Migration, Remittances and Human Capital Investment in Kenya

Annie Hines and Nicole B. Simpson

Colgate University

February 16, 2015

Abstract

This paper investigates the impact of migration and remittances on household human capital investment in Kenya. First, we develop a theoretical model predicting that remittances act as a mechanism for transmitting income from migrants to their households and will affect expenditure patterns similarly to other sources of income. Using data from the 2009 Kenya Migration Household Survey to test this hypothesis, we find a positive relationship between the amount of remittances a household receives and the level of education expenditures in that household. However, we do not find a correlation between remittances and the share of total expenditures allocated to education, indicating that the positive relationship between remittances and human capital investment related to remittances may be reflecting an income effect, rather than substitution away from other goods.

1   Introduction

Remittances are an important source of income for many Kenyan households; in 2011, personal remittances received in Kenya totaled \$934 million and accounted for 3 percent of the country's GDP (World Development Indicators). At the household level, migration entails substantial economic costs. These include the costs of transportation, relocation, and forgone wages during the migration process. Yet migration can benefit the sending household as well as the migrant through remittances, or money transferred from the migrant to his or her family in the origin country. In particular, additional income from remittances can relax budget or credit constraints, allowing for investment in goods such as education. Alternatively, income from remittances may fund additional consumption but not investment.

While employment and education opportunities may be greater abroad, migration also entails substantial costs. Due to this difference in costs and opportunities, one would expect different 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 determine household decisions about investing in human capital. For example, wealthy families may send a migrant abroad for purposes other than remitting, such as education or health problems, while their less affluent counterparts may be motivated to migrate by the need for additional income through remittances. This circumstance suggests a negative correlation between remittances and welfare. On the other hand, some people migrate with the intention of sending money home to support their families, and the additional income from remittances will allow their households to spend more. How they choose to spend this money depends in part on their willingness to invest in the future rather than consume more in food and durable goods.

First, we develop a theoretical model to explain the decision to migrate as a means for a household to increase its income. The model predicts that migration relaxes the household budget constraint, allowing for more consumption and investment as migrants transfer some of their earnings to their household through remittances. We then estimate several empirical models using household level remittance and expenditure data from Kenya. We analyze education expenditures and the amount of remittances a household receives using both both OLS and an instrumental variables strategy. Unobservable household and individual characteristics such as risk preferences, ambition, and ability influence the amount of remittances that a household receives as well as investment in education. To correct for the endogeneity of remittances, we use several instrumental variables: the GDP per capita of a migrant's destination country, the stock of Kenyan migrants in the destination country, household ownership of a bank account, and the average amount of remittances received by households in a district. We also estimate a selection model to test whether remittance values are biased by censoring on the migration

decision. Next, we look at how remittances impact spending on education relative to food, and find that remittances are correlated with a proportionally higher increase in education investment than consumption goods. To see if remittances impact household expenditures differently than other income, we examine household shares of remittances and education expenditures relative to total income.

2   Literature Review

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 spending behavior is not immediately clear. If a household facing budget and credit constraints wants to spend more on education, income from remittances will 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. Alternatively, remittances may increase consumption of food and durable goods, but not change investment decisions. Yang (2011) notes that whether remittances are used for consumption or investment may depend on the income of the household (Yang 2011: 136-7). While poor households are likely to spend more on food and durable goods, wealthier households can afford to invest in the future through businesses or human capital.

Individual characteristics including education, as well as household wealth and investment preferences, affect the migration and remittance decisions. A person's education can influence the decision to migrate as well as affecting remittances sent to the origin country. Highly educated people may find that their skills are better rewarded in a foreign country, and higher income in the sending country from greater skill or ability can help finance migration. Chiquiar and Hanson (2005) examine the self-selection of migrants from Mexico to the United States and find that these migrants are general more educated than non-migrants, although they are less educated than U.S. natives. To compare the skill level of migrants to non-migrants, they compare the counterfactual wages of Mexican immigrants in the United States to the wage distribution in Mexico (Chiquiar and Hanson 2005). While all migrants face fixed costs when leaving their home country, more educated people may face lower costs, either because they are better equipped to navigate bureaucracy associated with legal migration, more able to afford the administrative costs of illegal migration, such as counterfeit documents, or able to borrow at lower rates due to their higher wages (Chiquiar and Hanson 2005). The costs contribute to the migration decision. Previous research also demonstrates the role of social networks in the migration decision. Networks may assist the migrant's transition to living in another country or help the migrant find a higher paying job. Winters, de Janvry, and Sadoulet (2001) establish the importance of networks in Mexico-U.S. migration, arguing that networks have a positive

effect on the decision to migrate and the number of migrants to send. Munshi (2003) shows that migrants with larger community networks are more likely to be employed and to earn a higher wage in a nonagricultural job. Mckenzie and Rapoport (2007) demonstrate that networks lower the costs of migration for communities in Mexico and diminish the effect of liquidity constraints, thus allowing poorer households to migrate.

Wealthier households are more 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 his or her household. Thus, migration can be a risk diversification strategy in which the migrant and the origin household participate in more than one labor market in which remittances act as a form of insurance for the household against shocks that affect one party and not the other. Azam and Gubert (2006), Bedi, Calero and Sparrow (2008) and Dorantes and Pozo (2011) also discuss remittances as a mechanism to cope with adverse economic shocks to the household. 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). In either case, one expects less wealthy households to be more likely to receive remittances due to a greater need for financial support. Yang (2011) notes that many international migrants send remittances frequently, and reducing transaction costs can lead to higher levels of remittances. In one sample of migrants in the U.S., the average migrant made 16.9 remittance transactions per year, and the average amount sent was just under $300 (Yang 2011). In a randomized field experiment conducted by Aycinena, Martinez, and Yang (2010), migrants who received a discount on transaction fees increased the frequency of their remittances as well as the total amount of money that the migrants remitted.

Theoretical studies of the effect of migration on human capital accumulation have focused on differences in returns to human capital across countries. Stark et al. (1997) show that migration can lead to a higher level of human capital in the source country when foreign employers are faced with asymmetric information about the skill of immigrant labor. Vidal (1998) also presents a model in which emigration to a country with higher returns to skill is an incentive for people to invest in human capital. He shows that a higher probability of migration is associated with a higher level of human capital accumulation in the origin country. Stark (2004) considers the positive externalities of human capital in the production process. He claims that while individuals underinvest in their own education in a closed economy, migration can raise the level of human capital to the social optimum by raising the expected returns to

investment in education.

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) looks at shocks to Filipino households due to exchange rate fluctuations during the 1997 Asian financial crisis. Migrants send more remittances when their international currency appreciates against the Philippine peso and Yang finds that an increase in remittances experienced by a migrant's sending household is associated with more investment in education and a fall 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 look attempt to 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 migrations in relaxing budget constraints, are positively correlated with the probability that children are in school (Bansak and Chezum 2009: 147).

Alcaraz, Chiquiar, and Salcedo (2012) look at how remittances affect decisions about child labor and education in Mexico. Mexican immigrants in the United States saw an increase in unemployment during the U.S. recession from 2008-2009. The authors use a difference-in-differences 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 that experience a negative shock to remittances are more likely to be working and less likely to go to school.

Cox and Ureta (2003) use the Cox proportional hazard model to 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. El Salvador experienced a civil war in the 1980s, resulting in a wave of politically motivated emigration. Cox and Ureta argue that remittances from a migrant who left for political reasons, rather than for the explicit purpose of working abroad and remitting, approximates a random selection and gives a more precise estimate of the effect of remittance income on school retention. Mansour, Chaaban, and Litchfield (2011), using a censored ordered probit model, find a positive effect of remittances on both educational attainment and attendance in Jordan. They identify several instruments for remittances, including the historical district level migration rate, the prevalence of households owning a bank account by region, the number of household members over the age of 50, and the age of the household head. The motivation for the last two instruments is that altruism plays a role in determining remittance behavior, and migrants will send

4

more remittances to care for elderly household members, particularly in the case of medical expenditures.

