

6-1-2562

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Recommended Citation

Chea, Vatana and Wongboonsin, Patcharawalai (2562) "Migration, Remittances, and Child Growth: Evidence from Cambodia," *Journal of Demography*. Vol. 35: Iss. 1, Article 2.

Available at: <https://digital.car.chula.ac.th/jdm/vol35/iss1/2>

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Migration, Remittances, and Child Growth: Evidence from Cambodia

Vatana Chea²

Patcharawalai Wongboonsin³

Abstract

Remittances have become a main resource for development in low- and middle-income countries around the world. With impressive growth in remittances over the decades comes interest in their importance to development. Using data from the 2009 Cambodian Socio-Economic Survey with a sample of 2,767 children under 5 years of age, this study investigates the impact of migration and of remittances on children's quality of health, and tests whether or not the so-called permanent income hypothesis holds for remittances relative to other income. Also employed is two-stage least squares analysis to account for potential endogeneity problems. In short, it was found that the net effect of migration and remittances is positive and significantly improves children's health outcome. The effect is also larger for girls than boys if both short- and long-term growth are taken into account. In addition, the finding maintains support for the permanent income hypothesis, and it is concluded that remittances are not fungible because they are used disproportionately compared with other types of household income to invest in children's health stock.

Keywords: Cambodia, children, health, migration, remittances

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Received 7-Mar-2019, Revised 24-May-2019, Accepted 4-Jun-2019

1. Introduction

As a consequence of globalization, the growth in the absolute amount of remittances has been quite impressive, and thereby has become a main wellspring of resources for developing countries around the globe (Yang, 2011). This is particularly true for some Southeast Asian countries such as Cambodia, where remittances, on average, amounted to 2.5 percent of its GDP from 2000 to 2007. Remittances surpassed even foreign direct investment in the country in 2003 and 2004 (World Bank Databank, 2019). However, the magnitude of such financial transfers also raises a few important questions. Are remittances being channeled toward mere food consumption or to productive investment? Do households use remittances to invest in human capital? Such questions are motivated by an increasing interest in the potential mechanism through which remittances might stimulate long-term growth. As a result, there has been an understandable growing tendency in research studies to concentrate on the impact of migration on children's human capital formation, which is inherent in the nature of development since their potential will decide the future of the society.

Nevertheless, it is found that migration and subsequent inflow of remittances do not always promote investment in children (Brown & Jimenez-Soto, 2015). An important caveat worth noting is that, despite increasing household income through remittances, migration also precipitates detrimental impacts on those who are left behind, especially children whose health may suffer from the disadvantages of losing household members who would otherwise provide physical care and a nurturing environment. Therefore, it is arguable that migration is not a viable method for long-term development if its drawbacks exceed its benefits. Unfortunately, the existing literature does not reach a conclusion as to whether or not migration offers a more promising or a more unfavorable prospect (Adams, 2011; Antman, 2013; Brown & Jimenez-Soto, 2015 provide an extensive literature review). In the context of migration in the Global South, even less is known about this effect of migration due to limited empirical evidence. This is because most research is focused on South-North mobility of people migrating to the United States although the rate of migration is higher in Asia (United Nations, 2017).

The overall aim of this paper is to investigate the impact of migration and of remittances on children's human capital accumulation and thereby contribute to the current body of literature. We ask a very essential question: Do migration and remittances significantly influence investment in children and, in particular, the quality of health as reflected by nutritional status? If so, to what extent? Unlike many previous studies in this area that use various indicators to measure health (briefly discussed in section 3), we use the World Health Organization (WHO) (2006) international child growth standards that closely document health outcomes. In addition to that, we distinguish migration from remittances' effects. Doing so will permit us to compute the amount of remittances required to offset the effects of migration. Additionally, separating each effect will enable policymakers to know whether they should choose a policy that encourages migration (a controversial area) or remittances (much less controversial) (McKenzie & Sasin, 2007).

We address the aforementioned question using Cambodia, a Southeast Asian country, as a case study and the dataset from the country's 2009 Socio-Economic Survey. Our interest in the context originates from the fact that, by the late 1990s, Cambodia had emerged from a period of internal conflicts and had begun to send large numbers of unskilled migrant workers to neighboring Thailand to cope with local widespread poverty. By 2014, the number of migrants was estimated to be 700,000 (Asian Development Bank, 2015). At the same time, Cambodia's urbanization rate, reinforced by internal migration, has been one of the highest in the world (Zimmer & Van Natta, 2018). As would be expected, remittances are found to have been used for household daily consumption but, surprisingly, also for increasing healthcare expenditure (Jampaklay & Kittisuksathit, 2009). If this is true, as Cambodian migrants have claimed but for which we have no supporting evidence, the potential findings from our paper should attract considerable attention from academics and policymakers who strive to promote children's health capital. Such interest has peaked in recent years, for Cambodia is also among the countries where prevalence of malnutrition is severe. In 2010, 40 percent of children were stunted, and 13.6 percent were severely stunted while 28.3 percent were underweight, and 6.7 percent were severely underweight (National Institute of Statistics et al., 2015).

There may be a question as to why there is a preference for using remittances to purchase some specific types of goods, as found by Jampaklay & Kittisuksathit (2009). Should remittances not be allocated proportionately to other types of household consumption rather than being specified for a particular purpose? In the literature, there are at least two perspectives, the most widespread of which is that remittances are fungible (McKenzie & Sasin, 2007; Adams & Cuecuecha, 2010). In another words, households use remittances the same way they use other income and allocate such funds to various types of consumption. However, Friedman's (1953) life-cycle permanent income hypothesis (PIH) argues that some types of income are likely to be directed toward consumption, such as food, if individuals expect that they will receive such income over a long period of time. In contrast, transitory and sporadic income is likely to be invested. To test whether or not PIH holds and to learn more about the importance of remittances relative to other income, we set a second, minor objective, namely, to understand household behavior in terms of using different types of income. We ask a simple question: Is there any difference between the impact of remittances and of other income on children's health outcome?

