NÚMERO 452

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Remittances, Consumption and Investment in Ghana

DICIEMBRE 2008

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Abstract

This paper uses a new, 2005/06 nationally-representative household survey from Ghana to analyze how the receipt of internal remittances (from Ghana) and international remittances (from African or other countries) affects the marginal spending behavior of households on various consumption and investment goods. Two findings emerge. First, controlling for selection and endogeneity, it finds that that households receiving international remittances spend less at the margin on one key consumption good –food– compared to what they would have spent without remittances. Second, it finds that households receiving internal or international remittances spend more at the margin on one important investment good –education– compared to what they would have spent without remittances. These findings are important because they support the growing view that remittances can help increase the level of investment in human capital.

Keywords: Remittances, consumption, investment, Ghana, Sub-Saharan Africa.

Resumen

Este artículo usa el suplemento en Migración y Remesas de la encuesta nacional de hogares de Ghana 2005-06 para analizar cómo la recepción de remesas internas (es decir, del mismo Ghana) y externas (de otros países africanos y otros países) modifican el comportamiento de gasto marginal de los hogares en bienes de consumo y de inversión. Dos resultados principales emergen: primero, controlando por selección y endogeneidad, se encuentra que los hogares que reciben remesas externas gastan menos en el margen en comida de lo que ellos gastarían si no recibieran remesas externas. Segundo, se encuentra que tanto los hogares que reciben remesas internas como los que reciben remesas externas gastan más en un bien de inversión muy importante, la educación, comparado a lo que ellos gastarían si no recibieran las remesas. Estos resultados soportan la literatura que ha encontrado recientemente que las remesas ayudan a incrementar los niveles de capital humano.

Introduction

In 2006 migrants working outside of their countries of origin sent home an estimated $221 billion in officially recorded international remittances to households in Africa, Asia, the Middle East and Latin America (World Bank, 2008).[1] From the standpoint of economic development, the key question regarding these large transfers is quite simple and direct: How are international remittances spent or used? Are these monies spent on newly desired consumer goods back home, or are they channeled into human and physical investments in origin countries?

In the literature there are at least three views on how remittances are spent and the impact of these monies on economic development. The first, and probably most widespread, view is that remittances are fungible and are spent at the margin like income from any other source. In other words, a dollar of remittance income is treated by the household just like a dollar of wage income, and the contribution of remittances to development is the same as that from any other source of income. The second view takes a more pessimistic position, arguing that receipt of remittances can cause behavioral changes at the household level that may lower their development impact relative to receipt of income from other sources. For example, a recent review of the literature by Chami, Fullenkamp and Jahjah (2003:10-11) reports that: (a) a "significant proportion, and often the majority," of remittances are spent on "status-oriented" consumption; and (b) the ways in which remittances are typically invested —in housing, land and jewelry— are "not necessarily productive" to the economy as a whole. A third, and more recent, view of remittances is decidedly more positive, arguing that remittances actually increase investments in human and physical capital at the margin, relative to other forms of household income. For instance, in a recent study of remittances and education in El Salvador, Edwards and Ureta (2003) find that international remittances (mainly from the US) have a large positive impact on student retention rates in school. In a similar study in the Philippines, Yang (2008) reports that positive exchange rate shocks lead to a significant increase in remittance expenditures on education. In Nigeria, Osili (2004) finds that a large proportion of remittance income is spent on housing. A 10 percent increase in remittance income in Nigeria raises the probability of investing in housing by 3 percentage points.

This paper proposes to refine and extend the debate on how remittances are spent or used and their impact on economic development by analyzing how remittances are used in one low-income, Sub-Saharan African country, Ghana. The results of the nationally-representative, 2005/06 Ghana household

[1] These figures for official international remittances do not include the large –and unknown– amount of international remittances which return to developing countries through unrecorded, informal channels.

survey are used to compare the marginal spending behavior of three groups of households: those receiving no remittances, those receiving internal remittances (from within Ghana) and those receiving international remittances (from African or other countries). Because all surveyed households can be separated into one of these three groups, it is possible to compare the marginal spending patterns of remittance and non-remittance receiving households across a broad range of consumption and investment goods, including food, education and housing.

The results, which should be of interest to economic policymakers in Ghana, may have broader relevance to the remittances and development debate as well. Since household incomes in Ghana are a fraction of those in many other developing countries that receive international remittances (e.g. El Salvador, Mexico, and the Philippines), remittances may be used differently by households in Ghana than in the studies cited above. Thus, our results can add to the body of comparative evidence available on the impact of remittances on countries at various levels of development.

At the outset it should be emphasized that such a comparative analysis of household marginal spending behavior is subject to problems of both selection bias and endogeneity. If the three groups of households in Ghana —those receiving no remittances, internal remittances and international remittances— differ systematically in their unobservable characteristics (e.g. skills, motivation, ability), regression results based on the observed characteristics of those households will be biased. We address this concern by using a two-stage multinomial logit-ordinary least squares (OLS) procedure to test for selection bias in the household receipt of remittances. However, ensuring the exogeneity of the variables used in the specification of this selection model is not straight-forward. To address this issue we use an instrumental variables approach, focusing on variations in migration networks and remittances among various statistical regions in Ghana. Based on the results of our selection model we then proceed to estimate an expenditure model that allows us to determine the marginal expenditure patterns of each household type.

The balance of the paper proceeds as follows. Section 1 describes the data set and Section 2 discusses the functional form for analyzing the expenditure patterns of remittance-receiving and non-receiving households. Since the problems of selection and identification are so important for identifying the impact of remittances on expenditure behavior, Section 3 presents the two-stage multinomial logit selection model used in the analysis. Section 4 specifies this two-stage model using an instrumental variables approach focusing on variations in migration networks and remittances among various statistical regions. Section 5 estimates the model and Section 6 presents robustness checks. The last section summarizes the findings.

1. The Data Set

Data come from the 2005/06 Ghana Living Standards Survey (GLSS 5), a nationally-representative survey of 8,000 households carried out by the Ghana Statistical Service (GSS). This survey, administered from September 2005 to September 2006, contains detailed information on all aspects of living conditions in Ghana, including income, expenditure, health, education, savings, and credit. As part of this survey, a supplemental migration and remittances module was administered to a nationally representative sub-sample of 4,000 households.[2] This paper uses the data from the migration and remittances sub-sample of 4,000 households. In carrying out the analysis we dropped 59 households because of missing data, which resulted in a sample of 3,941 households.

Since the focus here is on remittances, it is important to clarify how these income transfers are measured and defined. Data on remittances includes transfers received in three forms: (1) money (cash); (2) food; and (3) non-food goods.[3] While most remittances (about 75 percent) come in the form of money (cash), including food and non-food goods is important because it leads to a more accurate measure of the total flow of remittances to households in Ghana. In this study each household that is classified as receiving remittances —either internal (from Ghana) or international (from African or other countries)— is assumed to receive exactly the amount reported in the survey. Households which report having migrants but do not report receiving remittances are classified as non-remittance receiving households. Using this definition distinguishes our work from much of the previous empirical literature on migration and household behavior by focusing on the origin of income flows rather than presence or absence of a migrant in the household. This approach seems sensible for two reasons: (i) only about one-half of all migrants in Ghana remit, and (ii) about 50 percent of all remittance-receiving households in the survey do not have a migrant.[4] In Ghana, where family ties are very strong, households without migrants receive internal or international remittances from relatives (e.g. cousins, aunts, uncles) and close friends.[5]

[2] This migration and remittances module included about 45 questions on the socio-economic characteristics of current migrants, including their age, educational status, occupation and amount of remittances (cash, food and non-food goods) sent home.

[3] Non-food goods include such items as household appliances (stoves, refrigerators), vehicles and equipment.

[4] In the 2005/06 Ghana GLSS 5 Survey (sub-sample) only 49 percent of internal migrants (within Ghana) and 68 percent of international migrants (to African and other countries) remit. These figures are similar to those observed in other countries. For example, in their study in the Dominican Republic, de la Briere, Sadoulet, de Janvry and Lambert (2002) find that only one- half of all international migrants remit.

[5] In the 2005/06 Ghana GLSS 5 Survey (sub-sample) 56 percent of households receiving internal remittances (from Ghana) and 50 percent of households receiving international remittances (from African or other countries) do not have a migrant. On average, non-migrant households that receive remittances receive less in per capita remittances than migrant households that receive remittances.

Table 1 presents summary data from the 2005/06 Ghana GLSS 5 Survey (sub-sample). Since we want to work with three exclusive groups of households, in this table and in all subsequent tables, we have dropped the 57 households that receive remittances from both internal and international sources. Of the remaining 3,884 households, 2,515 households (64.7 percent) receive no remittances, 1,159 households (29.8 percent) receive internal remittances (from Ghana) and 210 (5.4 percent) receive international remittances (from African or other countries).

Table 1 reveals several interesting contrasts between the three groups of households, that is, those receiving no remittances, those receiving internal remittances (from Ghana) and those receiving international remittances (from African or other countries). With respect to human capital, households receiving international remittances generally have more human capital than households with no remittances, while households receiving internal remittances have less. The table also shows that for households receiving remittances, remittances represent a large share of annual per capita household expenditure: 17.3 percent of expenditure for households receiving internal remittances and 29.8 percent of expenditure for households receiving international remittances.[6]

Since we want to examine the impact of remittances on expenditure behavior, it is important to present the type of expenditure data contained in the 2005/06 Ghana survey. Table 2 shows that the survey collected detailed information on six major categories of expenditure, and on several subdivisions within each category. While the time base over which these expenditures were measured varied (from last visit for most food items, to last 12 months for most durable goods), all expenditures were aggregated to obtain yearly values. For household durables (stove, refrigerator, automobile, etc), annual use values were calculated to obtain an estimate of the cost of one year's use of that good. Annual use values were also calculated to obtain an estimate of the one year use value of housing (rented or owned).

Table 3 presents average budget shares devoted to the six categories of expenditure for the three groups of households —those receiving no remittances, those receiving internal remittances (from Ghana) and those receiving international remittances (from African or other countries). On average, each of the three groups of households spends over 65 percent of their budget on the two categories of goods that are clearly consumption: food and consumer goods/durables.

