

Remittances, Consumption and Investment in Ghana

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Abstract

This paper uses a new, nationally-representative household survey from Ghana to analyze within a rigorous econometric framework 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. Contrary to other studies, which find that remittances are spent disproportionately on consumption (food and consumer goods/durables) or investment goods (education and housing), the findings show that households receiving remittances in Ghana do not spend

more at the margin on food, education and housing than households with similar income levels and characteristics that do not receive remittances. When the analysis controls for endogeneity and selection bias, the findings show that any differences in the marginal spending behavior between remittance-receiving and non-receiving households are explained completely by the observed and unobserved characteristics of households. Households in Ghana treat remittances just like any other source of income, and there are no changes in marginal spending patterns for households with the receipt of remittance income.

This paper—a joint product of the Development Prospects Group, Development Economics Department and the Africa Region—is part of a larger effort to understand the impact of migration and remittances on investment and consumption in the developing world. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at radams@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

Remittances, Consumption and Investment in Ghana

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In 2004 migrants working outside of their countries of origin sent home an estimated \$93 billion in officially recorded international remittances to households in Africa, Asia, the Middle East and Latin America (Ratha, 2004).¹ From the standpoint of economic development, the key question regarding these large transfers is quite simple and direct: How are 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 or farm income, and the contribution of remittances to development will be 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 remittances literature by Chami, Fullenkamp and Jahjah (2003:10-11) reports three “stylized facts”: (a) a “significant proportion, and often the majority,” of remittances are spent on “status-oriented” consumption; (b) a smaller part of remittance funds goes into saving or investment; and (c), the way 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 of remittances and education in the Philippines, Yang (2005) reports that positive exchange rate shocks lead to a significant increase in remittance expenditures on education. Osili (2004) finds that a large proportion of remittance income in Nigeria is spent on housing. At the mean, a 10 percent increase in remittance income raises the probability of investing in housing in Nigeria by 3 percentage points. Choosing among these three quite distinct views of the role of remittances in development is largely a question of creating a body of careful empirical work based on statistically representative household surveys.

This paper provides new, statistically robust evidence on how remittances are used in one low-income, Sub-Saharan African country, Ghana. The results of the nationally-representative, 2005/06 Ghana household 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 are of interest for economic policy making 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, and their contribution to economic development may be different. Thus, our results can add to the body of comparative evidence available on the impact of remittances on countries at varying stages of development.

At the outset it should be emphasized that the comparative analysis of household marginal spending behavior is subject to both selection bias and endogeneity problems. If the three groups of households -- 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 ethno-religious groups. 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.. Since the problems of selection and identification are so important, Section 2 presents the two-stage multinomial logit-OLS selection model and discusses the various identification issues involved in estimating this model. Section 3 estimates the selection model using an instrumental variables approach, employing variations in migration networks and remittances at the ethno-religious level. Section 4 describes the expenditure data for Ghana. Section 5 develops the functional form for the expenditure analysis, and Section 6 presents estimates of the expenditure model. Section 7 summarizes the main findings and conclusions.

1. The Data Set

Data for this study 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 at the outset 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

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).

2. An Econometric Model of Household Incomes with Selection Controls

As noted above, if households with and without remittances differ systematically in their unobservable characteristics (e.g. skills, motivation, ability), selection bias may make the estimation results inconsistent. The purpose of this section is therefore to examine the extent of selection bias in the Ghana household data using the multinomial logit selection model developed by Lee (1983) and Bourguignon, Fournier, and Gurgand (2004).⁶

The multinomial logit selection model is based on two equations: (i) a choice equation, which predicts the receipt of remittances; and (ii), an income equation, which determines household income, conditional on the receipt of remittances. Denoting the receipt of remittances in each group by r , $r=1$ (no remittances), $r=2$ (receive internal remittances), $r=3$ (receive international remittances), this can be summarized in the following equations:

$$y_r^* = z_r \gamma_r + \eta_r \quad (1)$$

$$y_r = x_r\beta_r + \sigma_r\mu_r \quad (2)$$

where z_r and x_r are matrices of explanatory variable for households in group r , γ_r and β_r are group-specific coefficients, and where it is assumed that μ_r and η_r are independent of all of the components of x and z , for all j , $j = 1, \dots, R$, and that $\mu_r \sim N(0,1)$. The first equation is estimated across all observations in the data set and represents the household choice decision to receive remittances. Household i ($i=1, \dots, N$) selects group r if and only if:

$$y_{ri}^* > \text{Max}(y_{ji}^*); j \neq r \quad (3)$$

This can be interpreted as meaning that households obtain a higher level of income from that choice of classification than any other. In reality, y_{ri}^* is not observable; what is observed is the index I_i where $I_i = r$ if group r is chosen by household i . This is modeled as a function of household-specific explanatory variables, estimated as a multinomial logit regression, using the same variables across all households.

The second equation then applies only to those households selected as belonging to group r (separate equations applying to households in other groups). This second equation estimates the income of the household as a function of relevant explanatory variables. In this case the dependent variable (household income) is both observable and continuous. Because of the possible selectivity bias, however, the two equations must be considered jointly. They can be estimated using a two-stage procedure, as long as a Heckman-like selectivity term (λ), derived from the multinomial logit estimation, is included in the second equation. Having included this term in the second equation, the second equation can then be estimated by ordinary least squares to give consistent coefficient estimates.

To implement such a two-stage procedure, it is necessary to identify variables that are distinct for the receipt of remittances in the first-stage equation, and for the determination of household income in the second-stage equation. The model is identifiable if there is at least one independent variable in the first-stage choice function that is not in the second-stage income function.

The main econometric problem lies in selecting the variables that should go into the equations. Identifying variables that are truly exogenous to the receipt of remittances is difficult. While some variables – such as age of household head – are probably exogenous to household decision-making, other variables – such as those relating to household education – are more problematic. In the literature, the cleanest strategies for identifying exogenous variables affecting migration and/or the receipt of remittances have focused on short-term economic shocks. For example, Yang (2005) 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 seven instrumental variables and nine control variables using information from the two most recent nationally-representative household surveys in Ghana: the 2005/06 GLSS 5 Survey, which is the focus of our analysis, and the earlier 1998/99 GLSS 4 Survey. We constructed these variables using the following three steps.

First, since 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), and since ethnicity and religion represent two important forms of association in Ghana, we assume

that individuals in Ghana will form migration networks on the basis of ethnicity and religion. On the basis of this assumption, in order to link the two Ghana household surveys, we partitioned the data from the 2005/06 Ghana GLSS 5 Survey (sub-sample) into fifteen ethno-religious groups. We defined these ethno-religious groups by classifying households according to five religious and 3 ethnographic groups. The five religious groups are: (1) Catholic and Anglican; (2) Presbyterian and Methodist; (3) Pentecostal, Spiritualist and other Christian; (4) Muslim; and (5) all others.⁷ The three ethnographic groups include: (1) households belonging to ethnic groups representing 17% or more of the population in 1998/99 (e.g., Asante and other Akan); (2) households belonging to ethnic groups representing between 10% and 15% of the population in 1998/99 (e.g., Fanti, Ga-Adangbe, Ewe); and (3) all other households.⁸

Second, using these ethno-religious groups, we created seven instrumental variables. Some of these instrumental variables are used in our selection model, while others are used in the estimation of marginal budget shares, as described later in the paper.⁹ The first two instrumental variables come from the 1998/99 Ghana GLSS 4 Survey and include: (1) the fraction of females receiving internal remittances (from Ghana) in the ethno-religious group; and (2) the fraction of females receiving international remittances (from African and other countries) in the ethno-religious group. The intuition for including these variables is that ethno-religious groups share information on the costs of sending and receiving remittances, consequently those groups which receive more remittances will have lower costs. The assumption is that these variables observed in 1998/99 are correlated with the decision to receive remittances in 2005/06 but not with observed household income in 2005/06.

