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Remittances, Household Expenditure and Investment in Guatemala

OCTUBRE 2008

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Abstract

This paper uses a large, nationally-representative household data set from Guatemala to analyze how the receipt of internal remittances (from Guatemala) and international remittances (from USA) affects the marginal spending behavior of households on consumption and investment goods. Two findings emerge. First, controlling for selection and endogeneity, it finds 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 two investment goods —education and housing— 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 and physical capital.

Key words: remittances, consumption, investment, Guatemala.

Resumen

Este trabajo usa una base de datos representativa a nivel nacional de Guatemala para analizar cómo la recepción de remesas internas (de Guatemala) y las remesas internacionales (de USA) afectan el comportamiento marginal de consumo e inversión de los hogares. Dos resultados sobresalen. Primero, controlando por selección y endogeneidad, se encuentra que los hogares que reciben remesas internacionales gastan menos en comida, comparado a lo que ellos gastarían si no tuvieran las remesas. Segundo, se encuentra que los hogares que reciben remesas internacionales o remesas internas gastan más en educación y vivienda, comparado a lo que ellos gastarían si no tuvieran las remesas. Estos resultados dan respaldo a la idea de que las remesas pueden ayudar a incrementar la inversión tanto en capital humano como físico.

Palabras clave: remesas, consumo, inversión, Guatemala.

Introduction

Remittances refer to the money and goods that are transmitted to households by migrant workers working outside of their origin communities. At the start of the 21st Century these resource transfers represent one of the key issues in economic development. In 2006 official international remittances to developing countries were estimated at $221 billion per year (World Bank, 2008),[1] making them about twice as large as the level of official aid-related flows to the developing world.

From the standpoint of economic development, the basic question is quite simple: How are these 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 the receipt of remittances can cause behavioral changes at the household level that may lower their development impact relative to the 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 can actually increase investments in human and physical capital at the margin. For instance, in a recent study of remittances and education in El Salvador, Edwards and Ureta (2003) find that international remittances (mainly from the USA) have a large positive impact on student retention rates in school. In a similar study of remittances and housing in Nigeria, Osili (2004) finds that a large proportion of remittance income is spent on housing.

The purpose of this paper is to refine and extend the debate concerning how remittances are spent or used and their impact on economic development by using the results of a recent large, nationally-representative household budget survey in Guatemala. The results of this survey are used to rigorously compare the marginal spending behavior of three groups of

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[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.

households: those receiving no remittances, those receiving internal remittances (from Guatemala) and those receiving international remittances (from USA). Since all survey households are separated into one of these three groups, it becomes possible to compare the marginal budget shares of remittance and non-remittance receiving households to a broad range of consumption and investment goods, including food, education and housing.

At the outset it should be emphasized that such a comparative analysis of the marginal spending behavior of non-remittance receiving and remittance-receiving households is not without its problems. One obvious issue is that of selection, that is, households receiving remittances might have unmeasured characteristics (*e.g.* more skilled, able or motivated members) which are different from households not receiving remittances. We address this concern by using a two-stage multinomial logit model to estimate the marginal spending behavior of households controlling for selection in unobservable characteristics. The identification of this model is based on the use of instrumental variables. Since past research has found that migration networks are important in migration and the receipt of remittances (*e.g.* Woodruff and Zenteno, 2007; Munshi, 2003), our instrumental variables focus on variations in migration networks and remittances at the municipality level. This instrumental approach enables us to control for selection and to identify the marginal expenditure patterns of households with and without remittances.

The paper proceeds in seven further parts. 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 at the municipality level. Section 5 estimates the model and Section 6 presents robustness checks. Section 7 summarizes the findings.

1. Data Set

Data come from the 2000 Guatemala ENCOVI Survey, a national household survey done by the Instituto Nacional de Estadistica in Guatemala during the period July to December 2000.[2] The survey included 7145 urban and rural households and was designed to be statistically representative both at the national level and for urban and rural areas. The survey was comprehensive, collecting detailed information on a wide range of topics, including income, expenditure, education, financial assets, household enterprises and remittances.[3]

It should, however, be emphasized that this 2000 Guatemala ENCOVI Survey was not designed as a migration or remittances survey. In fact, it collected very limited information on these topics. With respect to migration, the survey collected no information on the characteristics of the migrant: age, education or income earned away from home. This means that no data are available on the characteristics of migrants who are currently living outside of the household. With respect to remittances, the survey only asked three basic questions: *(1)* Does your household receive remittances from family or friends?; *(2)* Where do these people sending remittances live? and *(3)* How much (remittance) money did your household receive in the past 12 months? The lack of data on individual migrant characteristics in the Guatemala survey is unfortunate, but the presence of detailed information on household expenditures makes it possible to use responses to these three questions to examine the impact of remittances on household expenditure behavior.

Since the focus is on remittances, it is important to clarify how these income transfers are measured and defined. Each household that is recorded as receiving remittances —internal or international— is assumed to be receiving exactly the amount of remittances measured by the survey. This means that households which have migrants who do not remit are not recorded in this study as receiving remittances; rather these households are classified as non-remittance receiving households. This assumption seems sensible because migration surveys in other countries generally find that about half of all migrants do not remit.[4] Since no data are available on the number of remitters per household, each household that is recorded as receiving remittances is assumed to be receiving remittances from just one migrant. Since the survey data also contain no information on the

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[2] The 2000 Guatemala ENCOVI Survey was implemented as part of the "Program for the Improvement of Surveys and Measurement of Living Conditions in Latin America and the Caribbean" (ENCOVI), which was sponsored by the Inter-American Development Bank (IDB), the World Bank and the Economic Committee for Latin America and the Caribbean (CEPAL).

[3] For more details on the 2000 Guatemala ENCOVI Survey, see World Bank (2004).

[4] For example, in their study in the Dominican Republic, de la Briere, Sadoulet, de Janvry and Lambert (2002) find that fully half of all international migrants do not remit.

characteristics of the migrant, households may be receiving remittances from different people: family members or relatives. Because of data limitations, the focus throughout this study is on the receipt of remittances by the household rather than on the type of person sending remittances. Finally, all remittances in this study are "cash" remittances: remittances in kind are not included in the calculations. To the extent that remittances in kind are important in Guatemala, this latter point may lead to an under-counting of the actual flow of remittances to households in Guatemala.

