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Do Remittances Influence Household Investment Decisions? Evidence from Sub-Saharan Africa

by Md Shahadath Hossain and Adesola Sunmoni

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Department of Economics
University of Reading
Whiteknights
Reading
RG6 6AA
United Kingdom

www.reading.ac.uk

Do Remittances Influence Household Investment Decisions? Evidence from Sub-Saharan Africa

Md Shahadath Hossain* Adesola Sunmoni†

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Abstract

The impact of remittances on left behind households is ambiguous a priori due to competing income and substitution effects. Similarly, empirical evidence in the literature is inconclusive. We offer new evidence on the effect of remittances on household investment decisions. We enrich our analysis by considering different types of capital investment and remittance sources. We use data from the World Bank's Migration and Remittances Household Survey, a recursive bivariate probit model, and instrumental variables approach to account for endogeneity concerns. We find that remittance-receiving households in sub-Saharan Africa are more likely to invest in human and social capital compared to non-remittance receiving households. However, there is substantial variation in investment behaviour across countries. We also show the heterogeneous effect of remittance sources on investment behaviour. Our study is relevant for policymakers seeking to maximise the impact of remittances to foster local economic opportunities.

Keywords: Remittances; Investments; Africa, Physical capital; Human capital and Social Capital.
JEL Codes: F24, F22, O15, O24, J61.

*mhossai3@binghamton.edu: Department of Economics, Binghamton Univeristy, New York, USA
†a.o.sunmoni@pgr.reading.ac.uk: Department of Economics, University of Reading, UK.
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1 Introduction

One in nine people globally receive remittances from a migrant family member, and these transfers make up about 60 percent of the receiving household's income (United Nations, 2019). The United Nations estimate that about three-quarters of the remittances are spent on necessities, such as food and housing, while the rest is saved or invested in income-generating activities and coping against shocks (i.e. crop failure or family emergencies) (United Nations, 2019). Consequently, remittances can play a vital role in capital accumulation, income generation, and shock mitigation in receiving households as well as the overall economic development in receiving regions.

Despite the potential of remittances to stimulate capital accumulation and investment, the earning capacity of receiving households often stays unchanged even after years of receiving remittances. This suggests that remittance-receiving households often fail to accumulate capital and invest in income-generating activities (Chami et al., 2003; Simiyu, 2013). Besides, remittance receipt could have unintended consequences such as reducing the income-generating activities of receiving households. Furthermore, dependence on remittances may reduce the labour supply – both employment likelihood and hours worked – of the household members through income and substitution effects.

Since it is difficult to determine the effect of remittances on household investment decisions a priori, it becomes an interesting empirical question. Furthermore, the evidence in the empirical literature is inconclusive (Démurger, 2015). Besides, the bigger concern is the reliability of the existing empirical studies, as these studies often suffer from selection bias and other endogeneity issues (Adams, 2011). Given the lack of consensus in the literature and methodological limitations, we rigorously evaluate this issue using micro-data from five sub-Saharan Africa (SSA) countries. More specifically, we investigate two questions. First, are remittance-receiving households more likely to make investment expenditure compared to non-remittance receiving households? Second, does the household investment behaviour vary by type of investment expenditure (i.e., human, physical capital, and social capital[1])?

This study utilises a unique household survey, specially designed to fill the gap in knowledge regarding migration, remittances, and their impact in sub-Saharan Africa (Plaza et al., 2011). The World Bank, as part of the Africa Migration Project (AMP), surveyed six countries: Uganda, Kenya, Nigeria, Burkina Faso, South Africa, and Senegal. Following Bredtmann et al. (2018), we use five predominantly remittance receiving countries and exclude South Africa as it is mostly a remittance sending country. An important characteristic of the AMP surveys is that they are standardised across countries, which allows for easy aggregation and comparison. The AMP surveys enabled us to provide country-specific and pooled (regional) analyses of the investment pattern of remittances in SSA. Furthermore, the data-set provides the opportunity to analyse remittance flows by sources, namely, domestic remittances, within-Africa remittances, and out-of-Africa remittances.

Regarding our methodology, we circumvent the issue of fungibility of money by making the investment expenditure a binary variable, namely whether an investment expenditure has been made in the previous six months before the interview[2], rather than using the amount of money invested. The key explanatory variable is also binary, which takes the value one if the household has received remittances in the previous 12 months before the interview and zero otherwise. Since the investment decision and remittance receipt are binary variables and remittance receipt is potentially endogenous, the regression analysis employs a recursive bivariate probit model and instrumental variables approach to account for endogeneity. The recursive bivariate probit model estimates remittance receipt and investment decisions simultaneously while incorporating the remittance-receipt variable in the investment decision equation.

Results from the pooled analysis show that remittance-receiving households in SSA are more likely to invest in human and social capital compared to non-remittance receiving households. However, remittances have no statistically significant effect on physical capital investment in SSA. The country-specific analysis shows that remittance receipt increases the probability of human capital investment in all five countries. Furthermore, remittances increase the likelihood of physical capital investment in Kenya and Nigeria and reduces the likelihood in Burkina Faso. Remittance receipt also increases the likelihood of social capital investment in Kenya, Uganda, and Burkina Faso. The findings suggest that remittance-receiving households in sub-Saharan Africa do not only generate tangible returns from human capital investment; they also derive substantial returns from their social networks.

On the heterogeneous effect of remittance sources, we find that investment behaviour varies significantly with the source of remittances. For SSA (pooled analysis), domestic remittances and out-of-Africa remittances have a positive and significant effect on human capital investment, but within-Africa remittances do not. Conversely, domestic and within-Africa remittances lead to social capital investment, but out-of-Africa remittances do not. The country-specific analysis also shows substantial variation in investment behaviour by remittances sources. These results suggest that remittance sources contain crucial information to understand the investment behaviour of receiving households.

Most empirical studies on the impact of remittances are based on Latin American countries, with a scattered focus on Asia (Acharya and Leon-Gonzalez, 2014) but largely ignoring Sub-Saharan Africa. It is also difficult to derive cohesive policy implications from these studies due to differences in research methodology (i.e., survey methods) and variable definitions. Our contribution to the literature is threefold. First, to our knowledge, we are the first study to provide empirical evidence for the sub-Saharan Africa region and specific countries using micro-level data while adequately accounting for selection bias and endogeneity concerns. Second, our study disaggregates investment expenditure into three categories– human capital, physical capital, and social capital investment. Addressing the

multiplicity of the investment alternatives allows us to explore the heterogeneity among the investment types. Finally, we identify the differential effect of remittances from domestic, within-Africa, and out-of-Africa sources on receiving households' investment behaviour.

Our study has important policy implications. First, we provide further evidence that remittances can contribute to economic development through productive investments. Policymakers in SSA can design policies aimed at reducing remittance transfer costs to harness remittances and foster local economic development. Our study is also relevant for the local and international organisations working on designing business models and financial instruments to maximise the impact of remittances on economic development. Understanding the heterogeneous effect of remittance sources will help these organisations design effective financial instruments to boost capital formation and income-generation in the remittances receiving communities.

The rest of the paper is structured as follows: Section 2 describes the conceptual framework; Section 3 describes the data used; Section 4 explains the empirical methodology; Section 5 discusses the main results, robustness checks and, the heterogeneity by source of remittances; and Section 6 concludes the paper.