2. Permanent Income Hypothesis

Due to impressive growth of remittances worldwide, effects of remittances on household resource allocation have been constantly studied in order to better understand how households use such money and what kind of expenditure they spend remittances on. The findings are, however, mixed. For example, Chami et al. (2005) asserted that a large proportion of remittances is spent on food consumption. Remittances were also found to fund consumption in Fiji (Brown & Leeves, 2011) and in Ghana (Adams et al., 2008). However, many researchers also argued that remittances are more likely to be used for investment in business activities in the Dominican Republic (Amuedo-Dorantes & Pozo, 2006) and in hospitalization in Mexico (Amuedo-Dorantes & Pozo, 2011). In some Latin American countries, they are being channeled toward education and health (Acosta et al., 2007). In a convincing study, Yang (2008) showed that Filipino households use remittances to invest in their children's education. Nevertheless, it might be reasonable to ask: Why are remittances being channeled toward different expenditure?

There are at least two standpoints. Common perspectives have regarded remittances as fungible (McKenzie & Sasin, 2007; Adams & Cuecuecha, 2010a). Due to this fungibility, most individuals consider remittances essentially similar to other types of income and believe that remittances may eventually increase investment even if they do not do so straightaway (Stark, 1991; Adams & Cuecuecha, 2010a). Friedman's (1953) life cycle permanent income hypothesis contradicted the principle of the fungibility of money and argued that regular and permanent income is more likely to be consumed because individuals expect to enjoy it over a long period. In contrast, irregular and transitory income is likely to be saved or invested, as households find it difficult to predict their future gain. In line with PIH, Amuedo-Dorantes & Pozo (2011) also asserted that the differences in the use of household income and remittances are a result of intrahousehold bargaining with respect to expenditure, as remitters may insist on how their transfers should be used.

To further elaborate, in theory, the permanent income hypothesis links individual's consumption at one point in time to their total income over their entire lifetime (Aguiar & Hurst, 2016). In other words, any individual makes the decision to consume particular goods or services based on their perceived income in a reasonably long horizon. Thus, their current consumption pattern will change based on the expectation of change in income in the future rather than on current earnings which is the conventional views. Income as well as consumption is separated into "permanent" and "transitory." If an individual expects to earn one type of income regularly (known as permanent income), he or she will have a plan to use that to smooth consumption over time. On the other hand, the person is more likely to save or invest it if he or she believes that the income is irregular/transitory. As a result, PIH makes clear why consumption is less volatile even when income fluctuates, particularly that of agricultural households in developing countries. However, PIH has also been criticized over the years especially for the assumption that individuals have capability to realize their long-term future income on which their consumption decisions are based.

Because of its potential to describe the differences between permanent and temporary income and consumption in remittances research, PIH has been used to describe household behavior in using remittances and other types of earning and to explain why remittances have different effects on different forms of consumption in different

countries (McKenzie & Sasin, 2007). Based on the theory, one can make certain assumptions whether or not migrant(s) remits constant amount of money regularly by looking at how households use remittances. Households are judged to have considered remittances as transitory income if they have a significant effect on human capital development or business/agricultural activities which are deemed long-run investment. In the Caribbean, Lim & Simmons (2015) argue that remittances are channeled toward less productive activities because migrants in the United States can become permanent residents or even United States citizens, so there is a constant inflow of remittances to left-behind household members who in turn consider remittances as permanent income.

3. Impact of Migration on Children's Health

Migration of one or more members can have myriad effects both positive and negative on multiple persons in households and communities and even at the macroeconomic level. However, because the focus of this study is impact on left-behind children's health, we will limit reviewing only relevant literature. It is also worth noting that the vast majority of papers concerning the impact of migration/remittances on children are focused frequently on education or educational performance rather than health or growth (Antman, 2013).

As mentioned previously, migration is a double-edged sword. It improves a family's economic situation and increases the household's ability to spend more on children's health, but at the same time, it also minimizes physical engagement, such as childrearing (Hanson & Woodruff, 2003; Lu & Treiman, 2011). Nonetheless, due to the availability of data, many previous studies tend to use only the variable for either migration (Antón, 2010; Azzarri & Zezza, 2011; Carletto et al., 2011; Stillman et al., 2012) or remittances through migration (Amuedo-Dorantes & Pozo, 2011; Lopez-Cordova, 2005) to capture the net impact of migration itself rather than both variables for migration and remittances. Including both, however, will allow us to separate remittances' effect from migration effect (Amuedo-Dorantes & Pozo, 2010). That is, both positive and negative impacts occur, respectively. The former may come from remittances that increase household income and probably result in investment in children's health whereas the latter may derive from absence of an adult

member who is responsible for family income and/or non-income work, which may be then be foisted upon children (McKenzie & Rapoport, 2011).

One may also question the necessity of distinguishing such an effect. The answer is that households receiving remittances may not have a labor migrant whereas migrant households may not receive remittances at all. However, surveys often record only the amount of remittances at the household level. Thus, we tend to think that those who received zero remittances have no household member migrating and that, on the other hand, those who did receive remittances received them only from labor migrants. In addition, employing the migration variable will disregard the amount of remittances, while using only the remittance variable will entirely ignore the characteristics of the migrants. However, it is documented that the sex of the migrant is also an important factor in determining the magnitude of impact of migration, especially in Asian cultures (Jampaklay, 2006).

Although a comprehensive understanding of the influence of migration on children's health has remained elusive (Adams, 2011; Brown & Jimenez-Soto, 2015), there seems to be agreement that female migration is more harmful to children than that of males. Many studies, regardless of context, put important emphasis on the negative influence of female absence on children's health, ranging from preventive methods to mental well-being (Azzarri & Zezza, 2011; Graham & Jordan, 2013; Jordan & Graham, 2012; Meng & Yamauchi, 2017; Zhang et al., 2016). The authors attribute their finding to the fact that, in many societies, the man is normally deemed the main breadwinner while the woman is considered the main caregiver, and her incomparable childrearing cannot be substituted under normal circumstances. In addition, Kroeger & Anderson, (2014) and Zhang et al. (2015) asserted that not only does male and female migration influence children differently but also it influences sons and daughters differently.

The majority of initial studies in this field have also employed various indicators to measure health, such as the infant mortality rate, vaccination status, psychological well-being, and birth weight (Frank & Hummer, 2002; Graham & Jordan, 2011; Hildebrandt & McKenzie, 2005; Kanaiaupuni & Donato, 1999). Of these studies, most have discovered that children who are born to or living in migrant households are in a more favorable situation relative to those who are not. Some investigations which use a somewhat similar health

indicator as does our study (described in section 6) also have found positive and significant effects of international migration on left-behind children in Ecuador (Antón, 2010), Tajikistan (Azzarri & Zezza, 2011), and Guatemala (Carletto et al., 2011), as well as on those who migrated with their family to New Zealand (Stillman et al., 2012). In these countries, the authors report children having better access to a healthier diet and hygiene.