Table 1 presents summary data from the 2000 Guatemala survey. It shows that 5665 households (79.3% of all households) receive no remittances, 975 households (13.6%) receive internal remittances (from Guatemala) and 505 households (7.1%) receive international remittances (from USA).[5] For households receiving remittances, remittances represent a large share of household income: 17.9% of income for households receiving internal remittances and 31.2% of income for households receiving international remittances.

Since we want to examine the impact of remittances on expenditures, it is important to present the type of expenditure data contained in the 2000 Guatemala 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 expenditure outlays were measured varied (from last 7 days for most food items, to last year 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 Guatemala) and those receiving international remittances (from USA). On average, each of the three groups of households spends over 62% of their budgets on the two categories of goods that are clearly consumption items: food and consumer goods, durables.

Table 3 also reports differences in average budget shares. After conditioning for differences in household characteristics and the income of households, only two differences in average budget shares are statistically significant: *(1)* households receiving internal remittances (from Guatemala) spend more on housing and education than households with no remittances;

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[5] The 2000 Guatemala ENCOVI Survey included a total of 7,276 households, but for the purposes of this analysis we exclude 131 households that either receive remittances from both Guatemala and the US, or that receive remittances from other countries.

and *(2)* households receiving international remittances (from USA) spend more on education and less on health than households with no remittances.[6]

The objective of this paper, however, is to investigate whether the receipt of remittances changes the marginal spending patterns of 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:[7]

$$C_i / EXP = \beta_i + a_i / EXP + \gamma_i \, (log \, EXP) \tag{1}$$

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:

$$C_i = a_i + \beta_i \, EXP + \gamma_i \, (EXP) \, (log \, EXP) \tag{2}$$

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 composition

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[6] These differences in average budget shares are obtained using OLS estimations.

[7] The functional form used in this analysis differs from the Working-Leser model because it includes an intercept in equation (1). 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. For more on the Working-Leser model, see Prais and Houthakker (1971).

(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:

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

Written in expenditure share form, this is equivalent to:

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

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:

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

$$ABS_i = C_i\,/EXP_i \tag{6}$$

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 Guatemala), and *(3)* receive international remittances (from USA).[8] 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*.

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

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[8] Ideally, we would like to model both the household decision of sending migrants and the household decision to receive remittances. However, as explained in the data section, this cannot be done because the 2000 Guatemala ENCOVI Survey contains no information on the characteristics of migrants. The survey only contains information on whether or not households receive remittances and the source (internal or international) of these remittances.

And for each choice we have a latent variable:

$$I_s = X\psi_s + \eta_s \tag{8}$$

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:

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

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

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

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

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

$$E(u_s | \eta_1 \eta_2 \eta_3) = \sigma_s \Sigma_{j=1...3} r_{sj}(\eta_j - E(\eta_j)), \text{ with } \Sigma_{j=1...3} r_{sj} = 0. \tag{12}$$

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:

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

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

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

Consequently, equation (7) can be rewritten as:

$$C_{si}/EXP = \beta_{si} + a_{si}/EXP + \gamma_{si}(\log EXP) + \Sigma_k[(\mu_{sik})Z_k/EXP + \lambda_{sik}(Z_k)] + \sigma_s \Sigma_{j \neq s} r_{sj}(P_j \ln P_j/(1-P_j) + \ln P_s) + v_{si} \tag{15}$$

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:

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

Where $E(\text{MBS}_{hi} \mid s= h)$ 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 $E(\text{MBS}_{hi} \mid s= h)$ is given by:

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

We have that $E(\text{MBS}_{li} \mid s= h)$ 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

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used for households that choose action l, conditioning on the characteristics of households that choose action h:

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

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

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

We have then that the ATT is given by:

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

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}:

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

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

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.

4. Specifying the Two-Stage Selection Model

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

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 (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 Guatemala 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 construct two instrumental variables using information from the 2000 Guatemala ENCOVI Survey and a supplemental source of data: the 2002 Guatemala Population Census. These instrumental variables focus on migration networks and the receipt of remittances at the municipality level. The first instrumental variable —from the 2000 ENCOVI Survey— is the percent of households receiving international remittances (from USA) in the municipality, excluding household i. The intuition for including this variable is that municipalities with more households receiving international remittances may enjoy lower costs for receiving their remittances. The second instrumental variable —from the 2002 Guatemala Population Census— is the international migration rate in the municipality, calculated as the number of international migrants divided by the total population in the municipality in which the household lives. This instrument reflects the extent of international migration networks in the municipality.

Ideally, both of these instrumental variables should have been measured before the 2000 Guatemala ENCOVI survey, in order for us to claim that they were predetermined at the time of the survey. Unfortunately, this is not the case. Therefore, our claim with respect to these instrumental variables is that conditional on the characteristics of households these aggregate measures of migration networks are correlated only with migration and remittances, but not with household income.

To ensure that this is the case, we construct two aggregate control variables at the level of the region and municipality in which the household lives; these variables measure the strength of migration networks abroad and the level of economic development in the municipality. The first aggregate control variable is the average 1998 employment creation rate in the 20 US metropolitan areas that were the top destinations for Guatemalan migrants.[11]

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[11] Data on the employment creation rate in the US metropolitan areas is from the United States Census (2008), while information on the number of Guatemalans living in each US metropolitan area is from the International Organization for Migration (2004).

The second aggregate control variable is the mean per capita household income in the Guatemalan municipality in which the household lives, excluding household i. This variable measures the level of economic development in the various municipalities. To avoid problems of collinearity we use the inverse of this measure raised to the second, third and fourth powers.

Table 4 presents summary data on the instrumental and aggregate control variables classified by the eight administrative regions in Guatemala. The data show that the percentage of households receiving international remittances is lowest in the region with the highest per capita household income (Metropolitan capital region). Tests for the validity of our instruments are presented below.