2 Conceptual Framework

Migration decisions have been explained by the role of remittances in the literature. Households send migrants to urban centres or out of the country with a desire to increase household income level and to diversify income sources (Rosenzweig and Stark, 1989; Stark, 1991; Adams, 1998; Clemens and Ogden, 2013). Theoretical models present different remittance motives such as altruism, insurance contract, loan contract, and investment and inheritance (Lucas and Stark, 1985). First, the altruism model posits that remittances are sent simply because migrants care about their left-behind family members (Lucas and Stark, 1985; Stark, 2009). Second, the insurance contract model suggests that remittances result from an implicit contract between the households and migrants to protect the household against shocks (Rosenzweig and Stark, 1989; Cox et al., 1998). Third, the loan contract model argues that remittances are repayments for an informal loan taken out by the migrants from their families to enhance their human capital and finance the cost of migration (Poirine, 1997). The first three models–altruism, insurance contract, and loan contract–are silent about the investment use of remittances or assume that remittances are not invested. The fourth model, the investment and inheritance motive, suggests that migrants send remittances because of their aspiration to inherit family property, intent to return home, and considerations that left behind family members are trustworthy agents to maintain assets on their behalf (Lucas and Stark, 1985; Taylor and Wyatt, 1996).

The migration literature further points out that these motives may not be mutually exclusive. It may be the case that remittances are sent for all the motives at the same time,

with each motive comprising a share of it (Poirine, 1997). It could also be the case that one of these motives become dominant at different stages of migration. For instance, at the early stage of migration, remittances sent back are typically for loan repayments. However, regardless of the motive, remittances are expected to positively affect household income at home if migrants earn a substantially higher income in the destination country. Like other non-labour income, remittances affect households' economic behaviour–such as consumption spending, labour supply, and investments in physical, human, and social capital–through income and substitution effects.

Remittances may reduce labour supply–both employment likelihood and hours worked–of the non-migrant household members through income and substitution effects. The income effect eases household budget constraints and raises the reservation wage for the non-migrant members, while the substitution effect creates an incentive to cut back labour supply to continue receiving remittances (Killingsworth, 1983; Amuedo-Dorantes, 2014). On the contrary, households may utilise the non-labour income from remittances to invest in physical capital (i.e., setting up a business, opening a store, purchasing farming equipment such as tractors, and purchasing other productive assets) which can lead to higher labour supply.

Remittances can also affect the human capital investment of the left behind household members. On the one hand, remittances relax household budget constraints, increase education and healthcare spending, and reduce child labour. This larger human capital investment raises school enrolment and educational attainment (Cox-Edwards and Ureta, 2003; Alcaraz et al., 2012). On the other hand, remittances may reduce human capital investment by raising the opportunity cost of education and lowering the incentive to study (Antman, 2012). First, having an adult migrant member can raise the opportunity cost of education as children often make up for the migrant worker in home production (Amuedo-Dorantes and Pozo, 2006). Second, young children who foresee themselves emigrating soon have lower incentives to study.

Remittances may also affect the social capital investment of the left-behind household as they can spend the extra income from remittances on big social events such as wedding ceremonies and funerals. Rao (2001) shows that spending on big social events generates tangible returns, such as paying a lower price of items in the local marketplace and higher social status. On the contrary, remittances may reduce social capital investment by lowering reliance on the social network to protect against shocks (Yang and Choi, 2007).

It is difficult to determine the effect of remittances on household investment decisions theoretically. Thus, we set out to empirically investigate this phenomenon. Focusing on three investment categories–human capital, physical capital, and social capital investments–also helps us to understand whether the household investment behaviour varies by type of investment expenditure.

3 Data Description

We used data from the Migration and Remittances Household Surveys conducted by the World Bank between 2009 and 2010. These household surveys are part of the Africa Migration Project and are designed to provide information about the volume, causes, and impacts of migration and remittances in Sub-Saharan Africa (Plaza et al., 2011). A unique feature of the surveys is that they are standardised across countries, which allows for easy aggregation and comparison. The surveys covered six Sub-Saharan countries, namely Burkina-Faso, Kenya, Nigeria, Senegal, Uganda, and South Africa. They are cross-sectional surveys and provide comprehensive information about migration, remittances, housing conditions, household assets and expenditures, and other socioeconomic and demographic characteristics. The surveys contain information about households with no migrants, internal (domestic) migrants, within-Africa migrants, and out-of-Africa migrants, which we use to create a variable representing the source of remittances. The principal respondent to the survey was the household head or their representative who also reported information about the migrant(s).

Since our focus is to evaluate the effect of remittances on the investment behaviour of remittance-receiving households, we follow Bredtmann et al. (2018), to exclude South Africa, which is a migrant-receiving or remittances sending country. We construct three binary dependent variables that take the value one if the household has made an investment expenditure and zero otherwise. The three binary variables are household expenditure on physical capital, expenditure on human capital, and expenditure on social capital. We define investment expenditure as an outlay for which the individual or household expects financial returns in the future. We define physical capital investment as household expenditure on setting up a business/opening a store, purchasing farming equipment such as tractors, and purchasing other productive assets[3]. Human capital investments are broadly defined as households' expenditure on education and health, including tuition payment, purchase of school uniform and books, and purchase of medicine[4]. We define social capital investments as households' expenditure on festivals, weddings, and funerals[5]. Each household reports the amount of money spent on these items during the last six months before the interview date. Since we do not want to focus on the actual amounts spent and to circumvent the issue of fungibility of money, we construct a dummy variable capturing whether the household made an investment expenditure or not in the preceding six months (the value of which would be either 1 or 0).

Table 1: Proportion of Households Investment Expenditure by Country

Types of Capital	Uganda	Kenya	Nigeria	Burkina Faso	Senegal	Chi^2 (χ^2)
Human capital	0.933	0.821	0.914	0.944	0.924	155.05***
Education	0.773	0.599	0.729	0.656	0.666	
Health	0.839	0.679	0.766	0.875	0.827	
Physical capital	0.120	0.141	0.188	0.233	0.095	183.39***
Establishing business	0.048	0.069	0.096	0.022	0.043	
Farming equipment	0.064	0.067	0.072	0.205	0.050	
Productive asset	0.023	0.023	0.039	0.013	0.004	
Social capital	0.468	0.424	0.381	0.656	0.743	871.56***
Wedding and Funeral	0.468	0.424	0.381	0.656	0.743	

Table 1 presents the proportion of households that make human, physical, and social capital investments and their sub-components. A considerable proportion of households make human capital investment, followed by social capital, and a relatively small proportion makes a physical capital investment. Within human capital investment, healthcare expenditure dominates education expenditure across all countries included in the study. Despite a relatively small proportion of households investing in education, Burkina Faso has the highest proportion of households investing in human capital. Burkina Faso also leads in physical capital investment with a high proportion (20.5% of households) investing in farming equipment. Among the five countries, Burkina Faso and Senegal have a relatively high proportion of households making a social capital investment, 65.6% and 74.3%, respectively.

The key explanatory variable is binary, which takes the value one if the household has received remittances in the previous 12 months before the interview and zero otherwise. Since our focus is on remittances and not migration, we follow Adams and Cuecuecha (2013) to classify all households into remittance-receiving households and non-remittance receiving households. These two types of households may or may not have a migrant. This is because in countries of Sub-Saharan Africa, not all migrants send remittances, and a sizeable proportion of households without a migrant member receive remittances from non-household members, such as adult children, brother, nephew/niece, and son-in-law/daughter-in-law. The other explanatory variables are socio-economic characteristics of the household head and household characteristics such as household size, number of male household members in the labour force, location of the household, demographic characteristics such as age, sex, education level, and employment status of the household head. We also control for the overall resource availability to the household by including per capita income. Per capita income is proxied by per capita expenditure following the standard practice in the literature as income data often suffer from measurement errors (Deaton, 2018; Jena, 2018).

Table 2 presents summary statistics of the control variables for the pooled sample of Sub-Saharan Africa. There exists considerable variation between remittances receiving and non-remittance receiving households. Apart from the household head with primary education, all other variables show a statistically significant difference between remittances receiving

and non-remittance receiving households. This is also true for individual countries included in the study (See Appendix Table A1-A3 for individual country descriptive statistics). As a result, we have added all other explanatory variables except primary education in the final estimation.