The five other instrumental variables come from the 2005/06 Ghana GLSS 5 Survey (sub-sample) and include: (1) the fraction of households receiving internal remittances (from

Ghana) in the ethno-religious group, excluding household i ; (2) the fraction of households receiving international remittances (from African or other countries) in the ethno-religious group, excluding household i ; (3) the fraction of internal migrants (from Ghana) in the ethno-religious group, excluding household i ; (4) the fraction of international migrants (to African or other countries) in the ethno-religious level, excluding household i ; (5) per capita household income at the ethno-religious level, excluding household i . These five variables reflect the extent of migration networks in the ethno-religious group in 2005/06, the costs of sending and receiving remittances in the ethno-religious group in 2005/06 and the level of poverty in the ethno-religious group in 2005/06.

Third, using the religious-ethnic groups, we also created nine control variables that help guarantee that our instrumental variables are uncorrelated with the unobserved terms in their corresponding equations. The nine control variables include: (1) fraction of population belonging to top three religions in 1998/99 (Catholic 16%, Pentecostal 15% and other Christian 13%); (2) fraction of households receiving internal remittances (from Ghana) in 1998/99; (3) fraction of households receiving international remittances (from African or other countries) in 1998/99; (4) fraction of population with primary school education in 1998/99; (5) fraction of population with junior secondary school in 1998/99; (6) fraction of population with senior secondary and university education in 1998/99; (7) fraction of population living in forests in 1998/99; (8) number of inhabitants per square meter of house in 1998/99; and (9) annual per capita household income (excluding remittances) in 1998/99.

Table 2 presents the means and standard deviations for the seven instrumental variables, and Table A1 lists summary data for the nine 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:

$$\text{Prob (Y = receive remittances)} = f [\text{Human Capital (Number of household members with primary, junior secondary, secondary or university education), Household Characteristics (Age of household head, Household size, Number of males over age 15, Number of children under age 5), Migration Networks, Instrumental Variables}] \quad (4)$$

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).¹⁰ In the literature household characteristics – such as age of household head and number of male members and children – are also hypothesized to affect the probability of migration. The migration network variables are included in the model because the literature has stressed the importance of migration networks in encouraging migration (Massey, et al 1987) and in helping migrants to find jobs and invest (Munshi, 2003; Woodruff and Zenteno, 2007). In the model the migration network variables are based on the ethno-religious groups described above, and capture the potential differences in human capital and income that can exist between these groups. The other characteristics of the ethno-religious groups are included in the model to insure that conditional on such characteristics our instruments are not be correlated with income observed in 2005/06.

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

Household income = γ [Human capital (Number of household members with primary, junior secondary, secondary or university education), Household Characteristics (Age of household head, Household size, Number of males over age 15, Number of children under age 5), Migration Networks]

(5)

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 (5) and throughout the rest of the paper.¹¹

The rationale for including the various variables in equation (5) is similar to that for including them in the first-stage choice equation.¹² However, it should be pointed out that the model is identified from differences in the instrumental variables between ethno-religious groups, which are excluded from the second stage equation. Notice that our identification is done conditional on a set of characteristics of the ethno-religious group. This type of identification creates several potential econometric problems. First, since the instrument provides independent information by ethno-religious group, this information is shared by all individuals forming that ethno-religious group and thus generates correlation of observations within an ethno-religious group. We solve this problem by clustering standard errors by ethno-

religious group. A second problem is whether the estimation error 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 those are the standard errors reported for the estimation of equation (5).

3. Econometric Estimates of the Model of Household Incomes with Selection Controls

Econometric estimates of equations (4) and (5) are contained in Tables 3, 4 and 5. It should be noted that the coefficients of the multinomial logit model in equation (4) do not give the marginal effect of the variable in question on the probability of a household receiving remittances. These marginal effects, however, can be readily computed by a standard transformation, and it is these marginal effects from the multinomial logit that are reported in Table 3.

In Table 3 the outcomes for the human capital variables are unexpected. For households receiving internal and international remittances, most of the human capital variables are statistically insignificant. This suggests that the relationship between education, migration and remittances may not be as strong as hypothesized by human capital theory.¹³ Table 3 also shows that our instruments are significant in the equation for receiving international remittances (from African or other countries) but they are not significant for receiving internal remittances (from Ghana).

The results for the ordinary least squares (OLS) and the sample selection-corrected income estimates are presented in Table 4 for households receiving internal remittances and in Table 5 for households receiving international remittances. The sample corrected estimates include those corrected using the Lee (1983) and the Bourguignon, Fournier, and Gurgand

(2004) (BFG) methods. The most striking result in these tables is the absence of a strong, positive relationship between education and household income (expenditure). In both tables the correlation between human capital variables and household income is only significant in the case of university education.

In general, the effect of selection bias on the coefficient estimates in Tables 4 and 5 does not seem to be severe. Table 4 shows that the selection control variable is insignificant for households receiving internal remittances (from Ghana) using both the Lee and the BFG methods. This suggests that selection is not a problem for households receiving internal remittances. However, for households receiving international remittances (from African or other countries) in Table 5 the selection control variable is significant at the 5% level using both methods, but its impact is ambiguous. The Lee method suggests that there is negative correlation between unobserved heterogeneity and household income, while the BFG method suggests just the opposite, namely, that there is positive correlation between unobserved heterogeneity and household income. Hausman tests performed for both the Lee and the BFG methods cannot reject the null hypothesis that the coefficients are similar. We also tested whether our instruments identify selection in the expenditure equations; this analysis shows that our instruments perform well.¹⁴

To summarize, the correlation between unobservable household characteristics and the probability of receiving remittances is insignificant for internal, but significant for international remittances. We interpret these results as indicating that the receipt of internal remittances is correlated with the observable characteristics of households to the point that conditional on those characteristics, the unobservable component in income does not bias our estimations. On the other hand, given that observable characteristics seem to be less correlated with the receipt of

international remittances, unobservable components in the income equation could bias our estimates for households with international remittances. Because of this, in our analysis of marginal expenditure patterns we will show estimates based on both OLS and instrumental variables.

4. Household expenditure data

As shown in Table 6, the 2005/06 Ghana GLSS 5 Survey (sub-sample) 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 7 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 60 percent of their budget on two categories of goods that are clearly consumption: food and consumer goods/durables.

Table 7 also reports differences in average budget shares, and conditions these differences for the income and characteristics of the households. The only differences in average budget shares that are significant after conditioning for household income and characteristics are: (1) households receiving internal remittances (from Ghana) spend more on health and less on

housing than households with no remittances; and (2) households receiving international remittances (from African or other countries) spend more on consumer goods/durables and education, while they spend less on housing and food than households with no remittances.¹⁵

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 our analysis in the next three sections.

5. Marginal Expenditures: 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. We will therefore use a modified version of the Working-Leser model as the basic form for our analysis.¹⁶ It can be written as:

$$C_i/EXP = \beta_i + a_i/EXP + \gamma_i (\log EXP) \quad (6)$$

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

Equation (6) is equivalent to the Engel function:

$$C_i = a_i + \beta_i EXP + \gamma_i (EXP) (\log EXP) \quad (7)$$

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

$$C_i = a_i + \beta_i EXP + \gamma_i (EXP) (\log EXP) + \sum_j [(\mu_{ij})(Z_j) + \lambda_{ij}(EXP)(Z_j)] \quad (8)$$

Written in expenditure share form, this is equivalent to:

$$C_i / EXP = \beta_i + a_i / EXP + \gamma_i (\log EXP) + \sum_j [(\mu_{ij})Z_j / EXP + \lambda_{ij}(Z_j)] \quad (9)$$

Including the various household characteristic variables in equation (9) is important, because it introduces considerably more flexibility in the way that marginal budget shares can vary by household type.

