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ABSTRACT

Migration, Remittances and Human Capital Investment in Kenya*

This paper investigates the relationship between international migration, remittances and human capital investment in Kenya. We use household level data from the 2009 Kenya Migration Household Survey (produced by the Africa Migration Project) to test our hypothesis and uncover a positive and significant relationship between the amount of international remittances a household receives and the amount of expenditures allocated to education (for all levels of education). We consider various robustness checks and find that our results hold up to various specifications, including an instrumental variable approach.

JEL Classification: F24, I25, J61, O12

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1 Introduction

International migration can benefit the sending household as well as the migrant through remittances as a result of improvement in employment and education opportunities abroad. In particular, additional income from remittances can relax budget or credit constraints, allowing for investment in goods and services such as education. Despite the benefits of having household members abroad who are potentially earning more and remitting, migration entails substantial economic costs for households. These include the costs of transportation, relocation, and forgone wages during the migration process.

Due to the differences in costs and opportunities associated with migration, one would expect variation across household and individual characteristics between migrant and non-migrant households in observable qualities such as education, employment status and expenditures, as well as unobservable traits such as ambition and ability. Variation in these characteristics may impact household decisions related to investing in human capital. For example, wealthy families may send a migrant abroad for purposes other than remitting, such as acquiring education or remedying health problems, while others may be motivated to migrate by the need for additional income. Some individuals migrate with the intention of sending money home to support their families, and the additional income from remittances will allow their households to spend and/or invest more. How they choose to spend/invest their resources depends in part on their willingness to invest in the future rather than consume more in consumption and durable goods. In addition, the absence of an adult in the household due to migration may lead to children having to enter the labor force to compensate for the missing wage earner. Ex ante, the relationship between remittances and education expenditures is therefore theoretically unclear.

Remittances are an important source of income for many Kenyan households. In 2016, remittances received in Kenya totaled \$1.7 billion and accounted for 2.5 percent of the country's GDP (World Bank, 2017), which is slightly higher than official development assistance (ODA) into Kenya (OECD, 2017). Thus, remittances

are clearly playing an important role in the Kenyan economy. At the household level, nearly 14 percent of Kenyan households receive remittances on a regular basis (World Bank-Central Bank of Kenya, 2010). The explosion of mobile banking services in the early 2000's throughout parts of Africa may have provided an important impetus in making it easier and cheaper for households to receive remittances.

The proliferation of mobile phone access combined with developments in mobile banking services led to a significant increase in access to financial services for households across the socioeconomic spectrum. Even in remote villages with no formal banks, households could more easily access and transfer funds between individuals using M-PESA and other types of mobile banking services. According to a 2010 report, the World Bank states that households cite using M-PESA to help pay school fees and medical procedures, and document an increase in M-PESA transfers in months when school fees are typically due. The 2010 report also mentions that funds received via M-PESA led to increases in school attendance and retention rates.

It is important to provide some context for the educational system in Kenya. Primary schooling in Kenya is mandatory and most schools are subsidized by the central government. Still, households must pay many different types of fees to send their children to school; these fees often take the form of uniforms, books, building fees, etc. At the secondary level, schooling is not mandatory and there is a mix of public and private schools. Even for public secondary schools, children often are boarded away from home, so families may have to pay boarding fees, in addition to tuition, uniforms, books, etc. Thus, the financing of primary and secondary schooling can be nontrivial, especially for poorer households. In addition, Kenyan culture highly values education and often times, extended family and friends contribute to funding school fees for children of all ages. Education is therefore often considered to be an important investment in a child's future among Kenyans of different socioeconomic statuses. In this paper, we will try to uncover how migration and remittance decisions enter into the household decision to invest in their children's education.

We use data from the Kenya Migration Household Survey conducted for the Africa Migration Project (and made publicly available by the World Bank) to study the relationship between international remittances on household-level education expenditures. The dataset provides detailed information on household expenditures, migration and remittance behavior for a cross-section of Kenyan households in 2009. To our knowledge, this dataset has not been used in this context. We estimate several empirical models using household level remittance and expenditure data to determine the relationship between remittances and education expenditures, after controlling for differences in household characteristics and migration decisions.

We use Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) estimation techniques. Unobservable household and individual characteristics such as risk preferences, ambition, and ability may influence the amount of remittances a household receives as well as investment in education. In addition, there could be endogeneity between education expenditures and remittances, so we include two instrumental variables that serve as proxies for remittance levels. Our analysis uncovers a positive relationship between remittance levels and education expenditures.

2 Prior literature

In theory, migration has competing effects on household resources: households lose income with the migration of a wage earner, but remittances can counteract the negative effect of forgone income in the sending country. The effect of remittances on household investment behavior is therefore not immediately clear. If a household facing budget and credit constraints wants to invest more on education, income from remittances may increase investment. For example, Adams and Cuecuecha (2010, 2013) find a positive association between the receipt of remittances and investment in education, health and housing in Ghana and Guatemala. Alternatively, remittances may increase consumption of food and durable goods, but not change investment decisions. Amuezo-Dorantes and Pozo (2010), Bouoiyour and Miftah (2015) and others find negative effects on schooling outcomes due to the absenteeism of an adult

in the household due to migration. Yang (2011) notes that whether remittances are used for consumption or investment may depend on the income of the household. While poor households are likely to spend more on food and durable goods, wealthier households can afford to invest in the future through physical or human capital. Jena (2017) explores the relationship between remittances and physical capital investment in Kenya using the same dataset employed in our study and finds a significant positive effect.