Table 2: Summary Statistics of Explanatory Variables (Pooled)

Variables	Full Sample	No remittances	Remittances	Difference
= 1 Household head is female	0.213 (0.41)	0.166 (0.372)	0.292 (0.455)	-0.126***
Log household income per capita	5.991 (1.343)	6.043 (1.409)	5.94 (1.254)	-0.228***
Household size	6.665 (4.532)	6.195 (4.054)	7.327 (5.102)	-1.131***
Number of children in household	2.889 (2.864)	2.706 (2.628)	3.119 (3.163)	-0.413***
Number of elderly in household	0.444 (0.709)	0.338 (0.646)	0.601 (0.77)	-0.263***
Number of male member in labor force	1.720 (1.448)	1.660 (1.338)	1.819 (1.61)	-0.158***
= 1 if head is employed	0.201 (0.401)	0.235 (0.424)	0.155 (0.362)	0.080***
= 1 if head is self-employed	0.617 (0.486)	0.635 (0.482)	0.576 (0.494)	0.058***
= 1 if head has primary education	0.170 (0.376)	0.172 (0.378)	0.17 (0.376)	0.002
= 1 if head has secondary education	0.200 (0.400)	0.211 (0.408)	0.185 (0.388)	0.026***
= 1 if head has tertiary education	0.249 (0.432)	0.266 (0.442)	0.229 (0.42)	0.037***
= 1 if head age is 45-60	0.324 (0.468)	0.310 (0.463)	0.343 (0.475)	-0.033***
= 1 if head age is >60	0.217 (0.412)	0.153 (0.36)	0.307 (0.461)	-0.154***
= 1 if household is in urban area	0.426 (0.495)	0.443 (0.497)	0.416 (0.493)	0.027***
Number of observations	9518	5817	3701	9518

Notes: a) Standard deviation are reported in parentheses. b) The t-tests are for the difference between non-remittance receiving and remittance-receiving households. The null hypothesis is H_0: $\alpha_1 = \alpha_2$ and H_1: $\alpha_1 \neq \alpha_2$. c) *** p<0.01, ** p<0.05, * p<0.10. d) Children are defined as the household members below age 15 and elderly defined as household members above 60.

4 Empirical Methodology

We model households' investment decisions as a function of their remittance receipt status and a vector of other explanatory variables. Adams (2011) and many others have noted that empirical analyses of migration and remittances fail to provide needed insights because of various econometric issues. One such issue is endogeneity, which can arise from selection bias and simultaneity. First, sample selection may arise from the fact that migration and remittance transfers are not random events. Remittance-receiving households might differ systematically from non-remittance receiving households in unobservable characteristics, such as migration aspirations, entrepreneurial ambitions, level of altruism, and household-specific norms. As a result, there could be endogeneity arising from selection bias. Next, simultaneity may arise from the reason for sending the remittances. For example, it could be the case that the migrant sends money to take advantage of a business opportunity in the home community. In this case, remittances did not lead to investment expenditures; instead, the migrant's desire to invest lead to the transfer of remittances. Thus, researchers need to address endogeneity issues carefully to attain unbiased estimates.

Since the investment decision and the remittance receipt are binary variables and the latter is likely to be endogenous, we employ a recursive bivariate probit model (Bhattacharya et al.,

2006; Horrace and Oaxaca, 2006; Jena, 2018; Wooldridge, 2002). The recursive bivariate probit model accounts for endogeneity by estimating remittance receipt and investment decisions simultaneously while incorporating the remittance-receipt variable in the investment decision equation. The recursive bivariate probit model we estimate is as follows:

$$R_{i1}^{*} = X_i'\beta_1 + \varepsilon_{i1} \tag{1}$$

$$Y_{i1}^{*} = R_{i1}\delta_1 + Z_i'\beta_2 + \varepsilon_{i2} \tag{2}$$

and

$$E[\varepsilon_{i1}|X,Z] = E[\varepsilon_{i2}|X,Z] = 0$$

$$Var[\varepsilon_{i1}|X,Z] = Var[\varepsilon_{i2}|X,Z] = 1$$

$$Cov[\varepsilon_{i1},\varepsilon_{i2}] = \rho$$

Where R_{i1}^{*} and Y_{i1}^{*} are latent dependent variables that determine the propensity of remittances receipt and the propensity to make an investment expenditure by the household. X_i' and Z_i' are vectors of covariates, and ε_{i1} and ε_{i2} are unobservable error terms and are assumed to be correlated. The correlation between the remittance-receipt equation and investment decision equation is ρ. We let two observable indicator variables to represent the latent variables R_{i1}^{*} and Y_{i1}^{*} such that:

$$R_{i1} = \left\{ \begin{array}{ll} 1 & if \;\; R_{i1}^{*} > 0 \\ 0 & if \;\; R_{i1}^{*} \leq 0 \end{array} \right\} \tag{3}$$

$$Y_{i1} = \left\{ \begin{array}{ll} 1 & if \;\; Y_{i1}^{*} > 0 \\ 0 & if \;\; Y_{i1}^{*} \leq 0 \end{array} \right\} \tag{4}$$

Where R_{i1} indicates the remittance receipt status of the household, and Y_{i1} captures the households' investment decision. This study aims to empirically obtain estimates for the parameter δ_1 in equation 2, the parameter corresponding to the endogenous variable, R_{i1}

Based on equation 3 and 4, the four basic probabilities of bivariate probit model are:

$$Prob[R_{i1} = 1, Y_{i1} = 1] = F[X_i'\beta_1, Z_i'\beta_2 + \delta_1; \rho]$$

$$Prob[R_{i1} = 1, Y_{i1} = 0] = F[X_i'\beta_1, -Z_i'\beta_2 + \delta_1; -\rho]$$

$$Prob[R_{i1} = 0, Y_{i1} = 1] = F[-X_i'\beta_1, Z_i'\beta_2; -\rho]$$

$$Prob[R_{i1} = 0, Y_{i1} = 0] = F[-X_i'\beta_1, -Z_i'\beta_2; \rho]$$

where $F[.]$ indicates the distribution function of the bivariate normal distribution with correlation parameter ρ.

The identification of the recursive bivariate probit model parameters requires at least one variable (i.e., instrumental variable) in the remittance-receipt equation (eq.1) that is excluded from the investment decision equation (eq. 2). The instrumental variable should be correlated with remittance-receipt but uncorrelated with the error term in the investment decision equation. We use the migration network and soil quality in a district as instruments. We use the share of remittance-receiving households in a district[6] (area of reference) as a proxy for migration networks. This instrument is widely used in the migration and remittance literature (Calero et al., 2009; Acosta, 2011; Alcaraz et al., 2012; Coon, 2016). The argument for using migration networks as an instrument is that such networks can reduce the cost of migration by providing access to information and facilitating services at the destination (i.e., assistance with accommodation, employment opportunities). The identifying assumption is that the decision to migrate and send remittances is correlated with migration networks but is not necessarily affected by unobservable factors that affect the household's investment decisions. Households with more extensive migration networks are expected to have lower migration costs, which increases their likelihood of having a migrant member and receiving remittances (Coon, 2016). Using an aggregate measure such as migration networks as an instrument has the advantage of being less vulnerable to issues of reverse causality. This is because migration networks affect the household's decisions, but the individual household is too small to affect the remittance networks in any significant way.