Table 3 also reports differences in average budget shares, and conditions these differences for the characteristics and income of the households. The only differences in average budget shares that are significant after conditioning for household characteristics and income are: (1) households

[6] Since the focus of this paper is on remittances and household expenditure behavior, remittances are reported here as a percentage of per capita household expenditure.

receiving international remittances (from African or other countries) spend less on food than households with no remittances; and (2) households receiving international remittances (from African or other countries) spend more on consumer goods/durables and education than households with no remittances.[7]

The objective of this paper, however, is to investigate whether there are differences in the marginal spending patterns between remittance-receiving and non-remittance-receiving households. This issue will be the focus of the rest of our analysis.

2. Choice of Functional Form

To analyze the marginal expenditure patterns of remittance-receiving and non-receiving households, it is necessary to choose a proper functional form for the econometric model. The selected functional form must do several things. First, it must provide a good statistical fit to a wide range of goods, including food, housing and education. Second, the selected form must mathematically allow for rising, falling or constant marginal propensities to spend over a broad range of goods and expenditure levels. A model specification that imposes the same slope (or marginal budget share) at all levels of expenditure would not be adequate. Third, the chosen form should conform to the criterion of additivity (i.e. the sum of the marginal propensities for all goods should equal unity).

One useful functional form which meets all of these criteria is the Working-Leser model, which relates budget shares linearly to the logarithm of total expenditure. This model can be written as:[8]

$$C_i / EXP = \beta_i + a_i / EXP + \gamma_i \, (log\ EXP) \qquad (1)$$

where C_i / EXP is the share of expenditure on good i in total expenditure EXP. Adding up requires that $\Sigma\, C_i / EXP = 1$.

Equation (1) is equivalent to the Engel function:

$$C_i = a_i + \beta_i\, EXP + \gamma_i \, (EXP)\ (log\ EXP) \qquad (2)$$

In comparing the expenditure behavior of households with different levels of income, various socioeconomic and locational factors other than expenditure must be taken into account. Part of the observed differences in expenditure behavior may be due, for example, to differences in household

[7] These differences are obtained using OLS estimations as explained in Table 3. IV estimations were also done and Hausman tests revealed that the differences in coefficients between OLS and IV estimations were not significant.

[8] The functional form used in this analysis differs from the Working-Leser model because it includes an intercept in equation (1). In theory, Ci should always equal zero whenever total expenditure EXP is zero, and this restriction should be built into the function. But zero observations on EXP invariably lie well outside the sample range. Also, observing this restriction with the Working-Leser model can lead to poorer statistical fits. Including the intercept term in the model has little effect on the estimation of marginal budget shares for the average person, but it can make a significant difference for income redistribution results. For more on the Working-Leser model, see Prais and Houthakker (1971).

composition (family size, number of children, etc), education, geographic region or (in this sample) receipt of internal or international remittances. These household characteristic variables need to be included in the model in a way that allows them to shift both the intercept and the slope of the Engel functions. Let Z_j denote the jth household characteristic variable and let μ_{ij} and λ_{ij} be constants. The complete model is then:

$$C_i = a_i + \beta_i EXP + \gamma_i (EXP)(\log EXP) + \Sigma_j[(\mu_{ij})(Z_j) + \lambda_{ij}(EXP)(Z_j)] \quad (3)$$

Written in expenditure share form, this is equivalent to:

$$C_i/EXP = \beta_i + a_i/EXP + \gamma_i (\log EXP) + \Sigma_j[(\mu_{ij})Z_j/EXP + \lambda_{ij}(Z_j)] \quad (4)$$

Including the various household characteristic variables in equation (4) is important, because it introduces considerably more flexibility in the way that marginal budget shares can vary by household type.

From equation (4) the marginal and average budget shares for the ith good (the MBS_i and ABS_i, respectively) can be derived as follows:

$$MBS_i = dC_i / dEXP = \beta_i + \gamma_i (1 + \log EXP) + \Sigma_j[(\gamma_{ij})(Z_j)] \quad (5)$$

$$ABS_i = C_i / EXP_i \quad (6)$$

3. Estimating a Two-Stage Multinomial Selection Model

We now redefine the model in terms of the choices that households make. Assume that households choose between three states (*s*): (1) receive no remittances; (2) receive internal remittances (from Ghana); and (3) receive international remittances (from African or other countries). Once households have chosen a state, they decide their optimal consumption shares $C_{si,}$ where C_{si} is the optimal consumption share for households that choose *s=k* , in good *i*. On this basis, we have a polychotomous-choice model (Lee, 1983), where we have an equation like (4) for each type of expenditure good *i* that households choose and for each possible state *s*.

$$C_{si}/EXP = \beta_{si} + a_{si}/EXP + \gamma_{si} (\log EXP) + \Sigma_k[(\mu_{sik})Z_k/EXP + \lambda_{sik}(Z_k)] + u_{si} \quad (7)$$

And for each choice we have a latent variable:

$$I_s = X\psi_s + \eta_s \quad (8)$$

Notice that X is a set of characteristics of the households, which are not necessarily the same than those found in Z, and that include *logEXP*. Now we have:

$$I=s \text{ if } I_s > \text{Max } I_j \ (j=1,2,3, j\neq s) \quad (9)$$

$$\text{Let } \varepsilon_s = \text{Max } I_j - \eta_s \ (j=1,2,3, j\neq s) \quad (10)$$

If η_s follows a type I extreme value distribution, Domencich and McFadden (1975) show that ε_s has the following distribution function:

$$F_s(\varepsilon) = \text{Prob}(\varepsilon_s < \varepsilon) = \exp(\varepsilon)/(\exp(\varepsilon) + \Sigma_{j\neq s}\exp(X\psi_j)) \quad (11)$$

Following Dubin and McFadden (1984), we assume that:

$$E(u_s | \eta_1\ \eta_2\ \eta_3) = \sigma_s \Sigma_{j=1\ldots3}\, r_{sj}(\eta_j - E(\eta_j)), \text{ with } \Sigma_{j=1\ldots3}\, r_{sj} = 0. \quad (12)$$

Where σ_s is the standard deviation of u_s and r_{sj} represents the correlation coefficient between $u_s$and η_j . This assumption has several important

implications. First, since these correlations are going to be corrected for selection, they obtain the unconditional correlation r_{sj}. This implies that their value does not depend on the subsample of observations for which they are actually estimated. Second, in our case we need to estimate only six of nine possible correlations, because these correlations must equal zero for each category s. Third, the assumption implies that:

$$E(u_s|\eta_1\ \eta_2\ \eta_3) = \sigma_s\Sigma_{j\neq s}\, r_{sj}(\eta_j - \eta_s) \quad (13)$$

Dubin and McFadden (1984) show that with the multinomial logit model we obtain:

$$E(\eta_j - \eta_s|\ I_s>\text{Max}\ I_j)=P_j\ln P_j/(1-P_j)+\ln P_s \quad (14)$$

Consequently, equation (7) can be rewritten as:

$$C_{si}\ /EXP = \beta_{si} + \alpha_{si}\ /EXP + \gamma_{si}\ (log\ EXP) + \Sigma_k[(\mu_{sik})Z_k/\text{EXP} + \lambda_{sik}(Z_k)]$$
$$+\sigma_s\Sigma_{j\neq s}\, r_{sj}\ (\text{Pj}\ln\text{Pj}/(1-\text{Pj})+\ln\text{Ps}\ )+ v_{si} \quad (15)$$

where $E(v_{si}\ |X,Z)=0$.

According to a recent review of the literature on selection bias (Bourguinon, Fournier and Gurgand, 2004), the Dubin and McFadden method (1984) performs better than other selection methods in Monte Carlo experiments.[9] For this reason, the Dubin-McFadden method will be used in this analysis.

The Dubin and McFadden method represents a generalization of the Heckman two-stage method of selection correction. As in the Heckman method, identification of equation (15) in the Dubin and McFadden method depends on both the existence of instrumental variables and the non-linearity of the selection part of the model. In principle, the non-linearity of the selection part of the model is sufficient to identify the parameters of the model, because this non-linearity helps break the relation between the selection part and the rest of the expenditure equation. However, in this analysis we use instrumental variables to obtain independent variations in the first-stage choice equation that identify the second-stage expenditure equation.

To estimate the effect of remittances on the marginal spending behavior of households, we follow the literature on the evaluation of multiple treatments. This literature has shown that the pair wise comparison of treatments is enough to identify Average Treatment Effects on the Treated (ATT) (Lechner, 2002). Specifically, let the average treatment effect of treatment h compared to treatment i on the participants of treatment h be defined by:

$$\Theta_{hli} = E(\text{MBS}_{\text{hi}}\ |\text{s= h}) - E(\text{MBS}_{\text{li}}\ |\text{s= h}) \quad (16)$$

[9] According to Bourguinon, Fournier and Gurgand (2004), the Dubin and McFadden method (1984) performs better than other methodologies, like the Lee method (1983), in Monte Carlo experiments, even when the Independence of Irrelevant Alternatives, implicit in models using the multinomial logit model, is violated.