From equation (9) the marginal and average budget shares for the i th good (the MBS_i and ABS_i , respectively) and the expenditure elasticity (ξ_i) can be derived as follows:

$$MBS_i = dC_i / dEXP = \beta_i + \gamma_i (1 + \log EXP) + \sum_j [(\gamma_{ij})(Z_j)] \quad (10)$$

$$ABS_i = C_i / EXP_i \quad (11)$$

$$\xi_i = MBS_i / ABS_i \quad (12)$$

To estimate equation (9), the various household and human capital characteristic variables need to be specified and identified. These variables can be the same as those used in

the first-stage choice equation of the multinomial logit model. That is, for the i th household, let HS be the variable for family size, AGEHD be the variable for age of household head, MALE15 (number of household males over age 15), CHILD5 (number of children below age 5) the variable for number of children, EDPRIM is number of household members over age 15 with primary education, EDJSS is number of household members over age 15 with junior secondary education, EDSSS is number of household members over age 15 with senior secondary education, EDUNIV is number of household members over age 15 with university education, and LOC is six regional dummy variables (with capital city omitted). In addition, let INTREM be the dummy variable for the receipt of internal remittances and EXTREM be the dummy variable for the receipt of international remittances. The complete model to be estimated is then:

$$\begin{aligned}
C_i / \text{EXP} = & \beta_1 + \alpha_i / \text{EXP} + \gamma_1(\log \text{EXP}) + \gamma_2 \text{INTREM} + \gamma_3(\text{INTREM})(\log \text{EXP}) \\
& + \gamma_4 \text{EXTREM} + \gamma_5(\text{EXTREM})(\log \text{EXP}) + \mu_1 \text{HS} + \lambda_1 \text{HS} / \text{EXP} \\
& + \mu_2 \text{AGEHD} + \lambda_2 \text{AGEHD} / \text{EXP} + \mu_3 \text{MALE15} + \lambda_3 \text{MALE15} / \text{EXP} \\
& + \mu_4 \text{CHILD5} + \lambda_4 \text{CHILD5} / \text{EXP} + \mu_5 \text{EDPRIM} + \lambda_5 \text{EDPRIM} / \text{EXP} \\
& + \mu_6 \text{EDJSS} + \lambda_6 \text{EDJSS} / \text{EXP} + \mu_7 \text{EDSSS} + \lambda_7 \text{EDSSS} / \text{EXP} \\
& + \mu_8 \text{EDUNIV} + \lambda_8 \text{EDUNIV} / \text{EXP} + \delta_1 \sum_{j=1}^7 \lambda_j \text{LOC}_j + \varepsilon_i \quad (13)
\end{aligned}$$

where:

C_i = annual per capita household expenditure on one of six expenditure

categories defined above (food, consumer goods/durables, housing, education, health or other)

EXP = total annual per capita household expenditure

INTREM = internal remittances dummy variable (1 if household receives internal remittances, 0 otherwise)

EXTREM = international remittances dummy variable (1 if household receives international remittances, 0 otherwise)

In equation (13) the dummy variables for the receipt of internal and international remittances (INTREM and EXTREM) are entered separately and linearly, and each of these dummy variables is also interacted with the log of total annual expenditures (log EXP) in order to affect both the intercept and the slope of the Engel functions. This means that the marginal budget share for the i th good (MBS_i) can be derived as follows:

$$\text{(when INTREM, EXTREM = 0) } MBS_i = \text{equation (11)} \quad (14)$$

$$\begin{aligned} \text{(when INTREM = 1) } MBS_i &= \beta_i + \gamma_2 + (\gamma_1 + \gamma_3)[(1 + (INTREM)(\log EXP))] \\ &+ \sum_j [(\gamma_{ij})(Z_j)] \end{aligned} \quad (15)$$

$$\begin{aligned} \text{(when EXTREM = 1) } MBS_i &= \beta_i + \gamma_4 + (\gamma_1 + \gamma_5)[(1 + (EXTREM)(\log EXP))] \\ &+ \sum_j [(\gamma_{ij})(Z_j)] \end{aligned} \quad (16)$$

If we evaluate equations (14), (15) and (16) at the mean level of characteristics of the sample (i.e. implicitly assuming that $E[x_i | \text{Intrem}=1] = E[x_i | \text{Extrem}=1] = E[x_i]$) we have that the effect of remittances on the marginal budget share is equal to:

$$(MBS_i | \text{INTREM} = 1) - (MBS_i | \text{INTREM} = 0) = \gamma_2 + \gamma_3 \log EXP \quad (17)$$

$$(MBS_i | \text{EXTREM} = 1) - (MBS_i | \text{EXTREM} = 0) = \gamma_4 + \gamma_5 \log EXP \quad (18)$$

Moreover, inspection of equation (13) reveals that at the mean level of characteristics of the sample, equations (17) and (18) are also the effect of internal remittances (from Ghana) and international remittances (from African or other countries), respectively, on the average budget share, given our definition of the Engel curve. Since the effect is a function of the parameters estimated, we use the delta method to obtain the standard errors and to test the significance of the effect estimated.

6. Marginal Expenditures: Estimation of the Model

Equation (13) was estimated on all 3884 households in the Ghana survey. The equation was estimated in two ways: first, with no dummy variables for the receipt of internal or international remittances; and second, including both remittance variables. In both estimations the model was estimated for each of the six categories of expenditures described in Table 6 using both OLS and instrumental variables.

Estimating equation (13) presents several challenges. First, expenditure is endogenous or could be measured with error, which might lead to biased estimates of the Engel curve (Hausman, 2001). In the past, a standard solution to this problem has been to use income as an instrument for expenditure (Liviatan, 1961); however, recently the assumptions under which this can be done have been criticized (Hausman, 2001). Other authors have suggested the use of polynomials on age, education or consumption lagged (Hausman, Newey and Powell, 1995). In our estimation, we use two instruments for income: (1) a polynomial on age; and (2) annual per capita household expenditure in the ethno-religious group, excluding the income of the household studied.¹⁷ Second, given that we found that selection matters in the receipt of international remittances (from African or other countries), it appears that estimating the effect of receiving international remittances faces the problem of selection bias. To address this issue, we use as instruments the seven variables on migration networks and remittances at the ethno-religious level described above.¹⁸ A third problem in estimating equation (13) is that when we divide different variables in the model by expenditure, we generate a number of potentially endogenous variables. To meet this problem, we use as instruments interactions of annual per capita household expenditure at the ethno-religious level with each of the characteristics that are divided by expenditure. Fourth, to insure that the variables measured in the ethno-religious

group work as instruments, we include in the regressions the nine control variables on the characteristics of ethno-religious groups described above. Tests on the validity of these instruments were performed.¹⁹ The estimation technique also clusters observations by ethno-religious group to take into account the fact that the instruments for the effect of remittances are variables measured at the ethno-religious level. Finally, in estimating equation (13) we bootstrap the instrumental variables procedure to take into account the different stages involved in the estimation.

Results are shown in Tables 8, 9, and 10. Table 8 shows the OLS results without remittance variables, Table 9 shows the OLS results with remittance variables, and Table 10 shows the IV results with remittance variables. The results from these tables can be used to calculate marginal budget shares for the three groups of households for each of the six categories of expenditure. Calculating these shares makes it possible to identify at the margin how the receipt of internal or international remittances affects the expenditure patterns of households in Ghana.

Table 11(a) shows the marginal budget shares for the households for the six categories of expenditure for the estimations based on OLS and IV. The differences in marginal budget shares and the tests for its significance are shown in Table 11(b). In Table 11(b) the OLS estimations show that there are no significant differences in marginal budget shares between households receiving internal remittances (from Ghana) and households receiving no remittances. However, by contrast, there are significant differences in marginal budget shares between households receiving international remittances (from African or other countries) and households with no remittances for three categories of expenditure: food, consumer goods/durables and education.

Table 11(b) also shows the same tests based on the IV estimations. In this table none of the differences in marginal budget behavior between the various groups of households are significant. Since these IV results differ from the OLS results, it is important to know if the instrumentation that we have used generates a difference in the coefficients (i.e. whether the problems solved by the IV really matter). The Hausman tests shown in Table 10 (third to last row) indicate that instrumentation does make a difference at the 5% level for four categories of expenditure: food, consumer goods/durables, housing and education.

This means that the significant differences observed with the OLS estimations in Table 11 (b) for differences in marginal budget shares for food, consumer goods/durables and education are all spurious. Consequently, our results indicate that at the margin all households in Ghana spend similarly, regardless of whether they receive remittances or not. In other words, our results suggest that income (expenditure) levels and household characteristics determine spending patterns in Ghana not the source of the income. Households in Ghana treat remittances just like any other source of income.