The scarcity of fertile land and land degradation are often cited as causes of migration in sub-Saharan Africa (Laurian et al., 1998; Gray, 2011; Henry et al., 2004). Poor soil quality can lead to migration by undermining the agricultural livelihood of subsistence farming households. Poor soil quality has been found to increase migration in Uganda (Gray, 2011) and Burkina Faso (Henry et al., 2004). We measure soil quality by the soil suitability index data prepared by the Food and Agriculture Organisation (FAO) in the year 2000 (FAO, 2001)[7]. Soil suitability is measured based on nutrient availability, nutrient retention capacity, rooting conditions, oxygen availability to roots, excess salt, and toxicity. Soil suitability index is a qualitative measure to categorise soils into classes based on the plant growth potential– class-1 (80-100 percent of the growth potential), class-2 (60-80 percent growth potential), and class-3 (40-60 percent growth potential). We used the replication data from Jedwab and Moradi (2016) to construct the proportion of soil classes at the district level for each of the five countries. The authors provided the soil class data by grid cells (about

11x11 km of land) that we averaged to aggregate at the district level. Finally, we used the land proportion with the best quality soil in a district as the instrument. Since in our sample, districts in Nigeria and Burkina Faso have almost no soil class-1 land (0.1% and 0% respectively), we used the proportion of land with soil class-2 in a district to measure the soil quality for those countries. We use the proportion of soil class-1 land in a district for Uganda, Kenya, and Senegal. For regional analysis (pooled data), we used the land proportion with soil class-2 in a district.

In Sub-Saharan economies, a large share of the labour force is employed in the agriculture sector– Burkina Faso (52%), Kenya (60%), Nigeria (41%), Uganda (74%), and Senegal (41%)[8]. A lower proportion of good quality soil indicates lower agricultural livelihood activities and higher economic vulnerability (i.e., higher unemployment and lower income). As a result, it is expected that districts with a lower share of good quality soil have higher migration and remittances receipts. At the same time, we do not expect the historical share of soil classes from the year 2000 to affect households' current (in 2009) investment expenditure decisions.

We check the appropriateness of our instrument using the "rule-of-thumb" introduced by (Staiger and Stock, 1997), which states that an instrument is valid if it has an F-statistic of 10 or higher in the first stage. Our instruments are appropriate across all countries in our sample since the F-statistics are all greater than 10 (see table A4 in the Appendix). We check for over-identifying restrictions on our instruments using the Hansen's J statistic. The joint null hypothesis states that the instruments are valid. Rejecting the null hypothesis implies that at least one of the instruments is not valid. In our case, we cannot reject the null hypothesis for any of the countries because the p-values are higher than the traditional significance levels.

5 Main Results

Panel-A of Table 3 reports the pooled regression results, while panel B–F present the country-specific analyses. The results show that remittances have a positive and statistically significant effect on human capital investment in the pooled and individual country analysis. This implies that remittance-receiving households in sub-Saharan Africa are significantly more likely to invest in human capital compared to non-remittance receiving households. This result is consistent with the literature (Acharya and Leon-Gonzalez, 2014; Alcaraz et al., 2012; Amuedo-Dorantes and Pozo, 2010).

Unlike human capital, we find that physical capital investment behaviour varies across the countries. Remittances have no statistically significant effect on physical capital investment in SSA (pooled), Uganda, and Senegal. However, remittances have a positive and significant effect on physical capital investment in Kenya and Nigeria but a negative and significant effect in Burkina Faso. The positive effect found in Kenya and Nigeria complement findings in the literature i.e. Jena (2018) in Kenya, and Osili (2004) and Ajefu (2018) in Nigeria.

Table 3: Bivariate Probit Model Estimation

Variables	Human capital	Physical capital	Social capital
Panel-A: Pooled			
= 1 if household received remittances	1.193***	0.046	1.020***
	(0.116)	(0.264)	(0.183)
Mean of the outcome variable	0.933	0.120	0.468
Observations		9112	
Panel-B: Uganda			
= 1 if household received remittances	1.010*	0.032	1.285***
	(0.550)	(0.516)	(0.233)
Mean of the outcome variable	0.933	0.120	0.468
Observations		1800	
Panel-C: Kenya			
= 1 if household received remittances	1.397***	1.121***	1.421***
	(0.128)	(0.335)	(0.060)
Mean of the outcome variable	0.821	0.141	0.424
Observations		1821	
Panel-D: Nigeria			
= 1 if household received remittances	0.919**	0.806**	0.065
	(0.380)	(0.361)	(0.503)
Mean of the outcome variable	0.914	0.188	0.382
Observations		1671	
Panel-E: Burkina Faso			
= 1 if household received remittances	1.017***	-1.235***	1.374***
	(0.364)	(0.213)	(0.054)
Mean of the outcome variable	0.944	0.233	0.656
Observations		1895	
Panel-F: Senegal			
= 1 if household received remittances	1.413***	-0.523	-0.806
	(0.241)	(0.369)	(0.543)
Mean of the outcome variable	0.924	0.095	0.743
Observations		1925	

Note: a) ***p<0.01, **p<0.05, * p<0.10. b) Standard errors are clustered at the village level. c) Country fixed effects are included for the pooled analysis in panel-A. d) Each coefficient is from a separate regression. e) Controls included are the variables in Table 2.

In the pooled analysis, we find that remittances have a positive and significant effect on social capital investment. We find the same positive and significant effect in Uganda, Kenya, and Burkina Faso. This finding is consistent with Fransen (2015) in Burundi and Gerber and Torosyan (2013) in the republic of Georgia. However, we find no significant effect in Nigeria and Senegal. Likely, households in high economic vulnerability regions with inadequate formal insurance mechanisms invest more in social capital as they mostly rely on social networks to insure against shocks. On the contrary, Rao (2001) suggests that

households may invest in social capital to generate tangible returns, such as paying lower prices for items in the local market place and higher social status.

Based on these findings, we can argue that remittances-receiving households in sub-Saharan Africa do not only generate tangible returns from human capital investments but also derive tangible returns from their social networks. These households are likely to be better insured against future shocks and to enjoy higher social status. Also, remittances increase the likelihood of physical capital investment in some regions of SSA.

Robustness checks– We tested the robustness of our results using an alternative estimation technique and different specifications of our model. In Appendix Table A8, we present the estimation results for the 2SLS model and, the results are similar to those of the bivariate probit model (see Table 3). The only noteworthy difference is that the 2SLS estimation shows that remittances have a statistically significant negative effect on physical and social capital investment in Senegal, which were not statistically significant in bivariate probit estimation.

We also used the total amount of cash remittances received by households rather than a dummy indicating remittance receipt status as an alternative specification. This allowed us to address the issue that the indicator variable 'remittance receipt status' might be picking up the effect of unobservable differences between remittance-receiving and non-remittance-receiving households instead of the effect of remittances. The results for this exercise are presented in Appendix Table A9. Estimation results show that the amount of remittances have a significant positive effect on investment decisions, which suggests that our baseline model presents the true effect of remittances rather than any unobserved household differences arising from remittances receipt status.

To control for the potential selection bias arising from the migration decision, we estimated the effect of remittances conditional on migration. This is essentially restricting the remittance receipt status to households with a migrant member, and we find that remittances significantly affect investment decisions (see Appendix Table A6). This suggests that selection bias from migration decision is not a concern here.

5.1 Heterogeneity

Thus far, we explore the effect of remittance receipt on investment decisions. However, studies (Adams and Cuecuecha, 2010; Adams and Cuecuecha, 2013; Wouterse and Taylor, 2008) show that remittance sources can have differential effects on households' investment behaviour. Table 4 shows the heterogeneous effects of remittance sources– internal (domestic), within-Africa, and out-of-Africa– on investments. Panel-A (pooled analysis for SSA) shows that internal remittances increase the probability of human capital and social capital investment for receiving households. Although internal remittances (column 1-3) resemble our main results in Table 3, within-Africa remittances (column 4-6) increase the probability

of only social capital investment and out-of-Africa remittances (column 7-9) increase the probability of only human capital investment. There is no statistically significant effect of out-of-Africa remittances on social capital investment in SSA, suggesting that the reliance on out-of-Africa remittances reduces motivations to invest in social capital, as argued by Caarls et al. (2013).