In contrast, Gibson et al. (2011) argued that migration of household members leads to consumption of less nutritious food and hence poorer health outcomes for left-behind Tongan children. A negative effect is also documented by Meng & Yamauchi (2017) in the context of China, and Davis & Brazil (2016) in another study using Guatemalan data. The latter paper discovered that parental migration reduces a child's height by 22 percent. The result is somewhat surprising, for poverty and malnutrition are two conditions that often go hand in hand, and migration is usually seen as a method to address food insecurity.

4. Impact of Remittances on Child's Health

4.1 Impact of Internal Remittances

Published papers that evaluate the impact of internal remittances are overwhelmed by those conducted in the Chinese context due to ongoing massive rural-urban migration in the country, which is resulting in a high proportion of children being left behind by their migrating parents. Although remittances indeed improve household income, the majority of studies in the Chinese setting reported a net negative effect of remittances on children. Previous research has documented major challenges faced by left-behind children, including emotional problems (Gao et al., 2010; Jia & Tian, 2010), psychological problems (He et al., 2012; Hu et al., 2014) and health outcome (Lei et al., 2018). A commonality of these papers is that they also look at the differences across children in the same household based on their characteristics, namely age and sex, because it is believed that children are liable to compete among each other to get household support.

Having said that, findings are also controversial in this context, and prior papers also draw various conclusions. For example, Meyerhoefer & Chen (2011) argued that girls are likely to be in an unfavorable situation when household chores becomes increasingly intensive due to the absence of adult household members in China. On the other hand,

Jampaklay (2006) found that Thai daughters are more advantaged than sons if their household receives remittances. The mixed picture here, however, can be better understood and attributed to the cultural values of some countries. For instance, there is a strong preference for sons, especially the eldest one, in some contexts, such as India, China, and Vietnam, because the son is tasked to carry on the family name and take care of their elderly parents when they are retired.

4.2. Impact of International Remittances

The effect of international remittances on children's health is more frequently seen in the literature than the influence of internal remittances. It can be a single country case study or comparative study across countries to see if their patterns are consistent (Acosta et al., 2007). However, no consensus can be reached either in general, and each study is supported by certain evidence one way or another, and no paper is strongly refuted. Nevertheless, it should be emphasized that most empirical papers on the relationship between remittances and children's health in the Latin American context tend to indicate a positive or neutral impact. Studies such as Acosta et al. (2007) and Lopez-Cordova (2005) claim that international remittances from the United States do improve children's health outcome. In subsequent studies in similar contexts, researchers shifted their attention to focus more on using indicators that are better proxies for health investment. For instance, international remittances are found to have increased household ability to spend on children's healthcare (Amuedo-Dorantes & Pozo, 2011), but Ponce et al. (2011) found no significant difference in health outcome between children of recipient households and children living in intact families in Ecuador.

In countries that rely heavily on remittances, such as Tajikistan and Tonga, it was found that children living in recipient households tended to be better off relative to those whose household did not receive such money (Azzarri & Zezza, 2011; Stillman et al., 2012). The study about Tongan children is particularly convincing, for the authors used a randomized experiment. However, the majority of studies conducted in the Asia-Pacific region indicate a negative effect on children's health or physical growth. In research which includes Indonesia and Thailand, Graham & Jordan (2011) showed a negative

consequence of remittances on left-behind children's psychological well-being while in another one, Graham & Jordan (2013) found no significant impact of remittances on child's nutrition in Vietnam and the Philippines. In contrast, an additional study in Vietnam claimed that health outcome and cognitive ability of children living in a recipient household were worse off relative to those whose household did not receive remittances (Nguyen, 2016).

While most previous studies look exclusively at either domestic or international remittances, some studies attempted to separate the impact of domestic remittances from that of international funds. For instance, in Nepal (Bansak et al., 2015) and Mexico (Taylor & Mora, 2006), research found that those who receive internal remittances tend to invest more in children compared with those who receive international remittances. Using nationally representative panel data from 1992/93 and 1997/98 in Vietnam, Binci & Giannelli (2018) showed that remittances generally increase children's schooling and well-being, and reduce the requirement for their labor. However, when they distinguished between internal and international remittances, the latter was found to have no significant impact at all, and substantial influence only stemmed from the former. In sum, the literature suggests that remittances have not only been used for different purposes, but different types of remittances have also been spent on different expenditures.

In addition, conflicting results may be attributed to the different methodology employed in each paper. Different datasets are also prone to different biases, such as omitted variable bias, measurement error, or even a slightly distinct definition of migration or remittances used by the country under study. In addition, it can be the unobservable characteristics of a specific country, such as a political entity or social context itself, which researchers cannot account for. Unfortunately, we cannot tell exactly why there is a fundamental divergence of conclusions constructed on the basis of quantitative data. Nevertheless, it is worth noting that some studies that use the same dataset still reached conflicting conclusions in term of net effect between migration and remittances (Lee (2011); Mu & de Brauw (2015); and Zhang et al. (2015) employed panel data called China Health and Nutrition Survey, and Antón (2010) and Ponce et al. (2011) drew a sample from the Ecuador Living Standard Measurement Survey 2006). This has raised an important question as to whether or not their different findings are a result of their methods, but they have served

as evidence that we have little knowledge about how remittances are sent and used despite their numerous advantages (Yang, 2011).

5. Model and Analysis Strategy

This section outlines the theoretical model used to investigate the impact of migration and of remittances on children's nutritional status and growth. We start our analysis by adopting the Behrman & Skoufias (2004) framework that suggested a common standard model for the investment in the quality of children's health. In this framework, a household is assumed to try to maximize their investment in children as well as consumption of goods and services, all of which jointly increase as income grows. Nonetheless, similar to other production and investment activities, health investment/input is also subject to budget constraints and a variety of factors thought to be important determinants of health. The Behrman & Skoufias framework can be written as an econometric specification given by:

$$H_{ijc} = \alpha_0 + \beta_1 R_j + \beta_2 M_j + \beta_3 I_j + \beta_4 X_i + \beta_5 X_j + \beta_6 X_c + u. \quad (1)$$

Where the subscript i , j , and c index individual, household, and community, respectively; H is children's health outcome; R is household remittances; M is a vector of variables that captures the migration effect; I is other household income excluding remittances; X_i is a vector of child characteristics; X_j is a vector of household characteristics; X_c is a vector of community characteristics; u is the error term. A detailed description of variables is given in section 4. In addition, we cluster standard errors by province. The decision to do so is based on Abadie et al. (2017), who strongly recommend applying cluster-robust standard errors if the sampled data were drawn from the population using clustered sampling, as in our case. It is also because the residual is likely to be correlated within the local situation and ecological conditions, such as the surrounding environment, disasters, or public healthcare programs.