7. Conclusion

This paper has used a new, 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. One principal finding emerges. Contrary to other studies, which find that remittances are either spent disproportionately on consumption (food and consumer goods/durables) or investment goods (education and housing), we find that households receiving remittances spend their remittance income just like any other source of income. When we

control for endogeneity and selection bias, we find that any differences in the marginal spending behavior between remittance-receiving and non-receiving households are explained completely by the observed and unobserved characteristics of the households. The relevance of our instrumental variables in the expenditure functions leads us to conclude that any evidence from the OLS regressions of differences in expenditures in food, education and housing between households receiving and not receiving remittances can be accounted for by the correlation between unobserved components in the expenditure equations and the decisions of the households to receive remittances.

In contrast with earlier studies cited above, we have found that remittances do not have a statistically significant impact at the margin on the consumption and investment behavior of households in Ghana. Household expenditures in Ghana change proportionately with income, and since remittances are fungible, we observe no changes in marginal budget shares for households receiving income from internal or international remittances.

There are several possible reasons why our results indicate that households in Ghana do not treat remittances differently from other sources of income. The first may be that our sample of 3,884 households is not large enough to generate sufficient variation in our variables. This may imply that our instruments do not have enough independent variation to identify the effects of remittances on consumption and investment. A second possible explanation is that once selection bias and endogeneity have been addressed remittances do not have a statistically observable impact at the margin on the consumption and investment behavior of Ghanaian households. A third reason may be that while our study is based on a low-income country, Ghana, most other studies of remittances and household behavior have been based on middle-income countries with substantially higher incomes. It is entirely possible that households with

more disposable income will treat income from different sources differently in making consumption and investment decisions.

Unfortunately, on the basis of our data, we cannot discriminate among these three competing explanations. But our results strongly suggest the need for further empirical work on nationally-representative household data from a wide range of countries at different levels of income before the debate about the development impact of remittances can be resolved.

Table 1. Summary Data on Non-Remittance and Remittance-Receiving Households, Ghana, 2005/06 (sub-sample)

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					
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**
Number of members over age 15 with junior secondary school education	0.72 (.90)	0.55 (0.78)	0.89 (0.94)	-5.36**	2.78**
Number of members over age 15 with senior secondary school education	0.11 (.38)	0.07 (0.30)	0.23 (0.50)	-2.30*	4.60**
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					
Age of household head (years)	43.38 (14.13)	48.42 (18.40)	45.34 (15.46)	9.10**	1.77
Household size	4.19 (2.78)	3.68 (2.58)	3.28 (2.20)	-5.39**	-4.75**
Number of males over age 15	1.18 (0.90)	0.91 (0.90)	0.97 (0.85)	-8.50**	-3.31**
Number of children under age 5	0.56 (0.81)	0.49 (0.73)	0.24 (0.52)	-2.69**	-5.81**
Mean annual per capita expenditure (excluding remittances) in thousand Ghanaian cedis	6,402 (7,614)	4,715 (4,954)	9,269 (10,600)	-6.66**	5.67**
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 the 0.05 level.
- ** Significant at the 0.01 level.

Table 2. Means and standard deviations for instrumental variables.

Variable	Mean
Variables measured by ethno-religious group, 1998/99	
Fraction of females receiving internal remittances (from Ghana) in ethno-religious group	45.67 (6.75)
Fraction of females receiving international remittances (from African or other countries) in ethno-religious group	6.97 (3.1)
Variables measured by ethno-religious group, 2005/06	
Fraction of households receiving internal remittances (from Ghana), excluding household i,	29.4 (4.43)
Fraction of households receiving international remittances (from African or other countries), excluding household i	5.74 (3.96)
Fraction of internal migrants (from Ghana) in ethno-religious group excluding household i	4.6 (1.1)
Fraction of international migrants (to African or other countries) in ethno-religious group excluding household i	1.43 (1.35)
Per capita household income in ethno-religious group excluding household i (in thousand Ghanaian cedis)	4,548 (1,201)

Notes: N = 5,852 households for 1998/99 Ghana GLSS 4 survey; 3,884 households for 2005/06 Ghana GLSS 5 survey (sub-sample). All values weighted; standard deviations in parentheses. In 2006, US \$1.00 = 9,000 Ghanaian cedis.

Table 3. Multinomial Logit Model for Ghana (Marginal Effects)

Variable	Receive internal remittances (from Ghana)	Receive international remittances (from African or other countries)
Human Capital		
Number of members over age 15 with primary school education	0.018 (1.03)	-0.002 (-0.95)
Number of members over age 15 with junior secondary school education	-0.012 (-1.00)	0.001 (0.76)
Number of members over age 15 with secondary education	0.014 (0.61)	0.003 (1.07)
Number of members over age 15 with university education	-0.220 (-3.93)**	0.001 (1.87)
Household Characteristics		
Age of household head	0.005 (11.12)**	0.0001 (1.29)
Household size	-0.011 (-1.63)	-0.001 (-0.84)
Number of males over age 15	-0.074 (-4.32)**	-0.002 (-1.39)
Number of children under age 5	0.011 (0.52)	-0.005 (-1.41)
Migration Networks for ethno-religious group, 1998/99		
Fraction of people in top 3 religions	-0.092 (-1.56)	0.055 (5.34)**
Fraction of households receiving internal remittances (from Ghana) in ethno-religious group	-1.252 (-1.12)	1.520 (8.94)**
Fraction of households receiving international remittances (from African or other countries) in ethno-religious group	1.162 (0.77)	-3.368 (-7.96)**
Instrumental Variables, 2005/06		
Fraction of internal migrants (from Ghana) in ethno-religious group, excluding household i	6.258 (1.16)	-8.496 (-8.42)**
Fraction of international migrants (to African or other countries) in ethno-religious group, excluding household i	-8.660 (-1.76)	8.549 (7.15)**
Per capita household income in ethno-religious group, excluding household i (in thousand Ghanaian cedis)	-8.44e-08 (-0.01)	1.11e-07 (0.01)
Log likelihood	-2873.22	
Pseudo R ²	0.0812	
Test of joint significance for all IV's χ^2	11.34	
Degrees of freedom (6), degree of significance	.0783	
N	3884	

Notes: Table reports the marginal effects of a variable on the probability of a household receiving internal or international remittances. The regression includes the following variables for the characteristics of the ethno-religious group: fraction of population in top three religions in 1998/99, number of inhabitants in a house per square meter, the square of the number of inhabitants, fraction of population with primary education in 1998/99, fraction of population with junior secondary education in 1998/99, fraction of population with senior secondary and university education in 1998/99, fraction of people living in forest areas in 1998/99, per capita household income in 1998/99, and a dummy for rural areas. All values are weighted. Standard errors are clustered at the level of the ethno-religious group. Figures in parentheses are t-values.

* Significant at the 0.05 level.

** Significant at the 0.01 level.

Table 4. Per Capita Household Expenditure Estimates (Selection Corrected) for Households Receiving Internal Remittances (from Ghana)

Variable	OLS	Lee-Selection Corrected	BFG-Selection Corrected
Human Capital			
Number of members over age 15 with primary education	-345057.7 (-1.33)	-179729.9 (-0.68)	-433887 (-1.10)
Number of members over age 15 with junior secondary education	-63653.89 (-0.31)	-82875.9 (-0.39)	-37886.33 (-0.16)
Number of members over age 15 with senior secondary education	396727.2 (1.08)	513603.4 (1.23)	386885.2 (0.82)
Number of members over age 15 with university education	5006049 (2.36)*	3637374 (1.51)	6037244 (1.79)
Household Characteristics			
Age of household head	-52236.18 (-8.87)**	-9583.96 (-0.27)	-63636.42 (-1.14)
Household size	-490414.6 (-4.60)**	-612024.3 (-4.80)**	-454976.7 (-2.59)**
Number of males over age 15	509778.2 (2.51)*	-63520.02 (-0.13)	806324.7 (0.91)
Number of children under age 5	-582458.7 (-4.31)**	-439500.2 (-1.91)	-620175.2 (-2.18)*
Migration Networks in ethno-religious group, 1998/99			
Fraction of people in top 3 religions	434594 (2.87)**	230954.8 (0.44)	506917.6 (0.85)
Fraction of households receiving internal remittances (from Ghana) in ethno-religious group	-7454825 (-3.42)**	-8404264 (-0.96)	-8017443 (-0.81)
Fraction of households receiving international remittances (from African or other countries) in ethno-religious group	1.09e+07 (1.93)	1966242 (0.13)	1.43e+07 (0.72)
Lambda (Selection control)		-5526975 (-1.31)	-5820394 (-1.00)
Lambda 2 (Selection control)			-3217328 (-0.63)
Constant	-2.74e+07 (-2.81)*	-2.44e+07 (-0.73)	-2.98e+07 (-0.82)
Adjusted R ²	23.47		
Hausman $\chi^2(23)$		1.78	.17
Joint test for Lambda and Lambda 2 $\chi^2(2)$			1.97
N	1159	1159	1159