We present country-specific analysis in Panel B-F. In Uganda, internal remittances increase the probability of social capital investment by receiving households. However, even though within-Africa remittances increase the probability of human capital investment, Out-of-Africa remittances reduce the probability of human capital investment. The negative effect of Out-of-Africa remittances on human capital investment could be due to migration expectations from the left behind household members. Lopez-Cordova et al. (2005) and Mckenzie and Rapoport (2011) find similar results. This finding implies that out-of-Africa remittances create a disincentive for human capital investment.

Table 4: Bivariate Probit Model Estimation by Source of Remittances

	Internal remittances			With-Africa remittances			Out-of-Africa remittances		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	Human capital	Physical capital	Social capital	Human capital	Physical capital	Social capital	Human capital	Physical capital	Social capital
Panel-A: Pooled									
= 1 if received remittances	1.143***	0.240	1.042***	0.267	-0.589	0.598*	1.412***	0.137	-0.007
	(0.139)	(0.352)	(0.175)	(0.580)	(0.438)	(0.310)	(0.104)	(0.240)	(0.374)
Mean of the outcome variable	0.90	0.147	0.526	0.898	0.141	0.526	0.898	0.136	0.520
Observations		7092			6262			6428	
Panel-B: Uganda									
= 1 if received remittances	0.584	-0.018	1.312***	1.843***	-0.714	0.793	-2.827***	0.786	1.008
	(0.760)	(0.539)	(0.211)	(0.357)	(0.753)	(1.679)	(0.184)	(1.031)	(1.096)
Mean of the outcome variable	0.932	0.116	0.461	0.931	0.112	0.461	0.930	0.115	0.461
Observations		1662			1513			1524	
Panel-C: Kenya									
= 1 if received remittances	1.273***	1.543***	1.494***	1.696***	0.645	1.153**	1.559***	1.067***	1.351***
	(0.227)	(0.340)	(0.098)	(0.253)	(0.770)	(0.545)	(0.116)	(0.378)	(0.164)
Mean of the outcome variable	0.796	0.137	0.409	0.795	0.112	0.393	0.801	0.114	0.381
Observations		1363			1114			1259	
Panel-D: Nigeria									
= 1 if received remittances	1.113**	1.206***	0.128	1.944***	1.580	1.287	1.555***	0.408	0.765
	(0.490)	(0.388)	(0.568)	(0.239)	(1.332)	(1.036)	(0.145)	(0.615)	(0.653)
Mean of the outcome variable	0.912	0.166	0.390	0.899	0.148	0.355	0.904	0.155	0.359
Observations		1339			1017			1119	
Panel-E: Burkina Faso									
= 1 if received remittances	1.350***	-1.252***	1.439***	1.212***	-1.445***	1.426***	1.125	-	2.474***
	(0.260)	(0.238)	(0.067)	(0.216)	(0.060)	(0.060)	(0.805)	-	(0.253)
Mean of the outcome variable	0.943	0.228	0.642	0.936	0.226	0.640	0.939	-	0.643
Observations		1445			1458			1142	
Panel-F: Senegal									
= 1 if received remittances	0.880	-0.861**	-1.169***	0.965	-0.635*	-0.461	1.625***	-0.907	-0.291
	(0.663)	(0.370)	(0.352)	(0.754)	(0.363)	(0.496)	(0.158)	(0.561)	(0.918)
Mean of the outcome variable	0.907	0.086	0.746	0.913	0.091	0.747	0.913	0.091	0.742
Observations		1283			1160			1384	

Note: a) ***p<0.01, **p<0.05, * p<0.10. b) Standard errors are clustered at the village level. c) Country fixed effects are included for the overall analysis in Panel-A. d) Each coefficient is from a separate regression. e) Controls included are the variables in Table 2.

For Kenya, there is not much variation in investment behaviour by remittance source. Most remittance sources have a positive and significant effect on investment decisions. For Nigeria, only physical capital investment behaviour varies across remittance sources. Although Table 3 shows that remittance-receiving households in Nigeria are more likely to invest in physical capital, Table 4 suggests that this effect is driven by internal remittances. In Burkina Faso, there is not much heterogeneity in investment behaviour across remittance sources. However, the earlier negative effect of remittances on physical capital investment persists across sources[9]. For Senegal, the results show marked variation in investment behaviour by remittances sources. Internal remittances reduce the probability of investment in physical capital and social capital. Besides, within-Africa remittances reduce the probability of physical capital investment. It is only households that received out-of-Africa remittances that have a higher probability of investing in human capital. Based on our findings in Table 4, we can argue that ignoring remittance sources masks important variation in investment behaviour.

Most studies ignored internal remittances and estimated the effect of international remittances– combining within-Africa and out-of-Africa remittance receipts. We explored how

much variation in investment behaviour is masked by using a broad definition of remittances (i.e. international remittances) and the result of this exercise is presented in Appendix Table A7. In comparison to Table 3, the receipt of the international remittances paints a similar picture. It is only in Uganda and Nigeria, where about 25% of total remittances are from internal sources, that we see some variation in physical and social capital investment. However, compared to Table 4, we observe that combining within-Africa and Out-of-Africa into one source of remittances (i.e., international remittances) hides important variation in investment behaviour. The effects of international remittances on investment decisions are dominated mostly by the larger estimates of the two sources–within-Africa or out-of-Africa remittances–whichever has the bigger coefficient determines the net effect.

6 Conclusion

Remittances can stimulate investment in income-generating activities by relaxing liquidity constraints in receiving households. However, remittance dependence and other unintended consequences can reduce receiving households' investment in income-generating activities. In the context of SSA, we study whether the remittance-receiving households make any investment expenditures, and if they do, what kind of investments do they make. Using microdata from five SSA countries, our pooled results show that remittance leads to investment in human and social capital, but not in physical capital. However, country-specific analysis shows that remittances lead to physical capital investment in Kenya and Nigeria. Conversely, remittances reduce physical capital investment in Burkina Faso.

Our study has important policy implications for SSA's economic development. First, we provide further evidence that remittances can contribute to economic development through productive investments. Given that migrants send about 15 percent of their total income as remittances, there is great potential to harness remittances by devising policies to reduce remittances transfer costs. It also coincides with the Sustainable Development Goal (SDG) 10.7.C (United Nations, 2015), which aims to reduce the cost of sending remittances to less than 3% by 2030 from the current 9% to SSA (World Bank, 2018). Second, we show that remittance investment behaviour varies across investment types. Our study highlights the importance of social capital investment which suggests that researcher and policymakers should devote more attention to this investment type. Furthermore, investing in social capital to insure against shocks crowds out funds for human and physical capital investments. Thus, policymakers seeking to boost human and physical capital investments should also focus on social capital investment behaviour. In other words, public policies should be aimed at improving formal insurance mechanisms to reduce households' reliance on social networks. Finally, our study is also relevant for domestic and international organisations designing business models and financial instruments to maximise the impact of remittances to foster local economic opportunities.

Although highly complementary to the existing literature, our findings must be evaluated against the fact that our analysis is not free from limitations. We attempt to provide an overall view of Sub-Saharan Africa using only data from five countries, which makes our estimates relatively less precise. Besides, we use cross-sectional data, which makes us unable to follow the same household over time. Given that remittances are recorded for the previous 12 months and investment expenditures are recorded for the previous six months before the survey, we focus on the sign of the coefficients rather than the magnitude. Considering the rising importance of remittances, a multi-country longitudinal study is required to generate more precise and deeper knowledge for policy action.