If remittances relax budget constraints, thus allowing households to increase investment in children's health, we would expect them to have a significant and positive effect. Furthermore, if PIH holds true for remittances, that is, if remittances are indeed directed deliberately toward healthcare expenditure, we should also find remittances to

have a remarkably larger influence relative to other income. However, equation (1) should not be simply estimated by general linear regression (OLS), for remittances cannot be treated as exogenous (Brown & Jimenez-Soto, 2015). Economic studies conventionally acknowledge that a direct comparison between recipient and non-recipient households would result in an underestimation of true effect due to a number of substantive econometric issues. In reviewing the literature, Adams (2011) suggested a few lurking variables that can be potentially correlated with both remittances and children's health outcome but that are not normally reported by survey. First, households can simultaneously make a decision to earn remittances and invest in the left-behind members. Second, a decision to earn remittances may be driven by household desire to increase spending on health input. Third, some unobservable characteristics, such as motivation, ability, or ambition, can determine both migration, remittances, and health input and outcome. Therefore, although we manage to include a wide range of control variables, it is still unlikely that the issues are fully addressed.

As suggested by Brown & Jimenez-Soto (2015), a practical method to correct for potential endogeneity when estimating the impact of remittances is to use an instrumental variable (IV). With a good instrument, we can easily purge the correlation between remittances and the error term and at the same time disentangle any reverse causality to make remittances exogenous. However, to initiate such a method, we need to have at least a variable to be used as an instrument that is excluded from the equation (1). More importantly, IV has to be strongly correlated with the endogenous variable but uncorrelated with the error term (Wooldridge, 2016). Our choices of instrument are the percentage of out-migrants to total population in 2008 in the district and the distance from village to the nearest microfinance institute (MFI).

As for the percentage of out-migrants, it is computed using variables from the 2008 Cambodia census, which was collected by the National Institute of Statistics. As one would normally expect, the census contains information on in- and out-migrants and the total population of the districts across the country. What follows is that we apply sampling weight, sum up the estimated number of out-migrants, divide by the total population of the district,

and then multiply the result by 100. The percentage of out-migrants varies considerably, ranging from 9.4 percent to as high as 71.3 percent, indicating a wide range of variation. In migration research, the percentage of out-migrants conventionally represents the “migration network” that plays a key role in the possibility of future migration and of left-behind members receiving remittances (McKenzie & Rapoport, 2011). It is also the most popular and least controversial IV in the literature (Antman, 2013; Brown & Jimenez-Soto, 2015), but not without a shortcoming. A threat to the validity of this instrument is the transmission of health knowledge and healthy lifestyle from migrants to rural households (Amuedo-Dorantes & Pozo, 2011). Having stated that, some researchers argues that this assumption is likely to hold if we base the migration network on the household level rather than a higher regional level, the latter of which is out of any individual control. That is, recipient and non-recipient households can be both randomly located in the district where some or many unrelated people have migrated (McKenzie & Rapoport, 2011).

What is our assumption behind the selection of the second instrument? Distance from village to the nearest MFI proxies for accessibility to credit loans, which in theory would reduce migration. This notion was suggested by Stark & Bloom (1985), who asserted that households in developing countries send members to migrate to earn remittances and diversify sources of income. They do so to minimize agricultural risks due to liquidity constraints imposed by banking and insurance systems. Empirically, Bylander & Hamilton (2015) indeed found a strong association between the expansion of MFIs in Cambodia and out-migration and hence remittances inflow. One potential threat to the validity of this IV is that MFIs are only situated in certain migrant-sending areas or cities and thus will be correlated with some unobservable characteristics of the area that may also determine the health outcome. However, since Cambodia is one of the top five countries in the world in terms of MFI penetration rate and is thus a “microfinance-saturated country,” MFIs are also found in rural Cambodia and not only in the cities or certain developed regions (Bateman, 2010; Bylander & Hamilton, 2015).

Along with the assumption above is that, after controlling for village development, remoteness, and other regional differences, in addition to clustering standard errors, both instruments do not significantly have any direct partial effect on children’s health outcome.

To confirm the validity of our IVs, we thoroughly checked and performed a few tests, as suggested by Wooldridge (2016). First, we examined whether or not the instruments are highly associated with remittances. Table 2 below confirms this. Second, we reviewed the literature and found no empirical or theoretical evidence or logical reasons that would suggest that both instruments have any direct effect on children's health except through remittances that would enable households to increase health input. Thus, both IVs satisfy the requirements.

6. Data and Variables

6.1 Data Sources and Sample

This study draws its sample from nationally representative data from the 2009 Cambodia Socio-Economic Survey (CSES) conducted by the National Institute of Statistics, which used it to monitor living standards and measure progress toward national development goals. Data collection spanned one year (January to December). The time frame ensured that the survey was conducted throughout the entire year in order to provide a complete picture of annual living situations of the Cambodian population. CSES contains rich and comprehensive information about households and each individual member, including their general characteristics, income and expenditure, assets, and children's anthropometric traits. Information on household members who were living elsewhere or not present at the time of the survey was reported by other members. In addition, the survey also gathered details from village heads about recent socioeconomic situations of the villages where sampling households were located. It is worth noting that the village is the smallest administrative unit in Cambodia, and, in rural areas, a village typically comprises several hundred people.

The total number of sampled individuals was 57,105, living in 11,971 households in both rural and urban regions across all 24 provinces. In this article, however, we primarily utilize the information from samples of children under 5 years of age (0-59 months). In addition, because our study is focused on the impact of migration and remittances, we limit our sample to only those who lived in major migrant-sending provinces, namely Banteay Meanchey, Battambang, Kampong Cham, Kandal, Prey Veng, Siem Reap, and Takeo. The

provinces of Banteay Meanchey and Battambang share a border with Thailand. Other provinces have very small numbers of out-migrants and thus hardly ever receive remittances, so they have been excluded. The initial number of child samples from these seven provinces was 3,184, but some of them did not have complete data necessary for our analysis while some were extreme outliers in terms of household income or anthropometric indicators (beyond ± 6 standard deviations which will be discussed later). As recommended by WHO (2006), they should be removed from the sample because these extreme values are more likely to be a result of measurement or data entry error. Finally, this study utilizes information on 2,767 individual children and on households and villages where the children are living. Of them, 26 percent are living in households that receive some remittances. It should also be highlighted that some households may have more than one under-5 child included in the sample.

