077)	(0.028)	(0.209)
Southeast	-0.100***	-3.982***	0.013	0.097	-0.008	-0.151
	(0.021)	(0.935)	(0.018)	(0.071)	(0.026)	(0.193)
Mekong River Delta	-0.131***	-7.281***	-0.042***	-0.148***	-0.085***	-0.536***
	(0.016)	(0.734)	(0.014)	(0.056)	(0.020)	(0.151)
Constant	-0.145***	-6.759***	0.152***	0.635***	-0.142***	-0.915***
	(0.028)	(1.275)	(0.025)	(0.097)	(0.035)	(0.263)
N	3678	3678	3678	3668	3678	3678
adj. R^2	0.600	0.525	0.065	0.048	0.293	0.284

Source: authors' calculations

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5. The Effect of Migration on Nutritional Status of Children under 5 Years: Unconditional Quantile Regressions

	10th quantile	25th quantile	50th quantile	75th quantile	95th quantile	N
	(1)	(2)	(3)	(4)	(5)	(6)
Height for age Z-score	1.065	1.406**	1.419***	1.940***	0.763	3563
	(0.734)	(0.570)	(0.540)	(0.626)	(1.200)	
Weight for age Z-score	0.495	0.472	1.237***	1.958***	4.426***	3601
	(0.636)	(0.504)	(0.462)	(0.556)	(1.239)	
Weight for height Z-score	0.873	0.190	1.268***	3.224***	5.289***	3561
	(0.641)	(0.491)	(0.446)	(0.589)	(1.207)	

Source: authors' calculations

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

All regressions control for sex of child, age of child, age of child squared, four dummy variables for mother's education (i.e., incomplete primary education as a reference group, primary education, lower secondary education, upper secondary education and tertiary education), dummy for ethnicity of the household head, five dummy variables for regions (Red River Delta as the reference group, Northern Midlands and Mountains, North Central and Central Coastal area, Central Highlands, Southeast and Mekong River Delta).

4.4. Channels and discussions

People born in different countries or regions have been exposed to diverse life experiences, schools, and value systems. As a result, they form a variety of perspectives that allow them to perceive and solve problems differently. Previous studies show that migration leads to innovation and creativity (Alesina & La Ferrara 2005), increases the probability of introducing new product innovations (Nathan & Lee 2013), and enhances entrepreneurship (Audretsch et al. 2010; Cheng & Li 2012; Marino et al. 2012) and labor productivity (Trax et al. 2015; Parrotta et al. 2014; Buchholz 2021). Obviously, better innovation, entrepreneurship and labor productivity due to migration would increase workers' wages. Indeed, current studies find that migration is positively associated with workers' wages (Ottaviano & Peri 2006; Kemeny 2012; Suedekum et al. 2014; Elias & Paradies 2016). Zhao (2020) also show that rural-urban migrants are positively associated with the wages of urban natives in China. These findings suggest that migration may increase the income of native people. Parents with better income improve the well-being of their children under 5. Therefore, we hypothesize that migration and ethnical and cultural diversity associated with migration increase the well-being of children under 5 through the channel of income.

To test this hypothesis, we rerun regressions of Tables 3 and 4, adding the wealth index score as a control variable. We have no information on the income or expenditures of households, so we use the wealth index score as a proxy for household income (Sahn & Stifel 2003). We expect that the household wealth index score will capture the impact of migration on the well-being of children under 5 years of age. This means that the magnitude of the coefficient of migration on the well-being of children would be much greater in regressions without controlling for the wealth index score than in regressions that do control for the wealth index score, or we find no statistically significant effect of migration on the well-being of children.