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

Prob (Y=receive remittances) = f [Log of Household expenditure, Human Capital (Number of household members with primary, secondary, preparatory or university education), Household Characteristics (Age of household head, Household size, Children below age 5), Aggregate Variables, Instrumental Variables, Urban/Rural Dummy, Regional Variables] (23)

The rationale for including these variables in the first-stage equation follows the standard literature on migration and remittances. According to the basic human capital model, human capital variables are likely to affect migration and remittances 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 and number of children— are also hypothesized to affect the probability of migration and the receipt of remittances. 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 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 invest (Munshi, 2003; Woodruff and Zenteno, 2007). In the model it is hypothesized that the aggregate control variables will measure how effective migration networks are in placing migrants in labor markets in the USA. Finally, since urban/rural residence and geographic region may affect migration and the receipt of

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

remittances, the model includes an urban/rural dummy and seven regional dummies (with metropolitan capital region omitted).[13]

The second-stage expenditure share equation can be estimated as:

$C_{si}/EXP = \beta_{si} + a_{si}/EXP + \gamma_{si}(\log EXP) + \mu_{si1}HS/EXP + \lambda_{si1}HS + \mu_{si2}AGEHD/EXP + \lambda_{si2}AGEHD + \mu_{si3}CHILD5/EXP + \lambda_{si3}CHILD5 + \mu_{si4} EDPRIM/EXP + \lambda_{si4} EDPRIM + \mu_{si5} EDSEC/EXP + \lambda_{si5} EDSEC + \mu_{si6} EDPREP/EXP + \lambda_{si6} EDPREP + \mu_{si7}EDUNIV/EXP + \lambda_{si7}EDUNIV + \lambda_{si8}EMPUS +$ (24)

$$\sum_{j=2}^{4}\lambda_{si(8+j-1)}\frac{1}{MUNIN^{j}} + \delta_{si0}AR + \sum_{j=1}^{7}\delta_{sij}REG_{j} + \sigma_{li}[r_{lm}\{(P_m - lnP_m)/(1-P_m)+lnP_h\}$$

$-(r_{lh+} r_{lm})\{(P_l - lnP_l)/(1-P_l)+lnP_h\}] + v_{si}$

Where C_{si} is annual per capita household expenditure on one of six expenditure categories defined above (food, consumer goods/durables, housing, education, health or other) by households that chose category *s*, EXP is total annual per capita household expenditure, HS is family size, AGEHD is the age of household head, CHILD5 is the number of children below age 5, EDPRIM is number of household members over age 15 with primary education, EDSEC is number of household members over age 15 with secondary education (junior high), EDPREP is number of household members over age 15 with preparatory education (high school), EDUNIV is number of household members over age 15 with higher (university) education, EMPUS is employment creation rate in US metropolitan areas in 1998, and MUNIN is the mean per capita household income in the Guatemalan municipality, excluding household i. Finally, AR is the variable for urban/rural location and REG (region) represents a set of seven regional dummy variables.

   In estimating the model we use household expenditure, rather than income data. We do this for several reasons. Since the purpose of the analysis is to estimate the impact of remittances on the marginal spending behavior of households, expenditure data is more useful than income data. Moreover, in developing country situations like Guatemala, expenditures are often easier to measure 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. Finally, as discussed above, household expenditure is included in the first-stage equation as a way of generating a clean way of linking the first-stage selection part of the model

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[13] The seven regional dummy variables (with metropolitan capital region omitted) in the 2000 Guatemala ENCOVI Survey are: North, Northeast, Southeast, Central, Southwest, Northwest and Peten.

with the second-stage part of estimating marginal budget shares. Notice that in the first-stage choice equation that household expenditure is not interacted with the characteristics of the households. This simplifies the estimation of the marginal budget shares in the second-stage equation.

It should be noted that the model as a whole is identifiable because the instrumental variables, which are included in the first-stage equation, are excluded in the second-stage equation. However, this type of identification creates several potential econometric problems. For example, since the instrument provides independent information at the municipality level, this information is shared by all individuals living in that municipality and thus generates correlation of observations within a municipality. We solve this problem by clustering standard errors by municipality. Another possible problem is that the estimation error which is introduced in the model by using a two-step procedure can inflate standard errors. To address this issue 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 Guatemala), most of the education variables are insignificant and the variable for household members with university education is negative and significant. For households receiving international remittances (from USA), the variable for household members with high school education is positive and significant, as expected; however, the variable for household members with university education is negative and 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 instrumental and aggregate control variables. For households receiving international remittances (from USA), both of the aggregate control variables are significant, as expected. For households receiving internal remittances (from Guatemala), one of the instrumental variables is positive and significant. A test of joint significance for the two instrumental variables in Table 6 shows that these variables are jointly significant at the 1% level.

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

In these three tables it is interesting to note that the per capita household expenditure variable (logEXP) is always negative and highly significant for one key consumption good —food— and always positive and (sometimes) significant for two investment goods —housing and health. These results suggest that as per capita household expenditure increases, households spend proportionately less on food and proportionately more on housing and health.

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 never significant. However, in Tables 8 and 9 this variable is significant for one expenditure category in each table. These results suggest that selectivity in unobservable components matters for households receiving internal or international remittances. 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 $E(\text{MBS}_3 \mid s=1)$ which represents the expenditure that households that chose to receive internal remittances (from Guatemala) 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 Guatemala). The second counterfactual is $E(\text{MBS}_3 \mid s=2)$ which represents the expenditure that households that chose to receive international remittances (from USA) 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. Three 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 26% less at the margin on food that what they would have spent without the receipt of remittances.[14] 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 62 and 44% more at the margin, respectively, on education than what they would have spent without the receipt of remittances. These large marginal increases in spending on education are important because they can help raise the level of human capital in Guatemala. Finally, households receiving both internal and international remittances spend more at the margin on housing. At the mean, households with internal and international remittances spend 69 and 81% more, respectively, on housing than what they would have spent without the receipt of remittances.

6. Robustness Checks: Remittances and Expenditure on Education and Housing

Two of the more striking findings from the previous section are that households receiving internal and international remittances spend more at the margin on education and housing than what they would have spent on these goods without the receipt of remittances. Since households receiving remittances also enjoy higher levels of per capita income (expenditure),[15] 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.

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[14] These percentage figures are calculated as follows: estimated ATT ($\theta*_{kli}$) (in Table 11) divided by the expected value of the counterfactual MBS (E(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.

[15] While mean annual per capita expenditures for households receiving no remittances is 4,854.5 quetzals/capita/year, it rises to 6,039.9 quetzals/capita/year for households receiving internal remittances (from Guatemala) and to 6,632.5 quetzals/capita/year for households receiving international remittances (from USA).