Wealthier households are better able to finance the costs of migration, although less affluent families may be more likely to migrate for the purpose of sending remittances. In addition to relaxing the household's budget constraint, remittances can act as insurance against adverse economic shocks. Previous literature has explored the reasons for migrants deciding to remit; in particular, Lucas and Stark (1985) suggest that remittances are not motivated solely by altruism or self-interest; rather, they facilitate a mutually beneficial contract between a migrant and their household. Thus, migration can be a risk diversification strategy in which the migrant and the origin household participate in more than one labor market so that remittances act as a form of insurance against shocks. Using data from the Kenya Integrated Household Budget Survey, Kiiru (2010) finds that internal and external remittances in Kenya are used to cope with poverty and economic crisis and lead to improvements in household welfare. Simiyu (2013) uses a two-wave (2007 and 2009) panel data set of rural households in two Kenyan provinces and finds that internal and external remittances are used primarily to finance consumption expenditures, rather than investment in education. Azam and Gubert (2006), Beti et al. (2008) and Amuedo-Dorantes and Pozo (2011) also discuss remittances as a mechanism to cope with adverse economic shocks in other countries. Another possibility is that households invest in the education of certain members, who then migrate and earn a higher wage than they would otherwise, indicating that remittances are a form of repayment to the household (Lucas and Stark, 1985).

The majority of previous research on migration and human capital investment at

the household level has analyzed the relationship between remittances and child outcomes in the origin country, particularly the trade-off between schooling and child labor. Yang (2008) analyzes shocks to Filipino households due to exchange rate fluctuations during the 1997 Asian financial crisis. He found that migrants send more remittances when the international currency appreciates against the domestic currency, and remittances are associated with more investment in education and a reduction in child labor. Bansak and Chezum (2009) provide evidence from Nepal of a positive relationship between remittances and the likelihood that children are enrolled in school. By controlling for the absence of household members who migrate, they isolate the effect of remittances on schooling decisions from the disruption of a wage earner leaving the household. The results show that higher relative net remittances, which indicate a larger effect of migration in relaxing budget constraints, are positively correlated with the probability that children are in school.

Alcaraz et al. (2012) look at how remittances affect decisions about child labor and education in Mexico. The authors use a difference-in-difference estimation to explore the effect of a negative shock to remittances on children in remittance-receiving households compared to children in households that do not receive remittances. While OLS results suggest the effect of the financial crisis on child labor is not significantly different for children in remittance-receiving and non-receiving households, an instrumental variable specification finds that children from households who experience a negative shock to remittances are more likely to be working and less likely to go to school.

Cox and Ureta (2003) look at the effect of remittances on the decision to leave school in El Salvador and find that the positive impact of remittances on schooling is much larger than the effect of other household income. Mansour et al. (2011), using a censored ordered probit model, find a positive effect of remittances on both educational attainment and school attendance in Jordan. A recent paper by Bucheli et al. (2018) finds mixed effects of remittances on education outcomes in Ecuador using 2010 Census data: they find a positive relationship between remittances and

secondary school enrollment for poor, urban males and negative effects for rural females. Thus, the link between remittances and education outcomes can vary, depending on the characteristics of the migrant and the household.

3 Data

The data used in this paper are from the 2009 Kenya Migration Household Survey conducted for the Africa Migration Project and made publicly available by the World Bank. The cross-sectional dataset provides detailed information on household expenditures, individual characteristics, migration and remittances in 2009.¹ The dataset is novel in that it provides individual level information about migration histories which can then be mapped to household remittance behavior. Overall, the survey includes responses from 1,942 household heads who report information for 10,588 individuals. Of those individuals, approximately 36 percent of the households report having an international migrant in the household. The survey's primary weakness is that the sample is not nationally representative. Only 17 (of 46) districts are surveyed, and the districts are concentrated in the southern region of Kenya.² In addition, migrant households are over-sampled (see Plaza *et al.*, 2011). To deal with the sampling bias, we cluster standard errors at the district level.

We chose to focus on international migration so that we can isolate the effects of international migration on education expenditures. The migration and remittance decisions are quite different for internal migrants compared to international migrants, and can depend on different factors. For example, internal migration may be driven more by local factors (such as local employment situations) and are likely to be more temporary in nature than international migration patterns. In addition, the costs of international migration far exceed the costs of migrating internally. International remittances may have also different impacts on education than internal remittances.

¹For a detailed description of the dataset, please refer to Jena (2016) and Jena (2017).

²At the time of the survey, Kenya had eight provinces which were subdivided into 46 districts.

Of the 1,942 households in the sample, 844 households report all of the variables of interest (which are described below) and have household members who are school-aged (which we define as those with 20 years of age or less). Of these 844 households, 351 have at least one household member with international migration experience (or 41.5 percent).³ Thus, our sample slightly over-represents migrant households compared to the original dataset (with 36 percent of households having at least one migrant).

Tables 1-6 report various summary statistics. Table 1 reports individual characteristics for migrants and non-migrants while Table 2 reports characteristics for remitting migrants and non-remitting migrants. The average age of migrants in this sample is approximately 48 years (compared to an average age of non-migrants of 21 years). Overall, the average age of migrants in our sample is much older than most other studies find. The survey collects information about each household member that currently lives outside of the household, whether they live in Kenya or in another country. The survey, administered only in 2009, captures current age rather than the age at migration. We restrict our analysis to those living in another country. The age difference between migrant and non-migrant households holds up when we remove children in the sample. We estimate our model for samples that are restricted to households with at least one international migrant.