Fewer studies have examined the relationship between remittances and household consumption choices. However, Adams and Cuecuecha (2013) use a generalization of the two-stage selection model and find that remittance-receiving households in Ghana spend marginally less on food and more on education, health and housing. Using a multinomial logit model in the first stage, they consider the household level choice to receive remittances from an international migrant, receive remittances from an internal migrant, or not receive remittances at all. Adams and Cuecuecha (2010) employ a similar method to analyze household expenditure patterns in Guatemala. Correcting marginal budget shares for selection bias in the decision to receive remittances, both Adams and Cuecuecha (2010, 2013) find a that households receiving remittances spend more on investment in education and housing at the margin. Their findings contradict Adams, Cuecuecha and Page (2008), who report that remittances in Ghana are spent similarly to other sources of income and do not change marginal spending patterns. Because these studies essentially consider selection into remittances as the equivalent of selection into migration, the selection instruments are variables that are correlated with migration or remittances, but not household expenditure decisions. In particular, Adams, Cuecuecha and Page (2008) construct an instrument based on ethno-religious networks. Adams and Cuecuecha (2013) use a measure of distance of a household to railroad lines built in 1930. Households closer to the railroad would have been more likely to migrate, so distance acts as a proxy for current social networks. Both strategies require that social networks affect the decision to migrate but do not affect household investment and consumption patterns, except through migration. Adams and Cuecuecha (2013) also use a weighted measure of the unexpected fluctuations in employment creation in the destination countries, while Adams and Cuecuecha (2010) use a measure of job creation in the top U.S. cities that received Guatemalan migrants in 2004. They expecting that these variables are correlated with remittances because by affecting the job prospects of migrants. One advantage of the data that we use from the Kenya Migration Household Survey is that it provides individual level information about household members. Rather than considering the selection bias at a household level under the assumption that households receiving remittances only receive those remittances from one migrant, we can employ a two-stage model to correct the amount of remittances sent by an each migrant for selection into migration. Furthermore, Adams and Cuecuecha (2010, 2013) focus exclusively on the remittance decision, and do not consider differences in expenditures between migrants who choose not to remit and non-migrants.

3   Theory

As a theoretical motivation, we examine the migration decision for a representative house-

hold that sends of fraction of its members to work in another country. In this model, remittances act as a mechanism for with migration equalizing earnings in the home country and earnings in the foreign country. In the aggregate, the fraction of migrants in the household that migrates can be interpreted as the migration rate of the sending country. Building on the model proposed by Docquier, Rapoport, and Shen (2006) to examine the impact of migration on inequality, we consider a household-level utility function. Each household maximizes its welfare by allocating its income between consumption and human capital investment. Household income depends on production in the origin country and income from migrant labor in a foreign country. we model household welfare with the logarithmic utility function $u_t = (1 - \sigma)ln(x_t) + \sigma ln(h_{t+1})$, where u_t is household welfare in period t, x_t is the amount of consumption in period t, and h_{t+1} is investment in human capital for the next period. The household's preference for human capital investment, represented by σ, can be interpreted as the desire of the current generation for the welfare of future generations. The desire to invest in future generations can be explained by altruism or parental concern for the welfare of children. Household income is equal to the sum of consumption and human capital investment. Thus the budget constraint is $x_t + h_{t+1} = y_t$, where y_t is household income.

Solving for the optimal amounts of consumption and human capital investment results in he following equation for household human capital accumulation (see Appendix A.1 for a full derivation):

$$h_{t+1} = \sigma(y_t) \tag{1}$$

Turning to the household's budget constraint, migration allows households to earn income from two sources: production in the home country and income from migrants working abroad, and household can allocate its labor force between two countries. Earnings in the home country are given by q_t and depend on the human capital of the household. Without migration, all household labor works in the origin country. In this case, income can be written as $q_t = \alpha l_t h_t^a$, where α represents production efficiency, $l_t = 1$ is the household labor force, and a is the rate of return to human capital in the origin country. Households experience diminishing returns to human capital in domestic production when $0 < a < 1$.

The decision to migrate is based on the costs of leaving the household and the expected returns from employment or education elsewhere, relative to returns in the place of origin. Migrant wages are depend on human capital and are given by $w = wh_t^b$. When $b = 0$, wages in the foreign country are exogenous to human capital. When $0 < b < 1$, migrants experience diminishing returns to human capital, though the rate of return to human capital abroad may be different than the rate of return in the home economy. Migration also involves a cost c which is proportional to the number of household members migrating. Sjaastad (1962) notes that these

costs can include the monetary costs of moving, the opportunity cost of forgone earnings while securing a new job, and psychic costs associated with entering a new environment (Sjaastad 1962).

Household income is the sum of earnings in the domestic household and the net returns to migration. Following Docquier, Rapoport, and Shen (2006), the budget constraint can be written as

$$y_t = (1 - m_t)\alpha h_t^a + m_t(wh_t^b - c) \tag{2}$$

Households divide labor between the home country and the foreign country to maximize household income by choosing a level of migration $m_t \in [0, 1]$.

$$\frac{\delta y_t}{\delta m_t} = -\alpha h_t^a + (wh_t^b - c) = 0 \tag{3}$$

In equilibrium, the net returns to migration equal the returns to production in the home country, or $(wh_t^b - c) = \alpha h_t^a$. Households will send fewer migrants when the costs of migration increase, and more migrants when foreign wages increase. If $(wh_t^b - c) > \alpha h_t^a$ for all $h_t > 0$, the household will not send any migrants. If $(wh_t^b - c) < \alpha h_t^a$ for all $h_t > 0$, the household will want all workers to earn income in the foreign country, so $m_t = 1$. In this case, $h_{t+1} = \sigma(wh_t^b - c)$. Assuming that a fraction of the household migrates allows for an analysis of the determinants of the behavior of a household at the margin of not migrating at all and leaving the country entirely. When aggregating across all households, this equilibrium condition defines the migration rate from the domestic country to the foreign country.

Substituting the equilibrium condition into household income gives $y_t = \alpha h_t^a$. Assuming $h_0 > 0$, there exists a steady state where $h_{t+1} = h_t$. Using equation 1 gives a difference equation $h_{t+1} = \sigma(\alpha h_t^a)$. According to this equation, migration does not affect human capital investment independently of allowing households to maximize their income. The difference equation can be solved for the steady state level of human capital, $h_{ss} = (\sigma\alpha)^{\frac{1}{1-a}}$. This is the equilibrium level of human capital with an optimal level of migration. When households can equalize returns to labor in the home country and the foreign country, human capital accumulation depends on the return to human capital in the home country. As returns to human capital diminish more slowly, the effect on the steady state level of human capital can be expressed as $\frac{\delta h_{ss}}{\delta a} = \frac{ln(\sigma\alpha)(\sigma\alpha)^{\frac{1}{1-a}}}{(1-\sigma\alpha)^2}$. Whether the total impact is positive or negative depends on the magnitude of $\sigma\alpha$. If $\sigma\alpha > 1$, an increase in a results in a higher steady state level of human capital. Intuitively, this makes sense: when human capital diminishes more slowly, households want to invest more in education to maximize income.

Analyzing the maximization condition, which shows the decision of a household at the margin of migrating completely and not migrating at all, demonstrates the effects of changes

in parameters on the migration decision. Clearly, an increase in costs decreases the net return to migration, and the effect does not depend on the human capital of the household. This can be demonstrated by $\frac{\delta^2 y_t}{\delta m_t \delta c} = -1$. An increase in foreign wages will increase the net return to migration, as shown by $\frac{\delta^2 y_t}{\delta m_t \delta w} = h_t^b$. The magnitude of the gain depends on the household's level of human capital and returns to human capital in the destination country. Similarly, a change in domestic production efficiency will decrease net returns to migration, as indicated by $\frac{\delta^2 y_t}{\delta m_t \delta \alpha} = -h_t^a$, and the magnitude of the gain depends on the household's level of human capital.

