

# **The Static and Dynamic Benefits of Migration and Remittances in Nicaragua**

by

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**Abstract:** This paper utilizes a unique three-wave panel of household data from Nicaragua, which allows a thorough exploration of the relationships between migration, remittances and household consumption. The paper distinguishes between the effects of emigration and the impacts of remittances received. There is a self-selection bias in the decision to send a migrant, as well as in the decision to receive remittances. To adequately correct for these selection biases, we develop a bivariate selection correction procedure. Perhaps surprisingly, the results show that households do not benefit (in terms of higher consumption growth) from receiving remittances, but rather from having migrants abroad. This suggests that not only money are remitted from abroad, but also something more subtle, which could be business ideas, belief systems, aspirations, patterns of social interaction, and other intangibles, which have been dubbed social remittances.

**JEL classification:** F35.

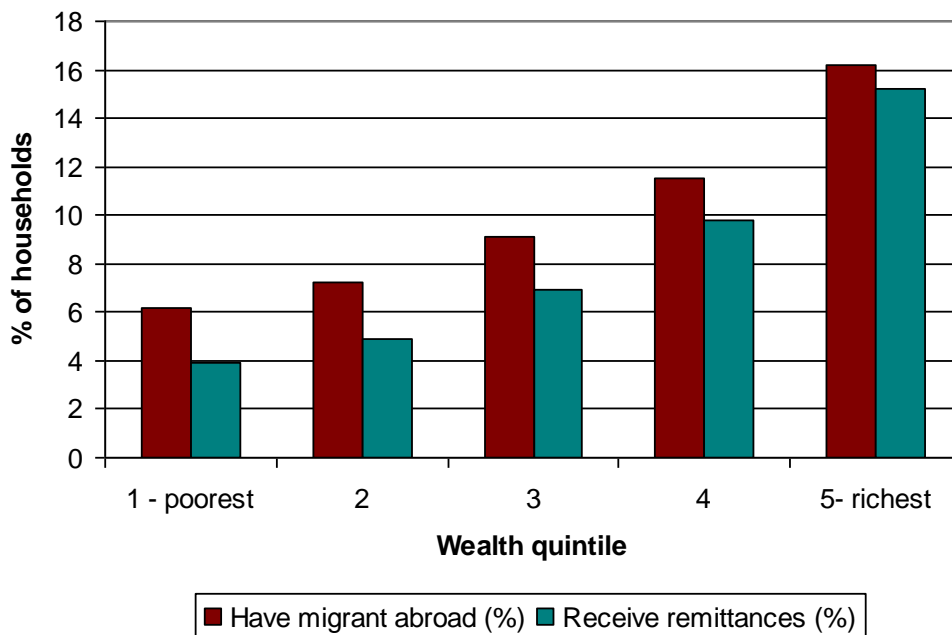
**Keywords:** Migration, Remittances, Social Remittances, Nicaragua, Bivariate Selection Correction.

## 1. Introduction

Nicaragua is a small nation of just 5.1 million people, but it is currently losing about 40,000 persons annually to emigration (Bay, 2006). In return, it receives at least \$500 million in remittances each year, corresponding to more than 10% of GDP<sup>1</sup>. This implies that labor has become one of Nicaragua's main export products (Baumeister, 2006).

According to the 2005 Census, about 10.1% of all households have a migrant abroad, and about 8.1% receive remittances. Households with a migrant abroad are much more likely to receive remittances than those who do not have a migrant abroad (48.4% versus 3.6%). Figure 1 shows that it is mostly the relatively wealthy households that are able to send migrants abroad and thus also the relatively wealthy households that receive remittances.

*Figure 1: Share of households in Nicaragua who have migrants abroad and who receive remittances, by wealth quintile, 2005*



*Source:* Authors' calculation based on the 2005 Census.

Previous research indicates that the emigration strategy is beneficial for the sending household, as remittances received are sufficient to more than compensate for the loss of a

<sup>1</sup> World Development Indicators, for the year 2004.

working member. For example, Andersen, Christensen & Molina (2005) show that remittances tend to reduce the vulnerability of households and increase their upward social mobility, at least as long as the households do not depend too heavily on remittances. Cox & Ureta (2003) found that remittances are very important for school retention in El Salvador, especially in urban areas, and especially compared to other sources of income. Similarly, Hanson & Woodruff (2003), using data from Mexico, find a positive relationship between child education and having a family member living abroad. They hypothesize that it is remittances that drive this result. Yang (2006), Lu & Treiman (2007) and Gonzales-König & Wodon (2007) find similar results for the Phillipines, South Africa, and Congo, respectively. Woodruff & Zenteno (2001) estimate that remittances account for 20% of the capital invested in micro-enterprises throughout urban Mexico, and conclude that migration and remittances can be instrumental in overcoming liquidity constraints to the implementation of micro-enterprises. Arends-Kuenning *et al* (2005) show that remittances allow households to invest in better and healthier housing. Finally, Yang & Choi (2005) find that remittances work as an effective insurance mechanism.