Migrants tend to be more educated than non-migrants, with more than nine years of completed schooling, compared to non-migrants with fewer than eight years (excluding those with no education). Migrants tend to leave their households for long periods of time; the average duration of a migrant's stay in a foreign country is more than six years. Migrants are fairly evenly balanced between genders, with men accounting for 54 percent of migrants and 47 percent of non-migrants.

Remitting migrants (as reported in Table 2) are slightly older than non-remitting migrants (with 49 years of age compared to 45). They are also slightly less educated

³Our final sample drops 594 households without at least one member age 20 or younger and drops 468 households with internal migrants. We also drop 36 households for which we are missing information about educational attainment.

than non-remitting migrants, with approximately one less year of average educational attainment. However, remitting migrants have approximately one more year of average migration duration than non-remitting migrants (6.7 years for remitting migrants versus 5.7 years for non-remitting migrants).

Table 3 documents the reason for migration and compares those who remit compared to those who do not remit. The most commonly-cited reason for migration is work among both remitters and non-remitters; the second most cited reason is education. However, for migrants who send remittances, a larger share cite work-related reasons (60 percent compared to 47 percent for non-remitters), suggesting that the primary goal is to earn income abroad and send it home in the form of remittances. The other reasons cited for migration include marital reasons, health problems, and winning a green card.

In Table 4, we list the most common destination countries for international migrants from Kenya in the sample. The United States and the United Kingdom are the most common destination countries with more than 34 and 13 percent of all migrants in the sample, respectively. The next most common destination countries are Uganda and Tanzania, which are closer in proximity to Kenya, but much less developed. Overall, the majority of Kenyan migrants are going to richer countries as measured by per capita GDP. This will be important in discussing our results as we use per capita GDP in the destination country as an instrument for remittance levels.

Table 5 compares various household characteristics of migrant households to non-migrant households in the sample. Migrant households are slightly larger in size, with an average of 5.24 household members compared to 4.97 for non-migrant households, with slightly fewer dependents. Migrant households have an average of 1.36 household members with international migration experience. There are very few differences in terms of the highest level of educational attainment in a household between migrant and non-migrant households, with the maximum years of schooling being approximately 10 years. Similarly, both migrant and non-migrants households

in the sample are as likely to live in an urban area than a rural area. Importantly, migrant households spend three times as much on education expenditures (on average) than non-migrant households and also tend to spend significantly more on total monthly expenditures. Education expenditures represent approximately 13.1 percent of total expenditures for the typical household in the sample. Unfortunately, the data do include a robust measure of household income. To complicate matters further, expenditures are reported for the past six months in the survey, while remittances are reported for the past twelve months. We address this issue by calculating average monthly remittances and average monthly total expenditures so that data are comparable. However, our measure of educational expenses will smooth out the lumpiness of educational expenditures that take place over the course of a year. We thought it was best to take this approach so that we do not overestimate the effects of remittances.

We compare remittance behavior for different subgroups of the population in Table 6. Women are more likely to send remittances than men (60 percent versus 56 percent of the sample) and women send more than twice the amount of remittances as men (on average per month). In addition, employed individuals have a higher propensity to remit (at 72 percent) with relatively higher remittance amounts, while only 9 percent of students remit.

We collect two additional data series and use them as instruments: per capita GDP in migrant destination countries and cell phone coverage. Per capita GDP in 2009 is from the World Bank World Development Indicators. We follow the approach in Jena (2017) and use cell phone tower data from Jack and Suri (2011), which capture the number of Safaricom cell phone towers in each Kenyan province in 2009. Safaricom was the leading telecommunications company in Kenya at the time as a result of their mobile banking service called M-PESA. Table 7 reports an average per capita GDP of \$27,340 (in 2009 dollars) for destination countries of Kenyan migrants and approximately 216 cell phone towers per province in 2009.

4 Empirical specification

We estimate the elasticity of education expenditures with respect to remittances using OLS and 2SLS. We examine the association between remittance decisions and education spending to determine whether migrant households, particularly those that receive remittances, differ from non-migrant households in human capital investment.

We use equation 1 to estimate the relationship between remittances and household education expenditures:

$$\begin{aligned} \ln(\text{Educ.Expenditure}) = & \beta_0 + \beta_1 \ln(\text{Remittances}) + \beta_2 \text{Remit} + \beta_3 \text{ChildrenAge}(0 - 5) + \\ & \beta_4 \text{ChildrenAge}(6 - 13) + \beta_5 \text{ChildrenAge}(14 - 20) + \\ & \beta_6 \text{MaxEducation} + \beta_7 \text{Urban} + \beta_8 \text{Assets} + u \end{aligned} \quad (1)$$

$\ln(\text{Educ.Expenditure})$ is the natural logarithm of average monthly household expenditures on education. We rescale education expenditures so that the minimum value is positive.⁴ The main variable of interest, $\ln(\text{Remittances})$, is the natural logarithm of average monthly remittances a household receives from migrants, also rescaled to take on positive values. As both remittances and education expenditures are expressed in logs, the coefficient on the natural logarithm of remittances can be interpreted as the elasticity of education expenditures with respect to remittances. We include the dummy variable *Remit* to indicate whether a household receives remittances from abroad. Due to multicollinearity concerns with the inclusion of both the decision to remit and the level of remittances, we will also consider specifications (in section 5.3) that include only the dummy variable for receiving remittances or the level of remittances on the right hand side of equation 1.