The level of human capital is another factor in determining how many people migrate. In the aggregate, the human capital of each household determines which households migrate and which do not. An increase in human capital increases or decreases the net return to migration, and thus the migration rate, depends on the relative magnitudes of α and w, as well as the relative return to human capital in the domestic country and the foreign country, as show in in equation 4.

$$\frac{\delta^2 y_t}{\delta m_t \delta h_t} = -a\alpha h_t^{a-1} + bw h_t^{b-1} \tag{4}$$

According to this model, migration depends on the relative returns to human capital in the domestic country and the foreign country. This finding implies that migration does not independently affect human capital accumulation, but it does allow households to earn a higher income by taking advantage of higher wages abroad, which may then be spent on further human capital investment. To show the effect of returns to human capital on migration, suppose migrants from a developing country can earn higher wages in a wealthier foreign country than they would by producing at home, or $w > \alpha$. This is a reasonable assumption because more developed countries have greater physical capital and technological advantages that translate to a higher marginal product of labor. Moreover, if returns to human capital diminish more quickly in the home country, perhaps because of a lower demand for skilled labor, then an increase in human capital will increase the migration rate. Assuming the current level of human capital is greater than one, an increase in returns to human capital in the domestic country will lead to fewer households migrating, while an increase in returns to human capital in the foreign country will lead to more households migrating. The effects of a change in a or b, or the domestic and foreign rates of return to human capital, are expressed in equations 5 and 6.

$$\frac{\delta^2 y_t}{\delta m_t \delta a} = -ln(h_t)\alpha h_t^a \qquad h_t > 1 \tag{5}$$

$$\frac{\delta^2 y_t}{\delta m_t \delta b} = ln(h_t)w h_t^b \qquad h_t > 1 \tag{6}$$

Another central result for this paper is that remittances themselves do not affect household

8

consumption and investment choices, but they do allow the entire household to benefit from the higher income of a migrant wage earner. If a household sends a migrant abroad with the intention of earning additional income to send back to home country, thus increasing the welfare of the entire household, remittances can act as the mechanism for equalizing income across household members. Income from migrants is the product of the fraction of the household that migrated, the foreign wage, and returns to human capital abroad, or $m_t w h_t^b$. Income from non-migrants is given by the product of the household labor force in the origin country, production efficiency, and returns to human capital. $(1-m_t)\alpha h_t^a$. Following the model proposed by Docquier et al. (2006), the remittances received by each household member in the origin country can be represented by equation 7 when assuming a household divides both income and migration costs equally among its members.

$$r_t = m_t[w h_t^b - \alpha h_t^a] \tag{7}$$

Furthermore, household income can be written as $y_t = \alpha h_t^a + r_t$. This makes clear that an increase in remittances will increase the welfare of the household. How the household spends this additional income is not obvious. According to this model, income from remittances does not impact household welfare any differently than additional income from domestic production. Migration and remittances can be interpreted as a means by which the household relaxes its budget constraint, but remittances do not have an independent effect on household consumption and investment patterns.

As an extension, consider the the case in which a household with high productivity in the domestic country chooses not to migrate at all (see Docquier et al. 2006). Domestic productivity exceeds net returns to migrations, so $\overline{\alpha} h_t^a > w h_t^b - c$. This may be due to land or business ownership, political connections, social networks, or specific skills and experience that are better used in the domestic country. Though they may migrate for other reasons, these households will not choose receive remittances because they are better off producing domestically. As shown previously, migration with remittances can increase household income when net returns to migration exceed net returns to production in the domestic country. However, other households may not gain from working abroad, and thus will not choose to receive remittances.

4 Data

The data come 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. The survey uses a two-stage sampling procedure to capture a higher number of households with migrants. Overall, the survey includes 2,209 migrants, more than 25

percent of the 8,487 individuals. It is only representative of the 17 districts surveyed, which are concentrated in the southern region of Kenya (Plaza, Navarrete and Ratha). To my knowledge, this data has not been previously used to study the relationship between migration, remittances and education. For this analysis, we exclude households with internal migrants and focus only on international migration. Additionally, we use information about GDP per capita and migrant stocks in an instrumental variable specification. World Bank data on GDP per capita in 2009 is from the World Bank, and values for migrant stocks in 2010 come from the United Nations Population Division, which publishes a panel of migrant stocks by the origin country and the destination country of the migrant.[1]

As reported in Table 1, the average age of migrants in this sample is approximately 48 years, while the average age of non-migrants is 22 years. On average, migrants tend to be more educated than non-migrants, with over 9 years of schooling. The average non-migrant has completed fewer than 8 years for non-migrants not including people without any schooling, such as very young children. Migrants tend to leave their households for long periods of time; the average duration of a migrant's stay in a foreign country is over six years. Migrants are fairly evenly balanced between genders, with men accounting for 54 percent of migrants and 46 percent of non-migrants.

Nearly 68 percent of migrants are currently employed, indicating that current or potential employment opportunities are an important motivation for migration (see Table 2). Table 3 shows that searching for work or a job opportunity is the primary reason for migration for over 62 percent of migrants. A job opportunity was the main motivation to migrate for more than 38 percent of migrants who send remittances. It is likely that these individuals decided to migrate for the purpose of earning a higher wage abroad to support their household; employment can offer them a more secure financial position that enables them to send remittances home. Education is another key reason for moving to another country, and it is the main motivation for 36 percent of migrants. Unexpectedly, it is also the main reason for migration for almost 25 percent of migrants who send remittances, although less than 9 percent of students send remittances (see Table 4). This disparity may be driven by people who leave their household to further their education in another country, but also have another occupation that enables them to send remittances, as well as by those who complete their schooling and remain in the destination country to send remittances. Less than 55 percent of all migrants send any remittances, although over 72 percent of employed migrants remit.

At the household level, remittances account for a substantial amount of household resources. As shown in Table 6, remittances constitute over 35 percent of total expenditures for remittance-receiving households. For households facing budget or credit constraints that prevent them from

---

[1]The World Bank does not provide recent data about GDP in Somalia, so the 2SLS regressions drop one household with a migrant to Somalia.

investing in human capital, additional income from remittances can relax these constraints and lead to higher education expenditures. Migration can also provide an incentive for investing in education because it signals the availability of job opportunities for skilled workers and the development of migration networks. Additionally, migrant households may have greater financial resources a priori, which are necessary to finance international migration.

Because households with international migrants tend to be wealthier, any additional income from migration is more likely to be spent on investment goods, such as education, rather than day-to-day consumption and durable goods. As reported in Table 6, the total monthly expenditures of the average migrant household are over 140 percent higher than those of non-migrant households. While households that receive remittances consume more on average than non-migrant households, at over 49,000 KES per month (about 566 USD), compared to less than 29,000 KES (about 335 USD) for non-migrant households, they spend substantially less than the average migrant household.

The data also suggest that migrant households have different consumption and investment preferences. Specifically, migrant households spend an average of 9.39 percent of their budget on education, compared to 6.65 percent for non-migrant households. This could be due to a higher level of overall wealth, but the decision to migrate may also signal a higher tolerance for risk or more ambition, both of which could be associated with greater human capital investment. A t-test comparing education expenditures between migrant and non-migrant households indicates that the mean is significantly different for these two groups; in particular, the test fails to reject the null hypothesis that migrant households spend more than non-migrant households on education, on average (see Table 8). Furthermore, comparing the mean education expenditures for remittance-receiving and non-remittance receiving migrant households indicates that there is also a statistically significant difference between these groups, as non-remittance-receiving households spend substantially more on education than those that receive remittances. This result is likely driven by households who send a person abroad to be educated in a foreign secondary school or university. These households are probably financing a more expensive education abroad and are likely to be wealthier overall, allowing them to spend more on all categories of goods. Table 3 shows that more remitting migrants leave for work opportunities and fewer remitting migrants leave for educational purposes, compared to migrants who do not remit.

5 Empirical model

We develop an empirical model to test the theoretical prediction that remittances affect human capital investment by transferring income between household members. First, we examine the elasticity of education expenditures with respect to remittances using OLS and 2SLS. We also examine the association between the migration and remittance decisions and education

spending to determine whether migrant households, particularly those that choose to receive remittances, differ from non-migrant households in human capital investment. We also use a selection model to test whether the amount of remittances sent by a migrant is biased by self-selection into migration. Next, we look at how households allocate remittances between investment and consumption by modeling education expenditures relative to food expenditures. A positive correlation between remittances and education expenditures relative to food expenditures indicates that households receiving more income spend a greater fraction of that income on investment than consumption. Finally, we analyze the relationship between shares of remittances and education spending relative to total expenditures to see whether remittances are related to human capital investment independently of increasing the total resources available to a household.