However, most previous studies do not adequately control for the selection bias that arises from the fact that not all households are able to use the migration-remittance strategy, as migration often requires a substantial initial investment. This implies that estimation results often present too rosy a picture of the effects of remittances. One notable exception is Acosta (2006), who shows that robust estimates that take into account both selection bias and endogeneity problems in estimating an average impact of remittances are substantially different from the naïve OLS estimates presented in previous studies. For example, he shows that once selection bias is taken into account, remittances no longer have a positive effect on school attendance in El Salvador.

One additional problem is that the emigration strategy may impose negative externalities on non-migrant households that do not receive remittances. First, the large inflow of remittance dollars may create “Dutch Disease,” with the well-known effects of reduced competitiveness of local products compared to imports, and an increase in prices of non-tradables (Acosta *et al*, 2007). Second, migrants are often either better educated or more

dynamic and entrepreneurial than the average citizen, which means that they contributed disproportionately to job creation and tax revenues before they migrated. Such negative externalities inflate the apparent positive effects of remittances.

Most previous analyses are limited to assessing the immediate static impacts, but not the subsequent dynamic effects of remittances. A household that receives an extra \$100 immediately becomes wealthier, but what we are really interested in is whether this has a lasting impact, or quickly disappears in a consumption splurge. Some research has found that remittances account for a large share of the capital invested in micro-enterprises (e.g. Woodruff & Zenteno, 2001), suggesting that remittances might have a permanent positive effect on household consumption. Others find that remittances are detrimental to growth, likely because they induce a reduction in effort on part of the recipient (Chami, Fullenkamp & Jahjah, 2003). Thus, while the static effects of remittances are more or less obvious, there is still a big debate about the dynamic effects.

In this paper we compare the static and dynamic impacts of both remittances and migration, taking into account selection biases in both the likelihood of having a migrant abroad and the likelihood of receiving remittances. We do this by developing a bivariate selection correction procedure for the purpose.

The results show that households sending migrants do experience higher consumption growth. However, the effect does not stem from the receipt of financial remittances, but simply from having one or more household members living abroad. These findings are consistent with the notion that more than just money is remitted by migrants. This could be social remittances in the sense of Levitt 1996, 1998, 2001; Newland & Patrick 2001; Gakunzi 2006, including business ideas, patterns of social interaction, and other intangibles that modify the behavior of recipient families.

The rest of the paper is organized as follows: In section 2, we present the data used in this study and demonstrate the importance of remittances and migration in Nicaragua. Section 3 explains the estimation strategy and presents the results. Section 4 discusses some of the

underlying mechanisms through which migration and remittances may affect consumption patterns, and, finally, Section 5 concludes.

## **2. The Importance of Migration and Remittances in Nicaragua**

Nicaragua is well suited for the study of the impact of migration and remittances, for two reasons. First, it is a poor country where remittances account for an important share of household incomes: Remittances into Nicaragua have accounted for at least 7% of GDP since 1997, peaking at 13.6% in 1999 due to Hurricane Mitch (World Development Indicators, The World Bank). The second reason is the availability of panel data. We use the three living standard measurement surveys conducted in Nicaragua in 1998, 2001, and 2005 that have the unusual, but very useful, feature that, to the extent possible, the same families have been surveyed in all three years<sup>2</sup>. This proves to be a tremendous advantage when investigating the dynamic effects of remittances.

### *2.1 Data description*

Our sample contains 2451 households for which we have information from all three waves. In part of the analysis, however, we will not make use of the 1998 information, but just concentrate on the 3220 households which we can follow from 2001 to 2005, since the 1998 remittance data is of lower quality than in the 2001 and 2005 waves. In 1998 households were only asked about the “amount of money received from friends and family members last month.” While these friends and family members reside outside the household, they do not necessarily reside in another country, so the question does not only capture international remittances. Also, households were only asked about last month, which may not have been representative for the whole year. In the 2001 and 2005 waves, the remittance question was made more precise, by asking about remittances from within the country and abroad separately, and by asking about remittances received the last 12 months instead of just last month. This allows us to calculate the variable “Average annual

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<sup>2</sup> 4080 households were surveyed in the 1998 wave. Of these, 3028 households were re-surveyed in 2001, and 1143 new households were included in the 2001 wave. In the 2005 wave, there were only 2451 households left from the 1998 wave, but 3220 households could be matched between 2001 and 2005.

international remittances received per household member in 2001 (\$US/year),” which is one of our key explanatory variables. This variable is positive for 16% of the households in our sample. Other variables in the 1998 data are used in modeling the migration decision, even though the remittances are not, so all three waves of the panel do come into play.