Because households with more members enrolled in school are likely to spend

⁴This is a very common approach in estimation when the variables are reported in local currencies, are skewed positively and have many cases of zeros. The zeros are truly zeros in our context, that is, they do not represent cases when expenditures/remittances are merely not reported. Thus, it is common (though imperfect) to add a constant scalar in this case. In addition, natural logs allow for ease of interpretation for the estimated coefficients.

more on education, we control for the number of children in each household. We separate children into age groups based on typical enrollment ages for primary and secondary school. $ChildrenAge(0-5)$, $ChildrenAge(6-13)$, and $ChildrenAge(14-20)$ are the number of household members aged 0-5 years, 6-13 years, and 14-20 years, respectively. The assignment of ages to the respective school-age groups follows the divisions used by Bold *et al.* (2013). These variables are relevant to education expenditures as per the structure of Kenya’s education system. Since 1985, schooling in Kenya has been based on an 8-4-4 curriculum. According to this system, students receive eight years of primary education, four years of secondary education, and four years of tertiary education (Eshwari, 1990). We incorporate a slightly longer age range (of between 14 and 20 years) because some children may start their education later, repeat grades, or take time off to work.⁵ Because households without any traditionally school-aged members are unlikely to spend on education, we restrict our sample to households with at least one member with 20 years of age or younger.

The distinction between primary and secondary schooling is especially important due to the availability of government-funded schools in Kenya. Although secondary education remains fee-based, Kenyans have had access to free primary schools since the government introduced the Free Primary Education (FPE) program in 2003. Still, families have to cover other fees related to school enrollment at all levels, including uniforms, books, supplies, building fees, etc. For secondary schooling, families often have to cover costs associated with boarding as children may have to attend school far from home. Thus, the cost of children attending secondary schooling is often much higher than attending primary school so we expect the im-

⁵We do not include a variable for the number of household members likely to be completing tertiary education because post-secondary schooling applies to a small fraction of the population, and the age variance for this group of students is probably much larger than that of primary and secondary pupils. In 2011, the gross enrollment ratio (GER) for tertiary education in Kenya was only 8% (UNESCO, 2010). This is significantly smaller than the GER for primary school (101 percent) and secondary school (41 percent). Furthermore, the GER is calculated as the number of students of any age enrolled in a particular level of education relative to the relevant group of school-age children. Not only is tertiary enrollment small compared to primary and secondary enrollment, but the gross enrollment ratio is almost certainly smaller than the net enrollment ratio, which is calculated as the number of students in the typical age group as a percentage of that age group.

impact of primary school age children on education expenditures to be different than that of secondary school aged children. Previous case studies have reported that the quality of public schools, or at least perceptions of quality, declined since the adoption of FPE (Tooley *et al.*, 2012; Oketch *et al.*, 2010). While the availability of free primary schooling may reduce household educational expenditures, households and their extended families are also making a decision about the quality of education they receive. When families perceive government-funded schools to be of lower quality than fee-based schools, they can choose to send children to private school instead, thus increasing education expenditures. For example, Bold *et al.* (2013) find that the adoption of Free Primary Education reduced demand for public schooling and increased enrollment and fees for private schools as children from affluent families moved to private schools.

A highly educated family member may be an indication that a household has a stronger preference for investment in education, so we include the variable *MaxEducation* to control for the number of years of schooling of the most educated household member. Due to the geographic distribution of schools, or social and cultural factors affecting the demand for education, urban and rural households may make different decisions about investing in human capital. For example, if government funded schools are less accessible in rural areas, then these households may spend more on primary education. Therefore, we include *Urban* as a dummy variable that indicates whether or not the household is located in an urban area. We also use an index of the immovable assets as a proxy for household wealth. *Assets* includes ownership of agricultural land, non-agricultural land, a house, and other buildings as a proxy for household wealth. A significant number of households own such assets, and none of them are specific to urban or rural households. Houses and agricultural land are concentrated among urban families, with 73 percent of rural households and 49 percent of urban households owning a house, and 79 percent of rural households and 38 percent of urban households owning agricultural land. However, nonagricultural land and other buildings are more evenly distributed between urban and rural

households, with 20 percent of urban households and 18 percent of urban households owning non-agricultural land, and 20 percent of urban households and 16 percent of rural households owning other buildings.

Remittances may be endogenous with education expenditures. Unobservable household characteristics such as ambition, ability, risk preferences, and attitudes towards investing in the future can affect both remittances and education expenditures. The financial well-being of the household in Kenya may also relate to the amount of remittances the household receives and its spending on education. Migration can be a form of risk insurance against economic shocks to a household in one country, so if a household is struggling financially, it is likely to receive more remittances as well as spend less on education.

To account for endogeneity in the amount of remittances received by a household, we use per capita GDP in the destination country and the number of cell phone towers in each province as instruments. The standard of living in the destination country acts as a pull factor in the migration decision, but also affects individuals after the migration decision. A migrant located in a more affluent country is likely to earn a higher wage than a migrant to a poor country, and a migrant with a higher paying job can afford to send more remittances. We follow Antman (2011) and Bucheli et al. (2018) who use instruments that capture economic conditions in the destination country. It is assumed that per capita GDP in the destination is not correlated with household-level education expenditures in Kenya. As in Jena (2017), the number of cell phone towers in a province is used as a proxy for the ease of receiving remittances. Better cell phone coverage makes it easier to accept remittances from abroad. In fact, the explosion of mobile banking service providers (such as M-PESA) has fundamentally changed the way financial transactions are handled, especially in remote regions where access to banks and other financial services are limited.