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 and housing, when controlling for the level of household expenditure.

This can be done by ranking all 7,145 households in the data set into quintile groups on the basis of total annual per capita expenditure, including remittances. The 7,145 households can then be divided into three groups: those receiving no remittances, those receiving internal remittances (from Guatemala) and those receiving international remittances (from USA). 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.

Tables 12 and 13 show the expenditure behavior on education and housing 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 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 5% for each of the three groups of households. However, for all of the quintile groups, households receiving either 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. Compared to what they would have spent on education without remittances, the final column in Table 12 shows that households receiving internal remittances spend between 37 and 166% more at the margin on education, while households receiving international remittances spend between 8 and 300% more at the margin on education. In other words, when controlling for the level of expenditure, households receiving remittances spend more of their additional increments to expenditure on education.

Table 13 presents the expenditure behavior for housing for the three groups of households. At the mean, the share of total expenditure spent on housing is only slightly higher than that for education: 15% or less for each of the three groups of households. However, for 9 of the 10 quintile groups, households receiving either internal or international remittances spend more at the margin on housing than what they would have spent on this good without the receipt of remittances. Compared to what they would have spent

on housing without remittances, Table 12 shows that —with only one exception— households receiving internal remittances spend between 19 and 92% more at the margin on housing, while households receiving international remittances spend between 80 and 158% more at the margin on housing. This is an important finding because it suggests that when controlling for level of expenditure, households receiving remittances spend more of their additional increments to expenditure on housing. From the standpoint of the migrant, these remittance-inspired expenditures on housing represent investment to the extent that they provide migrant households with some expected future rate of financial return. From the standpoint of the economy at large, these remittance-inspired expenditures on housing also represent a type of productive investment because they have critical second and third-round effects on wages, employment and business opportunities. As households receiving remittances spend more at the margin on housing, this creates new income and employment opportunities for laborers, and new business opportunities for merchants selling building materials.

TABLE **1**. SUMMARY DATA ON NON-REMITTANCE AND REMITTANCE-RECEIVING
HOUSEHOLDS, GUATEMALA, **2000**

Variable	Receive no remittances	Receive internal remittances (from Guatemala)	Receive international remittances (from USA)	t-test (No remittances *vs.* internal remittances)	t-test (No remittances *vs.* international remittances
Mean household size	5.29 (2.47)	4.71 (2.61)	5.24 (2.64)	6.71***	0.43
Mean age of household head (years)	42.88 (14.49)	51.08 (17.08)	47.74 (16.06)	-15.77**	-6.97***
Mean number of males in household over age 15	1.36 (0.84)	1.14 (0.98)	1.19 (0.98)	7.21***	4.12***
Mean number of children in household under age 5	0.88 (0.95)	0.64 (0.90)	0.69 (0.93)	7.38***	4.28***
Mean number of household members over age 15 with secondary education	0.50 (0.89)	0.60 (0.95)	0.73 (1.07)	-3.05***	-5.36***
Area (0=urban, 1=rural)	0.55 (0.49)	0.45 (0.49)	0.46 (0.49)	5.68***	3.80**
Mean annual per capita income (excluding remittances) in Guatemalan quetzals	6,681.97 (13,651.12)	6,353.13 (8,474.98)	6,546.42 (11,157.01)	0.74	0.23
Mean annual per capita income (including remittances) in Guatemalan quetzals	6,681.97 (14,021.55)	7,741.50 (10,114.86)	9,138.71 (14,724.71)	1.96**	3.81***
Remittances as percent of total per capita income (including remittances)	0 (0)	17.90 (22)	31.24 (41)	33.39***	49.80***
N	5,665	975	505		

Notes: N = 7,145 households. All values are weighted; standard deviations are in parentheses.
In 2000, 1 Guatemalan quetzal = US$0.128.
Source: 2000 Guatemala ENCOVI Survey, Instituto Nacional de Estadística.
**Significant at the 0.05 level.
***Significant at the 0.01 level.

TABLE **2**. EXPENDITURE CATEGORIES IN **2000** GUATEMALA ENCOVI SURVEY

CATEGORY	DESCRIPTION	EXAMPLES
Food	Purchased food	Bread, tortillas, milk, meat, fruit, vegetables
	Non-purchased food	Food from: own-production, gifts, donations, social programs
Consumer goods, durables	Consumer goods Household durables	Clothing, shoes, fabric 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 fees, medicine, x-rays, tests, hospitalization, health insurance premiums
Other goods	Household services Transport, communications Legal, personal services	Water, gas, electricity, telephone Bus and taxi fees, gasoline, faxes, postage, internet charges Fees for lawyers, accountants, professionals

Source: 2000 Guatemala ENCOVI Survey, Instituto Nacional de Estadística.

TABLE 3. AVERAGE BUDGET SHARES ON EXPENDITURE FOR NON-REMITTANCE AND REMITTANCE-RECEIVING HOUSEHOLDS, GUATEMALA, 2000

Expenditure Category	Households receiving no remittances (A) (N=5665)	Households receiving internal remittances (from Guatemala) (B) (N=975)	Households receiving international remittances (from USA) (C) (N=505)
Food	0.488	0.460	0.447
Difference with respect to (A)	-	-.027 (-5.10)***	-.038 (-4.69)***
Diff. conditional on hh char. (D)	-	-.011 (-1.51)	-.025 (-2.71)***
Diff. conditional on hh char. And income (E)	-	-.009 (-1.09)	-.012 (-1.41)
Consumer goods, durables	0.171	0.164	0.190
Difference with respect to (A)	-	-.008 (-2.78)***	.0180 (4.86)***
Diff. conditional on hh char. (D)		-.0001 (-0.03)	.013 (2.61)***
Diff. conditional on hh char. And income (E)		-.002 (-0.54)	.004 (0.83)
Housing	0.126	0.151	0.131
Difference with respect to (A)	-	.024 (7.83)***	.004 (1.01)
Diff. conditional on hh char. (D)		.0105 (2.28)**	.001 (0.09)
Diff. conditional on hh char. And income (E)		.0106 (2.31)*	.001 (0.19)
Education	0.031	0.038	0.047
Difference with respect to (A)	-	.004 (2.52)**	.014 (6.06)***
Diff. conditional on hh char. (D)		.005 (2.41)**	.012 (4.33)***
Diff. conditional on hh char. And income (E)		.005 (2.38)**	.011 (4.16)***
Health	0.025	0.029	0.025
Difference with respect to (A)	-	.004 (3.15)***	-.009 (-.54)
Diff. conditional on hh char. (D)		.002 (1.08)	-.002 (-0.88)
Diff. conditional on hh char. And income (E)		.001 (0.79)	-.004 (-1.83)*
Other goods	0.159	0.158	0.160
Difference with respect to (A)	-	.00003 (.12)	.002 (.74)
Diff. conditional on hh char. (D)		-.006 (-1.28)	.001 (0.13)
Diff. conditional on hh char. And income (E)		-.006 (-1.30)	-.0002 (-0.03)
	1.00	1.000	1.000