Where $E(MBS_{hi} | s= h)$ represents the marginal budget share (MBS) for good i, estimated with the *equation* for households that choose action h, conditioning on the characteristics of households that choose action h. The $E(MBS_{hi} | s= h)$ is given by:

$$E(MBS_{hi} | s= h) = \beta_h + \gamma_h (1 + log\ EXP) + \Sigma_j[(\gamma_{hj})(Z_j)]$$
$$+ \sigma_h \Sigma_{j \neq h} r_{hj} \{P_j/(1-P_j)[\psi_j - \Sigma_s P_s \psi_s][\psi_j - \Sigma_s P_s \psi_s + P_j \ln P_j /(1-P_j)] + \psi_h - \Sigma_s P_s \psi_s\} \quad (17)$$

We have that $E(MBS_{li} | s= h)$ represents the MBS for good i, estimated with the equation for individuals that choose action l, conditioning on the characteristics of households that choose action h. To generate this expression we first present the equation for the consumption share for good i used for households that choose action l, conditioning on the characteristics of households that choose action h:

$$C_{li}/EXP = \beta_{li} + a_{li}/EXP + \gamma_{li} (log\ EXP) + \Sigma_j[(\mu_{lij}) Z_j/EXP + \lambda_{lij}(Z_j)]$$
$$+ \sigma_{li}[r_{lm} \{(P_m - ln P_m)/(1-P_m) + ln P_h\} - (r_{lh+} r_{lm}) \{(P_l - ln P_l)/(1-P_l) + ln P_h\}] \quad (18)$$[10]

Based on (18), it can be shown that the counterfactual MBS is given by:

$$E(MBS_{li} | s= h) = \beta_l + \gamma_l (1 + log\ EXP) + \Sigma_j[(\gamma_{lj})(Z_j)]$$
$$+ \sigma_l \{ r_{lm} \{ [\psi_m - \Sigma_s P_s \psi_s][2P_m - 1 + P_m \ln P_m] /(1-P_m)^2 + \psi_h - \Sigma_s P_s \psi_s\}$$
$$-(r_{lh+} r_{lm}) [\psi_l - \Sigma_s P_s \psi_s][2P_l - 1 + P_l \ln P_l] /(1-P_l)^2 + \psi_h - \Sigma_s P_s \psi_s\}\} \quad (19)$$

We have then that the ATT is given by:

$$\theta^*_{hli} = \beta_{hi} - \beta_{li} + (\gamma_{hi} - \gamma_{li})(1 + log\ EXP) + \Sigma_j[(\gamma_{hij} - \gamma_{lij})(Z_j)]$$
$$+ \sigma_h \Sigma_{j \neq h} r_{hj} \{P_j/(1-P_j)[\psi_j - \Sigma_s P_s \psi_s][\psi_j - \Sigma_s P_s \psi_s + P_j \ln P_j /(1-P_j)] + \psi_h - \Sigma_s P_s \psi_s\}$$
$$- \sigma_l \{ r_{lm} \{ [\psi_m - \Sigma_s P_s \psi_s][2P_m - 1 + P_m \ln P_m] /(1-P_m)^2 + \psi_h - \Sigma_s P_s \psi_s\}$$
$$-(r_{lh+} r_{lm}) [\psi_l - \Sigma_s P_s \psi_s][2P_l - 1 + P_l \ln P_l] /(1-P_l)^2 + \psi_h - \Sigma_s P_s \psi_s\}\} \quad (20)$$

Each pair wise ATT is estimated for each household that is involved in the estimation of the given pair wise ATT. In particular, we estimate θ_{13i} and θ_{23i}:

$\theta_{13i} = E(MBS_{1i} | s= 1) - E(MBS_{3i} | s= 1)$, which represents the effect in MBS produced by the receipt of internal remittances (from Ghana (21)

$\theta_{23i} = E(MBS_{2i} | s= 2) - E(MBS_{3i} | s= 2)$, which represents the effect in MBS produced by the receipt of international remittances (from African or other countries) (22)

In estimating equations (21) and (22) there are as many ATT as households in choice s=k. Following Maddala (1983), we use the mean and standard error of the ATT estimated to obtain its significance.

[10] The derivation of equation (18) is available from the authors upon request.

4. Operationalizing the Two-Stage Selection Model

To operationalize our model, it is necessary to identify variables that are distinct for the receipt of remittances in the first-stage choice equation, and for the determination of household income in the second-stage equation.

In the first-stage choice equation, it is difficult to identify variables that are truly exogenous to migration and the receipt of remittances. In the literature, the cleanest strategies for identifying exogenous variables affecting migration and the receipt of remittances have focused on short-term economic shocks. For example, Yang (2008) uses panel data from the 1997 Asian currency crisis to analyze how short-term changes in currency rates affect the value of international remittances received by Filipino households. Since our Ghana data come from a single, cross-sectional survey, we are not aware of any identifiable exogenous shocks to exploit in our data set.

To address the problem of endogenous variables, we constructed two instrumental variables using the following procedure. Past research has found that migration networks are important in migration decisions and the receipt of remittances (e.g. Woodruff and Zenteno, 2007, Munshi, 2003). To measure the strength of migration networks in Ghana we used data from the 2005/06 Ghana survey to create two instrumental variables: (1) internal migration rate in statistical region in Ghana, excluding household i; and (2) international migration rate in statistical region in Ghana, excluding household i.

Table 4 shows means and standard deviations for these two instrumental variables by statistical region in Ghana. The table also shows how these instrumental variables are related to other key variables, specifically, the fraction of households receiving internal remittances (from Ghana) and the fraction of households receiving international remittances (from African or other countries).

According to Table 4, migration and the receipt of remittances are distributed quite unevenly among the various statistical regions in Ghana. This uneven distribution suggests that certain regions in Ghana are more "efficient" than others, if we measure efficiency by comparing how much remittance income is received by households in the various regions. Measuring the efficiency of regions to receive remittances is important because if one of the main products of migration is the receipt of remittances then a region that receives more remittances for its members conditional on the set of resources at its command can be considered to be more "efficient" than another. For example, in Table 4 we see that three regions (Central, Volta and Ashanti) each have an internal migration rate of about 0.07. However, the fraction of households receiving internal remittances in each of these regions varies considerably (from 0.375 for Volta to 0.281 for Ashanti). Similarly, while the Ashanti region has the highest international migration rate (0.042),

the fraction of households receiving international remittances in that region (0.11) is just barely higher than that for Greater Accra region (0.10), which has a much smaller international migration rate. These variations in the efficiency of migration networks in different regions to generate remittance income are important to our analysis because they help to explain why these variables work well as instrumental variables in our econometric analysis. In the next section we present tests that demonstrate the validity and strength of these instruments.

Using the statistical regions in Ghana, we also created four aggregate control variables that help guarantee that our instrumental variables are uncorrelated with the unobserved terms in their corresponding equations. The first aggregate control variable comes from the 2005/06 Ghana GLSS 5 Survey and is the mean annual per capita household income in statistical region, excluding household i. The other 3 control variables come from the earlier, 1998/99 nationally-representative Ghana GLSS 4 Survey and include:[11] (1) fraction of female-headed households receiving internal remittances in statistical region in 1998/99; (2) fraction of population that lives in ecological zones with forest in statistical region in 1998/99; and (3) mean number of inhabitants per square meter of house in statistical region in 1998/99.

Table A1 lists summary data for the four aggregate control variables.

On the basis of the preceding, the first-stage choice function of the probability of a household receiving remittances can be estimated as follows:

Prob (Y = receive remittances) = f [Household Expenditure, Human Capital (Number of

household members with primary, junior secondary, senior secondary or university education), Household Characteristics (Age of household head, Household size, Number of children under age 5, Number of males over age 15), Aggregate Control Variables, Instrumental Variables, Interaction Variables, Ethnic Dummies, Regional Variables] (23)

The rationale for including these variables in the first-stage choice equation follows the standard literature on migration and remittances. According to the basic human capital model, human capital variables are likely to affect migration because more educated people enjoy greater employment and expected income-earning possibilities in destination areas (Schultz, 1982; Todaro, 1976).[12] In the literature household characteristics – such as age of household head, the number of children and the number of males above 15– are also hypothesized to affect the probability of migration. In particular, some analysts (Adams, 1993; Lipton, 1980) have suggested that migration is a life-cycle event in which households with older heads and fewer

[11] The 1998/99 Ghana GLSS 4 Survey was a nationally-representative household survey covering 5,582 households.
[12] While early work on the human capital model found that education had a positive impact on migration (Schultz, 1982; Todaro, 1976), more recent empirical work in Egypt (Adams, 1991and 1993) and Mexico (Mora and Taylor, 2005; Taylor, 1987) has found that migrants are not necessarily positively selected with respect to education.

children under age 5 are more likely to participate. As noted above, the literature has stressed the importance of migration networks in encouraging migration (Massey, et al 1990) and in helping migrants to find jobs and to invest (Munshi, 2003; Woodruff and Zenteno, 2007). In the model it is hypothesized that the aggregate control and instrumental variables will measure how effective migration networks are in encouraging migration and the receipt of remittances. Finally, since ethnicity and statistical region may affect migration and the receipt of remittances, the model includes six ethnic and nine regional dummies.[13]

The second-stage income function can be estimated as follows:

Household expenditure on good i = g [Household Expenditure, Human capital (Number of household members with primary, junior secondary, senior secondary or university education), Household Characteristics (Age of household head, Household size, Number of children under age 5, Number of males above 15), Aggregate Control Variables, Interaction Variables, Ethnic Dummies, Regional Variables) (24)

In the second-stage equation the dependent variable is household expenditure, rather than household income. There are at least two reasons for using expenditure rather than income data here. First, the purpose of this paper is to estimate the impact of remittances on the marginal spending behavior of households, and therefore expenditure data is more useful than income data. Second, in low income countries, like Ghana, expenditures are often easier to measure with precision than income, because of the many problems inherent in defining and measuring income for the self-employed in agriculture, who represent such a large proportion of the labor force. For these reasons, we will use expenditure data in equation (24) and throughout the rest of the paper.[14]

The rationale for including the various variables in equation (24) is similar to that for including them in the first-stage choice equation. However, it should be pointed out that the model is identified from differences in the instrumental variables between statistical regions, which are excluded from the second stage equation. Notice that our identification is done conditional on a set of characteristics of the statistical region. This type of identification creates several potential econometric problems. First, since the instrument provides independent information by statistical region, this information is shared by all households in that region, and thus generates correlation of observations within a region. We solve this problem by clustering standard errors by statistical region. A second problem is whether the estimation error

[13] The six ethnic dummy variables (with Guan ethnic group omitted) are: Asante, Akwapim, Fanti, Other Akan, Ga-Adangbe and Ewe. The nine regional dummy variables (with metropolitan Accra region omitted) are: Western, Central, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East and Upper West.. See Table 4 for more information on these regions.

[14] From this point on, the terms "expenditure" and "income" will be used interchangeably in this paper.

that is introduced in the model by using a two-step procedure can inflate standard errors. To address this problem we implement a bootstrap procedure, and these are the standard errors reported for the estimation of equation (24). A final problem is that since we use a possibly endogenous variable (expenditure) in our estimation, our results could be biased. To meet this problem we check the robustness of results using procedures described in section 6.

5. Estimating the Model

Table 5 presents tests showing the validity of the two instrumental variables. Results from the under-identification and weakness tests show that the model is identified and that the instruments are not weak. These tests are based on a linear version of our model, but since the non-linearity helps to break the endogeneity in our model, these tests are sufficient to show the validity of using the instruments in the Dubin-McFadden methodology.