Notes

[1] We could not study financial capital investment due to data limitations.

[2]Given that remittances are recorded for the previous 12 months, the occurrence of investment expenditure in the dependent variable are understated.

[3]We find a similar definition in Jena (2018) for her study on remittances and physical investments in Kenya

[4]Hines and Simpson (2018) defined human capital investment as households' expenditure on education and Berloffa and Giunti (2019) defined human capital investment as households' expenditure on health.

[5]Rao (2001) used the same definition for social capital.

[6]We used districts to refer to third-tier administrative units within a country. "District" refers to a district in Uganda and Kenya, local government in Nigeria, and department in Burkina Faso and Senegal.

[7]FAO (2001) Permanent Crop and Arable Land of Sub-Saharan Africa. Rome: Food and Agricultural Organisation.

[8]World Bank data. Employment in agriculture (% of total employment)

[9]We could not obtain a probit estimate that converges for out-of-Africa remittances receiving households investing in physical capital due to a small sample size.

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Do Remittances Influence Household Investment Decisions? Evidence from Sub-Saharan Africa

Appendix

Md Shahadath Hossain Adesola Sunmoni

Corresponding author: a.o.sunmoni@pgr.reading.ac.uk: Department of Economics, University of Reading, UK.

Appendix A. Additional Tables

Table A1: Summary Statistics of Explanatory Variables

Variables	Uganda				Kenya			
	Full Sample	No remittances	Remittances	χ^2	Full Sample	No remittances	Remittances	χ^2
= 1 Household head is female	0.302 (0.459)	0.278 (0.448)	0.394 (0.489)	15.94***	0.312 (0.463)	0.222 (0.416)	0.424 (0.494)	83.18***
Log household income per capita	7.330 (1.180)	7.276 (1.19)	7.575 (1.096)	19.95***	4.808 (1.300)	4.754 (1.385)	4.879 (1.183)	4.49**
Household size	4.89 (2.770)	4.748 (2.705)	5.431 (2.931)	15.51***	4.218 (2.303)	4.142 (2.34)	4.286 (2.214)	1.87
Number of children in household	2.168 (1.964)	2.12 (1.939)	2.356 (2.037)	3.84*	1.448 (1.578)	1.462 (1.612)	1.429 (1.538)	0.2
Number of elderly in household	0.203 (0.474)	0.171 (0.434)	0.322 (0.583)	20.25***	0.451 (0.701)	0.346 (0.637)	0.584 (0.748)	50.66
Number of male member in labor force	1.314 (1.150)	1.284 (1.052)	1.428 (1.495)	2.91*	1.191 (1.030)	1.23 (0.928)	1.135 (1.124)	3.73*
= 1 if head is employed	0.239 (0.427)	0.238 (0.426)	0.256 (0.437)	0.53	0.334 (0.472)	0.408 (0.492)	0.239 (0.427)	60.69***
= 1 if head is self-employed	0.632 (0.482)	0.653 (0.476)	0.539 (0.499)	14.69***	0.381 (0.486)	0.383 (0.486)	0.381 (0.486)	0.01
= 1 if head has primary education	0.164 (0.371)	0.168 (0.374)	0.14 (0.347)	1.82	0.307 (0.461)	0.306 (0.461)	0.308 (0.462)	0.01
= 1 if head has secondary education	0.326 (0.469)	0.328 (0.47)	0.32 (0.467)	0.08	0.28 (0.449)	0.295 (0.456)	0.261 (0.44)	2.5
= 1 if head has tertiary education	0.366 (0.482)	0.353 (0.478)	0.43 (0.496)	6.78***	0.258 (0.437)	0.261 (0.439)	0.251 (0.434)	0.22
= 1 if head age is 45-60	0.248 (0.432)	0.227 (0.419)	0.336 (0.473)	15.56***	0.3 (0.459)	0.301 (0.459)	0.286 (0.452)	0.54
= 1 if head age is >60	0.125 (0.331)	0.107 (0.31)	0.19 (0.393)	13.13***	0.222 (0.416)	0.15 (0.357)	0.315 (0.465)	67.22***
= 1 if household is in urban area	0.457 (0.498)	0.449 (0.498)	0.497 (0.501)	2.61	0.489 (0.500)	0.543 (0.498)	0.423 (0.494)	26.76***
Number of observations	1813	1469	344		1830	1038	792	

Note: a) Standard deviations are reported in parentheses. b) The χ^2 (Chi2) tests are for the difference between remittance-receiving and non-remittance receiving households. The null hypothesis is H_0:α_1=α_2 and H_1:$\alpha_1 \neq \alpha_2$. c) ***p<0.01, **p<0.05, * p<0.10.

Table A2: Summary Statistics of Explanatory Variables

Variables	Nigeria				Burkina Faso			
	Full Sample	No remittances	Remittances	χ^2	Full Sample	No remittances	Remittances	χ^2
= 1 Household head is female	0.119 (0.324)	0.075 (0.264)	0.174 (0.38)	43.00***	0.302 (0.459)	0.278 (0.448)	0.394 (0.489)	9.46***
Log household income per capita	5.647 (0.954)	5.557 (0.946)	5.79 (0.946)	31.23***	7.330 (1.180)	7.276 (1.19)	7.575 (1.096)	0.82
Household size	5.953 (3.289)	5.996 (3.381)	5.961 (3.185)	0.06	4.89 (2.770)	4.748 (2.705)	5.431 (2.931)	21.74***
Number of children in household	2.286 (2.298)	2.462 (2.399)	2.049 (2.158)	16.81***	2.168 (1.964)	2.12 (1.939)	2.356 (2.037)	13.91***
Number of elderly in household	0.402 (0.739)	0.299 (0.716)	0.535 (0.756)	50.80***	0.203 (0.474)	0.171 (0.434)	0.322 (0.583)	47.73***
Number of male member in labor force	1.886 (1.397)	1.815 (1.311)	2.025 (1.51)	10.93***	1.314 (1.150)	1.284 (1.052)	1.428 (1.495)	6.97***
= 1 if head is employed	0.261 (0.439)	0.299 (0.458)	0.213 (0.41)	19.69***	0.239 (0.427)	0.238 (0.426)	0.256 (0.437)	2.55
= 1 if head is self-employed	0.608 (0.488)	0.624 (0.485)	0.576 (0.494)	4.62**	0.632 (0.482)	0.653 (0.476)	0.539 (0.499)	5.37**
= 1 if head has primary education	0.028 (0.165)	0.03 (0.172)	0.02 (0.139)	2.49	0.164 (0.371)	0.168 (0.374)	0.14 (0.347)	0.41
= 1 if head has secondary education	0.224 (0.417)	0.213 (0.41)	0.236 (0.425)	1.53	0.326 (0.469)	0.328 (0.47)	0.32 (0.467)	0.07
= 1 if head has tertiary education	0.527 (0.499)	0.54 (0.499)	0.516 (0.5)	1.16	0.366 (0.482)	0.353 (0.478)	0.43 (0.496)	1.51
= 1 if head age is 45-60	0.388 (0.487)	0.365 (0.482)	0.43 (0.495)	8.64***	0.248 (0.432)	0.227 (0.419)	0.336 (0.473)	2.12
= 1 if head age is >60	0.195 (0.396)	0.116 (0.321)	0.294 (0.456)	93.48***	0.125 (0.331)	0.107 (0.31)	0.19 (0.393)	61.66***
= 1 if household is in urban area	0.483 (0.500)	0.513 (0.5)	0.449 (0.498)	8.68***	0.457 (0.498)	0.449 (0.498)	0.497 (0.501)	0.53
Number of observations	2046	1201	845		1898	1132	766	

Note: a) Standard deviations are reported in parentheses. b) The χ^2 (Chi2) tests are for the difference between remittance-receiving and non-remittance receiving households. The null hypothesis is H_0:α_1=α_2 and H_1:$\alpha_1 \neq \alpha_2$. c) ***p<0.01, **p<0.05, * p<0.10.