Our second key explanatory variable is the number of migrants that the household has living abroad in 2001. Table 1 shows that 85.7% of all the households in our sample has no migrant living abroad, 8.5% have 1 migrant abroad, 3.0% have 2 migrants abroad, while 2.7% have 3 or more migrants living abroad.

*Table 1: Households in the 2001 survey, by number of migrants abroad*

	<b>Number of migrants living abroad</b>			
	0 migrants	1 migrant	2 migrants	3+ migrants
No. of households	2570	256	91	82
% of households	85.7	8.5	3.0	2.7

It is not strictly necessary to have a migrant abroad in order to receive remittances, nor will having a migrant abroad guarantee the receipt of remittances. Table 2 shows that a significant share of households (7.1%) received remittances in 2001 although they didn’t have a migrant abroad. This means that they must have received from friends or relatives that did not originally belong to this household. About 5.4% of all households did have a migrant abroad, but didn’t receive any remittances in 2001, possibly because the migrant needed the money more than the household of origin.

*Table 2: Households in the 2001 survey, by migrant status and remittance status*

	<b>Did not receive remittances in 2001</b>	<b>Received remittances in 2001</b>
<b>Did not have a migrant abroad in 2001</b>	2,357 (78.6%)	213 (7.1%)
<b>Did have a migrant abroad in 2001</b>	162 (5.4%)	267 (8.9%)

The fact that all four types of households exist in significant numbers, allows testing the impact of having migrants abroad separately from the impact of the receipt of remittances.

The key dependent variables in our analysis are consumption per person in each household in 2001 and growth in consumption per person between 2001 and 2005. The first is used to measure the immediate static impact of remittances and migrants abroad, while the latter is used to measure the dynamic (medium run) impacts.

Apart from these key variables, we use a number of control variables. These include location of the household (rural or urban), the highest education level in the household (measured in years), number of household members currently living in the household, a dummy indicating if the head of household is a woman, and separate dummies for having a migrant in either the US or Costa Rica. These are the main receiving countries of migrants from Nicaragua, and they are associated with very different household characteristics, since migration to the US is more costly initially and should generate higher income abroad, whereas migrants to Costa Rica mainly are poorer agricultural workers.

### **3. Estimation results**

In order to put the main empirical results of this paper into perspective and understand the mechanisms driving the results, it is useful to start from a simple, standard model and step by step address some of the problems associated with the simple model.

#### *3.1 The simple OLS model in levels*

Most empirical papers on the effect of remittances only have cross-section data – typically a household survey – available. If you run a simple OLS regression explaining the log level of per capita consumption using as explanatory variables the log level of per capita remittances received, the same variable squared, number of migrants abroad, the same variable squared, as well as some control variables, then you find that remittances have a positive and highly significant effect on contemporary consumption. In this simple model, having up to 6 migrants abroad also appears to be beneficial for the household (see Table 3 and Figure 3).

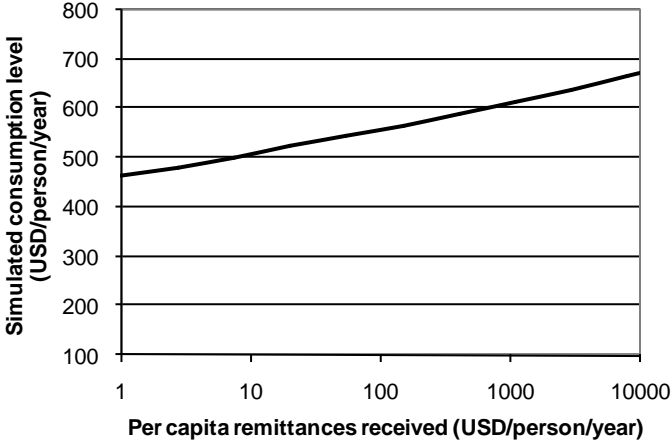
Table 3: OLS cross section regression analysis for 2001 using log consumption level in 2001 as the dependent variable

Explanatory variable	Coefficient	t-value
Ln(remittances per capita) in 2001	0.0404	7.06
Ln(remittances per capita) <sup>2</sup> in 2001	----	----
Number of migrants abroad in 2001	0.0837	2.97
Number of migrants abroad <sup>2</sup> in 2001	-0.0129	-2.41
Highest education level in 2001	0.0668	24.24
Number of household members 2001	-0.1182	-31.33
Urban dummy 2001	0.3333	14.96
Female household head dummy 2001	-0.0729	-3.22
Constant	6.1877	195.84
No. obs. = 2835		R <sup>2</sup> = 0.4847

Note: ---- The quadratic term was excluded because of statistical insignificance.