Table 6 presents results from the first-stage equation of the multinomial logit model. The table shows the marginal effects of the variables included in the first stage equation, which are obtained from the coefficients obtained in the estimation.

In Table 6 the outcomes for several of the human capital variables are rather unexpected. For households receiving internal remittances (from Ghana), only two of the human capital (education) variables are significant, and for households receiving international remittances (from African or other countries) none of the human capital variables are statistically significant. While these results are for the probability of households receiving remittances (internal or international), and not for the probability of households producing migrants (internal or international), they suggest that the relationship between education, migration and remittances might not be as strong and positive as hypothesized by human capital theory.

Table 6 also reports results for the aggregate control and instrumental variables. For households receiving internal and international remittances, both of the aggregate control variables are significant, as expected. Also, for both sets of households, the two instrumental variables are highly significant. A test of joint significance for the instrumental variables in Table 6 shows that these variables are jointly significant at the 1 percent level.

Tables 7, 8 and 9 show the results of the second-stage equation for each expenditure good and for each type of household: households with no remittances (Table 7), households receiving internal remittances (from Ghana) (Table 8), and households receiving international remittances (from USA) (Table 9).

In these three tables it is interesting to note that the annual per capita household expenditure variable (logEXP) is always negative and highly

significant for one key investment good – housing. These results suggest that as annual per capita household expenditure increases, households spend proportionately less on housing.

The most important variable in Tables 7, 8 and 9 is the selection term, which is the $\sigma_s\rho_{si}$ variable. For households with no remittances (Table 7), the $\sigma_s\rho_{si}$ variable is significant for two goods, for households receiving internal remittances (Table 8) it is significant for five goods and for households receiving international remittances (Table 9) it is significant for three goods. These results are important because they show that selectivity in unobservable components matters for all three groups of households. In other words, estimations ignoring the selectivity part of the model would be biased.

Table 10 takes the coefficients from Tables 7 to 9 and calculates the estimated marginal budget shares for the six categories of expenditure for each type of household. This table accounts for selectivity because it includes the derivative of the selection term with respect to household expenditure.

Table 10 also shows the counterfactual marginal budget shares used in the estimation of the two pair wise Average Treatment Effects on the Treated (ATT). The first counterfactual is E(MBS3 |s= 1) which represents the expenditure that households that chose to receive internal remittances (from Ghana) would have had without the receipt of remittances. It is obtained using the equation for expenditure shares for households that receive no remittances on households that receive internal remittances, taking into account the selection part that the household receives internal remittances (from Ghana). The second counterfactual is E(MBS3 |s= 2) which represents the expenditure that households that chose to receive international remittances (from African or other countries) would have had without the receipt of remittances.

Table 11 shows the Average Treatment Effects on the Treated (ATT) for the six categories of expenditure. Two results are noteworthy. First, when compared to what they would have spent without the receipt of remittances, households receiving international remittances (from USA) spend less at the margin on one key consumption good: food. At the mean, households with international remittances spend 14 percent less at the margin on food that what they would have spent without the receipt of remittances.[15] Second, households receiving both internal and international remittances spend more at the margin on one key investment good: education. At the mean, households receiving internal and international remittances spend 3 and 33 percent more at the margin, respectively, on education than what they would have spent on education without the receipt of remittances. These large

[15] These percentage figures are calculated as follows: estimated ATT (θ^*_{kli}) (in Table 11) divided by the expected value of the counterfactual MBS ($E(\text{MBS}_{li}|s=k.)$) (in Table 10). The intuition is that the ATT shows the change in expenditure behavior produced by remittances, while the counterfactual MBS shows the expenditure behavior that the households would have had without the receipt of remittances.

marginal increases in spending on education are important because they can help raise the level of human capital in Ghana.

6. Robustness Checks: Remittances and Expenditure on Education

The most striking finding from the previous section is that households receiving internal and international remittances spend more at the margin on education than what they would have spent on education without the receipt of remittances. Since households receiving remittances also enjoy higher levels of per capita income (expenditure),[16] it is possible that these findings are driven by the higher levels of income (expenditure) enjoyed by remittance-receiving households. This correlation arises because the estimation of the marginal budget share depends on using the expenditure variable which is correlated with the unobserved components that enter into the consumption share equation. To the extent that the Dubin-McFadden methodology controls for selection in unobservable characteristics, and to the extent that these controls purge the parameters involved in the estimation of the MBS from the partial correlation between the unobservable components and the expenditure, our estimation should not suffer from bias. However, it is important to analyze the extent to which our estimated ATTs and signs for those ATTs vary with the level of household expenditure. It is therefore useful to check the robustness of our results for remittance-inspired expenditure on education, when controlling for the level of household expenditure.

This can be done by ranking all 3,884 households in the data set into quintile groups on the basis of total annual per capita expenditure, including remittances. The 3,884 households can then be divided into three groups: those receiving no remittances, those receiving internal remittances (from Ghana) and those receiving international remittances (from African or other countries). The regression results reported above can then be used to calculate counterfactual marginal budget shares and average treatment effects on the treated (ATT) for the various quintile groups. This makes it possible to compare marginal budget shares and ATT at similar levels of expenditure for the three groups of households.

Table 12 shows the expenditure behavior on education for the three groups of households. Within each group of household, quintile means are determined by aggregating mean individual household values, and all households are evaluated on the basis of per capita income (expenditure) including remittances. Thus, the main difference for any quintile group

[16] According to Table 1, while mean annual per capita expenditure for households receiving no remittances (in thousand Ghanaian cedis) is 6,402 cedis/capita/year, it is 5,545 cedis/capita/year for households receiving internal remittances (from Ghana) and rises to 12,600 cedis/capita/year for households receiving international remittances (from African or other countries).

between the three groups of households is that the "no remittance" group received no remittances, while the other two groups received either internal or international remittances.

According to Table 12, at the mean, the share of total expenditure spent on education is quite low: less than 8 percent for each of the three groups of households. However, with only one exception for each group of households, households receiving internal or international remittances spend more at the margin on education than what they would have spent on this investment good without the receipt of remittances. For households receiving internal remittances (from Ghana), the final column in Table 12 shows that —excluding the lowest quintile group —households spend between 5 and 21 percent more at the margin on education as compared to what they would have spent on education without remittances. For households receiving international remittances (from Africa or other countries), the final column shows that — excluding the top quintile group— households spend between 34 and 61 percent more at the margin on education as compared to what they would have spent on education without remittances. In other words, when controlling for the level of expenditure, households receiving remittances spend more of their additional increments to expenditure on education.

TABLE 1. SUMMARY DATA ON NON-REMITTANCE AND REMITTANCE-RECEIVING HOUSEHOLDS, GHANA, 2005/06

VARIABLE	RECEIVE NO REMITTANCES	RECEIVE INTERNAL REMITTANCES (FROM GHANA)	RECEIVE INTERNATIONAL REMITTANCES (FROM AFRICAN OR OTHER COUNTRIES)	T-TEST (INTERNAL REMITTANCES VS. NO REMITTANCES)	T-TEST (INTERNATIONAL REMITTANCES VS. NO REMITTANCES)
HUMAN CAPITAL					
MEAN NUMBER OF MEMBERS OVER AGE 15 WITH PRIMARY SCHOOL EDUCATION	0.35 (.62)	0.32 (0.57)	0.21 (0.45)	-1.27	-3.26***
MEAN NUMBER OF MEMBERS OVER AGE 15 WITH SENIOR SECONDARY SCHOOL EDUCATION	0.11 (0.38)	0.07 (0.30)	0.23 (0.50)	-2.30*	4.60**
MEAN NUMBER OF MEMBERS OVER AGE 15 WITH UNIVERSITY EDUCATION	0.03 (.22)	0.01 (0.10)	0.07 (0.27)	-3.90**	2.89**
HOUSEHOLD CHARACTERISTICS					
HOUSEHOLD SIZE	4.19 (2.78)	3.68 (2.58)	3.28 (2.20)	-5.39**	-4.75**
AGE OF HOUSEHOLD HEAD (YEARS)	43.38 (14.13)	48.42 (18.40)	45.34 (15.46)	9.10**	1.77
MEAN NUMBER OF MALES OVER AGE 15	1.18 (0.90)	0.91 (0.90)	0.97 (0.85)	-8.50**	-3.31**
MEAN NUMBER OF CHILDREN UNDER AGE 5	0.56 (0.81)	0.49 (0.73)	0.24 (0.52)	-2.69**	-5.81**
	RECEIVE NO REMITTANCES	RECEIVE INTERNAL REMITTANCES (FROM GHANA)	RECEIVE INTERNATIONAL REMITTANCES (FROM AFRICAN OR OTHER COUNTRIES)	T-TEST (INTERNAL REMITTANCES S. NO REMITTANCES	T-TEST (INTERNATIONAL REMITTANCES VS. NO REMITTANCES)
MEAN ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE (INCLUDING REMITTANCES) IN THOUSAND GHANAIAN CEDIS	6,402 (7,614)	5,545 (4,954)	12,600 (10,600)	-6.66**	5.67**
REMITTANCES AS PERCENT OF ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE (INCLUDING REMITTANCES)	0	17.3	29.8	8.95***	37.59***
N	2,515	1,159	210		

Notes: N = 3,884 households. All values are weighted; standard deviations in parentheses. In 2006, US$ 1.00 = 9,000 Ghanaian cedis. Source: 2005/06 Ghana GLSS 5 Survey (sub-sample). *Significant at 0.10 level. **Significant at 0.05level. ***Significant at .01level.