Notes: (D) Difference obtained using an OLS regression including household size, age of household head, children below age five in household, household members with primary education, household members with secondary education, household members with preparatory education, household members with university education, an urban/rural dummy, and seven regional dummies. (E) Difference obtained using an OLS regression including per capita household income, household size, age of household head, children below age five in household, household members with primary education, household members with secondary education, household members with preparatory education, household members with university education, urban/rural dummy, and seven regional dummies. All expenditure categories defined in Table 2. Standard errors not shown in table are obtained clustering observations at the municipality level.
 ** Significant at 0.05. ***Significant at .01.
Source: 2000 Guatemala ENCOVI Survey, Instituto Nacional de Estadística.

TABLE **4**. MEANS FOR INSTRUMENTAL AND AGGREGATE CONTROL VARIABLES

	N	Households receiving international remittances (from USA) (percent)	International migration rate in Guatemala municipality (percent)	Employment creation rate in US metropolitan area (1998) (percent)	Mean per capita household income in Guatemala municipality (quetzals)
Metropolitan	898	3.63	2.68	0.61	9576.30
North	795	15.99	1.06	0.51	2952.04
Northeast	582	27.74	2.52	0.19	5074.36
Southeast	788	15.24	2.31	0.51	3222.22
Central	1,231	8.37	1.51	0.28	3631.72
Southwest	1,094	8.72	3.49	0.61	3207.87
Northwest	1,174	5.48	2.99	0.26	2464.59
Peten	583	15.37	1.64	0.26	3130.43

Notes: N = 7,145 households for 2000 Guatemala ENCOVI survey. N=2,579,513 individuals for 2002 Guatemala Population Census. All values weighted.
In 2000, 1 Guatemalan quetzal = US$0.128.
Sources: Households receiving international remittances: 2000 Guatemala ENCOVI Survey; International Migration rate: 2002 Guatemala Population Census; Employment creation rate in US cities: United States Census, Local Area Unemployment Statistics (2008) and International Migration Organization (2004); Per capita household income: 2000 Guatemala ENCOVI Survey.

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%	53.18	53.18	53.18	53.18	53.18	53.18
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	27.71	27.71	27.71	27.71	27.71	27.71

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 Guatemala)" and "receive international remittances (from USA)". The instruments used are: (1) international migration rate in Guatemala municipality; and (2) percent of households receiving international remittances (from USA) in Guatemala municipality (excluding family i).

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

Variable	Receive internal remittances (from Guatemala)			Receive international remittances (from USA)		
	Coefficient	T	Marginal Effect	Coefficient	T	Marginal Effect
Household expenditure						
Log total annual per capita household expenditure (log EXP)	0.190	2.15**	0.014	0.948	4.8***	0.050
Human capital						
Number of members over age 15 with primary education	-0.043	-0.63	-0.004	-0.021	-0.47	-0.001
Number of members over age 15 with secondary (junior high school) education	0.063	1.28	0.006	0.050	0.67	0.002
Number of members over age 15 with preparatory (high school) education	-0.294	-0.72	-0.034	0.484	1.76*	0.028
Number of members over age 15 with university education	-0.212	-2.13**	-0.018	-0.660	-3.27***	-0.034
Household characteristics						
Age of household head	0.034	12.3***	0.003	0.020	4.42***	0.001
Household size	-0.067	-1.85*	-0.008	0.088	2.03**	0.005
Number of children in household less than 5 years (CHILD5)	0.109	1.8*	0.011	0.060	0.72	0.002
Aggregate variables						
Employment creation rate in US cities (1998)	0.000	1.41	0.000	0.000	3.42***	2.52E-07
Squared per capita household income in municipality, excluding household 1	0.000	-1.13	0.000	0.000	-3.33***	-2.16E-08
Instrumental Variables						
International migration rate in municipality	-1.704	-0.29	-0.327	22.051	7	1.1931
Percent of households receiving international remittances (from USA) in municipality (excluding family i)	0.025	2.69**	0.003	0.009	1.09	0.0003
Log likelihood	-4200					
Pseudo R^2	.0849					
Test of joint significance Wald Chi-squared (12)	126.36***					
N	7145					

Notes: All values are weighted. The model also includes an urban/rural dummy and seven regional dummy variables, but coefficients for these variables are not reported. Standard errors not shown in table are obtained clustering observations at the municipality level and using a bootstrap procedure.