We use equation 8 to estimate the relationship between remittances and household education expenditures.

$$
\begin{aligned}
Ln(Educ.Expenditure) = & \beta_0 + \beta_1 Children + \beta_2 Primary + \beta_3 Secondary + \beta_4 Max.Education \\
& + \beta_5 Urban + \beta_6 Assets + \beta_7 Ln(Remittances) + \beta_8 Remit \\
& + \beta_9 MigrantHousehold + u
\end{aligned} \tag{8}
$$

$Ln(Educ.Expenditure)$ is the natural log of household expenditures on education. To ensure positive values, we rescaled education expenditures so that the minimum value is one instead of zero. The main variable of interest, $Ln(Remittances)$ is the log of the total amount of 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 log 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. Controlling for the decision to remit shows that the amount of remittances and the decision to remit relate to household human capital investment in opposite directions. For example, consider the decision to migrate as simultaneous with the decision to remit, or at least the intention of finding employment and then remitting. 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. However, after accounting for the remittance decision, the amount of remittances a household receives may be associated with higher education expenditures. $MigrantHousehold$ indicates the decision of a household to send a migrant abroad, and the correlation between the migration decision and education spending indicates whether migrant households have different investment preferences than non-migrant households.

Because households with more members enrolled in school are likely to spend more on education, we control for the number of children in each household. Furthermore, we separate children into age groups based on typical enrollment ages for primary and secondary school. *Children*, *Primary*, and *Secondary* are the number of household members aged 0-5 years, 6-13 years, and 14-19 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 due to 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 8 years of primary education, 4 years of secondary education, and 4 years of tertiary education (Eshwari 1990). *Secondary* is defined as the number of household members between 14 and 19 years of age, rather than 14 to 17 years, because some children may start their education later, repeat grades, or take time off to work.[2] Because households without any traditionally school-aged members are unlikely to spend on education, Table 9 shows results for a sample restricted to households with at least one member 20 years of age or younger. Results are similar for a sample that includes households without school age children.

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 2003. Due to publicly funded schooling, the impact of primary school age children on education expenditures is likely to be different than that of secondary school aged children. However, primary school is still relevant to education expenditures, as families may choose to pay for private education. 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 are also making a decision about the quality of education they receive. When families perceive government-funded schools to be lower of lower quality than fee-based schools, they can choose to send children to private school instead, thus increasing their 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 more affluent

---

[2]We 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). This is significantly smaller than the GERs 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.

families moved to higher quality 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 *Max.Education* 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 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 in a model of human capital investment. Unobservable household characteristics such as ambition, ability, risk preferences, and attitudes towards investing in the future can affect both remittances and education expenditures. As an example, consider the case of attitudes towards risk. Jaeger et al. (2007) examine the role of risk attitudes in regional migration in Germany, and they find that individuals who are more willing to take risks are also more likely to migrate. If risk preferences can explain the decision to move across labor markets, they are also a likely factor in the decision to remit. According to Sjaastad (1962), migration can be viewed as an investment that increases human productivity by allocating labor efficiency; thus, the willingness of an individual or a household to take risks may also explain education expenditures, another form of human capital investment. If risk attitudes influence both remittances and education expenditures, then remittances are endogenous in this model. 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 (see Lucas and Stark 1985), so if a household is struggling financially in the domestic country, 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 the following instrumental variables: GDP per capita in the destination country, the stock of

Kenyan migrants in the destination country, household ownership of a bank account, and the average amount of remittances received by households in a district. While GDP and migrant stock do not vary across households prior to the migration decision because all households are subject to the same macroeconomic pull factors, the assumption here is that the location decision is random across households. Therefore, GDP and migrant stock act as proxies for household level characteristics. The wealth of the destination country acts as a pull factor in the migration decision, but also affects individuals after the migration decision. A migrant 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. The stock of Kenyan migrants is a proxy for the social networks of a migrant household. One expects that the household decision to migrate and the choice of destination are simultaneous, and the household is more likely to send a migrant if the family already has a personal connection to the destination country. These networks could take the form of intrafamily ties if a family member has previously migrated to that country, though they may also work at the community level through relationships with non-household members in the destination country. A family is more likely to have close ties to individuals in a country that has a larger stock of Kenyan migrants, and these personal ties may lower the costs and increase the expected returns of migration. The average amount of remittances received at the district level is also a proxy for social networks. Households in a high remittance district are likely to receive higher amounts of remittances themselves, as migration for the purpose of remitting is probably more common, with lower costs and higher returns. Ownership of a bank account may be associated with lower transaction costs in sending remittances, allowing migrants to send remittances in larger amounts or more frequently than they would otherwise (see Mansour et al. 2011 and Yang 2011).

Another challenge in analyzing migrant remittances is the fact that migrants self-select into migration and, by extension, households select into the receipt of remittances. Only households with migrants receive remittances, so a model of the relationship between remittances and human capital investment excludes information about the potential impact of remittances on expenditures by the households who chose not to migrate. Ideally, remittances should be considered against the counterfactual wage of the migrant in the sending country. A model that accounts for self-selection into migration can help control for this lack of information. Once a person makes the decision to migrate, the migrant must make the decision of whether or not to send remittances. Thus a model of household investment in education also excludes information about the potential impact of remittances on expenditures by households that do not receive remittances.

A selection model recasts the problem of self-selection into migration as a form of omitted variable bias. According to Heckman (1979), the inverse Mills ratio can be used to estimate the 'omitted variable', or the correction for the self-selection of migrants and remittances.

The selection stage in equation 9 is estimated using a probit model that explains the decision to migrate. Estimating the second stage, given by equation 10, uses maximum likelihood estimation and incorporates the inverse mills ratio computed from equation 9 as an independent variable. We then extend the selection model to a third stage, using the fitted values from the second stage as an independent variable in a regression of education expenditures.

$$
\begin{aligned}
\text{Stage 1: } Migration =& \beta_0 + \beta_1 Age + \beta_2 Age^2 + \beta_3 Education + \beta_4 Urban \\
& + \beta_5 Male + \beta_7 HouseholdMembers + \beta_8 Assets \\
& + \beta_9 Ln(Expenditures) + \beta_{10} Fraction + u
\end{aligned}
\tag{9}
$$

$$
\begin{aligned}
\text{Stage 2: } Ln(Remittances) =& \beta_0 + \beta_1 Age + \beta_2 Age^2 + \beta_3 Employment + \beta_4 Education + \beta_5 Duration \\
& + \beta_6 Urban + \beta_7 Male + \beta_8 Ln(Expenditures) \\
& + \beta_9 Children + \beta_{10} Primary + \beta_{11} Secondary + u
\end{aligned}
\tag{10}
$$

$$
\begin{aligned}
\text{Stage 3: } Ln(Educ.Expenditure) =& \beta_0 + \beta_1 Children + \beta_2 Primary + \beta_3 Secondary + \beta_4 Max.Education \\
& + \beta_5 Urban + \beta_6 Assets + \beta_7 Ln(\widehat{Remittances}) + \beta_8 Remit + u
\end{aligned}
\tag{11}
$$

Age is the age of the migrant, *Education* is defined as the years of schooling of an individual, and *Employment* is an indicator for the employment status of the migrant. *Duration* is the number of years a migrant has lived in his or her current location. We also control for the gender of a migrant, a household's location in an urban or rural area, and the number of people in a household. $Ln(Expenditures)$ is the log of a household's average total expenditures each month and acts as a proxy for household wealth. *Fraction* represents the fraction of households in each district that have at least one international migrant, *Assets* is an wealth index based on household ownership of immovable assets, and $HouseholdMembers$ is the total number of people in the household. The fraction of migrants in a district, asset ownership, and household members only appear in the first stage of the selection model and act as the selection instruments. The key assumption is that these instruments influence the decision to migrate, but not the amount of remittances sent by a migrant, independently of the migration decision. $Ln(\widehat{Remittances})$ is the fitted values from stage 2 of the selection model. The number of household members and asset ownership may increase the resources available to finance migration, while a larger fraction of migrants in a district is a proxy for social networks that

can lower the costs of migration.