Table 6. The Effect of Migration on Food and Nutritional Status of Children under 5, Control for Household Wealth

	Dummy variable for access to juice	Dummy variable for access to yogurt	Dummy variable for access to infant formula	Height for age Z-score	Weight for age Z-score	Weight for height Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
Migration	0.451***	0.693***	0.191*	0.564	1.015**	1.340***
	(0.137)	(0.135)	(0.109)	(0.451)	(0.403)	(0.432)
Wealth index score	0.112***	0.111***	0.035***	0.365***	0.342***	0.194***
	(0.009)	(0.009)	(0.007)	(0.030)	(0.027)	(0.029)
N	3678	3678	3678	3563	3601	3561
adj. R^2	0.188	0.228	0.240	0.193	0.183	0.067

Source: authors' calculations

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

All regressions control for sex of child, age of child, age of child squared, four dummy variables for mother's education (i.e., incomplete primary education as a reference group, primary education, lower secondary education, upper secondary education and tertiary education), dummy for ethnicity of the household head, five dummy variables for regions (Red River Delta as reference group, Northern Midlands and Mountains, North Central and Central Coastal area, Central Highlands, Southeast and Mekong River Delta).

Table 6 reports on the estimation results for the effect of migration on food and nutritional status of children under 5, controlling for the household wealth index score. We find that the magnitude of the migration coefficient on food and nutritional status of children drops considerably, and the statistically significant level also drastically declines. For example, a 10-percentage point increase in migration increases the likelihood of children having access to juice by 7.2% in the regression without controlling for the household wealth index score, and by 4.5% in the regression, controlling for the household wealth index score. A 10-percentage point increase in migration increases the weight for age Z-score by 0.18 standard deviation in the regression without adding the wealth index score, and by 0.1 standard deviation in the regression when the wealth index score is added. The estimation result is not statistically significant for the height for age Z-score in the regression, when the wealth index score is added, while it is statistically significant for the height for age Z-score in the regression when the wealth index score is not added.

Table 7 presents the estimates of the effects of migration on childcare and access to books, controlling for the household wealth index score. This time, the estimation results are not statistically significant for the dummy variable for early childhood education, hours a child attends an early education program, the dummy variable for access to books, and the number of books. The results are still statistically significant for the dummy variable for being left in the care of another child and the number of days left with another child.

The findings in Tables 6 and 7 suggest that migration affects the well-being of children under 5 through the channel of income. Specifically, migration improves workers' wages. This leads to higher incomes for households living in provinces more affected by migration. Obviously, parents with better incomes are more likely to buy food and books for their chil-

dren, thereby improving the nutritional status of their children. Similarly, other findings in China reveal that household income is a major determinant of children's academic performance, (Liu et al. 2020) while evidence from other developing countries shows that family income plays a key role in ensuring food security for children (Bhandari 2017). It is assumed by most parents that sending their children to formal school is better than keeping them at home, the opportunity to earn better wages would encourage families to send their children to kindergarten. All these factors improve the well-being of children.

Table 7. The Effect of Migration on Childcare and Access to Books, Control for Household Wealth

	Dummy variable for early childhood education	Hours of a child in early education program	Dummy variable for being left in the care of another child	Number of days left with another child	Access to books	Number of books
	(1)	(2)	(3)	(4)	(5)	(6)
Migration	0.121	7.776	-0.249***	-1.014***	-0.011	0.851
	(0.105)	(4.754)	(0.093)	(0.362)	(0.130)	(0.958)
Wealth index score	0.024***	1.610***	-0.015**	-0.046*	0.103***	0.895***
	(0.007)	(0.320)	(0.006)	(0.024)	(0.009)	(0.065)
N	3678	3678	3678	3668	3678	3678
adj. R^2	0.602	0.528	0.066	0.049	0.319	0.319

Source: authors' calculations

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

All regressions control for sex of child, age of child, age of child squared, four dummy variables for mother's education (i.e. incomplete primary education as a reference group, primary education, lower secondary education, upper secondary education and tertiary education), dummy for ethnicity of the household head, five dummy variables for regions (e.g. Red River Delta as reference group, Northern Midlands and Mountain area, North Central and Central Coastal area, Central Highlands, Southeast and Mekong River Delta).