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)	-348.637 (-5.81)***	-6.495 (-0.22)	136.971 (3.22)***	-7.182 (-0.76)	55.294 (3.19)***	170.050 (3.55)***
Log total annual per capita household expenditure (log EXP)	-0.094 (-9.53)***	0.046 (7.78)***	0.002 (0.25)	-0.001 (-0.4)	0.015 (3.61)***	0.033 (3.83)***
Household size (HS)	0.003 (1.17)	0.008 (5.93)***	-0.010 (-5.08)***	0.002 (2.83)***	-0.002 (-2.67)**	-3.41E-04 (-0.2)
Household size/total expenditure	11.922 (3.35)***	-6.329 (-2.8)***	5.891 (1.63)	-1.838 (-2.23)**	1.285 (1.34)	-10.932 (-3.73)***
Age of household head (AGEHD)	0.001 (1.65)	-0.001 (-3.17)***	4.00E-04 (0.77)	-1.90E-04 (-1.3)	1.56E-04 (0.85)	-2.92E-04 (-0.65)
Age household head/total expenditure	0.086 (0.1)	1.843 (3.8)***	-2.090 (-3.08)***	0.232 (1.39)	-0.349 (-1.24)	0.279 (0.39(
Number of children in household less than 5 years (CHILD5)	-0.004 (-0.77)	0.001 (0.17)	0.003 (0.63)	-0.004 (-2.5)**	0.010 (4.85)***	-0.005 (-1.69)*
Number children/total expenditure	13.155 (0.98)	-2.707 (-0.5)	-3.731 (-0.4)	4.531 (1.86)*	-16.907 (-4.1)***	5.659 (0.71)
Number household members with primary education (EDPRIM)	-0.013 (-4.51)***	0.003 (1.81)*	0.004 (2.26)**	-4.11E-04 (-0.9)	0.002 (2.77)***	0.004 (2.21)**
Number primary education/total expenditure	-0.525 (-6.95)***	-0.130 (-2.46)**	0.037 (0.52)	0.756 (19.93)***	0.015 (0.51)	-0.153 (-3.33)***
Number household members with secondary education (EDSEC)	-0.025 (-7.87)***	0.007 (3.04)***	0.004 (1.35)	0.006 (4.53)***	0.005 (4.89)***	0.003 (1.07)
Number secondary education/total expenditure	-0.326 (-5.37)	-0.143 (-5.85)***	-0.091 (-3.15)***	0.750 (15.27)***	-0.066 (-4.2)***	-0.123 (-3.89)***
Number household members with preparatory education (EDPREP)	-0.019 (-1.68)	-0.003 (-0.57)	0.008 (1.36)	-3.16E-04 (-0.21)	0.008 (2.79)***	0.007 (1.21)
Number preparatory	0.336 (0.93)	-0.515 (-1.98)*	-0.211 (-0.58)	0.855 (12.64)***	-0.080 (-1.42)	-0.386 (-1.82)*

Variable	Food	Consumer goods, Durables	Housing	Education	Health	Other goods
education/total expenditure						
Number household members with university education (EDUNIV)	-0.046 (-7.76)***	0.003 (0.92)	0.015 (2.39)**	0.016 (5.13)***	0.007 (2.26)**	0.004 (0.89)
Number university education/total expenditure	-34.792 (-0.6)	-24.998 (-0.96)	8.041 (0.25)	-4.674 (-0.14)	-4.427 (-0.19)	60.850 (1.96)*
$\sigma_3\rho_{31}$	0.111 (1.3)	0.032 (0.77)	-0.088 (-1.39)	-0.002 (-0.18)	-0.008 (-0.39)	-0.045 (-1.15)
$\sigma_3\rho_{32}$	0.002 (0.03)	-0.024 (-0.81)	0.018 (0.5)	-0.001 (-0.16)	-0.005 (-0.44)	0.010 (0.34)
Constant	1.161 (8.65)	-0.322 (-3.19)	0.303 (2.78)	0.010 (0.4)	-0.095 (-1.87)*	-0.057 (-0.51)
σ_3	.111	.078	.075	-024	.035	.075
Adj. R^2	.44	.15	.19	.77	.12	.10

Notes: N=7,145 households, 5665 non-remittance receiving households, the rest only used in the first stage of the method. All values are weighted. The model also includes employment creation rate in the US in 1998, a fourth degree polynomial of per capita household income in the municipality, an urban/rural dummy and seven regional dummy variables, 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 municipality 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 GUATEMALA), USING THE DUBIN AND MCFADDEN METHOD

Variable	Food	Consumer goods, Durables	Housing	Education	Health	Other goods
Reciprocal of total per capita expenditure (α /EXP)	-858.858 (-3.17)***	132.820 (0.77)	472.402 (3.26)***	-43.093 (-1.54)	142.140 (2.63)**	154.588 (1.25)
Log total annual per capita household expenditure (log EXP)	-0.165 (-5.42)**	0.048 (2.9)***	0.050 (1.72)*	3.93E-04 (0.08)	0.030 (3.92)***	0.037 (1.8)*
Household size (HS)	-1.63E-04 (-0.03)	0.016 (4.91)***	-0.016 (-2.96)***	4.40E-04 (0.29)	0.001 (0.49)	-0.001 (-0.51)
Household size/total expenditure	50.593 (3.72)***	-32.231 (-3.78)	8.067 (0.77)	0.310 (0.12)	-9.305 (-1.62)	-17.434 (-2.05)
Age of household head (AGEHD)	-0.002 (-1.81)*	-0.001 (-2.4)**	0.003 (2.24)**	-3.05E-04 (-1.13)	7.20E-05 (0.15)	0.001 (1.27)
Age household head/total expenditure	2.328 (0.97)	1.388 (0.84)*	-5.351 (-5.94)**	0.636 (2.1)*	0.645 (0.81)	0.354 (0.4)
Number of children in household less than 5 years (CHILD5)	-0.014 (-1.53)	-0.005 (-0.74)	0.012 (1.68)	-0.003 (-0.81)	0.007 (2.04)**	0.002 (0.27)
Number children/total expenditure	-27.928 (-0.86)	22.985 (1.17)	-17.505 (-0.76)	4.704 (0.76)	-9.283 (-1.58)	27.026 (1.23)
Number household members with primary education (EDPRIM)	-0.002 (-0.28)	0.001 (0.25)	-0.001 (-0.23)	0.001 (0.65)	0.002 (1.32)	-0.001 (-0.44)
Number primary education/total expenditure	-0.291 (-2.44)**	-0.274 (-4.59)***	0.001 (0.01)	0.723 (9.47)***	0.005 (0.08)	-0.164 (-1.78)*
Number household members with secondary education (EDSEC)	-0.034 (-5.18)***	0.005 (1.37)	0.015 (1.95)*	0.005 (2.09)**	0.003 (1.97)*	0.006 (1.83)*
Number secondary education/total	-0.500 (-4.22)***	-0.153 (-2.01)**	-0.197 (-4.19)***	0.889 (19.15)***	-0.007 (-0.22)	-0.033 (-0.37)