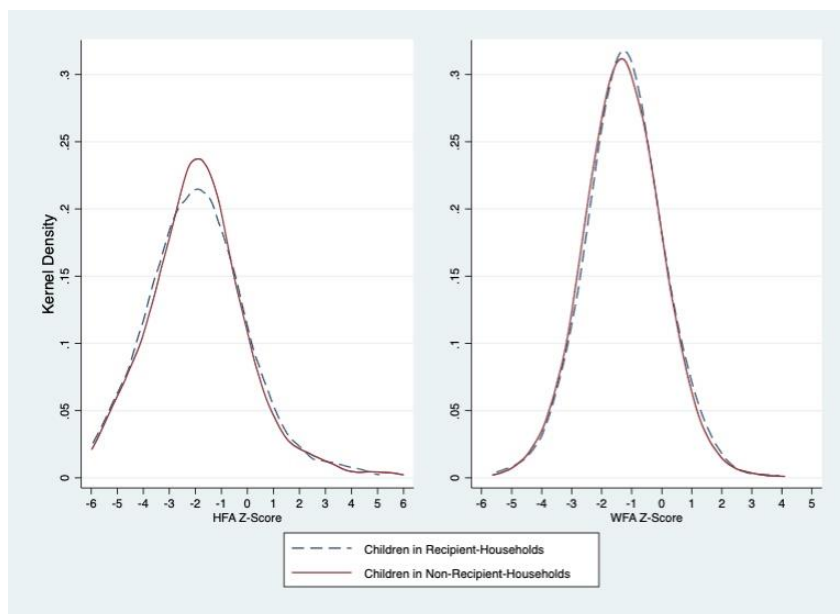
6.2 Measuring Children's Health Outcome

To measure the quality of children's health outcome, we employed the WHO (2006) standard measurement called height-for-age (HFA) and weight-for-age (WFA). Both indices are internationally accepted and recommended to evaluate children's cumulative health stock and growth. HFA is a long-term component of nutritional history and is hardly affected by any short-lived disruption or recent dietary intake. It also reflects recurrent and chronic illness. On the other hand, WFA is a composite indicator that accounts for both acute and chronic undernutrition. We used the latter to provide a robustness check for the results of HFA and to determine whether or not there is a consistent estimation. However, we did not utilize WFA or body mass index since both indicators only consider recent changes in nutrition due to diet or temporary illness. The construction of HFA and WFA Z-score requires variables for each child's age in months, sex, weight, height, and whether or not the height is measured when the child is standing up or lying down, all of which are available in the 2009 CSES. The measuring of weight and height was done by the enumerators, who were trained by medical personnel and who followed WHO guidelines. The equation used to calculate Z-score is given by:

$$y = \frac{\left[\left(\frac{Y}{M} \right)^L - 1 \right]}{(S * L)}$$

Where y denotes HFA or WFA Z-Score; Y is the individual's height or weight; M is the benchmark obtained from the WHO (2006) child growth standards table; L is the value of Box-Cox power transformation for normal distribution, which smooths centile curves for skew and kurtotic data; and S is a coefficient of variation that is also available in the WHO (2006) guidelines. In addition, we followed instructions (p. 303) to recompute and make a modest adjustment for those whose initial Z-score is beyond ± 3 standard deviations because without such correction the distribution will slightly depart from normality at the extreme tails. The distribution of HFA and WFA of children living in remittance-receiving and non-remittance-receiving households is depicted in Figure 1. The two-sample Kolmogorov–Smirnov equality-of-distributions test was also carried out under the null hypothesis that the samples are drawn from the same distribution. The test result indicated that the distributions of Z-score is not significantly different among children in different types of household.

Figure 1: Distribution of Anthropometric Indicators by Type of Household



Source: authors' calculation

Note: The bandwidth for Kernel estimation is 0.5.

6.3 Description of Covariates

Apart from correcting for endogeneity issues, we need to consider that migration and the subsequent inflow of remittances can have both negative and positive impacts on children's nutritional status and growth. Positive effects are a result of remittances that increase household income, hence generating better food consumption or health input, whereas negative influences are likely to come from the absence of household members who would have carried out the responsibilities for income- and non-income-generating activities and who would have been potential caregivers. In another words, households have to trade their members for remittances. To earn more remittances, households can simply send more migrant workers elsewhere, but doing so will cause such households to lose other production and income.

To capture the positive impact, we use the total amount of remittances a household received during the previous 12 months (excluding remittances-in-kind). It is worth pointing out that not all migrant workers send remittances, and remittances can also comprise private transfers from non-migrant workers. Therefore, it is possible that migrant worker remittances are actually less than the amount of remittances reported by a household. To represent the negative effect, on the other hand, we used variables for the number of migrant workers in the household but distinguished between males and females. Labor migrants are those considered as household members but who have migrated to live and work elsewhere for at least 12 months prior to the survey date. We identified them using information on the purpose of migration. It should be highlighted that the 2009 CSES does not consider those who are absent from the household less than 12 months as migrants but rather merely "not present during the survey." The duration is intended to provide a more complete picture of long-term cumulative impact of migration and because migrants may not remit any money in the first few months upon their arrival at the destination.

Households are also asked to report other types of income, such as wages, agricultural and business income, which we summed up into total household income, excluding remittances. For the possibility of international comparison, we also translated the remittances and other income from local currency, Khmer riel (KHR), into United States

dollars, with an exchange rate then of 4,000 KHR per dollar based on the World Bank Databank (2019). Apart from income, we constructed a variable for wealth quintile to control for household amenities, which arguably determine the quality of children's health (Vyas et al., 2016). The mentioned variable is generated from an asset-based index, and it is the sum of weight of each household asset, facility, and housing condition. To assign weight, we used the principal component analysis method, which scores variables according to their variability and strength of correlation among each other. We also assigned a different weight to the same indicators across subgroups (urban/rural). The CSES questions on household assets are almost identical to those found in the Cambodian Demographic and Health Survey. Owing to this similarity, we closely followed the step-by-step guideline to construct a DHS wealth index that includes applying household sampling weight.