We expect that migration leads to an increase in employment opportunities for women. Children under two can attend an early childcare center, but access to early childcare centers is limited in Vietnam. The Vietnamese education system is largely public, with 90% of children aged 3-5 attending public preschools (Dang et al. 2022). Dang et al. (2022) also show sizable, positive effects of childcare on women's employment opportunities, and these effects are greater for younger children. This means that the impact of migration on the well-being of children may be greater for mothers with children over 2 years than for those with children under the age of 2. To test this hypothesis, we use nutritional status as a dependent variable. Children of various ages have different needs, so it is appropriate to investigate the effect of migration on the height for age Z-score, weight for age Z-score, and height for age Z-score for children of various ages. Specifically, we divide the sample into two sub-samples — children under the age of 2 and those over 2.

Table 8. The Effect of Migration on Nutritional Status, by age

	Child age <=2			Child age >2		
	Height for age Z-score	Weight for age Z-score	Weight for height Z-score	Height for age Z-score	Weight for age Z-score	Weight for height Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
Migration	1.368**	1.186**	1.153**	1.714**	3.075***	2.997***
	(0.602)	(0.516)	(0.542)	(0.674)	(0.653)	(0.699)
N	2135	2167	2134	1428	1434	1427
adj. R^2	0.145	0.106	0.045	0.183	0.194	0.074

Source: authors' calculations

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

All regressions control for sex of child, age of child, age of child squared, four dummy variables for mother's education (i.e., incomplete primary education as a reference group, primary education, lower secondary education, upper secondary education and tertiary education), dummy for ethnicity of the household head, five dummy variables for regions (Red River Delta as reference group, Northern Midlands and Mountains, North Central and Central Coastal area, Central Highlands, Southeast and Mekong River Delta).

Table 8 reports on the estimation results of the effect of migration on nutritional status by age. We find that the magnitude of the coefficient of the effect of migration on the height for age Z-score, weight for age Z-score and weight for height Z-score is larger for children aged over 2 than those under the age of 2. A 10-percentage point increase in migration increases the height for age Z-score by 0.14 and 0.17 standard deviation for children under the age of 2 and children over 2, respectively. Similarly, a 10-percentage point increase in migration raises the weight for age Z-score by 0.12 and 0.31 standard deviations for children under the age of 2 and children over 2, respectively. Finally, a 10-percentage point increase in migration is associated with a 0.12 standard deviation increase in the weight for height Z-score for children under the age of 2, and 0.3 for children over 2. These findings corroborate the impact of migration on nutritional status through the channel of income. Mothers with children over 2 years of age may have greater opportunity to participate in the labor market than those with children under the age of 2. This suggests that mothers with children over 2 may have a better income due to migration than those with children under the age of 2. Mothers with better income would spend more on their children, leading to a better nutritional status.

4.5. Robustness check

We are concerned that migration is correlated with provincial gross domestic product (GDP) per capita. In other words, provinces with higher GDP per capita will have a larger inflow of migrants, and thereby experience greater diversity associated with migration. Thus, our estimation results may be driven by provincial GDP per capita. As a robustness check, we rerun regressions of Tables 3 and 4, adding provincial GDP per capita as a control variable, and report the results in Tables A2 and A3. The results in Table A2 remain unchanged and

almost the same as those in Table 3, that do not control for provincial GDP per capita. The same results are also found in Table A3 and Table 4. This confirms that our results are robust, even after controlling for the level of provincial GDP. Once again, these results affirm a positive contribution of migration on the well-being of children.