Notes: Dependent variable is annual per capita household expenditure (excluding remittances). The regression includes the following variables for the characteristics of the ethno-religious group: fraction of population in top three religions in 1998/99, number of inhabitants in a house per square meter, the square of the number of inhabitants, fraction of population with primary education in 1998/99, fraction of population with junior secondary education in 1998/99, fraction of population with senior secondary and university education in 1998/99, fraction of households living in forest areas in 1998/99, per capita household income in 1998/99, a dummy for rural areas and seven regional dummies. The estimations using the Lee and the BFG method include the following as instruments: the fraction of internal migrants (within Ghana) excluding family i in the ethno-religious group, the fraction of international migrants (to African and other countries) excluding family i in the ethno-religious group, and per capita household income in the ethno-religious group excluding family i . All values are weighted. Standard errors are clustered at the level of the ethno-religious group. Figures in parentheses are t-values.

- * Significant at the 0.05 level.
- ** Significant at the 0.01 level.

Table 5. Per Capita Household Expenditure Estimates (Selection Corrected) for Households Receiving International Remittances (from African or other countries)

Variable	OLS	Lee-Selection Corrected	BFG-Selection Corrected
Human Capital			
Number of members over age 15 with primary education	1438026 (0.62)	1182183 (0.67)	865090.1 (0.47)
Number of members over age 15 with junior secondary education	-1095597 (-1.03)	-516971.6 (-0.54)	-535500.3 (-0.45)
Number of members over age 15 with senior secondary education	-1998658 (-1.19)	674688.6 (0.45)	1679739 (1.00)
Number of members over age 15 with university education	1.07e+07 (2.51)*	1.27e+07 (2.86)**	1.34e+07 (2.99)**
Household Characteristics			
Age of household head	-112609.1 (-2.23)*	-66073.53 (-1.34)	-45665.6 (-0.84)
Household size	-992329.5 (-3.26)*	-1128953 (-2.50)*	-1230470 (-2.26)*
Number of males over age 15	1797542 (1.97)	777170.7 (0.68)	323967.3 (0.24)
Number of children under age 5	-463751.2 (-0.37)	-1516404 (-0.94)	-2864882 (-1.29)
Migration Networks in ethno-religious group, 1998/99			
Fraction of people in top 3 religions	2355370 (2.20)*	532962 (0.16)	1033035 (0.29)
Fraction of households receiving internal remittances (from Ghana) in ethno-religious group	-3.06e+07 (-1.08)	-3.79e+07 (-.82)	-1.07e+07 (-0.18)
Fraction of households receiving international remittances (from African or other countries) in ethno-religious group	9.81e+07 (1.63)	7.47e+07 (.56)	6.18e+07 (0.41)
Lambda (Selection control)		-1.85e+07 (-2.35)*	182577.5 (0.07)
Lambda 2 (Selection control)			1.42e+07 (2.30)*
Constant	-2.09e+08 (-1.62)	-2.38e+08 (-0.52)	-1.42e+08 (-0.29)
Adjusted R ²	26.44		
Hausman $\chi^2(18)$		5.22	6.09
Joint test for Lambda and Lambda 2 $\chi^2(2)$			5.34
N	210	210	210

Notes: Dependent variable is annual per capita household expenditure (excluding remittances). The regression includes the following variables for the characteristics of the ethno-religious group: fraction of population in top three religions in 1998/99, number of inhabitants in a house per square meter, the square of the number of inhabitants, fraction of population with primary education in 1998/99, fraction of population with junior secondary education in 1998/99, fraction of population with senior secondary and university in 1998/99, fraction of households living in forest areas in 1998/99, per capita household income in 1998/99, a dummy for rural areas and seven regional dummies. The estimations using the Lee and the BFG method include the following as instruments: the fraction of internal migrants (within Ghana) excluding family i in the ethno-religious group, the fraction of international migrants (to Africa and other countries) excluding family i in the ethno-religious group, and per capita household income in the ethno-religious group excluding family i . All values are weighted. Standard errors are clustered at the level of the ethno-religious group. Figures in parentheses are t -values.

* Significant at the 0.05 level.

** Significant at the 0.01 level.

Table 6. Expenditure Categories in Ghana GLSS Surveys, 1998/99 and 2005/06

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: 1998/99 Ghana GLSS 4 and 2005/06 Ghana GLSS 5 Survey (sub-sample).

Table 7. Average Budget Shares on Expenditure for Non-Remittance and Remittance-Receiving Households, Ghana, 2005/06

Expenditure Category	Households receiving no remittances (A) (N=2,515)	Households receiving internal remittances (from Ghana) (B) (N=1,159)	Households receiving international remittances (from African or other countries) (C) (N=210)
Food	0.56	0.58	0.45
Difference with respect to (A)	-	.02**	-.11**
Dif. conditional on hh char. (D)	-	-.004	-.052**
Dif. conditional on hh char., ethno-religious group, and income (E)	-	-.005	-.046**
Consumer goods, durables	0.18	0.17	0.22
Difference with respect to (A)	-	-.008**	.041**
Dif. conditional on hh char. (D)	-	-.001	.042**
Dif. conditional on hh char., ethno-religious group, and income (E)	-	.001	.035**
Housing	0.032	0.034	0.034
Difference with respect to (A)	-	.001	.002
Dif. conditional on hh char. (D)	-	.001	-.006**
Dif. conditional on hh char., ethno-religious group, and income (E)	-	-.002**	-.004*
Education	0.05	0.04	0.07
Difference with respect to (A)	-	-.007*	.024**
Dif. conditional on hh char. (D)	-	.002	.010*
Dif. conditional on hh char., ethno-religious group, and income (E)	-	.001	.013**
Health	0.016	0.01	0.02
Difference with respect to (A)	-	.002*	.003
Dif. conditional on hh char. (D)	-	.001	.002
Dif. conditional on hh char., ethno-religious group, and income (E)	-	.002*	.001
Other goods	0.14	0.13	0.18
Difference with respect to (A)	-	-.008*	.04**
Dif. conditional on hh char. (D)	-	-.00002	.003
Dif. conditional on hh char., ethno-religious group, and income (E)	-	.004	-.0002
	1.00	1.000	1.000

Note: (D) Difference obtained using an OLS regression including household size, age of head, children below five in household, males above 15 in household, household members with primary education, household members with junior secondary school, household members with senior secondary school, household members with university, rural dummy, and seven regional dummies. (E) Difference obtained using an OLS regression including per capita household expenditure, household size, age of head, children below five in household, males above 15 in household, household members with primary education, household

members with junior secondary school, household members with senior secondary school, household members with university education, a rural dummy, per capita household income in ethno-religious group in 1998/99, inhabitants per square meter in ethno-religious group in 1998/99, the square of the number of inhabitants per square meter in ethno-religious group in 1998/99, fraction of people in top three religions in the ethno-religious group in 1998/99, fraction of population receiving internal remittances (from Ghana) in ethno-religious group in 1998/99, fraction of population receiving international remittances (from African and other countries) in ethno-religious group in 1998/99, and seven regional dummies. A Hausman test rejects in all cases the need for instrumental variables. All expenditure categories defined in Table 6. All regressions are weighted.

*Significant at 0.10. ** Significant at 0.05. ***Significant at .01.