Table A3: Summary Statistics of Explanatory Variables

Variables	Senegal			
	Full Sample	No remittances	Remittances	χ^2
= 1 Household head is female	0.312 (0.463)	0.222 (0.416)	0.424 (0.494)	129.40***
Log household income per capita	4.808 (1.300)	4.754 (1.385)	4.879 (1.183)	0
Household size	4.218 (2.303)	4.142 (2.34)	4.286 (2.214)	54.06***
Number of children in household	1.448 (1.578)	1.462 (1.612)	1.429 (1.538)	42.97***
Number of elderly in household	0.451 (0.701)	0.346 (0.637)	0.584 (0.748)	29.26***
Number of male member in labor force	1.191 (1.030)	1.23 (0.928)	1.135 (1.124)	1.77
= 1 if head is employed	0.334 (0.472)	0.408 (0.492)	0.239 (0.427)	37.84***
= 1 if head is self-employed	0.381 (0.486)	0.383 (0.486)	0.381 (0.486)	5.33**
= 1 if head has primary education	0.307 (0.461)	0.306 (0.461)	0.308 (0.462)	1.97
= 1 if head has secondary education	0.28 (0.449)	0.295 (0.456)	0.261 (0.44)	0.01
= 1 if head has tertiary education	0.258 (0.437)	0.261 (0.439)	0.251 (0.434)	16.84***
= 1 if head age is 45-60	0.3 (0.459)	0.301 (0.459)	0.286 (0.452)	8.45***
= 1 if head age is >60	0.222 (0.416)	0.15 (0.357)	0.315 (0.465)	14.91***
= 1 if household is in urban area	0.489 (0.500)	0.543 (0.498)	0.423 (0.494)	5.98**
Number of observations	1928	977	951	

Note: a) Standard deviations are reported in parentheses. b) The χ^2 (Chi2) tests are for the difference between remittance-receiving and non-remittance receiving households. The null hypothesis is H_0:α_1=α_2 and H_1:$\alpha_1 \neq \alpha_2$. c) ***p<0.01, **p<0.05, * p<0.10.

Table A4: Testing the Exogeneity of the Remittances Binary Variable

Tests	Overall	Uganda	Kenya	Nigeria	Burkina Faso	Senegal
F-statistics (test of excluded instrument)	419.82***	53.88***	24.05***	103.42***	31.80***	28.21***
SW Chi-sq statistics (underidentification test)	841.12***	108.73***	48.53***	208.84***	64.13***	56.90***
SW F-statistics (weak identification test)	419.82***	53.88***	24.05***	103.42***	31.80***	28.21***
Anderson canon. LM statistic (underidentification test)	770.06***	102.54***	47.27***	185.64***	62.03***	55.27***
Cragg-Donald Wald F statistic (weak identification test)	419.82***	53.88***	24.05***	103.42***	31.80***	28.21***
Hansen's J statistic (overidentification test of all instruments)	0.131	2.439	0.567	2.256	2.366	0.114
Wu-Hausman test statistics (test of endogeneity)	24.66***	5.09**	20.61***	7.28***	8.61***	5.13**
Durbin-Wu-Hausman chi-sq test statistics (test of endogeneity)	24.64***	5.12**	20.56***	7.32***	8.65***	5.16**
Bivariate probit likelihood-ratio test statistics	42.22***	10.56***	60.99***	3.06*	44.95***	10.86***

Note: a) ***p<0.01, **p<0.05, * p<0.10.

Table A5: First Stage Regression

VARIABLES	Overall	Uganda	Kenya	Nigeria	Burkina Faso	Senegal
= 1 if Household head is female	0.186***	0.100***	0.227***	0.154***	0.159***	0.249***
	(0.012)	(0.021)	(0.026)	(0.036)	(0.046)	(0.026)
Log household income per capita	0.020***	0.054***	0.064***	0.056***	-0.015	0.056***
	(0.004)	(0.010)	(0.011)	(0.014)	(0.016)	(0.015)
Household size	0.012***	0.012	0.027**	0.003	-0.014	0.037***
	(0.004)	(0.010)	(0.012)	(0.008)	(0.009)	(0.007)
Number of children in household	0.001	0.010	-0.018	0.008	0.035***	-0.020**
	(0.005)	(0.011)	(0.015)	(0.010)	(0.011)	(0.009)
Number of elderly in household	0.035***	0.094***	0.024	0.004	0.047**	0.028
	(0.010)	(0.032)	(0.025)	(0.023)	(0.020)	(0.021)
Number of male member in labor force	-0.010*	0.004	-0.007	0.012	0.019	-0.047***
	(0.006)	(0.014)	(0.017)	(0.013)	(0.013)	(0.010)
= 1 if head is employed	-0.125***	-0.069**	-0.141**	-0.217***	-0.205**	-0.122***
	(0.017)	(0.033)	(0.032)	(0.040)	(0.086)	(0.038)
= 1 if head is self-employed	-0.096***	-0.093***	-0.090***	-0.157***	-0.076	-0.061**
	(0.014)	(0.028)	(0.028)	(0.035)	(0.055)	(0.027)
= 1 if head has secondary education	0.045***	0.041*	0.017	0.025	0.095	0.060*
	(0.013)	(0.023)	(0.027)	(0.032)	(0.066)	(0.033)
= 1 if head has tertiary education	0.099***	0.084***	0.023	0.035	0.190	-0.015
	(0.014)	(0.027)	(0.032)	(0.031)	(0.133)	(0.046)
= 1 if head age is 45-60	0.062***	0.083***	0.017	0.097***	0.096***	-0.033
	(0.011)	(0.023)	(0.027)	(0.026)	(0.026)	(0.026)
= 1 if head age is >60	0.108***	0.048	0.105**	0.164***	0.210***	-0.020
	(0.018)	(0.048)	(0.044)	(0.044)	(0.037)	(0.036)
= 1 if household is in urban area	-0.037***	-0.007	-0.065***	-0.020	-0.021	-0.065**
	(0.011)	(0.022)	(0.025)	(0.025)	(0.053)	(0.026)
Migration Network	0.893***	0.883***	0.861***	0.830***	0.938***	0.763***
	(0.031)	(0.089)	(0.127)	(0.058)	(0.129)	(0.112)
Soil class	0.064**	-0.080**	0.047	0.088**	0.047	0.015
	(0.025)	(0.035)	(0.043)	(0.043)	(0.080)	(0.036)
Constant	-0.212***	-0.080**	-0.366***	-0.296***	-0.062	-0.408***
	(0.034)	(0.035)	(0.096)	(0.095)	(0.029)	(0.120)
Observations	9,115	1,800	1,821	1,671	1,895	1,928
SW F-statistics	419.82	53.88	24.05	103.42	31.8	28.21
Hansen's J statistic	0.131	2.439	0.567	2.256	2.366	0.114

Note: a) ***p<0.01, **p<0.05, * p<0.10. b) Standard errors are clustered at the village level. c) The Sanderson-Windmeijer (SW) F statistics is a test of weak identification with a null hypothesis that the endogenous regressor is weakly identified. d) The Hansen's J statistic is the test statistics from Sargan Hansen test of overidentifying restrictions. The joint null hypothesis is that the instruments are the valid instruments.