5. Conclusion and policy implications

5.1. Summary of the main findings

Using the Vietnam Multiple Indicator Cluster Survey (MIC) 2010-2011 and the 2009 Population and Housing Census, this study documents the impact of migration, defined as a fractionalization index, on the well-being of children under 5. We find that migration is positively associated with the well-being of children under 5, including access to food, improved nutritional status, and childcare. A 10-percentage point increase in migration increases the likelihood of children having access to juice by 7.2%, yogurt by 9.6% and infant formula by 2.7%. Similarly, the estimation results show that migration is positively associated with the height for age Z-score, weight for age Z-score and weight for height Z-score. Also, migration has a positive effect on the probability and hours of children attending early childhood education programs. Children living in provinces more exposed to migration are less likely to be left in the care of another child and have a higher probability of access to books.

The results also show that migration increases the probability of children having access to early education programs and books and decreases the likelihood of children being left in the care of another child. Interestingly, the effects of migration on the nutritional status of children under 5 are heterogeneous across quantiles and tend to be larger for children with better nutritional status. For instance, a 10-percentage point increase in migration increases the weight for age Z-score by 0.124 standard deviation at the 50th quantile, 0.196 standard deviation at the 75th quantile, and 0.443 standard deviation at the 95th quantile. We also document income as a channel through which migration affects the well-being of children under 5. Migration may improve wages and employment opportunities for parents, thereby leading to better well-being for children under 5 years. Non-monetary factors may also be channels through which migration influences the well-being of children under 5.

5.2. Policy implications

There is a substantial body of evidence in economics that shows that malnutrition in early life affects human capital accumulation, health, and socio-economic status in adulthood. Therefore, it is of the utmost importance for both economists and policy makers to identify measures to improve the well-being of children. The government can intervene to counter child malnutrition by making cash transfers. However, the market can play an important role in enhancing the well-being of children without any government interventions. Obviously, migration helps allocate redundant labor efficiently, thereby increasing economic prosperity. Also, the study findings on the relationship between migration and the well-being of children suggest that encouraging migration can be a good way to improve the well-being of children. Given that the rate of inter-province migration remained unchanged between 1999 and 2019, our policy implications may be applicable to the current situation. Also, such implications can be used for other countries with similar socio-economic contexts (General Statistics… 2020). Meanwhile, Vietnam is still maintaining a household registration system

which restricts the labor movement from rural to urban areas and between cities. Household registration is regarded as a tool to place restrictions on people's movement and the household registration book limits access to vital services as public school and health insurance for young children (World Bank… 2016). The findings of this study provide empirical evidence for policy makers to consider cancelling the household registration system.

5.3 Limitations

The limitation of this study is that migration may face confounding factors, which can affect our estimation results, although this study attempts to address this issue by using migration at the provincial level with the variable lagging for over 1 year. The traditional method for dealing with confounding factors is to use instrumental variables. However, it is not easy to find a good instrumental variable that directly affects migration and does not affect the dependent variable and the error terms. The second way of addressing confounding factors is to use the difference-in-differences method. This method requires policy shocks, which affect one group and do not affect the others. Obviously, identifying such policy shocks is a thorny issue. It is also interesting to consider the effects of migration on children in terms of the risk of being abused, especially sexually abused, environments for living and schooling, and the effect of difficulties parents may face at the beginning of migration on a child (physical and mental health). However, the dataset is not available for this information. We suggest that future research should consider these issues.

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Appendix

Table A1. Descriptive Statistics of Dependent and Independent Variables

	Obs	Mean	Std. Dev.	Min	Max
Panel A. Dependent variables					
Dummy variable for access to juice	3,729	0.220	0.414	0	1
Dummy variable for access to yogurt	3,729	0.239	0.427	0	1
Dummy variable for access to infant formula	3,729	0.135	0.341	0	1
Height for age Z-score	3,563	-1.092	1.378	-5.90	5.54
Weight for age Z-score	3,601	-0.687	1.207	-5.89	4.41
Weight for height Z-score	3,561	-0.101	1.199	-4.87	4.99
Dummy variable for attendance in early childhood education program	3,729	0.273	0.446	0	1
Hours a child attends early education program	3,729	10.598	18.584	0	70
Dummy variable for being left in the care of another child	3,729	0.078	0.268	0	1
Number of days left with another child	3,668	0.271	1.111	0	9
Access to books	3,729	0.236	0.425	0	1