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

Table 8. OLS Regression Analysis of Household Expenditure in Ghana, Without Remittance Variables

Variable	Food	Consumer goods, durables	Housing	Education	Health	Other
Reciprocal of total per capita expenditure (α_i/EXP)	-4880.80 (-0.31)	-860.241 (-0.11)	4755.29 (1.93)	-14879.53 (-2.91)*	1502.378 (0.37)	11392.25 (1.39)
Log total annual per capita household expenditure (log EXP)	-.019 (-1.61)	.015 (2.79)*	-.020 (-13.42)**	-.011 (-5.25)**	.002 (2.27)*	.032 (6.20)**
Household size (HS)	-.011 (-3.22)**	-.001 (-0.84)	-.007 (-12.83)	.0172 (6.72)**	.0002 (0.55)	.001 (0.75)
Household size/total expenditure	5028.05 (2.13)	2280.17 (1.28)	370.12 (1.10)	-7158.027 (7.45)**	58.95 (0.12)	-488.5701 (-0.27)
Age of household head (AGEHD)	.001 (4.92)**	-.0005 (-4.16)**	.00001 (0.32)	-.0002023 (-1.90)	.0001 (2.14)*	-.0003 (-2.46)*
Age household head/total expenditure	-499.59 (-1.51)	140.27 (0.70)	30.97 (0.42)	198.28 (1.26)	-28.07 (-0.31)	192.60 (1.26)
Number of males in household over 15 years (MALE15)	.024 (6.14)**	-.007 (-1.81)	.0003 (0.35)	-.0045336 (-1.20)	-.002 (-1.85)	-.010 (-4.77)**
Number males/total expenditure	.024 (6.14)**	5098.42 (1.04)	3081.63 (1.94)	-305.7313 (-0.05)	1106.20 (0.67)	5885.01 (2.37)*
Number of children in household less than 5 years (CHILD5)	-.032 (-5.58)**	-.004 (-1.35)	.003 (3.45)**	.0258126 (11.26)**	-.001 (-1.30)	.009 (2.49)*
Number children/total expenditure	34614.02 (3.98)**	-3807.65 (-1.09)	-5443.32 (-3.34)**	-8101.319 (-1.55)	-540.13 (-0.28)	-16471.79 (-3.07)**
Number household members with primary education (EDPRIM)	.002 (0.20)	-.003 (-0.63)	-.002 (-1.60)	-.0027774 (-0.50)	.003 (1.62)	.003 (0.72)
Number primary education/total expenditure	-30837.5 (-3.04)**	13960.9 (1.89)	-672.98 (-0.46)	18689.95 (2.10)	-3883.16 (-1.39)	3940.16 (0.88)
Number household members with junior secondary education (EDJSS)	-.028 (-3.27)**	.001 (1.91)	-.0004 (-0.34)	.0079176 (1.98)	.001 (0.70)	.011 (3.30)**
Number junior secondary education/total expenditure	2892.6 (0.23)	-11856.52 (-1.20)	-2474.09 (-0.88)	15938.3 (2.75)*	887.25 (0.25)	-7196.60 (-1.66)
Number household members with senior secondary education (EDSSS)	-.0438377 (-2.74)*	.016 (2.30)*	-.004 (-1.49)	.039 (3.37)**	-.003 (-1.86)	-.001 (-0.82)
Number senior secondary education/total expenditure	6538.6 (0.17)	-11789.25 (-0.80)	14456.58 (1.53)	-22210.54 (-1.12)	538.71 (0.13)	14070.61 (0.86)
Number household members with university education (EDUNIV)	-.123 (-5.16)**	.069 (3.74)**	.012 (2.44)*	.0265458 (1.71)	-.003 (-1.46)	.018 (1.51)
Number university education/total expenditure	129785.7 (1.67)	-155531.7 (-1.59)	-21752.46 (-1.17)	-29042.83 (-0.55)	878.92 (0.10)	72636.17 (1.02)
Constant	.833 (4.60)**	-.044 (-0.51)	.377 (15.60)**	.250 (8.14)**	-.020 (-1.30)	-.303 (-3.63)**
Adj. R ²	.3089	.1023	.4334	.3321	.0344	.2401

Notes: N=3884 households. Regressions also included: sex of household head, the interaction between expenditure and the sex of household head, per capita household income in ethno-religious group in 1998/99, inhabitants per square meter in ethno-religious group in 1998/99, the square of the previous variable, fraction of population in top three religions in the ethno-religious group in 1998/99, fraction of households receiving internal remittances (from Ghana) in ethno-religious group in 1998/99, fraction of households receiving international remittances (from African or other countries) in ethno-religious group in 1998/99, a dummy for rural areas and seven regional

dummies. Numbers in parentheses are t-statistics (two-tailed). All standard errors are clustered at the level of the ethno-religious group. All expenditure categories defined in Table 6.

*Significant at the 0.05 level.

**Significant at the 0.01 level.

Table 9. OLS Regression Analysis of Household Expenditure in Ghana, With Remittance Variables

Variable	Food	Consumer goods, durables	Housing	Education	Health	Other
Reciprocal of total per capita expenditure (α_i/EXP)	-1438.66 (-0.10)	-4023.43 (-0.55)	5031.15 (1.99)	-13803.24 (-2.52)*	1907.98 (0.45)	12002.51 (1.47)
Log total annual per capita household expenditure (log EXP)	-.021 (-1.56)	.0162 (2.46)*	-.021 (-12.05)**	-.013 (-6.81)**	.002 (2.70)*	.035 (5.08)**
Internal remittances dummy (INTREM)	-.238 (-2.08)	.178 (2.25)*	.006 (0.19)	-.074 (-2.21)*	-.015 (-0.74)	.176 (3.02)**
(Internal remittances dummy) x (Total household expenditure) (INTREM) (log EXP)	.015 (2.01)	-.012 (-2.27)*	.001 (0.95)	.0050619 (2.26)*	.001 (0.84)	-.011 (-2.94)*
International remittances dummy (EXTREM)	.212 (0.67)	-.194 (-0.94)	-.024 (-1.10)	.048 (0.34)	.053 (0.99)	-.124 (-0.51)
(International remittances dummy) x (Total household expenditure) (EXTREM) (log EXP)	-.016 (-0.79)	.014 (1.08)	-.0007 (-0.31)	-.002 (-0.23)	-.003 (-0.95)	.008 (0.48)
Household size (HS)	-.011 (-3.22)**	-.001 (-0.86)	-.006 (-12.81)**	.0174531 (6.85)**	.0003 (0.67)	.001 (1.16)
Household size/total expenditure	5393.43 (2.14)	2096.06 (1.14)	419.02 (1.16)	-7401.94 (-7.71)**	66.52 (0.14)	-971.18 (-0.53)
Age of household head (AGEHD)	.001 (5.31)**	-.001 (-4.11)**	.00002 (0.62)	-.0002 (-1.67)	.00008 (1.84)	-.0004 (-2.52)*
Age household head/total expenditure	-515.46 (-1.66)	158.52 (0.84)	30.39 (0.40)	209.27 (1.29)	-30.6281 (-0.33)	171.02 (1.13)
Number of males in household over 15 years (MALE15)	.024 (5.85)**	-.007 (-1.68)	.0002 (0.28)	-.008 (-3.17)**	-.002 (-1.87)	-.010 (-4.92)**
Number males/total expenditure	-15829.21 (-1.64)	4468.46 (0.88)	3250.75 (1.96)	1559.22 (0.33)	1117.97 (0.67)	7052.44 (2.68)*
Number of children in household less than 5 years (CHILD5)	-.031 (-5.47)**	-.007 (-1.80)	.003 (3.24)**	.027 (13.70)**	-.001 (-1.16)	.009 (2.62)*
Number children/total expenditure	33640.48 (3.69)**	-2751.26 (-0.76)	-5402.62 (-3.21)	-8373.98 (-1.67)	-664.15 (-0.34)	-17101.32 (-3.25)**
Number household members with primary education (EDPRIM)	.002 (0.16)	-.003 (-0.58)	-.002 (-1.75)	-.002 (-0.33)	.003 (1.65)	.003 (0.87)
Number primary education/total expenditure	-30481.5 (-2.96)**	13335.25 (1.79)	-626.33 (-0.45)	18447.71 (2.04)	-3821.63 (-1.36)	2839.56 (0.68)
Number household members with junior secondary education (EDJSS)	-.028 (-3.42)**	.010 (2.05)	-.0003 (-0.30)	.008 (1.99)	.0007 (0.65)	.010 (3.06)**
Number junior secondary education/total expenditure	2028.76 (0.17)	-11765.98 (-1.25)	-2650.43 (-0.94)	16105.99 (2.44)*	952.24 (0.27)	-4535.05 (-0.98)
Number household members with senior secondary education (EDSSS)	-.042 (-2.70)*	.015 (2.33)**	-.003 (-1.39)	.039 (3.63)**	-.003 (-1.87)	-.006 (-0.94)
Number senior secondary education/total expenditure	255.18 (0.01)	-8311.38 (-0.63)	13386.74 (1.45)	-21755.07 (-1.19)	716.20 (0.16)	17264.95 (1.01)
Number household members with university education (EDUNIV)	-.118 (-5.01)**	.065 (3.51)**	.012 (2.45)*	.027 (1.79)	-.002 (-1.12)	.015 (1.27)
Number university education/total expenditure	116600.6 (1.57)	-143834.9 (-1.50)	-22639.34 (-1.27)	-32043.12 (-0.64)	-86.25 (-0.01)	81026.76 (1.20)
Constant	.892 (4.31)**	-.079 (-0.78)	.3851864 (14.06)**	.277 (10.36)**	-.016 (-1.07)	-.362 (-3.23)
Adj. R ²	.3135	.1122	.4362	.3324	.0366	.2424