5 Empirical results

In this section, we present results from OLS regressions for samples that include households without migrants. We then restrict the sample to those households who have at least one international migrant, employing both OLS and 2SLS analysis using Instrumental Variables (IV). The IV specification allows us to correct for endogeneity concerns.

5.1 Education expenditures and remittances: OLS

Our empirical specification implies that the estimated coefficient on remittances can be interpreted as an elasticity. That is, our coefficient of interest indicates how education expenditures respond to a one percentage point increase in remittances. The OLS regression results for all households (in column 1 of Table 8) reveal a positive correlation between the amount of remittances a household receives and household spending on education. In column 1, a one percent increase in remittances is associated with a 4.92 percent increase in education expenditures, controlling for the ages of children in the household, the maximum years of schooling for a household member, whether the household lives in an urban location, and household assets. In addition, we observe a negative coefficient on the indicator variable for households who receive remittances. Thus, receiving remittances is associated with a decrease in education expenditures.

The negative association between education expenditures and the decision to remit should not be interpreted as a sign that the decision to remit negatively affects education expenditures; rather, households with lower expenditures have a greater need for income from remittances which may be associated with the absence of a working adult in the household. Consider the decision to migrate as simultaneous with the decision to remit, or at least the intention of finding employment and then remitting. The correlation between the migration decision and education spending indicates whether migrant households have different investment preferences than non-migrant households. In this case, migrants who leave with the intention of

sending remittances may come from less affluent households and use the opportunity to migrate as a means of improving the welfare of their family. In addition, the absence of an adult in the household may lead to a reduction in schooling leading to fewer education expenditures. After accounting for the remittance decision, the amount of remittances a household receives is positively associated with higher education expenditures.

The relationship between education expenditures and the amount of remittances a household receives is related to the decision to migrate. To control for potential selection bias, in column 2 of Table 8, we restrict the sample to only those households who have a household member who has migrated internationally. Conditional on migration, we find a larger elasticity. In column 2, a one percent increase in remittances is correlated with a 5.15 percent increase in education expenditures. Similar to the OLS specification in column 1, the negative coefficient on the remittance indicator variable remains negative. This supports the hypothesis that the decision migrate is simultaneous with the decision to remit. Households that earn higher income by allocating labor to another country choose to send a migrant who will redistribute the gains from migration via remittances.

in Table 8, we report a positive correlation between the number of school-age children in the household and spending on education. The coefficient on the number of secondary school age children is larger than the coefficient on the number of primary school age children when considering a sample of all households (column 1). Given that Kenya offers universal free primary education, one expects secondary school age children to have a larger impact on education expenditure than children of primary school age. The coefficient on primary school age may be driven by spending on other school-related expenses. The coefficient on the number of primary school age children becomes smaller and is only significant at the ten percent level when the sample is restricted to migrant households (in column 2). The amount of schooling for the most educated household member is positively correlated with education spending for a sample including both migrant and non-migrant

households, but both the statistical significance and the magnitude of relationship diminish when restricting the sample to households with an international migrant. One explanation is that the maximum years of schooling in a household may not vary much among migrant households. As expected, wealthier households, or those with more immovable assets, spend more on education, controlling for other variables in the model. Surprisingly, whether a household is located in an urban or rural area does not appear to be related to spending on education declines when controlling for household income, school age children, the education level of the household, and remittances. This may be due to the accessibility of money transfer operators or the efficiency of social networks throughout the country (Ngugi, 2011).

Recall that our sample is not nationally representative and that migrants in our sample tend to be older and have longer durations abroad than migrants that originate from other developing countries. Typically, remittances fall with age and migration duration: the longer a migrant spends abroad, the less connected they are to their families back home. This may limit the impact of remittances on educational expenditures. Thus, our estimates of the relationship between remittances and education expenditures are likely understated. If our sample of migrants was more typical in being younger with shorter migration durations, it is likely that we would uncover a stronger positive relationship between remittances and expenditures.

5.2 Education expenditures and remittances: IV

Next, we consider a set of specifications that attempt to correct for correlation between the errors terms in education expenditures and remittances. We employ a Two-Stage Least Squares (2SLS) model and regress education expenditures on remittances using an IV specification. We include two instrumental variables for the level of education expenditures: per capita GDP in the destination country and the number of mobile phone towers in the province where the household resides. These variables are less likely to be correlated with education expenditures than the level of remittances. This model uses a sample restricted to international migrant

households because per capita GDP in the destination country is only available for households with at least one migrant. In the case of households with more than one migrant in different countries, GDP values are averaged for that household.

In column 3 of Table 8, we report the results when we include both instrumental variables in the specification. While the direction of the relationship between education expenditures and the level of remittances is the same as in the OLS specifications, we note that all of the control variables are no longer significant and the magnitude of the estimated coefficients for our variables of interest are larger. In this specification, a one percent increase in remittances is associated with a 20.95 percent increase in education expenditures, suggesting that there is significant downward bias in the OLS estimates due to the endogeneity, based on the results reported in column 2. In the Appendix, we report the results for each instrumental variable separately (in Table 11) and the first stage results using the two instrumental variables in Table 12). Both GDP in the destination and cell towers are positively and significantly correlated with remittance levels, indicating that both satisfy the relevance condition.⁶ However, when per capita GDP in the destination is used as the lone instrument, we no longer find a significant relationship between remittance levels and education expenditures. Thus, the use of cell phone towers in Kenyan provinces seems to be an appropriate instrument for remittance levels and one that researchers should consider using when attempting to sort out the various forms of endogeneity that may arise when considering complex relationships between remittances and other forms of household expenditures. Our findings are similar to those found in Jena (2017), who also found cell phone towers to be a robust instrument for remittances.