TABLE 9. HOUSEHOLD EXPENDITURE ESTIMATES (SELECTION CORRECTED) FOR HOUSEHOLDS RECEIVING INTERNATIONAL REMITTANCES (FROM USA), 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)	-636.483 (-6.52)***	-39.706 (-0.42)	332.902 (3.24)***	-13.614 (-0.63)	28.934 (0.61)	327.967 (2.91)***
Log total annual per capita household expenditure (log EXP)	-0.093 (-5.44)***	0.044 (3.34)***	0.025 (1.12)	-0.004 (-1.08)	0.007 (0.76)	0.021 (1.05)
Household size (HS)	0.005 (0.86)	0.009 (1.63)	-0.014 (-2.38)**	0.001 (0.72)	4.41E-04 (0.25)	-0.004 (-0.79)
Household size/total expenditure	-14.170 (-0.81)	-0.858 (-0.05)	39.003 (2.16)**	0.910 (14.86)***	0.333 (0.06)	-16.449 (-0.97)
Age of household head (AGEHD)	-0.002 (-1.37)	-0.002 (-1.55)	0.002 (1.47)	0.006 (2.25)**	-1.40E-04 (-0.36)	0.002 (2.3)**
Age household head/total expenditure	10.190 (4.22)***	1.319 (1.02)	-6.734 (-3.54)***	0.834 (12.5)***	-0.196 (-0.2)	-4.595 (-1.59)
Number of children in household less than 5 years (CHILD5)	-0.018 (-1.24)	0.008 (0.62)	0.023 (2.31)**	0.006 (0.89)	0.003 (0.84)	-0.007 (-0.54)
Number children/total expenditure	76.976 (1.54)	-37.085 (-0.87)	-101.545 (-3.1)***	0.967 (4.31)***	-10.409 (-0.68)	44.538 (0.91)
Number household members with primary education (EDPRIM)	0.007 (0.98)	0.004 (0.65)	-0.012 (-2.31)	0.024 (1.97)*	-0.001 (-0.3)	0.001 (0.16)
Number primary education/total expenditure	-0.258 (-0.96)	-0.075 (-0.45)	-0.131 (-1.14)	-185.547 (-0.89)	-0.029 (-0.39)	-0.416 (-1.97)*
Number household members with secondary education (EDSEC)	-0.011 (-1.38)	0.003 (0.46)	-0.003 (-0.39)	0.003 (1.72)*	2.51E-05 (0.01)	0.004 (0.81)
Number secondary	-0.359 (-3.01)	-0.108 (-1.68)*	-0.159 (-2.68)**	-7.860 (-2.17)*	-0.048 (-1.8)*	-0.160 (-2.51)**

Variable	Food	Consumer goods, Durables	Housing	Education	Health	Other goods
education/total expenditure						
Number household members with preparatory education (EDPREP)	0.040 (1.22)	-0.005 (-0.24)	-0.039 (-1.93)*	-9.61E-05 (-0.62)	0.002 (0.19)	-0.004 (-0.18)
Number preparatory education/total expenditure	0.393 (0.35)	1.288 (1.25)	-0.858 (-1.14)	0.016 (0.07)	-0.295 (-1.11)	-1.495 (-3.16)***
Number household members with university education (EDUNIV)	-0.021 (-0.64)	-0.018 (-0.77)	-0.021 (-1.08)	-0.010 (-2.39)**	0.005 (0.45)	0.030 (1.06)
Number university education/total expenditure	-197.322 (-0.65)	320.900 (1.86)*	21.981 (0.15)	27.526 (2.58)**	-57.993 (-0.58)	97.981 (0.51)
$\sigma_2 \rho_{21}$	0.096 (0.67)	0.073 (0.67)	-0.063 (-0.42)	0.007 (0.38)	0.042 (0.72)	-0.154 (-1.82)*
$\sigma_2 \rho_{23}$	-0.126 (-0.85)	-0.071 (-0.62)	0.075 (0.47)	-0.008 (-0.4)	-0.044 (-0.71)	0.175 (1.92)*
Constant	1.323 (2.79)***	0.362 (1.19)	-0.356 (-0.84)	0.059 (1.16)	0.019 (0.11)	-0.407 (-1.23)
σ_2	.104	.074	.066	.020	.036	.071
Adj. R^2	.42	.19	.36	.88	.09	.19

Notes: N=7145 households, 505 with international remittances (from USA), the rest only used in the first stage of the method. All values are weighted. The model also includes employment creation rate in the US in 1998, a fourth degree polynomial of per capita household income in the municipality, an urban/rural dummy and seven regional dummy variables, 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 municipality 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, GUATEMALA, **2000**

Expenditure Category	No remittances	Receive Internal remittances (from Guatemala)		Receive International remittances (from USA)	
	Estimated	Estimated	Counterfactual	Estimated	Counterfactual
Food	.534	.594	.520	.375	.509
Consumer goods/ Durables	.219	.145	.213	.279	.228
Housing	.068	.135	.080	.126	.069
Education	.009	.013	.008	.014	.009
Health	.026	.024	.029	.046	.029
Other goods	.142	.086	.147	.158	.152
Total	0.998	0.997	0.997	0.998	0.996

Notes: N=7,145 households. 5,665 non-remittance receiving households, 975 receive internal remittances (from Guatemala) and 505 receive international remittances (from USA). 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, GUATEMALA, **2000**

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	.073 (27.50)***	-.134 (-44.88)***
Consumer goods/ Durables	-.068 (-99.68)***	.050 (38.45)***
Housing	.055 (27.78)***	.056 (28.27)***
Education	.005 (26.61)***	.004 (13.15)***
Health	-.004 (-9.67)***	.016 (26.47)***
Other goods	-.060 (-66.78)***	.005 (3.17)***

Notes: N=7,145 households. 5665 non-remittance receiving households, 975 receive internal remittances (from Guatemala) and 505 receive international remittances (from USA). 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, GUATEMALA, 2000