Notes: N=3884 households. Numbers in parentheses are t-statistics (two-tailed). All regressions also included: sex of the household head, the interaction between expenditure and sex of household head, per capita household income in

ethno-religious group in 1998/99, inhabitants per square meter in ethno-religious group in 1998/99, the square of inhabitants per square meter in ethno-religious group in 1998/99, the fraction of population in top three religions in the ethno-religious group in 1998/99, fraction of households receiving internal remittances (from Ghana) in ethno-religious group in 1998/99, fraction of households receiving international remittances (from African or other countries) in ethno-religious group in 1998/99, a dummy for rural areas and seven regional dummies. Standard errors clustered at the ethno-religious group. All errors are boot-strapped clustering at the level of the ethno-religious group, 1000 repetitions. All expenditure categories defined in Table 6.

*Significant at the 0.05 level. **Significant at the 0.01 level.

Table 10. IV Regression Analysis of Household Expenditure in Ghana, With Remittance Variables

Variable	Food	Consumer goods, durables	Housing	Education	Health	Other
Reciprocal of total per capita expenditure (α_i/EXP) ^a	142772.8 (0.42)	-242473.5 (-0.52)	-11671.54 (-0.17)	-3754.90 (-0.01)	-77109.66 (-0.04)	-1929.32 (-0.01)
Log total annual per capita household expenditure (log EXP) ^a	-.003 (-0.03)	-.1268 (-0.53)	-.0218779 (-1.16)	-.016 (-0.20)	-.022 (-0.04)	.069 (0.34)
Internal remittances dummy (INTREM) ^a	-.492 (-0.55)	-2.542 (-0.58)	.112 (0.58)	-.266 (-0.43)	.247 (0.07)	1.41 (0.43)
(Internal remittances dummy) x (Total household expenditure) (INTREM) (log EXP) ^a	.031 (0.54)	.168 (0.58)	-.0072356 (-0.58)	.017 (0.42)	-.016 (-0.07)	-.092 (-0.43)
International remittances dummy (EXTREM) ^a	3.936 (0.76)	-6.912 (-0.83)	-.016 (-0.03)	-.208 (-0.09)	-1.89 (-0.11)	-.389 (-0.11)
(International remittances dummy) x (Total household expenditure) (EXTREM) (log EXP) ^a	-.251 (-0.77)	.440 (0.84)	.0006 (0.02)	.014 (0.10)	.120 (0.11)	.024 (0.10)
Household size (HS)	.040 (0.57)	-.042 (-0.60)	-.0154 (-1.20)	.038 (1.07)	.002 (0.01)	-.035 (-0.42)
Household size/total expenditure ^a	-116766.5 (-0.74)	86105.52 (0.61)	21910.56 (0.77)	-53800.95 (-0.61)	-5846.20 (-0.01)	85087.01 (0.43)
Age of household head (AGEHD)	-.003 (-0.74)	.002 (0.52)	.0006 (0.75)	-.0007 (-0.40)	-.00009 (-0.01)	.002 (0.46)
Age household head/total expenditure ^a	9421.31 (0.93)	-3956.65 (-0.51)	-1266.52 (-0.63)	580.70 (0.13)	581.14 (0.02)	-5893.526 (-0.46)
Number of males in household over 15 years (MALE15)	-.065 (-0.70)	.042 (0.40)	.015 (0.91)	-.013 (-0.29)	-.004 (-0.01)	.033 (0.29)
Number males/total expenditure ^a	218595.3 (0.86)	-120634 (-0.47)	-34958.63 (-0.83)	26693.73 (0.22)	6866.52 (0.01)	-110007 (-0.36)
Number of children in household less than 5 years (CHILD5)	.218 (0.78)	-.136 (-0.49)	-.024 (-0.49)	.058 (0.39)	-.008 (-0.01)	-.146 (-0.36)
Number children/total expenditure ^a	-537452.8 (-0.83)	301394.5 (0.53)	55341.42 (0.50)	-73764.03 (-0.20)	13838.63 (0.01)	328011.3 (0.32)
Number household members with primary education (EDPRIM)	.029 (0.68)	.025 (0.40)	-.004 (-0.55)	-.020 (-0.57)	-.006 (-0.04)	.020 (0.09)
Number primary education/total expenditure ^a	-98932.37 (-0.80)	-78074.19 (-0.41)	6872.87 (0.38)	50441.12 (0.52)	11180.63 (0.03)	-31328.77 (-0.05)
Number household members with junior secondary education (EDJSS)	.048 (0.35)	-.071 (-0.46)	-.012 (-0.70)	-.005 (-0.08)	-.008 (-0.02)	.0003 (0.01)
Number junior secondary education/total expenditure ^a	-261024 (-0.53)	271886.6 (0.48)	42616.81 (0.71)	31649.73 (0.15)	23248.33 (0.02)	52349.7 (0.08)
Number household members with senior secondary education (EDSSS)	-.048 (-0.25)	.067 (0.57)	.004 (0.26)	-.024 (-0.24)	.001 (0.01)	.042 (0.33)
Number senior secondary education/total expenditure ^a	-19353.02 (-0.02)	-207260.7 (-0.40)	-13299.35 (-0.22)	239205.4 (0.48)	-15523.71 (-0.01)	-158034.7 (-0.23)
Number household members with university education (EDUNIV)	-.411 (-1.11)	.407 (1.03)	.019 (0.23)	.174 (0.78)	.034 (0.04)	-.034 (-0.07)
Number university education/total expenditure ^a	2628913 (0.92)	-2855247 (-0.94)	-73774.8 (-0.11)	-1220970 (-0.67)	-331464.1 (-0.04)	409272.9 (0.11)
Constant	.497 (0.32)	2.235 (0.58)	.415 (1.32)	.315 (0.24)	.376 (0.05)	-.8724566 (-0.26)
Model Wald χ^2 (42)	959.95**	173.84**	1234.64**	514.68**	12.23	343.58**
Hausman χ^2 (10)	37.04*	146.75**	29.62**	35.66**	12.99	11.53
Overidentification χ^2	6.84	3.23	5.6	8.55	5.44	8.28
Degrees of freedom for overidentification	4	4	5	4	2	4