⁶In specifications where we use both instruments, we are able to conduct a version of the Sargan-Hansen test to check the validity of the over-identifying restrictions. We (marginally) fail to reject the null that the over-identifying restrictions are valid ($p = 0.12$), supporting our choice of instruments.

5.3 Multicollinearity concerns

Given that the dummy indicator for households that receives remittances is highly correlated with the log of average remittances received, multicollinearity is a concern. We therefore re-estimate equation 1 by including one measure of remittances at a time. That is, we separately estimate:

$$\begin{aligned} \ln(\text{Educ.Expenditure}) = & \beta_0 + \beta_2 \text{Remit} + \beta_3 \text{ChildrenAge}(0 - 5) + \\ & \beta_4 \text{ChildrenAge}(6 - 13) + \beta_5 \text{ChildrenAge}(14 - 20) + \\ & \beta_6 \text{MaxEducation} + \beta_7 \text{Urban} + \beta_8 \text{Assets} + u \end{aligned} \quad (2)$$

and

$$\begin{aligned} \ln(\text{Educ.Expenditure}) = & \beta_0 + \beta_1 \ln(\text{Remittances}) + \beta_3 \text{ChildrenAge}(0 - 5) + \\ & \beta_4 \text{ChildrenAge}(6 - 13) + \beta_5 \text{ChildrenAge}(14 - 20) + \\ & \beta_6 \text{MaxEducation} + \beta_7 \text{Urban} + \beta_8 \text{Assets} + u \end{aligned} \quad (3)$$

The results are reported in Tables 9 and 10, respectively, and include OLS and IV specifications. In Table 9, we find a significant positive relationship between education expenditures and the decision to remit in the first OLS specification (column 1). However, this result does not hold up when we restrict the sample to households with at least one international migrant (in columns 2 and 3). Table 10 reports the results when only (log) remittances are included. The results suggest a positive relationship between remittance levels and education expenditures for the OLS specifications in columns 1 and 2 but no significant relationship in the IV specification reported in column 3.⁷

Thus, when only one measure of remittances is included, we find a small positive relationship between remittances and education expenditures in some specifications. However, the result does not hold up in the IV specifications. When we include both

⁷We can reject the null hypothesis of the Sargan and Hansen test for these specifications, with p-values less than 0.015 and 0.03, respectively.

the level of remittances and the remittance dummy (in Table 8), the results indicate a positive relationship between education expenditures and remittance levels, but a negative correlation between receiving remittances and education expenditures. It is therefore likely that multicollinearity is biasing the results in the specifications with both variables.

In general, we find a positive relationship between education expenditures and remittances in some of our empirical specifications. We have controlled for possible selection effects by limiting our analysis to households who have at least one member who has migrated internationally. All of our specifications have considered differences between households who remit compared to those who do not remit. We also considered several other specifications that are not reported in the paper, including other instrumental variables (such as migrant stock in the destination and district level remittances). It is important to recall that we are somewhat limited by the dataset which is not nationally representative as discussed earlier. Still, we are confident that our results are relevant for policy makers as remittances are increasingly important in countries such as Kenya.

6 Conclusion

This paper studies the relationship between remittances and education spending among households in Kenya. Previous literature has considered both individual motivations to migrate and remit as well as the role of remittances in relaxing household budget constraints. Scholars have examined the impact of migration on educational outcomes, including school attendance and completion rates. Further research has found that households receiving remittances spend marginally greater shares of their budget on investment goods. We extend the existing literature by analyzing the relationships between remittances and education spending.

Using data from the 2009 Kenyan Migration Household Survey, a dataset that has not been extensively analyzed, we find some evidence of a positive relationship between remittances and education spending. Migrant households who receive re-

mittances from abroad tend to spend more on education-related expenditures. This result holds up in OLS and IV specifications that attempts to address endogeneity concerns, and when we control for whether or not a household receives remittances. However, the significance of this finding dwindles in the IV specifications where we isolate the effects of remittance levels and do not control for whether the household receives remittances. Still, our overall findings suggest a positive relationship among a sample of migrants who are older and have spent more time abroad and hence less likely to be connected to their families back home than what is typical in developing countries. We also find that using the number of cell phone towers as an instrument for remittances is important in estimating the link between remittances and education expenditures. The significant increase in cell phone usage and the consequential development of mobile banking services makes it easier and cheaper to transfer money from abroad. Households in Kenya who have household members abroad therefore have better access to additional financial resources and our analysis indicates that at least some of those additional resources are put towards educational investment. This is good news, as investment in education can have significant, positive effects on long-run GDP growth, especially in developing countries (see, for example, Blankenau et al., 2007).

There are very few studies to date that use the Kenya Migration Household Survey; recent exceptions include Jena (2016) and Jena (2017). The survey data are rich in that it contains migration and remittance experience of households along with detailed expenditure data. Similar datasets have been collected and made available for other African countries, including South Africa, Uganda and Senegal. We hope other researchers use these datasets to explore related topics so that there is a better understanding of household-level decisions as they pertain to migration and remittance behavior throughout Africa.