Besides incorporating a range of conventional control variables for children and household characteristics, we encompassed dummy variables for each province to account for regional differences. Moreover, rather than using just a binary variable for urban areas to capture development level, we used the percentage of households in the village that have access to electricity and to piped water, both of which have a wider range of variation because even for the areas classified as urban, the degree of development can still differ. If only a small share of total residents in the village have electricity and piped water, this would indicate a location in a poor and remote region. In addition, we included a variable for number of natural disasters faced by a village in the previous five years, which is likely to affect both the amount of remittances and other income households receive as well as their children's health (McKenzie & Sasin, 2007). Finally, distance to the nearest health facility (public hospital or private clinic) variable is used to account for access and availability of healthcare services in the area.

Table 1: Descriptive Statistics of Covariates by Type of Household

Variables	Non-Recipient-Household (N=2049)		Recipient-Household (N=718)		Mean Test
	Mean	SD	Mean	SD	
Remittances (USD)	-	-	123.8	194.9	-
Number of Female Migrant Workers	0.0078 1	0.103	0.146	0.463	***
Number of Male Migrant Workers	0.0092 7	0.110	0.181	0.476	***
Household Other Income (USD)	1,822	1,829	2,173	2,219	***
Child is Male	0.504	0.500	0.479	0.500	
Child's Age	1.988	1.421	1.855	1.397	**
Household Head is Child's Biological Parent	0.851	0.357	0.467	0.499	***
Percentage of Children in the Household (Under 6 Years Old)	31.53	12.63	27.58	12.27	***
Percentage of School-Age Children (6-17 Years Old)	18.19	17.65	16.37	16.72	**
Percentage of Adults (18+ Years Old) (baseline)	0.503	0.136	0.56	0.154	***
Total Number of Household Members	5.301	1.901	5.830	1.981	***
Household Head's Age	35.97	11.11	47.19	15.50	***
Household Head is Male	0.891	0.312	0.748	0.435	***
Household Head Year of Education	4.953	3.707	4.157	3.469	***
Household Head is Married	0.930	0.255	0.762	0.426	***
Number of Natural Disasters in the Last 5 Years	2.266	2.698	2.386	2.783	

Variables	Non-Recipient-Household (N=2049)		Recipient-Household (N=718)		Mean Test
	Mean	SD	Mean	SD	
Distance from Village to Nearest Health Facility (km)	2.272	3.155	2.302	3.248	
% of Household in the Village Has Electricity	20.24	33.03	18.07	31.43	
% of Household in the Village Has Piped Water	10.91	25.94	12.69	28.81	
Banteay Meanchey	0.0903	0.287	0.0446	0.206	***
Battambang	0.134	0.341	0.0850	0.279	***
Kampong Cham	0.260	0.439	0.290	0.454	
Kandal (baseline)	0.140	0.347	0.219	0.414	***
Prey Veng	0.141	0.348	0.143	0.351	
Siem Reap	0.12	0.325	0.127	0.333	
Takeo	0.115	0.319	0.092	0.289	*
<i>Instrumental Variable</i>					
% of Out-Migrants	26.54	12.64	26.81	11.24	
Distance from Village to Nearest MFI (km)	8.44	8.59	8.04	7.4	

Source: authors' calculation.

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 1 shows the descriptive statistics of independent variables by type of household, except for the wealth quintile, which is categorical. We performed the mean-comparison t-test to see if non-remittance- and remittance-receiving-households are significantly different in their socioeconomic characteristics. Results show that these households do differ. Major notable differences between them are characteristics of households per se and of the heads. In comparison, the head of a remittance-receiving household is more likely to be a much older female and have lower education relative to that

from a household receiving no such funds. In addition, she is unlikely to be the child's biological parent. These findings suggest that many heads of recipient households are the grandmother of the child whose parents are probably the migrants. Also, as should generally be expected, households with a greater number of migrant workers tend to receive remittances. The summary data in this section mainly indicates that remittances are not allocated randomly to households, but instead, there is a certain degree of selectivity at the household level. For instrumental variables, the mean tests indicate that both types of household are indeed randomly located in the areas where some or many people have migrated, and neither of them is selective in terms of access to MFI, adding evidence to our justification of using them as IVs.

7. Results and Discussion

7.1 Impacts of Migration, Remittances, and Other Income

To make a comparison, we present both the OLS and 2SLS regression results, but we do not consider outcomes of the former, as it is likely to be biased. Moreover, we do not report results for every control variable that is not among our main interests due to limitation of the length of the manuscript, but the complete table, including that of the first-stage regression, is available upon request. Table 2 demonstrates the impact of migration and of remittances on the left-behind children's growth indicators.

Table 2: Causal Relationship of Migration and Remittances with Child's Growth

Variables	HFA		WFA	
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)
Remittances	0.000100 (0.000483)	0.0163*** (0.00570)	-0.000231 (0.000154)	0.0118*** (0.00430)
Number of Female Migrant Workers	-0.283*** (0.0677)	-1.579*** (0.567)	0.0562 (0.0346)	-0.905* (0.514)
Number of Male Migrant Workers	-0.158 (0.154)	-1.475*** (0.546)	-0.0449 (0.0564)	-1.021*** (0.321)
Household Other Income	0.0000299 (0.0000220)	0.0000174 (0.0000287)	-0.00000413 (0.00000889)	-0.0000134 (0.0000245)
Child is Male	-0.0817 (0.0579)	-0.0832 (0.0690)	-0.111* (0.0514)	-0.112*** (0.0389)
Child's Age	-0.234*** (0.0325)	-0.231*** (0.0335)	-0.232*** (0.0125)	-0.230*** (0.0218)
Household Head is Child's Biological Parent	-0.0910 (0.276)	0.467 (0.493)	-0.192 (0.144)	0.222 (0.356)
Percentage of Child in the Household	-0.000702 (0.00510)	-0.00602 (0.00520)	-0.00670*** (0.00168)	-0.0106*** (0.00335)
Percentage of School-Age Child in the Household	0.00146 (0.00356)	-0.00720 (0.0104)	-0.00161 (0.00213)	-0.00803 (0.00693)
Household Size	-0.00508 (0.0258)	0.0518 (0.0603)	-0.0277 (0.0225)	0.0145 (0.0440)
Household Head Age	0.0290 (0.0191)	0.0399* (0.0223)	0.0227 (0.0132)	0.0308* (0.0168)
Household Head Age Squared	-0.000184 (0.000219)	-0.000407 (0.000262)	-0.000246 (0.000131)	-0.00041** (0.000171)
Household Head is Male	-0.0203 (0.155)	0.0326 (0.176)	0.0119 (0.0758)	0.0511 (0.153)