TABLE 2. EXPENDITURE CATEGORIES IN 2005/06 GHANA GLSS 5 SURVEY

CATEGORY	DESCRIPTION	EXAMPLES
FOOD	PURCHASED FOOD	MAIZE, BREAD, CASSAVA, MILK, MEAT, FRUIT, VEGETABLES
	NON-PURCHASED FOOD	FOOD FROM: OWN-PRODUCTION, GIFTS, DONATIONS, SOCIAL PROGRAMS
CONSUMER GOODS, DURABLES	CONSUMER GOODS	CLOTHING, SHOES, FABRIC
	HOUSEHOLD DURABLES	ANNUAL USE VALUE OF STOVE, REFRIGERATOR, FURNITURE, TELEVISION, CAR
HOUSING	HOUSING VALUE	ANNUAL USE VALUE OF HOUSING (CALCULATED FROM RENTAL PAYMENTS OR IMPUTED VALUES)
EDUCATION	EDUCATIONAL EXPENSES	BOOKS, SCHOOL SUPPLIES, UNIFORMS, REGISTRATION FEES, TRAVEL TO SCHOOL
HEALTH	HEALTH EXPENSES	DOCTOR AND DENTIST FEES, MEDICINE, HOSPITALIZATION, ANTIBIOTICS
OTHER	UTILITIES	WATER, GAS, ELECTRICITY, TELEPHONE
	TRANSPORT, COMMUNICATIONS	BUS AND TAXI FEES, GASOLINE, FAXES, POSTAGE
	REMITTANCE EXPENSES	EXPENSES ON REMITTANCES

Source: 2005/06 Ghana GLSS 5 Survey (sub-sample).

TABLE 3. AVERAGE BUDGET SHARES ON EXPENDITURE FOR NON-REMITTANCE AND REMITTANCE-RECEIVING HOUSEHOLDS, GHANA, 2005/06

EXPENDITURE CATEGORY	HOUSEHOLDS RECEIVING NO REMITTANCES (A) (N=2515)	HOUSEHOLDS RECEIVING INTERNAL REMITTANCES (FROM GHANA) (B) (N=1159)	HOUSEHOLDS RECEIVING INTERNATIONAL REMITTANCES (FROM OTHER COUNTRIES) (C) (N=210)
FOOD	0.56	0.580	0.450
DIFFERENCE WITH RESPECT TO (A)		0.020 (1.36)	-0.112*** (-8.54)
DIFF. CONDITIONAL ON HH CHARACTERISTICS (D)		-0.002 (-0.24)	-0.063*** (-12.34)
DIFF. CONDITIONAL ON HH CHAR. AND INCOME (E)		-0.004 (-0.54)	-0.058*** (-10.30)
CONSUMER GOODS, DURABLES	0.18	0.170	0.220
DIFFERENCE WITH RESPECT TO (A)		-0.009** (-2.05)	0.042*** (4.73)
DIFF. CONDITIONAL ON HH CHARACTERSITICS (D)		-0.005 (-1.39)	0.034*** (5.06)
DIFF. CONDITIONAL ON HH CHAR. AND INCOME (E)		-0.003 (-0.85)	0.030*** (4.44)
HOUSING	0.032	0.034	0.034
DIFFERENCE WITH RESPECT TO (A)		0.002 (0.70)	0.002 (0.73)
DIFF. CONDITIONAL ON HH CHARACTERISTICS (D)		0.002 (0.96)	-0.003 (-1.08)
DIFF. CONDITIONAL ON HH CHAR. AND INCOME (E)		-0.003 (-1.70)	-0.001 (-0.31)
EDUCATION	0.05	0.040	0.070
DIFFERENCE WITH RESPECT TO (A)		-0.007 (-1.45)	0.025** (2.89)
DIFF. CONDITIONAL ON HH CHARACTERISTICS (D)		0.004 (1.26)	0.014** (2.39)
DIFF. CONDITIONAL ON HH CHAR. AND INCOME (E)		0.003 (0.87)	0.020*** (3.02)
HEALTH	0.016	0.010	0.020
DIFFERENCE WITH		0.003	0.004

EXPENDITURE CATEGORY	HOUSEHOLDS RECEIVING NO REMITTANCES (A) (N=2515)	HOUSEHOLDS RECEIVING INTERNAL REMITTANCES (FROM GHANA) (B) (N=1159)	HOUSEHOLDS RECEIVING INTERNATIONAL REMITTANCES (FROM OTHER COUNTRIES) (C) (N=210)
RESPECT TO (A)		(1.58)	(1.23)
DIFF. CONDITIONAL ON HH CHARACTERISTICS (D)		0.001 (0.78)	0.003 (1.22)
DIFF. CONDITIONAL ON HH CHAR. AND INCOME (E)		0.002 (1.09)	0.001 (0.59)
OTHER GOODS	0.14	0.130	0.180
DIFFERENCE WITH RESPECT TO (A)		-0.008 (-0.89)	0.040*** (5.40)
DIFF. CONDITIONAL ON HH CHARACTERISTICS (D)		0.0001 (0.02)	0.015** (2.20)
DIFF. CONDITIONAL ON HH CHAR. AND INCOME (E)		0.002 (1.09)	0.001 (0.59)
	1.00	1.000	1.000

Notes: All expenditure categories defined in Table 2. All regressions are weighted. (A) Households receiving no remittances. (B) Households receiving internal remittances (from Ghana). (C) Households receiving international remittances (from African or other countries). (D) Difference obtained using an OLS regression including household size, age of household head, the square of the age of household head, children below age five in household, males above age 15 in household, household members with primary education, household members with junior secondary education, household members with senior secondary education, household members with university education, the number of inhabitants per square meter of house in the region in 1998/99, fraction of population living in ecological zones with forest in the region in 1998/99, plus six ethnic dummies and nine regional dummies. (E) Difference obtained using an OLS regression including all the variables of (D) plus the log of the household expenditure, the mean household income in the region (excluding household i), the square of mean household income in the region (excluding household i), an interaction between the mean of household income in region (excluding household i) and the number of children below age five , and an interaction between the mean household income in region (excluding household i) and the fraction of female-headed households receiving internal remittances in the region in 1998/99. Standard errors not shown in table are obtained clustering observations at the region level. *Significant at .10. **Significant at 0.05. ***Significant at .01. Source: 2005/06 Ghana GLSS 5 Survey (sub-sample) and 1998/99 Ghana GLSS 4 Survey.

TABLE 4. MEANS AND STANDARD DEVIATIONS FOR INSTRUMENTAL AND OTHER VARIABLES, BY STATISTICAL REGION IN GHANA, 2005/06

REGION	INTERNAL MIGRATION RATE IN REGION, EXCLUDING HOUSEHOLD I	INTERNATIONAL MIGRATION RATE IN REGION, EXCLUDING HOUSEHOLD I	FRACTION OF HOUSEHOLDS RECEIVING INTERNAL REMITTANCES (FROM GHANA) IN REGION	FRACTION OF HOUSEHOLDS RECEIVING INTERNATIONAL REMITTANCES (FROM AFRICAN OR OTHER COUNTRIES) IN REGION	MEAN ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE IN REGION (THOUSAND GHANAIAN CEDIS)
WESTERN	0.036	0.006	0.315	0.04	6,342
CENTRAL	0.079	0.007	0.345	0.06	6,859
GREATER ACCRA	0.017	0.010	0.153	0.10	11,700
VOLTA	0.062	0.007	0.375	0.02	4,911
EASTERN	0.048	0.009	0.314	0.03	6,056
ASHANTI	0.067	0.042	0.281	0.11	6,701
BRONG AHAFO	0.047	0.019	0.290	0.06	4,925
NORTHERN	0.025	0.001	0.326	0.00	3,461
UPPER EAST	0.023	0.003	0.253	0.00	2,364
UPPER WEST	0.054	0.001	0.515	0.00	1,695
ALL	0.046	0.014	0.298	0.05	6,127

Notes: N = 3,884 households. All values weighted; standard deviations in parentheses. In 2006, US $1.00 = 9,000 Ghanaian cedis. Source: 2005/06 Ghana GLSS 5 Survey (sub-sample).

TABLE 5. TESTS FOR VALIDITY OF INSTRUMENTAL VARIABLES, LINEAR REGRESSION MODEL

TEST	STATISTIC	FOOD	CONSUMER DURABLES	HOUSING	EDUCATION	HEALTH	OTHER GOODS
UNDER-IDENTIFICATION TEST. NULL HYPOTHESIS: MODEL IS NOT IDENTIFIED	KLEIBERGEN-PAAP LM STATISTIC CHI 2 (1 DEGREE OF FREEDOM)= 7.88 AT 1%	29.04	29.04	29.04	29.04	29.04	29.04
WEAKNESS TEST. NULL HYPOTHESIS: INSTRUMENTS ARE WEAK.	KLEIBERGEN-PAAP WALD F STATISTIC CRITICAL VALUES 10% MAXIMAL IV SIZE 7.03 15% MAXIMAL IV SIZE 4.58	13.98	13.98	13.98	13.98	13.98	13.98

Note: These tests were performed using a linear regression model of the given category good on all the exogenous variables and the endogenous variables "receive internal remittances (from Ghana)" and "receive international remittances (from other African countries or other countries)". The instruments used are: (1) internal migration rate in statistical region, excluding household i; and (2) international migration rate in statistical region, excluding household i.

TABLE 6. MULTINOMIAL LOGIT MODEL, USING THE DUBIN AND MCFADDEN METHOD

VARIABLE	RECEIVE INTERNAL REMITTANCES (FROM GHANA)			RECEIVE INTERNATIONAL REMITTANCES (FROM OTHER AFRICAN COUNTRIES AND OTHER COUNTRIES)		
	COEFFICIENT	T	MARGINAL EFFECT	COEFFICIENT	T	MARGINAL EFFECT
HOUSEHOLD EXPENDITURE						
LOG TOTAL ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE (LOG EXP)	-0.641	-5.48***	-0.132	0.340	3.03***	3.28E-05
HUMAN CAPITAL						
NUMBER OF MEMBERS OVER AGE 15 WITH PRIMARY EDUCATION	0.093	1.66*	0.019	-0.250	-1.16	-1.7E-05
NUMBER OF MEMBERS OVER AGE 15 WITH JUNIOR SECONDARY EDUCATION	0.045	0.59	0.009	0.139	1.15	7.89E-06
NUMBER OF MEMBERS OVER AGE 15 WITH SENIOR SECONDARY EDUCATION	0.200	2.5**	0.041	0.178	1.00	7.51E-06
NUMBER OF MEMBERS OVER AGE 15 WITH UNIVERSITY EDUCATION	-0.530	-1.38	-0.109	0.358	0.96	3.19E-05
HOUSEHOLD CHARACTERISTICS						
AGE OF HOUSEHOLD HEAD	-0.063	-3.99***	-0.013	0.013	0.57	1.95E-06
HOUSEHOLD SIZE	-0.056	-2.03**	-0.011	0.048	0.59	3.98E-06
NUMBER OF CHILDREN IN HOUSEHOLD UNDER AGE 5	-0.056	-0.32	-0.011	0.313	1.50	2.05E-05
AGGREGATE VARIABLES						
MEAN ANNUAL PER CAPITA HOUSEHOLD INCOME IN REGION, EXCLUDING HOUSEHOLD I	-2.21E-05	-1.88*	-4.54E-06	-4.60E-05	-3.82*	-2.47E-09
MEAN ANNUAL PER CAPITA HOUSEHOLD INCOME IN REGION, EXCLUDING HOUSEHOLD I, TIMES FRACTION OF FEMALE HEADED	3.61E-05	2.97***	7.40E-06	3.61E-05	2.97***	-5.54E-10