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7 Tables

Table 1: Individual Characteristics: Migrants vs Non-migrants

	Migrants	Non-migrants
Age	47.67 (25.625)	20.99 (15.955)
Age of household head	52.77 (16.452)	40.66 (13.493)
Male	0.54 (0.499)	0.47 (0.499)
Years of education	9.30 (5.069)	7.72 (4.231)
Duration of absence	6.27 (6.060)	. (.)
N	1001	6299

Notes: All differences between migrants and non-migrants are statistically significant at the one percent level.

Table 2: International Migrant Characteristics

	Remitting Migrants	Non-remitting Migrants
Age	49.28** (29.550)	45.45** (18.795)
Age of household head	52.52 (17.387)	53.20 (14.675)
Male	0.52 (0.500)	0.56 (0.497)
Years of education	8.78*** (4.626)	9.98*** (5.531)
Duration of absence	6.74*** (6.116)	5.70*** (5.946)
N	549	452

Notes: Stars represent p-values from a t-test of difference in means across migrants and non-migrants. *** p<.01, ** p<.05, * p<.10.

Table 3: Reason for Migration

	All migrants	Migrants sending remittances
Education	387 (38.66)	149 (27.14)
Work	475 (47.45)	330 (60.11)
Other	139 (13.89)	70 (12.75)
N	1,001	549

Notes: Table displays frequency of reported reason for migration of international migrants, with percentages in parentheses. "Other" includes factors such as marriage and divorce, health problems, and winning a green card.

Table 4: Common destination countries

Destination country	Number of migrants	2009 per capita GDP (in 2009 USD)
US	342	46,999
UK	133	35,722
Uganda	96	481
Tanzania	59	504
Germany	54	40,270
UAE	51	35,025
South Africa	41	5,758
Canada	31	39,659
Sudan	29	1,191
Italy	27	35,073

Notes: Table displays the ten most common destination countries for migrants in our sample, the number of migrants to each country and 2009 per capita GDP in each country (in 2009 US dollars).

Table 5: Household Characteristics: Migrants vs Non-migrants

	Migrant	Non-migrant	All
Household members	5.24* (2.211)	4.97* (2.004)	5.08 (2.095)
Dependents	2.50 (1.619)	2.64 (1.602)	2.58 (1.610)
Migrants	1.36*** (0.791)	0.00*** (0.000)	0.57 (0.843)
Maximum years of schooling	10.15 (4.287)	10.16 (3.679)	10.16 (3.941)
Urban	0.49 (0.501)	0.45 (0.498)	0.47 (0.499)
Education expenditures per month (1000s)	7.11*** (26.595)	2.12*** (6.498)	4.20 (18.010)
Total expenditures per month (1000s)	54.09*** (119.260)	25.81*** (86.478)	37.57 (102.295)
N	351	493	844

Notes: Household characteristics include the number of members of the household, the number of dependents, the number of migrants, the maximum years of schooling of any household member, urban location, education expenditures per month, and total expenditures per month. Expenditure variables are expressed in thousands of Kenyan shillings. All samples exclude households without at least one member under age 20 and households with an internal migrant. Stars represent p-values from a t-test of difference in means across migrants and non-migrants. *** $p < .01$ ** $p < .05$ * $p < .10$

Table 6: International Migrant Remittances

	All	Female	Male	Employed	Student
Sends remittances	0.55 (0.498)	0.60 (0.490)	0.56 (0.497)	0.72 (0.448)	0.09 (0.287)
Amount of remittances, 1000s	132.80 (936.583)	197.84 (1384.043)	96.93 (370.276)	183.19 (1127.716)	4.20 (17.349)
N	1002	422	492	680	189

Notes: Sample includes all international migrants. Variables are an indicator for sending remittances and the average amount of monthly remittances sent. For migrants who do not send remittances, the amount of remittances is zero. The amount of remittances is expressed in thousands of Kenyan shillings.

Table 7: Instruments

GDP in destination (1000s) in 2009	27.34 (19.558)
Safaricom towers in 2009	215.66 (138.112)
N	351

Notes: Table displays the average destination 2009 per capita GDP, in USD in 1000s, and the average number of Safaricom cell towers in a district in 2009. The sample is restricted to households with at least one member under age 20 and at least one international migrant.

Table 8: Education Expenditures: Main Results

	(1)	(2)	(3)
	OLS	OLS	2SLS
	b/se	b/se	b/se
Log remittances	0.492** (0.1270)	0.515*** (0.1217)	2.095** (0.6629)
Receives remittances	-3.521* (1.2427)	-3.767** (1.2516)	-17.281** (5.8537)
Children 0-5	0.022 (0.1660)	-0.219 (0.1738)	-0.301 (0.2066)
Children 6-13	0.530*** (0.1216)	0.441* (0.1950)	0.383 (0.1981)
Children 14-20	0.846*** (0.1456)	0.422 (0.2402)	0.277 (0.2835)
Max. education	0.131** (0.0405)	0.078 (0.0491)	0.031 (0.0396)
Urban	0.015 (0.4057)	0.078 (0.6148)	-0.906 (0.8661)
Assets	0.415** (0.1315)	0.360* (0.1663)	0.125 (0.2130)
N	844	351	351
R2	0.167	0.105	.

Notes: Table displays results from regressions of the log of average monthly education expenditures on the log of average monthly remittances and an indicator for the receipt of remittances at the household level. Controls include a dummy for receiving a positive amount of remittances, the number of children in three age categories, the maximum years of education of a household member, an indicator for urban location, and an index of immoveable assets (ownership of agricultural or nonagricultural land, a house, and other buildings). The sample excludes households without at least one member under age 20 and households with internal migrants. Column 1 includes households with an international migrant as well as non-migrant households. Columns 2 and 3 are restricted to households with at least one international migrant. Standard errors are clustered at the district level.