Household Head Year of Education	0.0334*	0.0317***	0.0111	0.00991
	(0.0139)	(0.0112)	(0.00949)	(0.00872)
Household Head is Married	0.262	0.259	0.0839	0.0819
	(0.224)	(0.372)	(0.149)	(0.198)
Wealth Quintile (poorest is baseline)				
Poorer	0.0639 (0.167)	0.368 (0.362)	-0.0358 (0.0502)	0.190 (0.179)
Middle	0.0653 (0.267)	0.331 (0.435)	-0.0852* (0.0400)	0.112 (0.185)
Richer	0.0113 (0.175)	0.330 (0.329)	-0.0155 (0.0167)	0.221 (0.147)
Richest	0.144 (0.177)	0.525 (0.338)	0.0694 (0.112)	0.352* (0.209)
Number of Disaster	-0.0123 (0.0184)	-0.0334** (0.0169)	0.0166 (0.0111)	0.000955 (0.0197)
Distance Nearest Health Facility	0.00323 (0.0111)	0.00641 (0.0126)	0.0133 (0.0119)	0.0156 (0.00981)
% of Household Has Electricity	-0.000463 -0.00166	0.000525 (0.00309)	0.00123 (0.000791)	0.00197 (0.00127)
% of Household Has Piped Water	0.000678 (0.00179)	-0.00189 (0.00403)	0.00194* (0.000834)	0.0000342 (0.00252)
Dummy for Each Province	Yes	Yes	Yes	Yes
Constant	-2.382***	-3.498***	-0.906**	-1.734**
	(0.433)	(1.120)	(0.263)	(0.778)
Observations	2767	2767	2767	2767
<i>First Stage Results for IVs</i>				
Percentage of Out-Migrants	-	0.352**	-	0.352**
		(0.174)		(0.174)
Distance to the Nearest MFI	-	-0.705***	-	-0.705***
		(0.275)		(0.275)

Note: Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

In the OLS results in columns 1 and 3, the effect of remittances and of the number of migrant workers on children's health, are rather small. In addition to that, the coefficient obtained from regressing WFA on remittances is negative, indicating that the more remittances households receive, the worse their children's health tends to be. Fortunately, the correlation is statistically insignificant. Are these findings counterintuitive? Not necessarily, as we have expected, there is a presence of endogeneity that OLS ignores. We can also simply check whether or not there is endogeneity by doing a direct comparison between OLS and 2SLS, as stated by Wooldridge (2016). After all, both estimators will produce a highly similar outcome if there is no such issue. To systematically ensure that remittances are really endogenous, we performed Wooldridge's (1995) robust regression-based test, which can accommodate both heteroskedasticity and autocorrelation. Eventually, we still reject the null hypothesis that remittances are exogenous.

We now discuss 2SLS results. First, remittances in column 2 are highly correlated with HFA. Since the amount of money is in a natural unit (United States dollars), a \$1.00 increase in household remittances can be interpreted as raising children's HFA Z-score by 0.0163 standard deviations (SD), holding other independent variables constant. For migration effect, because migration is synonymous with loss of manpower and potential caregivers, it is expected to have a negative effect on children. Nevertheless, our study found that it is more disadvantageous to select female instead of male household members to migrate. The coefficients suggest that sending off a female will lower children's HFA by 1.58 SD, which is 0.1 SD higher relative to sending a male.

We can also calculate how much, on average, each labor migrant needs to remit in order to offset the migration effect for every child in the household. As a \$100 increase in remittances raises the HFA Z-score by 1.63 SD, to balance between the two effects on one child, each female migrant has to remit at least \$97 ($97 \times 0.0163 = 1.58$, which is the effect of migration of one female member) whereas it is only \$90.80 for a male (or \$94 regardless of the migrant's sex). Since each remittance-recipient household in our sample has an average of 1.5 children (based on our tabulation), it needs to receive remittances no lower than \$141 if it has one migrant worker ($\$94 \times 1.5$). However, these households only have 0.33 migrants on average, as shown in Table 1, so to offset the migration effect, they only need \$46.50 in

remittances, which is apparently much lower than the actual mean of \$124. In sum, each remittance-receiving household generally has 1.5 children and 0.33 migrant workers. To derive \$46.50, we simply computed $(94 * 1.5 * 0.33)$.

In column 4, the coefficients for migration and remittances have the sign we expected, but their effects on WFA Z-score are relatively smaller than what they are for HFA. A \$1.00 increase in remittances will, *ceteris paribus*, increase the WFA Z-score by 0.012 SD, or 1.2 for every \$100. It is also worth noting that having a male migrant worker in this case has a larger effect than does having a female when we use a measurement that takes into consideration both short and long-run aspects of health. Why would this be the case? One explanation is that in Cambodian society as well as in many other Asian countries, males are usually the main breadwinners, so their migration will generally lead to an immediate loss of a portion of household income, which tends to affect short-term consumption and hence nutrition. On the contrary, the roles of females are more likely to involve taking care of household chores and caregiving. As a result, the migration of females will result in children experiencing long-term erosion of a social environment that nurtures their sense of safety and physical growth. This notion was shared by Jampaklay (2006), who found that in Thailand the negative effects of maternal migration start to exceed those created when the father migrates as the duration of the migration increases. For short-term absence, it is paternal migration that has a larger effect on children's educational outcome (Jampaklay 2006).

Our second objective is to understand whether or not one form of income is used differently from other forms in terms of investing in children's health. As shown in table 2, the responsiveness of both types of anthropometric measurements to remittances is substantially larger and statistically significant relative to other household sources of income. Both OLS and 2SLS estimators indicate that other income, excluding remittances, does not have any impact on children's health. Thus, different types of income are spent disproportionately on health investment. In other words, income from other sources may be channeled toward other kinds of expenditure other than health, which are not examined in this study. This outcome adds evidence for maintaining support to the claim made by Cambodian workers in Thailand that a large portion of their remittances goes toward funding

household healthcare expenditure. In Mexico, Amuedo-Dorantes & Pozo (2011) also discovered that remittances are more likely than other income to be expended on healthcare. Moreover, our finding corroborates Friedman's (1953) permanent income hypothesis, and McKenzie & Sasin (2007) who argued that the sources of income matter and that they influence household expenditure differently, particularly if one form of income is stipulated for a specific purpose.