	Obs	Mean	Std. Dev.	Min	Max
Number of books	3,729	1.479	3.150	0	10
Panel B. Independent variables					
Migration	3,729	0.066	0.071	0.011	0.437
Sex of child	3,729	0.510	0.500	0	1
Age of child	3,678	2.018	1.376	0	4
Age of child squared	3,678	5.963	5.769	0	16
Mother's education					
Primary education incomplete	3,729	0.079	0.270	0	1
Primary education	3,729	0.182	0.386	0	1
Lower secondary education	3,729	0.375	0.484	0	1
Upper secondary education	3,729	0.179	0.384	0	1
Tertiary education	3,729	0.184	0.388	0	1
Dummy for ethnicity of the household head (=1 for Kinh/Chinese groups, 0 other)	3,729	0.806	0.395	0	1
Red River Delta	3,729	0.149	0.356	0	1
Northern Midlands and Mountains	3,729	0.194	0.395	0	1
North Central and Central Coastal area	3,729	0.148	0.355	0	1
Central Highlands	3,729	0.197	0.398	0	1
Southeast	3,729	0.157	0.364	0	1
Mekong River Delta	3,729	0.156	0.363	0	1

Source: authors' calculations

Table A2. The Effect of Migration on Food and Nutritional Status of Children under 5, Control for GDP per capita at the Provincial Level

	Dummy variable for access to juice	Dummy variable for access to yogurt	Dummy variable for access to infant formula	Height for age Z-score	Weight for age Z-score	Weight for height Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
Migration	0.527***	0.649***	0.333***	1.425***	1.542***	1.535***
	(0.153)	(0.151)	(0.120)	(0.508)	(0.453)	(0.479)
Log of GDP	0.026***	0.042***	-0.008	0.002	0.037	0.037
	(0.009)	(0.009)	(0.007)	(0.031)	(0.028)	(0.029)
N	3678	3678	3678	3563	3601	3561
adj. R^2	0.157	0.201	0.235	0.159	0.147	0.055

Source: authors' calculations

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

All regressions control for sex of child, age of child, age of child squared, four dummy variables for mother's education (i.e. incomplete primary education as a reference group, primary education, lower secondary education, upper secondary education and tertiary education), dummy for ethnicity of the household head, five dummy variables for regions (Red River Delta as reference group, Northern Midlands and Mountains, North Central and Central Coastal area, Central Highlands, Southeast and Mekong River Delta).

Table A3. The Effect of Migration on Childcare and Access to Books, Control for GDP per capita at the Provincial Level

	Dummy variable for early childhood education	Hours of a child in early education program	Dummy variable for being left in the care of another child	Number of days left with another child	Access to books	Number of books
	(1)	(2)	(3)	(4)	(5)	(6)
Migration	0.237**	12.464**	-0.237**	-1.058***	-0.077	0.350
	(0.115)	(5.249)	(0.103)	(0.399)	(0.145)	(1.077)
Log of GDP	-0.008	-0.121	-0.007	-0.009	0.043***	0.361***
	(0.007)	(0.319)	(0.006)	(0.024)	(0.009)	(0.065)
N	3678	3678	3678	3668	3678	3678
adj. R^2	0.600	0.525	0.065	0.048	0.298	0.290

Source: authors' calculations

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

All regressions control for sex of child, age of child, age of child squared, four dummy variables for mother's education (i.e. incomplete primary education as a reference group, primary education, lower secondary education, upper secondary education and tertiary education), dummy for ethnicity of the household head, five dummy variables for regions (Red River Delta as reference group, Northern Midlands and Mountains, North Central and Central Coastal area, Central Highlands, Southeast and Mekong River Delta).

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