VARIABLE	RECEIVE INTERNAL REMITTANCES (FROM GHANA)			RECEIVE INTERNATIONAL REMITTANCES (FROM OTHER AFRICAN COUNTRIES AND OTHER COUNTRIES)		
	COEFFICIENT	T	MARGINAL EFFECT	COEFFICIENT	T	MARGINAL EFFECT
HOUSEHOLD RECEIVING INTERNAL REMITTANCES (FROM GHANA) IN REGION						
INSTRUMENTAL VARIABLES						
INTERNAL MIGRATION RATE IN REGION, EXCLUDING HOUSEHOLD I	-1649.566	-6.26***	-338.769	907.834	2.17**	0.086
INTERNATIONAL MIGRATION RATE IN REGION, EXCLUDING HOUSEHOLD I	-704.468	-1.65*	-144.571	-5428.964	-10.26***	-0.326
LOG LIKELIHOOD	-2586.1979					
PSEUDO R2	0.1591					
TEST OF JOINT SIGNIFICANCE WALD CHI-SQUARED (4) FOR IV´S.	159.52					
N	3884					

Notes: All values are weighted. The model also includes: age squared, number of males above age 15 in household, the square of mean household income in the region (excluding household i), an interaction between mean household income in the region (excluding household i) and the number of children under age 5 in the household, the fraction of population that lives in ecological zones with forest in the region, the number of inhabitants per square meter of house in the region, plus six ethnic dummies and nine regional dummies, but results for these variables are not reported. Standard errors not shown in table are obtained clustering observations at the region level and using a bootstrap procedure.
*Significant at 0.10. **Significant at 0.05. ***Significant at .01.

TABLE 7. HOUSEHOLD EXPENDITURE ESTIMATES (SELECTION CORRECTED) FOR HOUSEHOLDS RECEIVING NO REMITTANCES, USING THE DUBIN AND MCFADDEN METHOD

VARIABLE	FOOD	CONSUMER GOODS, DURABLES	HOUSING	EDUCATION	HEALTH	OTHER GOODS
RECIPROCAL OF TOTAL PER CAPITA EXPENDITURE (A I/EXP)	.013 (1.30)	0.006 (0.73)	-0.004 (-1.30)	-0.021** (-2.59)	0.004 (0.82)	0.004 (0.40)
LOG TOTAL ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE (LOG EXP)	0.008 (0.74)	-0.006 (-0.83)	-0.024*** (-9.97)	-0.004 (-0.85)	0.001 (0.49)	0.024*** (3.28)
HOUSEHOLD SIZE (HS)	-0.011*** (-3.57)	-0.003 (-1.1)	-0.005*** (-8.61)	0.013*** (5.61)	0.0002 (0.37)	0.006** (2.18)
HOUSEHOLD SIZE/TOTAL EXPENDITURE	0.011*** (3.99)	-0.0001 (-0.07)	-0.0006 (-0.66)	-0.004** (-2.50)	0.0003 (0.61)	-0.006** (2.18)
AGE OF HOUSEHOLD HEAD (AGEHD)	0.004** (2.08)	-0.002** (-2.16)	-0.0004 (-1.45)	-0.0004 (-0.57)	-0.0001 (-0.27)	-0.001 (-0.54)
AGE HOUSEHOLD HEAD/TOTAL EXPENDITURE	-0.001** (-2.62)	0.0002 (0.71)	0.0002** (2.36)	0.0002 (1.17)	-0.0001 (-1.04)	0.0003*** (3.03)
NUMBER OF CHILDREN IN HOUSEHOLD LESS THAN 5 YEARS (CHILD5)	0.036*** (3.49)	0.011 (1.72)	-0.008*** (-4.62)	-0.036*** (-4.03)	0.003 (0.71)	-0.006 (-0.73)
NUMBER CHILDREN/TOTAL EXPENDITURE	0.050*** (3.99)	-0.0001 (-0.02)	-0.009*** (-3.33)	-0.011 (-1.39)	-0.0001 (-0.03)	-0.029*** (-3.72)
NUMBER HOUSEHOLD MEMBERS WITH PRIMARY EDUCATION (EDPRIM)	-0.003 (-0.17)	-0.005 (-1.38)	0.001 (0.68)	0.006 (0.61)	-0.00004 (-0.01)	0.001 (0.09)
NUMBER PRIMARY EDUCATION/TOTAL EXPENDITURE	-0.046 (-1.75)	0.004 (0.51)	-0.003 (-0.92)	0.024* (1.81)	-0.0004 (-0.09)	0.021 (1.49)
NUMBER HOUSEHOLD MEMBERS WITH JSS EDUCATION (EDJSS)	-0.042*** (-5.92)	0.010 (1.57)	0.003** (2.42)	0.018*** (4.09)	0.0002 (0.09)	0.011* (1.83)
NUMBER JSS EDUCATION/TOTAL EXPENDITURE	-0.001 (-0.10)	-0.004 (-0.35)	-0.009** (-2.43)	0.005 (0.71)	0.003 (0.78)	0.006 (0.83)
NUMBER HOUSEHOLD MEMBERS WITH SSS EDUCATION (EDSSS)	-0.074*** (-3.11)	-0.030** (-2.77)	-0.001 (-0.50)	0.089*** (6.25)	-0.007** (-2.49)	0.023 (1.16)
NUMBER SSS EDUCATION/TOTAL EXPENDITURE	0.033 (0.58)	0.095*** (3.74)	0.012 (1.47)	-0.118*** (-3.58)	0.005 (0.90)	-0.028 (-0.54)
NUMBER HOUSEHOLD MEMBERS WITH UNIVERSITY EDUCATION (EDUNIV)	-0.187*** (-3.02)	0.032 (1.01)	0.038 (1.52)	0.042** (2.70)	0.001 (0.12)	0.074 (1.69)

VARIABLE	FOOD	CONSUMER GOODS, DURABLES	HOUSING	EDUCATION	HEALTH	OTHER GOODS
NUMBER UNIVERSITY EDUCATION/TOTAL EXPENDITURE	0.109 (1.10)	0.004 (0.08)	-0.067* (-1.86)	-0.097** (-2.31)	-0.003 (-0.20)	0.053 (0.81)
Σ3P31	-0.055 (-1.20)	156.7 (0.71)	0.008* (1.88)	-0.002 (-0.07)	0.002 (0.32)	0.033** (2.68)
Σ3P32	0.046 (1.08)	0.014 (0.69)	-0.006 (-1.56)	-0.001 (-0.03)	-0.001 (-0.28)	-0.019 (-1.68)
CONSTANT	9.947*** (3.38)	-0.018 (-0.85)	-1.813* (-1.82)	1.791 (1.14)	-1.469 (-1.63)	-4.014** (-2.11)
Σ 3	.129	.078	.025	.062	.0312	.18
ADJ. R2	.24	.13	.44	.33	.04	.10

Notes: N=3,884 households, 2515 non-remittance receiving households, the rest only used in the first stage of the method. All values are weighted. The model also includes: age squared, age squared interacted with consumption, the number of males above age 15 in the household, the number of males above age 15 interacted with consumption, mean household income in the region (excluding household i), mean household income in the region squared (excluding household i), an interaction between mean household income in the region (excluding household i) and the fraction of female-headed households that receive internal remittances, an interaction between mean household income in the region and the number of children under age 5 in the household, the fraction of population that lives in ecological zones with forest in region, the number of inhabitants per square meter of house in region, plus six ethnic dummies and nine regional dummies, but coefficients for these variables are not reported. Figures in parentheses are two tailed t-values. Standard errors not shown in table are obtained clustering observations at the region level, and via bootstrapping (1000 repetitions). The first stage of the model is shown in table 6. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.

TABLE 8. HOUSEHOLD EXPENDITURE ESTIMATES (SELECTION CORRECTED) FOR HOUSEHOLDS RECEIVING INTERNAL REMITTANCES (FROM GHANA), USING THE DUBIN AND MCFADDEN METHOD

VARIABLE	FOOD	CONSUMER GOODS, DURABLES	HOUSING	EDUCATION	HEALTH	OTHER GOODS
RECIPROCAL OF TOTAL PER CAPITA EXPENDITURE (A I/EXP)	-0.326 (-1.03)	0.428** (2.02)	-0.056** (-2.77)	0.079 (0.56)	-0.017 (-0.30)	-0.109 (-0.65)
LOG TOTAL ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE (LOG EXP)	-0.108 (-1.51)	0.162*** (3.91)	-0.028*** (-5.91)	0.013 (0.45)	0.004 (0.29)	-0.044 (-1.15)
HOUSEHOLD SIZE (HS)	-0.029 (-1.15)	0.029* (1.88)	-0.005 (-1.69)	0.034** (2.85)	-0.002 (-0.58)	-0.027* (-1.88)
HOUSEHOLD SIZE/TOTAL EXPENDITURE	0.091 (0.98)	-0.146** (-2.54)	-0.007 (-0.66)	-0.018 (-0.41)	0.007 (0.49)	0.074 (1.22)
AGE OF HOUSEHOLD HEAD (AGEHD)	0.012 (1.65)	-0.005 (-1.06)	-0.003*** (-3.62)	-0.003 (-1.49)	0.001 (0.50)	-0.002 (-0.76)
AGE HOUSEHOLD HEAD/TOTAL EXPENDITURE	0.005 (0.83)	-0.004 (-1.57)	0.002 (1.65)	-0.003 (-0.78)	-0.002 (-1.06)	0.002 (0.48)
NUMBER OF CHILDREN IN HOUSEHOLD LESS THAN 5 YEARS (CHILD5)	-0.053 (-0.48)	0.078** (2.69)	0.005 (0.51)	-0.088** (-2.12)	0.013 (1.17)	0.046 (0.74)
NUMBER CHILDREN/TOTAL EXPENDITURE	-0.186 (-0.62)	0.023 (0.27)	-0.011 (-0.55)	0.015 (0.18)	0.043 (1.14)	0.115 (0.51)
NUMBER HOUSEHOLD MEMBERS WITH PRIMARY EDUCATION (EDPRIM)	0.031 (0.49)	-0.049 (-1.47)	0.006 (1.22)	0.009 (0.27)	-0.017** (-2.37)	0.020 (0.48)
NUMBER PRIMARY EDUCATION/TOTAL EXPENDITURE	0.00004 (0.00004)	0.034 (0.27)	-0.028 (-1.18)	-0.030 (-0.35)	0.055** (2.66)	-0.032 (-0.26)
NUMBER HOUSEHOLD MEMBERS WITH JSS	0.012 (0.45)	0.007 (0.33)	0.002 (0.22)	0.001 (0.04)	-0.001 (-0.24)	-0.020 (-1.68)