Finally, we analyze the impact of remittances on education expenditures relative to food expenditures and education expenditures relative to total expenditures. We test both how households allocate income from remittances between consumption and investment and whether income from remittances impacts education investment differently from other sources of income by estimating the following models using OLS.

$$
\begin{aligned}
Education/Food =& \beta_0 + \beta_1 Children + \beta_2 Primary + \beta_3 Secondary + \beta_4 Max.Education \\
&+ \beta_5 Urban + \beta_6 Assets + \beta_7 Ln(Remittances) + \beta_8 Remit \\
&+ \beta_9 MigrantHousehold + u
\end{aligned}
\tag{12}
$$

$$
\begin{aligned}
Education/Total =& \beta_0 + \beta_1 Children + \beta_2 Primary + \beta_3 Secondary + \beta_4 Max.Education \quad (13) \\
&+ \beta_5 Urban + \beta_6 Assets + \beta_7 Remittances/Total + \beta_8 Remit \\
&+ \beta_9 MigrantHousehold + u
\end{aligned}
\tag{14}
$$

The proportion of total expenditures used to finance education is expressed as a fraction by $Education/Total$. Household spending on education relative to spending on food is expressed as $Education/Food$. The amount of remittances that a household receives relative to its total expenditures is given by $Remittances/Total$. Equation 12 examines whether income from remittances funds human capital investment more than consumption, and equation 13 tests whether households receiving a larger share of remittances choose to spend a larger share of their budget on education.

6 Empirical results

In this section, we present results from OLS regressions of education expenditures on the amount of remittances a household receives, the decision to remit, and the decision to migrate. We also examine regressions of the proportion of education expenditures compared to food expenditures to see whether households that receive more remittances prefer to invest or consume these resources. We compare these results to regressions of the household's share of education expenditures on the share of remittances as a fraction of total expenditures. Next, we apply an instrumental variables specification to correct for the endogeneity of remittances. Finally, we present results from a selection model to see whether remittance amounts are biased by censoring on the decision to migrate.

6.1   Levels of education expenditures

An OLS regression of the education expenditure on remittances reveals a positive correlation between the amount of remittances a household receives and household spending on education. Columns 1 and 2 of Table 9 examine the extensive margin, comparing migrant households receiving remittances to non-remittance receiving households, which include those with and without migrants. In column 1, a 10 percent increase in remittances is associated with a 13.5 percent increase in education expenditures, on average, controlling for school age children, the maximum years of schooling, urban location, and wealth. However, this coefficient is also related to the decisions to migrate and remit. Controlling for the decisions to migrate and remit, the model results in a larger elasticity of education expenditures. In column 2, a 10 percent increase in remittances is correlated with a 47.5 percent increase in education expenditures. An elasticity less than one suggests that when households receive remittances, they spend part of that income on education. However, receiving remittances is associated with a decrease in education expenditure, implying that migrants who decide to remit are from poorer households. These households probably need the additional income from remittances, and may send a migrant for this purpose, whereas wealthy households do not need the income from remittances and may choose to migrate for other reasons, such as receiving health care or education. While households that receive remittances spend more than non-migrant households, they spend substantially less than the average migrant household (see Table 6). 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. Controlling for the decision to remit, education expenditures are not significantly different for migrant households. This supports the hypothesis that the decision migrate is simultaneous with the decision to remit. According to this theory, households that can earn a higher income by allocating labor to another country choose to send a migrant who will redistribute the gains from migration by sending remittances.

The relationship between the number of school-age children in the household and spending on education is positive and statistically significant in columns 1 and 2 of Table 9. 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. Given that Kenya offers 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 private education, either for wealthy households or for those far from a free primary school. Looking at a sample of migrant households, 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 (see column 3 of Table 9). This may be because restricting the sample diminishes the sample size dramatically, leading to fewer degrees of freedom. The years of schooling of the most educated household member, a proxy for human capital accumulation, is 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 does 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 (see Ngugi 2011).

Column 4 of Table 9 presents results from regressing education expenditures on remittances using an instrumental variables specification. This model uses a sample restricted to international migrant households because GDP per capita and migrant stock information is only available for households with at least one migrant. In the case of households with more than one migrant in different countries, GDP and migrant stock values are averages for the household. Conditional on the decision to remit, the correlation coefficient between the instrumental variable and the amount of remittances a household receives is positive for all of the instruments. GDP per capita, ownership of a bank account, and the average remittances by district are all positive and significant in the first stage of the two stage least squares procedure (see Table 10). The number of primary school age children remains statistically significant and positively correlated with education expenditures. The coefficient on the amount of remittances increases substantially. According to this model, a ten percent increase in the amount of remittances sent by a migrant is associated with a 16.9 percent increase in education expenditures, controlling for the decision to receive remittances. The decision to remit remains negatively correlated with education spending, though it is larger in magnitude compared to OLS results. The increase in magnitude of the coefficient on the amount of remittances received by a household implies that OLS estimates are biased downward by the endogeneity of remittances. One reason may be that remittances are endogenous to income. If households receiving more remittances are struggling financially and need the additional money, When eliminating part of this endogeneity, the impact of remittance income on education spending is larger.

6.2 Selection model

After using instrumental variables to account for potential bias in my model due to the endogeneity of remittances, we use a selection model to correct for the possible bias of remittances due to self-selection into migration. Results from the first stage of the selection model, provided in Table 11), show that household expenditures and the fraction of migrants by district are the only significant predictors of the migration decision. Households with higher expenditures are less likely to migrate, probably because they are more productive in the home country. Unexpectedly, the fraction of migrants in a district has is inversely related to the migration decision. Though the coefficient is only statistically significant at the ten percent level, this relationship implies that people in districts with a larger fraction of migrants are less likely to migrate themselves. This result contradicts the hypothesis of a large number of migrants strengthening social networks, thus lowering the costs of migration and increasing the probability of leaving Kenya. However, districts with a larger fraction of migrants may also be more productive, on average, in the home country. For example, if Nairobi has more migrants than other districts, but households in the city have more resources and a higher standard of living already, then they will be less likely to migrate. Moreover, the Kenya Migration Household Survey was designed to capture a disproportionately large number of migrant households, relative to the actual distribution, so the fraction of migrants in a district in the survey may not be an accurate representation of social networks. Assets and total household members, the other selection instruments, are not statistically significant predictors of migration.

In the second stage of the selection model, migrant employment, duration of stay in a foreign country, and the number of secondary school age dependents are positively correlated with migrant remittances. Migrants who are employed, and thus earning money abroad, have more resources to send to their household in Kenya. The selection model also implies that migrants who have been gone for a longer amount of time tend to send more remittances. This contradicts the hypothesis that a longer duration of stay reduces remittances by weakening social ties to the home country; rather, migrants who have been abroad for a longer amount of time may earn a higher wage because they have more experience living and working in a different culture. The second stage of the selection model also reveals a positive association between migrant remittances and the number of secondary school age dependents in a migrant's sending household, indicating that secondary school expenses, or simply caring for a larger number of dependents, may motivate migrants to remit larger amounts. Contrary to the hypothesis of positive selection, in which more educated people leave to maximize returns to human capital, migrant education is negatively correlated with remittances. This may be because more educated migrants leave to further their education, or come from wealthier families that do not need income from remittances. Total household expenditures is also negatively correlated with

migrant remittances, probably because households that can afford to spend more have higher incomes, and thus do not need income from migrant remittances. These households may also be funding migrants who leave for education or health purposes.

The coefficients from the second stage of the selection model are similar in size and significance to the OLS regression of migrant remittances, indicating that controlling for selection into migration does not impact predictions of migrant remittances. A likelihood ratio test comparing the joint probability of an independent selection-stage probit model and an regression of migrant remittances to the outcome of the selection model fails to reject the independent models in favor of the selection equation. In other words, we do not find evidence that remittances are biased by the migration decision. However, one potential issue with this model is that variables in the first stage are not strong enough predictors of migration to capture selection bias. The lack of evidence for selection bias supports the use of GDP per capita and migrant stock as instrumental variables, even though these variables are specific to migrant households. Furthermore, it supports the idea that the remittance and migration decisions are simultaneous. According to my theoretical model, households receiving remittances decide to send a migrant to maximize the product of their labor and redistribute income through remittances. Households that are more productive in the sending country may not receive remittances at all. In this case, remittances should not be biased by the migration decision alone because households migrate for different reasons.