Table 9: Education Expenditures: Remittance Decision

	(1)	(2)	(3)
	OLS	OLS	2SLS
	b/se	b/se	b/se
Receives remittances	0.994** (0.2864)	0.635 (0.4574)	-3.811 (5.0653)
Children 0-5	0.018 (0.1621)	-0.193 (0.1719)	-0.285 (0.2302)
Children 6-13	0.530*** (0.1191)	0.460* (0.2024)	0.437 (0.2234)
Children 14-20	0.880*** (0.1324)	0.469 (0.2244)	0.435 (0.2384)
Max. education	0.141** (0.0453)	0.093 (0.0572)	0.049 (0.0444)
Urban	0.154 (0.4244)	0.399 (0.6468)	0.245 (0.5387)
Assets	0.454** (0.1379)	0.437* (0.1714)	0.589* (0.2382)
N	844	351	351
R2	0.152	0.074	.

Column 1 includes non-migrant households.

Columns 2 and 3 restricted to international migrant households.

Standard errors clustered at the district level.

Notes: Table displays results from regressions of the log of average monthly education expenditures on an indicator for receipt of remittances at the household level. Controls include a dummy for receiving a positive amount of remittances, the number of children in three age categories, the maximum years of education of a household member, an indicator for urban location, and an index of immoveable assets (ownership of agricultural or nonagricultural land, a house, and other buildings). The sample excludes households without at least one member under age 20 and households with internal migrants. Column 1 includes households with an international migrant as well as non-migrant households. Columns 2 and 3 are restricted to households with at least one international migrant. Standard errors are clustered at the district level.

Table 10: Education Expenditures: Remittance Amounts

	(1)	(2)	(3)
	OLS	OLS	2SLS
	b/se	b/se	b/se
Log remittances	0.135*** (0.0320)	0.114* (0.0484)	0.013 (0.3842)
Children 0-5	0.025 (0.1627)	-0.191 (0.1745)	-0.204 (0.1799)
Children 6-13	0.532*** (0.1198)	0.457* (0.1985)	0.457* (0.1951)
Children 14-20	0.870*** (0.1349)	0.462 (0.2265)	0.464* (0.2134)
Max. education	0.139** (0.0439)	0.093 (0.0570)	0.087 (0.0452)
Urban	0.117 (0.4218)	0.340 (0.6546)	0.373 (0.6413)
Assets	0.437** (0.1358)	0.408* (0.1716)	0.453* (0.1963)
N	844	351	351
R2	0.158	0.084	0.071

Column 1 includes non-migrant households.

Columns 2 and 3 restricted to international migrant households.

Standard errors clustered at the district level.

Notes: Table displays results from regressions of the log of average monthly education expenditures on the log of average monthly remittances at the household level. Controls include a dummy for receiving a positive amount of remittances, the number of children in three age categories, the maximum years of education of a household member, an indicator for urban location, and an index of immoveable assets (ownership of agricultural or nonagricultural land, a house, and other buildings). The sample excludes households without at least one member under age 20 and households with internal migrants. Column 1 includes households with an international migrant as well as non-migrant households. Columns 2 and 3 are restricted to households with at least one international migrant. Standard errors are clustered at the district level.

A Appendix: Additional Results

Table 11: Education Expenditures: Migrant Households

	(1) IV (GDP) b/se	(2) IV (Cell towers) b/se
Log remittances	0.550 (0.9691)	3.460** (1.1157)
Receives remittances	-4.071 (8.1242)	-28.949** (9.5264)
Children 0-5	-0.221 (0.1645)	-0.371 (0.2604)
Children 6-13	0.440* (0.2026)	0.333 (0.2283)
Children 14-20	0.419 (0.2330)	0.151 (0.3231)
Max. education	0.077 (0.0606)	-0.009 (0.0586)
Urban	0.056 (0.9171)	-1.755 (1.1027)
Assets	0.355 (0.1992)	-0.078 (0.2880)
N	351	351
R2	.	.

Notes: Table displays results from regressions of the log of average monthly education expenditures on the log of average monthly remittances. Controls include a dummy for receiving a positive amount of remittances, the number of children in three age categories, the maximum years of education of a household member, an indicator for urban location, and an index of immoveable assets (ownership of agricultural or non-agricultural land, a house, and other buildings). Instruments are GDP per capita in the destination country in \$1000s and the number of Safaricom cell towers in the district. Sample excludes households without at least one member under age 20, households with internal migrants, and households without at least one international migrant. Standard errors are clustered at the district level.

Table 12: Migrant Remittances: First Stage

	(1)	(2)	(3)
	OLS	OLS	OLS
	b/se	b/se	b/se
GDP in destination (1000s) in 2009	0.010** (0.0035)		0.009** (0.0035)
Safaricom cell towers in 2009		0.002** (0.0006)	0.002** (0.0006)
N	351	351	351
R2	0.914	0.914	0.916
F	8.133	9.140	8.128

Notes: Table displays results from a regression of average monthly migrant remittances (in Kenyan shillings) on GDP per capita in the migrant's destination county and the number of Safaricom cell towers in the district in 2009. Controls include a dummy for receiving a positive amount of remittances, the number of children in three age categories, the maximum years of education of a household member, an indicator for urban location, and an index of immovable assets (ownership of agricultural or non-agricultural land, a house, and other buildings). Sample excludes households without at least one member under age 20 and households with internal migrants. Standard errors are clustered at the district level.