Table A6: Bivariate Probit Model Estimation for Households with Migrants Only

Variables	Human capital	Physical capital	Social capital
Panel-A: Pooled			
= 1 if household received remittances	0.992***	0.198	1.172***
	(0.151)	(0.292)	(0.112)
Mean of the outcome variable	0.922	0.169	0.543
Observations		5348	
Panel-B: Uganda			
= 1 if household received remittances	0.422	0.349	1.281***
	(0.695)	(0.585)	(0.190)
Mean of the outcome variable	0.952	0.131	0.506
Observations		795	
Panel-C: Kenya			
= 1 if household received remittances	1.173***	0.909	1.406***
	(0.230)	(1.181)	(0.060)
Mean of the outcome variable	0.835	0.152	0.444
Observations		1158	
Panel-D: Nigeria			
= 1 if household received remittances	0.717	0.879***	0.548
	(0.496)	(0.320)	(0.489)
Mean of the outcome variable	0.929	0.196	0.364
Observations		1054	
Panel-E: Burkina Faso			
= 1 if household received remittances	0.727	-0.999***	1.313***
	(0.461)	(0.356)	(0.099)
Mean of the outcome variable	0.957	0.235	0.664
Observations		1042	
Panel-F: Senegal			
= 1 if household received remittances	1.080**	-0.552	-1.082**
	(0.532)	(0.474)	(0.469)
Mean of the outcome variable	0.942	0.107	0.745
Observations		1199	

Note: a) ***p<0.01, **p<0.05, * p<0.10. b) Standard errors are clustered at the village level. c) Country fixed effects are included for the pooled analysis in Panel-A. d) Each coefficient is from a separate regression. e) Controls included are the variables in Table 2.

Table A7: Bivariate Probit Model Estimation for Households with External Remittances

Variables	Human capital	Physical capital	Social capital
Panel-A: Pooled			
= 1 if household received remittances	1.380***	-0.197	0.702**
	(0.088)	(0.371)	(0.277)
Mean of the outcome variable	0.901	0.143	0.520
Observations		7111	
Panel-B: Uganda			
= 1 if household received remittances	1.367***	-0.110	0.879
	(0.419)	(0.982)	(0.834)
Mean of the outcome variable	0.930	0.115	0.466
Observations		1580	
Panel-C: Kenya			
= 1 if household received remittances	1.572***	0.937**	1.271***
	(0.102)	(0.381)	(0.153)
Mean of the outcome variable	0.808	0.114	0.385
Observations		1341	
Panel-D: Nigeria			
= 1 if household received remittances	1.547***	0.660	0.962*
	(0.151)	(0.560)	(0.508)
Mean of the outcome variable	0.902	0.167	0.341
Observations		1152	
Panel-E: Burkina Faso			
= 1 if household received remittances	1.197***	-1.445***	1.428***
	(0.227)	(0.060)	(0.060)
Mean of the outcome variable	0.936	0.227	0.642
Observations		1469	
Panel-F: Senegal			
= 1 if household received remittances	1.616***	-0.506	-0.203
	(0.172)	(0.531)	(1.002)
Mean of the outcome variable	0.919	0.096	0.744
Observations		1569	

Note: a) ***p<0.01, **p<0.05, * p<0.10. b) Standard errors are clustered at the village level. c) Country fixed effects are included for the pooled analysis in Panel-A. d) External remittances refers to both within Africa and out-of-Africa remittances. e) Each coefficient is from a separate regression. f) Controls included are the variables in Table 2.

Table A8: 2SLS Estimation

Variables	Human capital	Physical capital	Social capital
Panel-A: Pooled			
= 1 if household received remittances	0.235***	-0.006	0.437***
	(0.030)	(0.035)	(0.051)
Observations		9115	
Panel-B: Uganda			
= 1 if household received remittances	0.145**	-0.016	0.906***
	(0.065)	(0.083)	(0.152)
Observations		1800	
Panel-C: Kenya			
= 1 if household received remittances	0.528***	0.294***	1.676***
	(0.134)	(0.111)	(0.284)
Observations		1821	
Panel-D: Nigeria			
= 1 if household received remittances	0.149***	0.185***	-0.027
	(0.043)	(0.060)	(0.075)
Observations		1671	
Panel-E: Burkina Faso			
= 1 if household received remittances	0.180***	-0.528***	1.116***
	(0.066)	(0.130)	(0.187)
Observations		1895	
Panel-F: Senegal			
= 1 if household received remittances	0.204**	-0.195**	-0.353***
	(0.079)	(0.089)	(0.132)
Observations		1928	

Note: a) ***p<0.01, **p<0.05, * p<0.10. b) Standard errors are clustered at the village level. c) Country fixed effects are included for the overall analysis in Panel-A. d) Each coefficient is from a separate regression. e) Controls included are the variables in Table 2.

Table A9: Probit Model Estimation

Variables	Human capital	Physical capital	Social capital
Panel-A: Pooled			
Total amount of cash remittances	0.00026***	0.00007	0.00026***
	(0.000)	(0.000)	(0.000)
Observations		9501	
Panel-B: Uganda			
Total amount of cash remittances	0.00097***	0.00096***	0.00099***
	(0.000)	(0.000)	(0.000)
Observations		1836	
Panel-C: Kenya			
Total amount of cash remittances	-0.00014***	-0.00014***	-0.00014***
	(0.000)	(0.000)	(0.000)
Observations		1871	
Panel-D: Nigeria			
Total amount of cash remittances	0.00022***	0.00017***	-0.00002
	(0.000)	(0.000)	(0.000)
Observations		1759	
Panel-E: Burkina Faso			
Total amount of cash remittances	0.00399***	-0.00362***	0.00368***
	(0.000)	(0.000)	(0.000)
Observations		2064	
Panel-F: Senegal			
Total amount of cash remittances	0.00040***	-0.00034***	-0.00041***
	(0.000)	(0.000)	(0.000)
Observations		1953	

Note: a) ***p<0.01, **p<0.05, * p<0.10. b) Standard errors are clustered at the village level. c) Country fixed effects is included for the pooled analysis in Panel-A. d) Each coefficient is from a separate regression. e) Controls included are the variables in Table 2. f) The remittance amount is converted to USD using the average exchange rate in each country for year 2009. g) The coefficients are small because they represent a dollar change.

Appendix B. Additional Notes on Methodology

The recursive bivariate probit model is a specific case of a bivariate probit model that allows the error terms to be correlated and allows the binary endogenous variable to appear on the right-hand side of the second equation (Greene, 2002; Maddala, 1983; Wooldridge, 2002). Recursive bivariate probit system works either using full information or using limited information. In the full information bivariate probit system, the structural model is recursive and fully articulated (omitting no variables). The structural model leads to a set of recursive equations that form the basis for maximum likelihood estimation. On the other hand, in a limited information bivariate probit system, only the final stages are fully specified (i.e., earlier stages omit variables).

The seemingly unrelated full information maximum likelihood framework can consistently and efficiently estimate the recursive bivariate probit model by simply adding the observed endogenous variable into the vector of predetermined variables (Maddala and Lee, 1976; Roodman, 2011; Wooldridge, 2002). By treating one endogenous variable as a predetermined regressor, seemingly unrelated likelihood estimation leads to consistent estimates in both limited and full information maximum likelihood framework. However, it is efficient only in the latter case. The recursive nature and full observability conditions for consistency of seemingly unrelated maximum likelihood are less strict than they appear at first (Heckman, 1978; Maddala and Lee, 1976). Recursive bivariate probit often requires less assumption compared to the classical linear model (two-stage least square). Rank condition and order condition (i.e., in each equation, for every endogenous variable included at least one exogenous variable must be excluded) must satisfy for the classical system to be identified (Roodman, 2011). Such rules become less necessary for the recursive bivariate probit model, and it is identified as long as each equation has one varying predetermined variable (Wilde, 2000).