Regressing household education expenditures on the fitted values of remittances from the selection equation extends this model to a third stage (see Table 12). In theory, using the fitted values corrects for the selection bias of the remittance variable. Because the selection model only corrects uncensored observations, all of the third stage regressions are restricted to migrant households. Coefficients are slightly larger in these models than they are when using uncorrected remittances values. Selection corrected remittances are not statistically significant in column 1, and they are negatively correlated with education expenditures when controlling for the decision to remit in column 2, though the coefficient is small in magnitude and only statistically significant at the ten percent level. The decision to remit is positively correlated with education expenditures in column 2. However, if selection into migration does not bias remittance amounts and the the fitted values are not an accurate representation of migrant remittance, the decision to remit may be picking up the effect of the amount of remittances sent to a household. Moreover, the regressors in the third stage control for most of the same factors as the selection model, but at the household level rather than the individual level. These control variables may be capturing any potential relationship between the fitted values and education expenditures.

Overall, the lack of evidence for selection bias in remittances due to the migration decision provides additional evidence that migration is a way of increasing the income from the labor of

household members, and remittances allow households to redistribute the gains from migration. The lack of evidence for selection bias also suggests that it is appropriate to use instrumental variables specific to migrant households.

6.3   Relative education expenditures

Having found that households invest some remittance income in education, on average, we examine how households spend on investment relative to consumption. Table 13 shows a positive association between remittances and education expenditures relative to food expenditures. Results in column 1 imply that a 10 percent increase in remittances is correlated with a 0.28 percent increase in relative education expenditures. Controlling for the decisions to migrate and remit, the coefficient on remittances is much larger, and a 10 percent increase in remittances is associated with a 1.40 percent increase in relative education expenditures. Both of these results imply that households spend more remittance income on investment in education than on food consumption. The number of secondary school age children is positively correlated with education expenditures relative to food expenditures, but the number of children under age five is negatively is negatively correlated with education expenditures relative to food expenditures. This is to be expected, as young children do not attend school, but they do consume other resources, such as food. However, children in secondary school consume similar amounts to other household members, but the household is probably financing their education. The coefficient on the decision to migrate in column 2 of Table 13 shows a positive relationship between the migration decision and investment in education relative to food expenditures, although the coefficient is only statistically significant at the ten percent level. The positive association may be driven by households that are paying for of a member in another country, but are not including that migrant's food consumption as part of household food expenditures.

To see if households spend remittance income differently from other sources of income, we regress the share of education expenditures on the share of remittances (see Table13). Total expenditures as a proxy for income. Because the variables for relative education expenditures and relative remittances are scaled by total expenditures, this model is controlling for the financial status of the household. While relative remittances are positively associated with relative education expenditures in column 3 of Table 13, the share of expenditures attributed to remittances is not significant when controlling for the decisions to migrate and remit. The result in column 3 may be driven by households who fund the education of a household member in another country. However, among households that receive positive amounts of remittances, the share of remittances the household receives is not significant. Moreover, the results in column 4 of Table 13 suggest that migrant households do not allocate a larger fraction of their budget to human capital investment than non-migrant households. The lack of significance of

the migration decision in this model supports the hypothesis that migration does not affect household spending independently of increasing income. Both the number of secondary school age children in a household and asset ownership are positively correlated with relative education expenditures. This result is consistent with the intuition that households will spend more on education when they have to finance the education of more children and wealthier households are better equipped to underwrite the costs of education.

In summary, we find that remittances are positively correlated with household education expenditures. Remittances are also associated with a higher proportion of education expenditures relative to food expenditures, indicating that additional income from remittances may be used to finance investment rather than consumption. However, we do not find evidence that the share of household expenditures attributed to remittances affects relative education expenditures. This finding is consistent with the theory that remittances are a mechanism of transferring resources among household members and only affect household spending patterns through income.

7   Conclusion

This paper provides additional evidence about the impact of migration on human capital investment by studying 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. The majority of previous studies on remittances and human capital have examined the impact of migration on education outcomes, including attendance and completion. Further research has found that households receiving remittances spend marginally greater shares of their budget on investment goods. However, we find that remittances are correlated with higher levels of investment in education, but not higher shares. According to both my theoretical model and empirical results, migration allows households to maximize returns to labor by allocating members between two countries, while remittances are associated with higher education expenditures by increasing income. Theory predicts that households that decide to send remittances can increase their income, but remittances do not change spending patterns independently of the effect of additional income. While the causal effect of income from remittances on education expenditures remains unclear, we find evidence of a positive relationship between remittance income and education spending, though the share of remittances a household receives does not impact the share of its budget devoted to human capital investment. The result that the amount of remittances is correlated with a higher level of education expenditures, while a higher share of remittances does not appear to change a household's share of education expenditures,

supports my theoretical prediction.

First, we find that remittances are associated with higher education expenditure, a result that persists when restricting the sample to migrant households. We do not find a correlation between education spending and the decision to migrate, indicating that migration is a means of maximizing income, but is not otherwise related to the household decision to invest in human capital. Using an instrumental variables strategy, the elasticity of education expenditures with respect to remittances increases. The increase in the magnitude of the coefficient on the log of remittances may be because households receiving more remittances also choose to migrate because they need additional income for many different goods. The exogenous impact of remittances on education spending is larger, as households receiving more remittances are also poorer, and income affects both education spending and the receipt of remittances. A selection model provides evidence that the amount of remittances sent by migrants are not biased by censoring based on the decision to migrate, which supports the use of an instrumental variables approach that is restricted to migrant households.

My results demonstrate a negative relationship between the decision to remit and household education expenditures. This is probably due to variation in motivations to migrate based on household income or wealth. For example, suppose a person from a wealthy household chooses to migrate to receive further education, while a less affluent migrant makes the decision to relocate for the purpose of remitting. While the less affluent household may be better off due to remittances, it remains less wealthy than the household who sent a migrant to be educated. We find evidence that households tend to spend a larger proportion of remittances on education than food, showing that households may prefer to use additional income from remittances to finance investment, rather than consumption. However, we do not find evidence that the extent to which remittances account for total expenditures is related to the share of total expenditures that a household spends on education, a result which supports the hypothesis that remittances are a means of allocating resources among household members and do not affect expenditures independently of income.

References

[1] Alcaraz, Carlo, Daniel Chiquiar, and Alejandrina Salcedo (2012) "Remittances, Schooling, and Child Labor in Mexico" *Journal of Development Economics* 97: 156-165.

[2] Amuedo-Dorantes, Catalina and Susan Pozo (2011) "Remittances and Income Smoothing" *American Economic Review* 101.3: 582-87.

[3] Ashraf, Nava, Diego Aycinena, Claudia Martinez A. and Dean Yang (2010) "Remittances and the Problem of Control: A Field Experiment Among Migrants from El Salvador" Working Papers, University of Chile, Department of Economics.

[4] Aycinena, Diego, Claudia A. Martinez and Dean Yang (2010) "The Impact of Remittance Fees on Remittance Flows: Evidence from a Field Experiment Among Salvadoran Migrants" http://www-personal.umich.edu/~deanyang/papers/aamy_remittancecontrol.pdf (*do not cite without permission)

[5] Bansak, Cynthia and Brian Chezum (2009) "How do Remittances Affect Human Capital Formation of School-Age Boys and Girls?" *American Economic Review* 92.2: 145-48.

[6] Beti, Arjun S., Carla Calero and Robert Sparrow (2008) "Remittances, Liquidity Constraints and Human Capital Investments in Ecuador" *World Development* 37.6: 1143-1154.

[7] Bold, Tessa, Mwangi Kimenyi, Germano Mwabu and Justin Sandefur (2013) "Can Free Provision Reduce Demand for Public Services? Evidence from Kenyan Education" World Bank Policy Research Working Paper 6685.

[8] Bollard, Albert, David McKenzie, Melanie Morten, and Hillel Rapoport (2011) "Remittances and the Brain Drain Revisited: the Microdata Show that More Educated Migrants Remit More" *The World Bank Economic Review* 25.1: 132-156.

[9] Chiquiar, Daniel and Gordon H. Hanson (2005) "International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States" *Journal of Political Economy* 113.2: 239-281.

[10] Cox, Alejandra, and Manuelita Ureta (2003) "International Migration, Remittances, and Schooling: Evidence from El Salvador" *Journal of Development Economics* 72: 429-461.

 [1] Docquier, Frédéric, Hillel Rapoport, and I-Ling Shen (2010) "Remittances and Inequality: A Dynamic Migration Model" *Journal of Economic Inequality* 8.2: 197-220.