Variable	Food	Consumer goods, Durables	Housing	Education	Health	Other goods
EDUCATION (EDJSS)						
Number JSS education/total expenditure	0.027 (0.26)	-0.040 (-0.41)	-0.009 (-0.29)	-0.033 (-0.58)	0.018 (1.72)	0.037 (0.89)
Number household members with SSS education (EDSSS)	-0.007 (-0.19)	-0.019 (-0.62)	0.009 (1.23)	0.077** (2.47)	-0.001 (-0.24)	-0.058** (-2.61)
Number SSS education/total expenditure	-0.038 (-0.25)	-0.053 (-0.39)	-0.031 (-1.06)	-0.122 (-0.92)	-0.004 (-0.19)	0.248** (2.34)
Number household members with university education (EDUNIV)	-0.053 (-1.28)	0.115* (1.92)	0.004 (0.40)	-0.016 (-0.29)	0.004 (0.34)	-0.053 (-0.94)
Number university education/total expenditure	0.897* (1.91)	-1.164** (-2.93)	-0.105 (-0.68)	-0.120 (-0.36)	0.023 (0.18)	0.470 (1.24)
Σ3P31	-0.225** (-2.89)	-0.064 (-1.07)	0.042** (2.66)	0.136* (1.93)	-0.032** (-2.05)	0.144*** (4.54)
Σ3P32	0.190** (2.72)	0.068 (1.30)	-0.039** (-2.56)	-0.124* (-1.93)	0.032** (2.09)	-0.127*** (-3.89)
Constant	3.279 (0.28)	13.751*** (3.52)	0.504 (0.63)	10.232** (2.08)	-0.556 (-0.39)	-26.209*** (-4.31)
Σ 3	.115	.081	.021	.078	.026	.082
Adj. R2	.41	.39	.47	.54	.28	.42

Notes: N=3,884 households, 1159 internal remittance-receiving households (from Ghana), the rest only used in the first stage of the method. All values are weighted. The model also includes: age squared, age squared interacted with consumption, the number of males above age 15 in the household, the number of male above age 15 interacted with consumption, mean household income in the region (excluding household i), mean household income in the region squared (excluding household i), an interaction between mean household income in the region and the fraction of female-headed households that receive internal remittances, an interaction between mean household income in the region and the number of children under age 5 in the household, the fraction of the population that lives in ecological zones with forest in region, the number of inhabitants per square meter of house in the region, plus six ethnic dummies and nine regional dummies, but coefficients for these variables are not reported. Figures in parentheses are two tailed t-values. Standard errors not shown in table are obtained clustering observations at the region level, and via bootstrapping (1000 repetitions). The first stage of the model is shown in table 6. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.

TABLE 9. HOUSEHOLD EXPENDITURE ESTIMATES (SELECTION CORRECTED) FOR HOUSEHOLDS RECEIVING INTERNATIONAL REMITTANCES (FROM AFRICAN OR OTHER COUNTRIES), USING THE DUBIN AND MCFADDEN METHOD

VARIABLE	FOOD	CONSUMER GOODS, DURABLES	HOUSING	EDUCATION	HEALTH	OTHER GOODS
RECIPROCAL OF TOTAL PER CAPITA EXPENDITURE (A I/EXP)	-0.130** (-2.57)	0.045* (1.96)	0.026*** (4.49)	0.034** (2.01)	-0.010** (-2.50)	0.036 (1.27)
LOG TOTAL ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE (LOG EXP)	-0.055** (-2.23)	0.020* (1.78)	-0.014*** (-5.03)	0.001 (0.21)	-0.001 (-0.57)	0.048*** (3.78)
HOUSEHOLD SIZE (HS)	-0.015*** (-3.23)	0.002 (1.13)	-0.006*** (-7.19)	0.018*** (5.61)	0.001 (1.55)	0.001 (0.36)
HOUSEHOLD SIZE/TOTAL EXPENDITURE	0.015*** (3.28)	-0.002 (-0.60)	0.001 (1.05)	-0.011*** (-3.62)	-0.0002 (-0.28)	-0.003 (-1.71)
AGE OF HOUSEHOLD HEAD (AGEHD)	0.000 (0.27)	-0.002** (-2.26)	-0.001** (-2.40)	0.002** (2.62)	-0.001** (-2.42)	0.001 (0.92)
AGE HOUSEHOLD HEAD/TOTAL EXPENDITURE	-0.001 (-1.18)	-0.0003 (-0.75)	0.0001 (0.55)	0.0004 (0.84)	-0.0001 (-1.37)	0.001 (1.19)
NUMBER OF CHILDREN IN HOUSEHOLD LESS THAN 5 YEARS (CHILD5)	0.038*** (3.18)	-0.002 (-0.36)	0.003 (1.12)	-0.034*** (-8.88)	-0.001 (-0.70)	-0.003 (-0.32)
NUMBER CHILDREN/TOTAL EXPENDITURE	0.017 (1.67)	-0.002 (-0.27)	0.002 (0.87)	-0.011** (-2.00)	-0.003 (-1.06)	-0.004 (-0.70)
NUMBER HOUSEHOLD MEMBERS WITH PRIMARY EDUCATION (EDPRIM)	0.0003 (0.02)	0.0001 (0.01)	-0.003** (-2.10)	-0.005 (-0.87)	0.004** (2.63)	0.003 (0.55)
NUMBER PRIMARY EDUCATION/TOTAL EXPENDITURE	-0.020 (-1.12)	0.009 (0.72)	0.001 (0.44)	0.018 (1.50)	-0.005 (-1.23)	-0.004 (-0.46)
NUMBER HOUSEHOLD MEMBERS WITH JSS EDUCATION	-0.040*** (-4.17)	0.008 (1.12)	-0.001 (-0.60)	0.007 (1.51)	0.002** (2.47)	0.023*** (4.60)

Variable	Food	Consumer goods, Durables	Housing	Education	Health	Other goods
(EDJSS)						
Number JSS education/total expenditure	0.023 (1.27)	-0.015 (-0.92)	0.006* (1.83)	0.022** (2.61)	-0.005** (-2.10)	-0.031*** (-3.69)
Number household members with SSS education (EDSSS)	-0.027 (-1.47)	0.013 (1.09)	-0.003 (-1.26)	0.023** (2.75)	-0.003 (-1.50)	-0.003 (-0.35)
Number SSS education/total expenditure	-0.079** (-2.35)	-0.001 (-0.04)	0.022* (1.89)	0.026 (1.41)	0.004 (0.66)	0.028 (1.34)
Number household members with university education (EDUNIV)	-0.056** (-2.72)	0.023 (1.35)	0.009 (1.01)	0.017 (1.05)	-0.004 (-1.28)	0.011 (0.42)
Number university education/total expenditure	-0.143** (-2.06)	-0.023 (-0.23)	0.013 (0.31)	0.044 (0.91)	0.007 (0.33)	0.101 (0.57)
Σ3p31	-0.068** (-2.44)	0.016 (0.87)	0.023*** (5.46)	0.006 (0.47)	-0.002 (-0.37)	0.025 (1.29)
Σ3p32	0.068** (2.74)	-0.003 (-0.14)	-0.025*** (-4.69)	-0.001 (-0.09)	0.004 (0.81)	-0.043* (-1.93)
Constant	3.762** (5.18)	-3.109** (-2.18)	0.550*** (3.10)	0.188 (0.32)	-0.072 (-0.71)	-0.319 (-0.32)
Σ 3	0.134	0.090	0.026	0.064	0.023	0.093
Adj. R2	.30	.12	.39	.34	.05	.23

Notes: N=3,884 households, 210 international remittance-receiving households (from African countries or other countries), the rest only used in the first stage of the method. All values are weighted. The model also includes: age squared, age squared interacted with consumption, the number of males above age 15 in the household, the number of males above age 15 interacted with consumption, mean household income in the region (excluding household i), mean household income in the region squared (excluding household i), an interaction between mean household income in the region and the fraction of female-headed households that receive internal remittances, an interaction between mean household income in the region (excluding household i) and the number of children under age 5 in the household, the fraction of the population that lives in ecological zones with forest in region, the number of inhabitants per square meter of house in region, plus six ethnic dummies and nine regional dummies, but coefficients for these variables are not reported. Figures in parentheses are two tailed t-values. Standard errors not shown in table are obtained clustering observations at the region level, and via bootstrapping (1000 repetitions). The first stage of the model is shown in table 6. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.

TABLE 10. MARGINAL BUDGET SHARES ON EXPENDITURE FOR NON-REMITTANCE AND REMITTANCE-RECEIVING HOUSEHOLDS, GHANA, 2005/06

EXPENDITURE CATEGORY	NO REMITTANCES	RECEIVE INTERNAL REMITTANCES (FROM GHANA)		RECEIVE INTERNATIONAL REMITTANCES (FROM AFRICAN OR OTHER COUNTRIES)	
	ESTIMATED	ESTIMATED	COUNTERFACTUAL	ESTIMATED	COUNTERFACTUAL
FOOD	0.528	0.626	0.571	0.391	0.458
CONSUMER GOODS/ DURABLES	0.203	0.154	0.193	0.332	0.225
HOUSING	0.018	0.009	0.023	0.014	0.019
EDUCATION	0.049	0.038	0.036	0.076	0.057
HEALTH	0.019	0.019	0.021	0.029	0.021
OTHER GOODS	0.183	0.155	0.156	0.158	0.220
TOTAL	1.000	1.000	1.000	1.000	1.000

Notes: N=3,884 households. 2515 non-remittance receiving households, 1159 receive internal remittances (from Ghana) and 210 receive international remittances (from African or other countries). Expenditure categories defined in Table 2. Estimated MBS refers to using the MBS coefficients for type s households with households of type s. Counterfactual MBS obtained using the MBS coefficients for type l households with households of type s.