Ranked by total annual per capita expenditure Including Remittances	Percent of households in each group	Mean of total annual per capita household expenditure (quetzals)	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%	22.18	1720.91	1.54	0.004	Na	Na	Na
Second 20%	20.67	3092.05	2.21	0.005	Na	Na	Na
Third 20%	20.06	4651.97	2.85	0.007	Na	Na	Na
Fourth 20%	18.66	7524.93	3.70	0.009	Na	Na	Na
Top 20%	18.43	18851.37	5.28	0.020	Na	Na	Na
All	100.00	4854.48	3.03	0.009	Na	Na	Na
Households Receiving Internal Remittances							
Lowest 20%	13.41	1869.53	1.26	0.006	0.004	0.002 (4.63)***	50.0
Second 20%	18.01	3116.259	2.50	0.008	0.003	0.005 (11.65)***	166.6
Third 20%	19.71	4729.01	2.60	0.010	0.005	0.005 (11.84)***	100.0
Fourth 20%	24.31	7748.88	4.50	0.014	0.008	0.006 (13.95)***	75.0
Top 20%	24.55	17708.51	5.33	0.022	0.016	0.006 (16.95)***	37.5
All	100.00	6039.89	3.53	0.013	0.008	.005 (26.61)***	62.5
Households Receiving International Remittances							
Lowest 20%	8.61	1973.01	2.87	0.012	0.003	0.009 (9.33)***	300.0
Second 20%	16.55	3181.86	3.04	0.014	0.005	0.009 (9.67)***	180.0
Third 20%	19.73	4702.37	4.65	0.012	0.006	0.006 (10.17)***	100.0
Fourth 20%	26.6	7509.71	4.93	0.014	0.009	0.005 (6.26)***	55.5
Top 20%	28.51	16551.38	5.40	0.014	0.013	0.001 (.73)	7.7
All	100.00	6632.50	4.51	0.014	0.009	.004 (13.15)***	44.4

Notes: N=7,145 households. 5,665 non-remittance receiving households. 975 receive internal remittances (from Guatemala) and 505 receive international remittances (from USA). 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 2000, 1 Guatemalan quetzal = US$0.128.

TABLE 13. ROBUSTNESS CHECK: MARGINAL BUDGET SHARES ON HOUSING FOR HOUSEHOLDS RANKED BY QUINTILE GROUPS, GUATEMALA, 2000

Ranked by total annual per capita expenditure including remittances	Percent of households in each group	Mean of total annual per capita household expenditure (quetzals)	Percent of total household expenditure on Housing	Marginal budget share to Housing (estimated)	Marginal budget share to Housing (counter-factual)	Average Treatment Effect	Percent Difference (remittances vs. no Remittances)
Households Receiving no Remittances							
Lowest 20%	22.18	1720.91	10.91	0.028	Na	Na	Na
Second 20%	20.67	3092.05	10.82	0.051	Na	Na	Na
Third 20%	20.06	4651.97	11.74	0.068	Na	Na	Na
Fourth 20%	18.66	7524.93	13.45	0.088	Na	Na	Na
Top 20%	18.43	18851.37	16.65	0.117	Na	Na	Na
All	100.00	4854.48	12.55	0.068	Na	Na	Na
Households Receiving Internal Remittances							
Lowest 20%	13.41	1869.53	11.11	0.014	0.034	-0.02 (-4.55)***	(-58.8)
Second 20%	18.01	3116.259	11.62	0.066	0.053	0.01 (5.95)***	18.9
Third 20%	19.71	4729.01	14.04	0.121	0.073	0.05 (15.35)***	68.5
Fourth 20%	24.31	7748.88	15.02	0.168	0.097	0.07 (23.59)***	72.2
Top 20%	24.55	17708.51	20.81	0.233	0.119	0.11 (35.35)***	92.4
All	100.00	6039.89	15.11	0.135	0.080	.055 (27.78)***	68.7
Households Receiving International Remittances							
Lowest 20%	8.61	1973.01	11.82	0.050	0.019	0.03 (5.73)***	157.8
Second 20%	16.55	3181.86	11.23	0.076	0.038	0.04 (6.30)***	105.2
Third 20%	19.73	4702.37	10.94	0.104	0.057	0.05 (12.52)***	87.7
Fourth 20%	26.60	7509.71	12.24	0.135	0.075	0.06 (18.41)***	80.0
Top 20%	28.51	16551.38	16.85	0.193	0.106	0.09 (21.49)***	84.9
All	100.00	6632.50	12.66	0.126	0.069	.056 (26.61)***	81.1

Notes: N=7,145 households. 5,665 non-remittance receiving households. 975 receive internal remittances (from Guatemala) and 505 receive international remittances (from USA). Estimated MBS refers to using the MBS coefficients for type s households with households of type s. Counterfactual MBS obtained using the 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 2000, 1 Guatemalan quetzal = US$0.128.

Conclusions

This paper has used a large, nationally-representative household survey from Guatemala to analyze how the receipt of internal remittances (from Guatemala) and international remittances (from USA) affects the marginal spending behavior of households on a broad range of consumption and investment goods. Three key findings emerge.

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. 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 62 and 44 percent more at the margin, respectively, on education than what they would have spent on this investment good without the receipt of remittances. Third, households receiving both internal and international remittances spend more at the margin on housing. At the mean, households with internal and international remittances spend 69 and 81% more at the margin, respectively, on housing than what they would have spent without the receipt of remittances.

These three 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 and physical capital. At the household-level remittance-inspired investments in education can help build the human capital of households receiving remittances. Similarly, remittance-inspired investments in housing can represent an important type of investment for migrant households and a useful means for stimulating growth in wages, employment and business opportunities in the construction industry.

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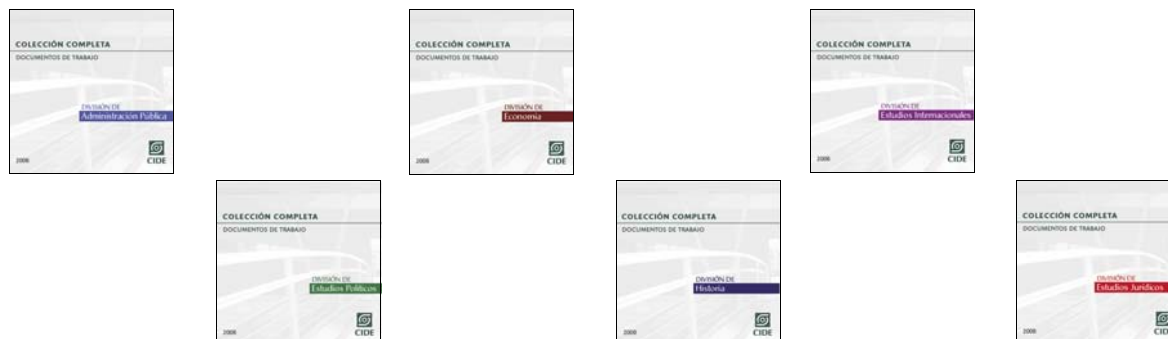
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