[23] Education Profile - Kenya, UNESCO Institute for Statistics. Acced online, http://stats.uis.unesco.org/.

[24] Eshwari, G.S. (1990) "Implementing Education Policies in Kenya" World Bank Discussion Papers, Africa Technical Department Series: 1-33.

[11] Funkhouser, Edward (1995) "Remittances from International Migration: A Comparison of El Salvador and Nicaragua" *The Review of Economics and Statistics* 77.1: 137-146.

[12] Hanson, Gordon H. and Christopher Woodruff (2003) "Emigration and Educational Attainment in Mexico" Working Paper, University of California, San Diego.

[13] Heckman, James (1979) "Sample Selection Bias as a Specification Error" *Econometrica* 47.1: 153-161.

[2] Jaeger, David A., Thomas Dohmen, Armin Falk, David Huffman, Uwe Sunde, and Holger Bonin (2007) "Direct Evidence on Risk Attitudes and Migration" *The Review of Economics and Statistics* 92.3: 684-689.

[3] Kenya Migration Household Survey (2009), University of Nairobi and The World Bank. Accessed online, microdata.worldbank.org.

[14] Lucas, Robert and Oded Stark (1985) "Motivations to Remit: Evidence from Botswana" *Journal of Political Economy* 93.5: 901-918.

[15] Makina, Daniel (2013) "Migration and Characteristics of Remittance Senders in South Africa" *International Migration* 51 (Supplement s1): e148-e158.

[4] Mansour, Wael, Jad Chaaban, and Julie Litchfield (2001) "The Impact of Migrant Remittances on School Attendance and Education Attainment: Evidence from Jordan" *International Migration Review* 45.4: 812-851.

[5] McKenzie, David, and Hillel Rapoport (2007) "Network Effects and the Dynamics of Migration and Inequality: Theory and Evidence from Mexico" *Journal of Development Economics* 84: 1-24.

[16] McKenzie, David and Hillel Rapoport (2010) "Self-Selection Patterns in Mexico-U.S. Migration: The Role of Migration Networks" *The Review of Economics and Statistics* 92.4: 811-821.

[6] Munshi, Kaivan (2003) "Networks in the Modern Economy: Mexican Migrants in the U.S. Labor Market" *The Quarterly Journal of Economics* 118.2: 549-599.

[17] Ngugi, Rose W. (2011) Kenya. In S. Mohpatra and D. Ratha (Eds.), *Remittance Markets in Africa.* Washington, D.C.: The World Bank

[7] Oketch, Moses, Maurice Mutisya, Moses Ngware, Alex C. Ezeh, and Charles Epari (2010) "Free Primary Education Policy and Pupil School Mobility in urban Kenya" *International Journal of Educational Research* 49.6: 173-183.

[18] Plaza, Sonia, Maria Navarrete and Dilip Ratha (2011) "Migration and Remittances Household Surveys in Sub-Saharan Africa: Methodological Aspects and Main Findings" Accessed from The World Bank: <http://microdata.worldbank.org/index.php/catalog/94>. (*do not cite without permission)

[19] Rozelle, Scott, Edward Taylor and Alan deBrauw (1999) "Migration, Remittances, and Agricultural Productivity in China" *American Economic Review* 89.2: 287-91.

[8] Sjaastad, Larry A. (1962) "The Costs and Returns of Human Migration" *The Journal of Political Economy* 70.5: 80-83

[9] Stark, Oded (2004) "Rethinking the Brain Drain" *World Development* 32.1: 15-22.

[10] Stark, Oded, Christian Helmenstein and Alexia Prskawetz (1997) "A Brain Gain with a Brain Drain" *Economics Letters* 55.2: 227-234.

[11] Tooley, Janes, Pauline Dixon, and James Stanfield (2012) "Impact of Free Primary Education in Kenya" *Educational Management Administration and Leadership* 36.4: 449-469.

[12] Trends in International Migrant Stock (2013), The United Nations Population Division, Department of Economic and Social Affairs. Accessed online, http://esa.un.org/unmigration/TIMSA2013/migrantstocks2013.htm?mtotals

[13] Vidal, Jean-Pierre (1998) "The Effect of Emigration on Human Capital Formation" *Journal of Population Economics* 11: 589-600.

[14] Winters, Paul, Alain de Janvry and Elisabeth Sadoulet (2001) "Family and Community Networks in Mexico-U.S. Migration" *The Journal of Human Resources* 36.1: 159-184.

[20] World Development Indicators, The World Bank. <http://data.worldbank.org>. Accessed 7 Dec. 2013.

[21] Yang, Dean (2008) "International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks" *The Economic Journal* 118.528: 591-630.

[22] Yang, Dean (2011) "Migrant Remittances" *Journal of Economic Perspectives* 25.2: 129-52.

A   Appendix

A.1   Household utility maximization

Households maximize utility $u_t = (1-\sigma)ln(x_t) + \sigma ln(h_{t+1})$ subject to the budget constraint $x_t + h_{t+1} = y_t$. To solve this problem using the method of Lagrange multipliers, we rewrite the utility function and budget constraint so that households maximize the Lagrangian function $\mathcal{L}$ by choosing x_t and h_{t+1}, where λ is the Lagrange multiplier.

$$max\mathcal{L} = (1-\sigma)ln(x_t) + \sigma ln(h_{t+1}) + \lambda(y_t - x_t - h_{t+1})$$

Households optimize according to the following first order conditions:

$$\frac{\delta\mathcal{L}}{\delta x_t} = \frac{(1-\sigma)}{x_t} - \lambda = 0 \tag{15}$$

$$\frac{\delta\mathcal{L}}{\delta h_{t+1}} = \frac{\sigma}{h_{t+1}} - \lambda = 0 \tag{16}$$

$$\frac{\delta\mathcal{L}}{\delta \lambda} = y_t - x_t - h_{t+1} = 0 \tag{17}$$

Solving equations (1) and (2) gives $x_t = \frac{(1-\sigma)}{\sigma}h_{t+1}$. Substituting for x_t in (3) results in the following equation for household human capital accumulation

$$h_{t+1} = \sigma(y_t) \tag{18}$$

A.2   Descriptive Statistics

Table 1: Individual Characteristics

	International migrants	Observations	Non-migrants	Observations
% Male	54.37	767	46.18	4,508
Age	48.29 (18.50)	743	22.12 (16.31)	4,425
Years of schooling	9.43 (5.09)	615	7.94 (4.33)	3,124
Years of last absence	6.02 (5.97)	815	-	-

Note: Standard deviations are in parentheses.

Table 2: Migrant employment

	Percent Employed	Observations
All migrants	67.84	821
Remitting migrants	89.43	454
Men	67.70	418
Women	70.39	358

Table 3: Primary reason for migrant leaving the household (as a percent of the sample)

Migrants	Education	Search for work	Job transfer/opportunity	Observations
All migrants	36.46	19.74	29.24	831
Remitting migrants	24.89	24.23	38.11	454
Men	37.08	20.10	27.27	418
Women	33.34	21.51	332.12	358

Table 4: Remittances

	Percent remitting	Observations	Amount of remittances	Observations
All migrants	54.74	822	265.77 (1381.28)	450
Men	56.12	417	174.11 (510.89)	234
Women	60.29	350	369.76 (1940.86)	211
Students	8.44	154	45.46 (40.69)	13
Employed	72.17	557	278.80 (1454.28)	402

Notes: Amount of remittances is calculated for the past 12 months as the mean for migrants who send positive remittances.

Amounts are given as local currency (Kenyan shillings) in thousands. Standard deviations are in parentheses.

Table 5: Household Characteristics

	Average	Standard Deviation	Min.	Max.	Observations
Household members	4.17	2.30	1	20	1260
Dependents	1.80	1.79	0	15	1262
Migrants	0.65	0.91	0	8	1262
Employed migrants	0.45	0.75	0	6	1262
Maximum years of schooling	10.49	4.24	1	25	1199
Urban (%)	0.51	0.50	0	1	1261
Total monthly expenditures	47.80	123.49	0	1796.50	1261

Notes: Total montly expenditures are in local currency (Kenyan shillings), in thousands. Standard deviations are in parentheses.