TABLE 11. PAIR WISE AVERAGE TREATMENT EFFECTS ON THE TREATED (ATT), USING THE DUBIN AND MCFADDEN METHOD, GHANA, 2005/06

EXPENDITURE CATEGORY	HOUSEHOLDS IN TREATMENT "RECEIVE INTERNAL REMITTANCES" COMPARED TO EXPENDITURE WITHOUT REMITTANCES	HOUSEHOLDS IN TREATMENT "RECEIVE INTERNATIONAL REMITTANCES" COMPARED TO EXPENDITURE WITHOUT REMITTANCES
FOOD	0.055 (37.47)***	-0.067 (-9.74)***
CONSUMER GOODS/ DURABLES	-0.038 (-39.28)***	0.107 (13.06)***
HOUSING	-0.014 (-48.56)***	-0.005 (-3.22)***
EDUCATION	0.001 (1.78)*	0.019 (4.38)***
HEALTH	-0.002 (-10.53)***	0.008 (5.88)***
OTHER GOODS	-0.002 (-2.53)**	-0.062 (-8.09)***

Notes: N=3,884 households. 2515 non-remittance receiving households, 1159 receive internal remittances (from Ghana) and 210 receive international remittances (from African or other countries). Expenditure categories defined in Table 2. Numbers in parenthesis are two tailed t-tests. ***Significant at the 0.01 level.

TABLE 12. ROBUSTNESS CHECK: MARGINAL BUDGET SHARES ON EDUCATION FOR HOUSEHOLDS RANKED BY QUINTILE GROUP, GHANA, 2005/06

RANKED BY TOTAL ANNUAL PER CAPITA EXPENDITURE INCLUDING REMITTANCES	PERCENT OF HOUSEHOLDS IN EACH GROUP	MEAN OF TOTAL ANNUAL PER CAPITA HOUSEHOLD EXPENDITURE (THOUSANDS OF CEDIS)	PERCENT OF TOTAL HOUSEHOLD EXPENDITURE ON EDUCATION	MARGINAL BUDGET SHARE TO EDUCATION (ESTIMATED)	MARGINAL BUDGET SHARE TO EDUCATION (COUNTER-FACTUAL)	AVERAGE TREATMENT EFFECT	PERCENT DIFFERENCE (REMITTANCES VS. NO REMITTANCES)
HOUSEHOLDS RECEIVING NO REMITTANCES							
LOWEST 20%	20.09	1,533	5.43%	0.004	NA	NA	NA
SECOND 20%	20.19	3,034	6.07%	0.005	NA	NA	NA
THIRD 20%	20.62	4,654	5.70%	0.007	NA	NA	NA
FOURTH 20%	20.04	7,036	5.15%	0.009	NA	NA	NA
TOP 20%	19.06	14,200	3.08%	0.020	NA	NA	NA
ALL	100.00	6,404	5.11%	0.009	NA	NA	NA
HOUSEHOLDS RECEIVING INTERNAL REMITTANCES							
LOWEST 20%	23.16	2,105	3.91%	0.033	0.038	-0.004*** (-3.57)	-10.5
SECOND 20%	22.11	3,200	5.62%	0.046	0.042	0.003* (1.94)	7.1
THIRD 20%	19.68	4,582	5.06%	0.045	0.042	0.003 (1.65)	7.1
FOURTH 20%	19.10	7,304	4.40%	0.041	0.034	0.007*** (3.00)	20.5
TOP 20%	15.96	18,800	2.52%	0.022	0.021	0.001 (0.61)	4.7
ALL	100.00	5,546	4.39%	0.038	0.036	0.001* (1.78)	2.8
HOUSEHOLDS RECEIVING INTERNATIONAL REMITTANCES							
LOWEST 20%	1.89	1,598	10.00%	0.087	0.065	0.022 (0.97)	33.8
SECOND 20%	6.28	3,054	5.97%	0.077	0.058	0.020 (1.67)	34.5
THIRD 20%	14.50	4,614	11.91%	0.137	0.085	0.052*** (4.27)	61.1
FOURTH 20%	24.41	7,066	9.87%	0.100	0.062	0.038*** (4.12)	61.3
TOP 20%	52.92	16,300	5.42%	0.046	0.046	-0.0002 (-0.05)	-1.0
ALL	100.00	12,600	7.57%	0.076	0.057	0.019*** (4.38)	33.3

Notes: N=3,884 households. 2,515 non-remittance receiving households. 1,159 receive internal remittances (from Ghana) and 210 receive international remittances (from African or other countries). Estimated MBS refers to using the MBS coefficients for type s households with households of type s. Counterfactual MBS obtained using the MBS coefficients for type l households with households of type s. Percent difference (remittances vs. no remittances) calculated by dividing ATT by the value of the counterfactual MBS. In 2006, US $1.00 = 9,000 Ghanaian cedis. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.

TABLE A1: SUMMARY DATA ON AGGREGATE CONTROL VARIABLES FOR NON-REMITTANCE AND REMITTANCE-RECEIVING HOUSEHOLDS, GHANA, 2005/06 GLSS 5 AND 1998/99 GLSS 4 SURVEYS

VARIABLE	RECEIVE NO REMITTANCES	RECEIVE INTERNAL REMITTANCES (FROM GHANA)	RECEIVE INTERNATIONAL REMITTANCES (FROM AFRICAN OR OTHER COUNTRIES)	T-TEST (INTERNAL REMITTANCES VS. NO REMITTANCES)	T-TEST (INTERNATIONAL REMITTANCES VS. NO REMITTANCES)
MEAN ANNUAL PER CAPITA HOUSEHOLD INCOME, EXCLUDING HOUSEHOLD I, IN REGION IN 2005/06 (THOUSAND GHANAIAN CEDIS)	8,760 (465)	7,780 (408)	11,400 (442)	-6.20**	8.44**
FRACTION OF FEMALE-HEADED HOUSEHOLDS RECEIVING INTERNAL REMITTANCES IN REGION IN 1998/99	0.46 (.08)	0.47 (.07)	0.46 (.06)	4.23**	0.95
FRACTION OF POPULATION THAT LIVES IN ECOLOGICAL ZONES WITH FOREST IN REGION IN 1998/99	0.40 (.23)	0.42 (.24)	0.54 (.23)	1.95	8.35**
MEAN NUMBER OF INHABITANTS PER SQUARE METER OF HOUSE IN REGION IN 1998/99	0.25 (.02)	0.25 (.02)	0.25 (.01)	-0.09	2.41*

Notes: N=3,884 households for 2005/06 Ghana GLSS5 Survey; N= 5,852 households for 1998/99 Ghana GLSS 4 Survey. All values are weighted; standard deviations in parentheses. In 2006, US $1.00 = 9,000 Ghanaian cedis. Source: 2005/06 Ghana GLSS 5 and 1998/99 Ghana GLSS 4. *Significant at the 0.05 level. **Significant at the 0.01 level.

Conclusions

This paper has used a new, 2005/06 nationally-representative household survey from Ghana to analyze how the receipt of internal remittances (from within Ghana) and international remittances (from African or other countries) affects the marginal spending behavior of households on a broad range of consumption and investment goods, including food, education and housing. Two key findings emerge.

First, when compared to what they would have spent without the receipt of remittances, households receiving international remittances (from other African countries and other countries) spend less at the margin on one key consumption good: food. At the mean, households receiving international remittances spend 14 percent less at the margin on food that what they would have spent without the receipt of remittances. Second, households receiving both internal and international remittances spend more at the margin on one important investment good: education. At the mean, households receiving internal and international remittances spend 3 and 33 percent more at the margin, respectively, on education than what they would have spent on this investment good without the receipt of remittances. Such remittance-inspired investments on education are important, because they can help to build human capital in Ghana.

These two findings hold when we control for potential selection in unobservable household characteristics, which is important in certain situations. These results also hold when we control for the potential endogeneity of household expenditure, which we also find to be important.

The findings of this study therefore support the growing view in the literature that remittances can actually have a positive impact on economic development by increasing the level of investment in human capital. In Ghana households receiving international remittances (from African or other countries) actually spend less on one key consumption good —food—, compared to what they would have spend on this good without the receipt of remittances. Instead of spending more of their marginal income on food, households receiving international remittances in Ghana tend to view their remittance earnings as a temporary (and possibly uncertain) stream of income, one to be spent more on investment goods, like education.

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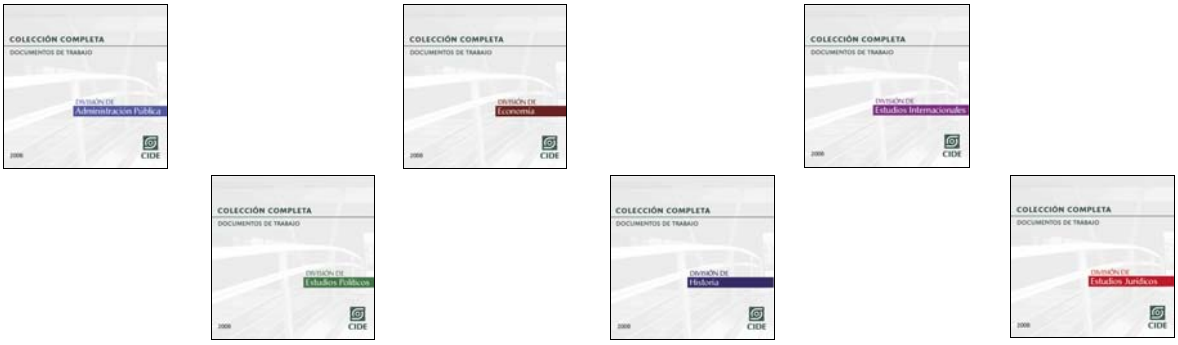

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