Notes: N=3884 households. Numbers in parentheses are t-statistics (two-tailed). Instrumented: All variables marked with an ^a. Instruments: Quadratic polynomial on age, fraction of females receiving internal remittances (from Ghana) in ethno-religious group in 1998/99, fraction of females receiving international remittances (from African or other countries) in ethno-religious group in 1998/99, fraction of households receiving internal remittances (from Ghana) excluding family i, fraction of households receiving international remittances (from African or other countries) excluding family i, fraction of internal migrants (from Ghana) in ethno-religious group excluding household i, fraction of international migrants (to African or other countries) in ethno-religious group excluding family i, per capita household income in ethno-religious group excluding family i, the square of per capita household income in ethno-religious group excluding family i, interaction between per capita household income in ethno-religious region excluding family i and the fraction of females receiving internal remittances (from Ghana) in 1998/99, interactions between per capita household income in ethno-religious group excluding family i and the characteristics of the household. The fraction of females receiving international remittances (from African or other countries) is used as an instrument in all regressions except that of health. Similarly the interaction between the square of per capita household income excluding family i is used in all regressions except that of health. The square of the fraction of international migrants in the ethno-religious group is also included as instrument in the equation of housing. All regressions also included: the sex of household head, the interaction between expenditure and the sex of household head, per capita household income in ethno-religious group in 1998/99, inhabitants per square meter in ethno-religious group in 1998/99, the square of inhabitants per square meter in ethno-religious group in 1998/99, the fraction of population in top three religions in the ethno-religious group in 1998/99, fraction of households receiving internal remittances (from Ghana) in ethno-religious group in 1998/99, fraction of households receiving international remittances (from African or other countries) in ethno-religious group in 1998/99, a dummy for rural areas and seven regional dummies. Standard errors clustered at the ethno-religious group. All errors are boot-strapped clustering at the level of the ethno-religious group, 1000 repetitions. All expenditure categories defined in Table 6.

*Significant at the 0.05 level. **Significant at the 0.01 level.

Table 11a. Marginal Budget Shares on Expenditure for Non-Remittance and Remittance-Receiving Households, Ghana, 2005/06

	OLS			IV		
	No remittances	Receive Internal remittances (from Ghana)	Receive International remittances (from African or other countries)	No remittances	Receive Internal remittances (from Ghana)	Receive International remittances (from African or other countries)
Food	0.571	0.582	0.523	0.529	0.533	0.401
Consumer goods/durables	0.198	0.186	0.236	0.158	0.341	0.365
Housing	0.011	0.009	0.006	0.014	0.10	0.008
Education	0.041	0.047	0.054	0.038	0.047	0.057
Health	0.019	0.022	0.020	0.021	0.010	0.065
Other goods	0.170	0.163	0.170	0.211	0.139	0.211
Total	1.011	1.011	1.011	0.974	1.083	1.109

Table 11b. Tests for Significance of Differences in Marginal Budget Shares, Ghana, 2005/06, Differences expressed as percentage of the marginal budget shares of households with no remittances

	Households with internal remittances Vs. Households with no remittances		Households with international remittances Vs. Households with no remittances	
	OLS	IV	OLS	IV
Percentage difference: Food	1.93	.76	-8.41	-24.2
F test for OLS; Chi square for IV	(0.74)	(1.22)	(9.24)**	(.34)
Percentage difference: Consumer goods/Durables	-6.06	115.82	19.19	131.01
F test for OLS; Chi square for IV	(0.01)	(.15)	(6.76)*	(.56)
Percentage difference: Housing	-18.18	614.29	-45.45	-42.86
F test for OLS; Chi square for IV	(3.44)	(.17)	(3.53)	(.11)
Percentage difference: Education	14.63	23.68	31.71	50.00
F test for OLS; Chi square for IV	(0.17)	(.30)	(5.26)**	(.01)
Percentage difference: Health	15.79	-52.38	5.26	209.52
F test for OLS; Chi square for IV	(3.81)	(.01)	(2.14)	(.01)
Percentage difference: Other goods	-4.12	-34.12	0.0	0.0
F test for OLS; Chi square for IV	(0.72)	(.61)	(2.55)	(0.03)

Notes: Tests for significance of equations 18 and 19. All expenditure categories defined in Table 6. Standard errors and coefficients used for the elaboration of Table 11 come from tables 8, 9 and 10. Standard errors for equations 18 and 19 obtained using the delta method.

* Significant at the 0.10 level. **Significant at the 0.05 level; ***Significant at 0.01 level.

Table A1: Summary Data on Control Variables for Non-Remittance and Remittance-Receiving Households, Ghana, 1998/99 GLSS Survey

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)
Migration Networks in ethno-religious group, 1998/99					
Fraction of population in top 3 religions	0.48 (0.43)	0.46 (0.44)	0.53 (.43)	-1.14	1.57
Fraction of households receiving internal remittances (from Ghana)	0.32 (.05)	0.32 (0.05)	0.35 (.04)	0.91	7.29**
Fraction of households receiving international remittances (from African or other countries)	0.05 (.02)	0.05 (0.02)	0.06 (.01)	-1.09	2.70**
Characteristics of ethno-religious groups, 1998/99					
Mean fraction of population with primary education	0.31 (.06)	0.30 (.06)	0.32 (.04)	-1.54	3.27**
Mean fraction of population with junior secondary education	0.70 (.24)	0.71 (.25)	0.83 (.14)	0.50	7.37**
Mean fraction of population with senior secondary and college education	0.07 (.03)	0.07 (.03)	0.08 (.03)	0.12	4.17**
Mean fraction of population that lives in ecological zones with forest	0.40 (.23)	0.42 (.24)	0.54 (.23)	1.95	8.35**
Mean number of inhabitants per square meter of house	0.25 (.02)	0.25 (.02)	0.25 (.01)	-0.09	2.41*
Mean annual per capita household income (excluding remittances) in thousand Ghanaian cedis	4,698 (744)	4,669 (765)	5,039 (465)	-.48	6.83**
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: 1998/99 Ghana GLSS 4 Survey.

* Significant at the 0.05 level.

** Significant at the 0.01 level.

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Notes

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.

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 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 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.

⁶ See also Schmertmann (1994) for a more formal and detailed explanation of this multinomial logit selection model.

⁷ Eleven religious groups are listed in the 2005/06 Ghana GLSS 5 Survey (sub-sample). The largest of these groups is Catholic, accounting for 15.9 percent of all households. Other large religious groups include: “other Christian” (15.5 percent), Pentecostal (13.3 percent), Presbyterian (11.3 percent), Muslim (11.8 percent) and Methodist (9.8 percent).

⁸ Over thirty ethnic groups are listed in the 2005/06 Ghana GLSS 5 Survey (sub-sample). The largest of these ethnic groups is the Asante group, accounting for 17.4 percent of all households. Other large ethnic groups in the survey include: “other Akan” (12.6 percent), Fanti (11.2 percent), Ewe (11.4 percent), and Ga-adangbe (8.4 percent)

⁹ Notes to Table 5 and Table 10 clarify which instruments are used in each equation.

¹⁰ 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, 1991 and 1993) and Mexico (Mora and Taylor, 2005; Taylor, 1987) has found that migrants are not necessarily positively selected with respect to education.

¹¹ From this point on, the terms “expenditure” and “income” will be used interchangeably in this paper.

¹² Since the income (expenditure) function in equation (5) is estimated at the household level – and not at the individual level – it is impossible to add the usual “experience” and “experience squared” terms that often appear in income (earnings) functions.

¹³ It is important to keep in mind, however, that we are predicting the probability that a household will choose to receive remittances, not the probability that it will produce a migrant. Because there are a large number of households in the sample that receive remittance without having a migrant it is possible that an alternative specification using the presence or absence of a migrant in the household would yield different results.

¹⁴ We performed an overidentification test which resulted in a Chi squared with one degree of freedom of .24, which implies that we can not reject the null that all correlations between unobserved components and our instruments are zero.

¹⁵ These differences are obtained using OLS estimations as explained in Table 7. IV estimations were also done and Hausman tests revealed that the differences in coefficients between OLS and IV estimations were not significant.

¹⁶ The functional form used in this analysis differs from the Working-Leser model because it includes an intercept in equation (8). In theory, C_i 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.

¹⁷ This was done for all equations except the housing equation, where the overidentification test indicated that the polynomial on age was not a good instrument.

¹⁸ This was done for all equations except the education equation, where the overidentification test indicated that the internal remittance variables needed to be excluded.

¹⁹ Table 10 specifies which instruments are included in each equation. This is because the tests of over-identification indicated that not all instruments performed well for all expenditure types.