Table 6: Household Consumption

	Migrant	Non-migrant	Remittance receiving
Food (% of total)	39.71 (26.38)	50.09 (24.79)	39.78 (25.06)
Education (% of total)	9.39 (15.66)	6.65 (11.83)	9.06 (14.65)
Remittances (% of total)	35.43 (98.41)	-	54.41 (117.69)
Total monthly expenditures	69.84	28.79	49.09
Observations	579	670	377

Notes: Standard deviations are in parentheses. Total expenditures are given in local currency in thousands.

Table 7: Instrumental Variables: means

	All households	Remittance receiving	Non-remittance receiving
Migrant stock /1000	38.66 (37.73)	36.16 (35.58)	43.34 (41.11)
GDP per capita /1000	29.19 (19.24)	30.23 (18.74)	27.24 (20.05)
Bank account	0.70 (0.46)	0.69 (0.46)	0.71 (0.45)
District remittances	8.53 (9.31)	7.98 (8.94)	9.54 (9.83)
Observations	584	381	203

Fraction of Migrants in District	Observations
0.164 (0.053)	5399

GDP per capita (converted to USD) and migrant stock are given in thousands. District remittances is the mean of remittances received by households in a district, in thousands.

Notes: Standard deviations are in parentheses.

Table 8: Independent Group t-test

Variable	Group	Mean	Std. Error	t	Significance	Observations
Education Expenditures	Non-migrant	1809.76	5823.67	-3.827	0.000	677
	Migrant	10424.33	58235.79			584
Education Expenditures	Non-remit	21367.96	6778.66	3.344	0.001	203
	Remit	4593.47	617.09			381
Fraction	Non-migrant	0.162	0.001	-6.188	0.000	4578
	Migrant	0.175	0.002			821

Note: The test of education expenditures by remittance-receiving households is restricted to migrant households.

A.3 Regression Results

Table 9: Education Expenditures

Dependent variable	OLS (1) $Ln(EducExp.)$	OLS(2) $Ln(EducExp.)$	OLS (3) $Ln(EducExp.)$	2SLS (4) $Ln(EducExp.)$
$Children(0-5)$	0.012	0.012	-0.197	-0.249
	(0.132)	(0.1332)	(0.217)	(0.254)
$Primary$	0.555***	0.548***	0.447***	0.403**
	(0.097)	(0.096)	(0.160)	(0.179)
$Secondary$	0.846***	0.818***	0.387*	0.283
	(0.126)	(0.126)	(0.203)	(0.226)
$Max.Education$	0.144***	0.137***	0.086*	0.053
	(0.031)	(0.031)	(0.047)	(0.051)
$Urban$	0.110	0.008	0.032	-0.663
	(0.236)	(0.239)	(0.411)	(0.537)
$Assets$	0.429***	0.407***	0.374**	0.206
	(0.111)	(0.110)	(0.174)	(0.195)
$Ln(Remittances)$	0.135***	0.475***	0.524***	1.691***
	(0.030)	(0.120)	(0.122)	(0.542)
$Remit$		-3.410***	-3.796***	-13.797***
		(1.100)	(1.135)	(4.665)
$Migrant Household$		0.498		
		(0.392)		
Observations	846	846	356	356
R^2	0.1583	0.1666	0.1052	-

***p<0.01, **p<0.05, *p<0.10

Dependent variable: log of rescaled household education expenditures.

Notes: Sample is restricted to households with at least one person less than 20 years of age for all models. Columns 3-4 are restricted to households with at least one international migrant.

Robust standard errors are in parentheses.

Table 10: First Stage of 2SLS

Dependent variable	OLS (1) $Ln(Remit)$
$GDPpercapita/1000$	0.010***
	(0.003)
$MigrantStock/1000$	-0.002
	(0.002)
$Bank\ Account$	0.374**
	(0.147)
$District\ Remittances$	0.028***
	(0.007)
Observations	356
R^2	0.9185
$F(4, 344) = 8.16$	

***p<0.01, **p<0.05, *p<0.10

Dependent variable: log of rescaled amount of remittances received by household.

Standard errors are in parentheses.

<p style="text-align:center">Table 11: Selection Model</p>

Variables	Probit (1) $Intl.Migrant$	MLE (2) $Ln(Mig.Remittances)$	OLS (3) $Ln(Mig.Remittances)$
Age	-0.027	0.115**	0.116**
	(0.040)	(0.057)	(0.057)
Age^2	0.000	-0.001	-0.001
	(0.000)	(0.001)	(0.001)
$Employment$		6.434***	6.445***
		(0.416)	(0.420)
$Education$	0.016	-0.090**	-0.091**
	(0.033)	(0.041)	(0.041)
$Duration$		0.085**	0.085**
		(0.034)	(0.034)
$Urban$	0.133	0.522	0.515
	(0.308)	(0.421)	(0.425)
$Male$	-0.288	-0.361	-0.352
	(0.312)	(0.396)	(0.399)
$Ln(Expenditures)$	-0.097**	-0.159**	-0.150
	0.039	(0.106)	(0.106)
$Children(0-5)$		0.157	0.164
		0.292	(0.295)
$Primary$		0.332	0.332
		(0.218	(0.220)
$Secondary$		0.511**	0.502**
		(0.235)	(0.236)
$Assets$	0.135		
	(0.128)		
$HouseholdMembers$	-0.042		
	(0.065)		
$Fraction_h$	-6.498*		
	(3.507)		
Observations			596
R^2			0.3274

<p style="text-align:center">***p<0.01, **p<0.05, *p<0.10</p>

Notes: (1) and (2) are results from a Heckman selection model. (3) is provided for comparison. Standard errors are in parentheses.

Selection Model	
Observations	3704
Censored	3108
Uncensored	596
λ	-0.607 (1.154)
LR test	$\chi^2 = 0.28$
Wald	$\chi^2(11) = 288.70$

Table 12: Education Expenditures with selection correction

Dependent variable	OLS (1) $Ln(EducExp.)$	OLS (2) $Ln(EducExp.)$
$Children(0-5)_h$	-0.180	-0.175
	(0.209)	(0.210)
$Primary_h$	0.451***	0.453***
	(0.166)	(0.165)
$Secondary_h$	0.431**	0.435**
	(0.206)	(0.207)
$Max.Education_h$	0.095**	0.106**
	(0.048)	(0.047)
$Urban_h$	0.289	0.316
	(0.399)	(0.400)
$Assets_h$	0.507***	0.494***
	(0.174)	(0.175)
$Ln(\widehat{Remittances})$	-0.040	-0.059*
	(0.034)	(0.0354)
$ReceivesRemittances$		0.889**
		(0.447)
Observations	356	356
R^2	0.0694	0.0810

***p<0.01, **p<0.05, *p<0.10

Dependent variable: log of rescaled household education expenditures.

Notes: Sample is restricted to households with at least one international migrant and one person less than 20 years of age.

Robust standard errors are in parentheses.

Table 13: Relative Expenditures

Dependent variable	OLS (1) Education/Food	OLS(2) Education/Food	OLS (3) Education/Total	OLS (4) Education/Total
$Children(0-5)$	-0.107**	-0.103***	-0.011**	-0.010*
	(0.042)	(0.039)	(0.005)	(0.006)
$Primary$	-0.036	-0.038	-0.000	-0.000
	(0.029)	(0.029)	(0.004)	(0.004)
$Secondary$	0.208***	0.195***	0.041***	0.040***
	(0.061)	(0.062)	(0.007)	(0.007)
$Max.Education$	0.018	0.014	0.002	0.002
	(0.012)	(0.011)	(0.001)	(0.001)
$Urban$	0.090	0.051	-0.008	-0.009
	(0.068)	(0.066)	(0.009)	(0.009)
$Assets$	0.042	0.033	0.010**	0.009**
	(0.035)	(0.035)	(0.005)	(0.005)
$Ln(Remittances)$	0.028**	0.140**		
	(0.012)	(0.054)		
$Remittances/Total$			0.021**	0.017
			(0.010)	(0.012)
$Remit$		-1.230***		0.004
		(0.460)		(0.018)
$Migrant Household$		0.305*		0.009
		(0.158)		(0.016)
Observations	837	837	838	838
R^2	0.0693	0.0836	0.1012	0.1027

***$p<0.01$, **$p<0.05$, *$p<0.10$

Dependent variable: Education expenditures divided by food expenditures.

Notes: Sample is restricted to households with at least one person less than 20 years of age.

Robust standard errors are in parentheses.