As for other covariates, we find that boys are in a more disadvantageous condition than girls for WFA, but there is no significant difference in long-term nutrition. As our indicator has rolled out the biological aspect of gender, the difference may come from social values, such as child preference, which we cannot account for. Antman (2012), Jampaklay (2006), Meng & Yamauchi (2017), and Anton (2010) have all concluded that girls are in a more favorable situation than boys when household members migrate. Antman (2012) attributed the results to an increase in women's bargaining power regarding intrahousehold resource allocation. As migrant households are more likely to be headed by women due to the fact that male members tend to migrate, decision-making power is shifted to women, resulting in more resources going toward daughters rather than sons. With regard to children's age, the variable suggests that the deleterious effects on Cambodian children's nutrition tend to be cumulative, worsening as children grow older, which may be due to a lack of caregiving or childrearing practices. The impact of the household head's education on long-term investment in health is also noted.

7.2 Impact of Internal and International Remittances

We also extended our investigation further to compare between internal and international remittances. Our interest in doing so is motivated by studies, such as those by Binci & Giannelli (2018), who insisted that domestic and international remittances do not have a similar influence on Vietnamese children in term of education. In our study, we distinguish the former from the latter using information on the origin of each type of household income and repeat the regression procedure that produces the results in table 2. Nonetheless, we put and instrument both types of remittances in the same equation rather than running a separate model for each one of them. Table 3 shows the results of such analysis.

Table 3: Causal Relationship of Internal and International Remittances with Child's Growth

Variables	HFA (2SLS)	WFA (2SLS)
International Remittances	0.0349*	0.0328**
	(0.0216)	(0.0157)
Internal Remittances	0.00353	-0.00264
	(0.0135)	(0.00882)
Number of Female Migrant Workers	-0.740	0.0414
	(0.762)	(0.467)
Number of Male Migrant Workers	-2.309*	-1.962**
	(1.207)	(0.853)
Observations	2767	2767
<i>Instrumental Variables</i>	<i>International Remittances</i>	<i>Internal Remittances</i>
Percentage of Out-Migrants	0.02	0.332**
	(0.156)	(0.152)
Distance to the Nearest MFI	-0.413**	-0.292**
	(0.189)	(0.137)

Note: - All regressions in this table also control for other household, its head, and village Characteristics, and provincial dummies listed in Table 1.

- Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

It appears that internal remittances do not have any impact on children's growth while funds from international sources have a very large effect – two-fold larger than overall remittances. Likewise, the effect of having male migrant workers is substantially larger than that found in Table 2 whereas the variable for the number of female migrants is not statistically significant. One possible reason is that the influence of domestic remittances tends to cancel out the effect of migration of females, who are also more likely to be internal labor migrants (Ministry of Planning, 2012) – or simply that only international remittances are more likely to be channeled toward health expenditure. A more concrete explanation is that the estimation is not precise since the percentage of out-migrants is not strongly correlated with international remittances. Future research is possible with better instruments to understand differences in responsiveness of children's health outcome to different types of remittances and migration.

8. Final Remarks

Using the 2009 Cambodia Socio-Economic Survey, we examined the impacts of migration and of remittances on children's quality of health, as measured by the WHO child growth standards indicators. In the attempt to mitigate potential reverse causality and omitted variable bias, we employed a two-stage least squares estimator with two instruments, both of which are strongly correlated with the endogenous variable. A few main findings emerge. Remittances significantly improve children's health outcome, and they do so more positively for girls than boys. Holding other variables fixed, a \$100 rise in remittances increases height-for-age and weight-for-age Z-score by a 1.6 and 1.2 standard deviations, respectively. It is also found that the migration of female household members is more harmful to children's long-term nutrition than is the migration of males. The opposite is true in the short term. To offset migration's effects, households need to receive remittances of approximately no less than \$94 from each migrant for every child in the household.

While this may be relatively good news for remittance-recipient households in Cambodia, which on average receive more than that, and hence experience a more positive net impact, it is detrimental to children who live in migrant-households that receive no remittances. Additionally, we found that remittances are not fungible. In another words, remittances are not spent proportionately as is other income on health accumulation. This finding provides evidence not only to support the permanent income hypothesis but also to indicate that remittances are indeed directed toward buying healthcare, just as the Cambodian migrant workers have claimed. It can be, therefore, of significant interest to policymakers who attempt to promote health. Nevertheless, in comparison between our study and those conducted particularly in Southeast Asia, the influence of migration and remittances seems rather mixed whereas research in other countries outside of the region appears to concur. However, based on quantitative data, it is difficult to explain thoroughly the mechanisms through which remittances positively or negatively affect children's health. Better understanding of country's specific context may help elucidate the mixed conclusion.

It should also be highlighted that remittances may also exacerbate social inequality between households that receive them and those that do not if they do not flow toward the poorest. It is generally believed that migrant-sending households are those that are relatively

well-off, for the migration journey is normally expensive, especially internationally. Therefore, only richer families can actually afford it; thus, they may be in an even more favorable situation since they have better access to remittances. Nevertheless, McKenzie & Rapoport (2007) argued that inequality may eventually fade away, as more and more people will be able to afford migration due to migration networks which lower the cost of the journey.

9. Limitations of the Study

Despite the insight, there are also a number of limitations in our study that we should pinpoint. First, the study does not include remittances in-kind (given as imputed value), so we may have underestimated the actual impact of remittances. In the survey, in-kind transfers are identified as goods received by a household, but the background of senders and reasons for receiving such items are not recorded. It is possible that migrants send back remittances in the form of goods because such goods are not available locally, or perhaps it is cheaper to buy and send them from abroad than to purchase them from the domestic market. However, it is not plausible to distinguish remittances in-kind from gifts or rewards that households acquire for other reasons. Second, remittances may be sent by both migrant workers and non-migrant workers—those who migrate for intentions other than employment. As the amount of remittances is recorded at the household level, it is not possible to separate those sent by labor migrants from those transferred by other types of migrant. Therefore, as stated before, our focus is on migrant remittances rather than only migrant worker remittances. Third, even though 2SLS is better than OLS when the model suffers from endogeneity, the former has a main weakness in itself. Standard error estimated using 2SLS is normally much larger than that of OLS, especially when IV is not strongly correlated with endogenous variable, as in our case international remittances.

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