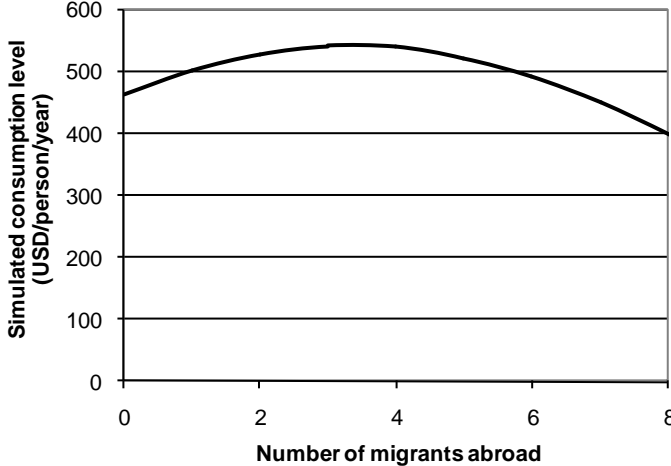
The effect of remittances was found to be linear in this model. However, although the coefficient is statistically significant, it is small, indeed much smaller than expected. A household that receives \$1000 per year in remittances for each household member only has a per capita consumption level that is about \$150 higher per year than a household that does not receive remittances (see Figure 2). This can mean two things: Either remittances *crowd out* other sources of income (own work), so that the net effect is much smaller than the amount of remittances received, or remittances are not used for consumption, but rather for investments. Andersen, Christensen & Molina (2005) use the Nicaraguan panel data to test how remittances received in 1998 affect changes in investment rates between 1998 and 2001, and find no effect. They also find that remittances received in 1998 have a negative effect on the change in hours worked between 1998 and 2001. This suggests that the dominant explanation for the limited impact of remittances is the crowding out effect.

Figure 2: Estimated partial effect of remittances on consumption level



The effect of having migrants abroad (independently of whether they send remittances or not) is non-linear in the simple OLS model. Having one migrant abroad is associated with a \$39 increase in per capita consumption compared to having no migrant abroad. Additional migrants have less impact and from the fourth migrant the effect is negative. The optimal number is three migrants, which is associated with a \$79 increase in annual consumption compared to having no migrant abroad (see Figure 3).

Figure 3: Estimated partial effect of migrants on the level of consumption



The joint significance of remittances and number of migrants suggests that not only the amount received matters, but also having migrants abroad in itself. The simple OLS model, however, may suffer from a serious self-selection bias, as households that have migrants abroad on average are richer than households that do not (see Figure 1 above).

### 3.2. Model in levels, corrected for self-selection bias in the receipt of remittances

The problem of selection bias can be addressed by applying Heckman's (1979) two-step method. To predict the probability of receiving remittances, we use the following four variables: the highest education level in the household, the number of migrants abroad, and the two dummies for migrants in the US and Costa Rica. All explanatory variables are highly significant and have a positive effect on the probability of receiving remittances (see Table 4). Having a migrant in the US yields a higher probability of receiving remittances than having a migrant in Costa Rica.

*Table 4: Heckman two-step cross section regression analysis for 2001 using log consumption level in 2001 as the dependent variable*

Explanatory variables – step 2	Coefficient	z-value
Ln(remittances per capita) in 2001	0.0466	4.04
Ln(remittances per capita) <sup>2</sup> in 2001	----	----
Number of migrants abroad in 2001	-0.0057	-0.20
Number of migrants abroad <sup>2</sup> in 2001	----	----
Highest education level in 2001	0.0461	7.80
Number of household members 2001	-0.1251	-13.43
Urban dummy 2001	0.3569	6.13
Female household head dummy 2001	-0.0449	-0.94
Constant	6.4328	38.73
Lambda	-0.0536	0.77
Explanatory variables – step 1	Coefficient	z-value
Highest education level in 2001	0.0533	6.97
Migrant in the US in 2001	1.1262	6.98
Migrant in Costa Rica in 2001	0.8933	6.42

Number of migrants abroad in 2001	0.4281	6.40
Constant	-1.7177	-25.90
<hr/>		
No. obs. = 2837	Uncensored obs. = 463	

Note: ---- The quadratic terms were excluded because of statistical insignificance.

Table 4 shows that remittances still have a highly significant effect on contemporary consumption after adjusting for self-selection bias, but having migrants abroad has become insignificant. The coefficient on Lambda (the inverse Mill's ratio) is insignificant, suggesting that the self-selection bias is not very large in this model, and indeed the coefficient estimate on the remittance variable changes little compared to the simple OLS model (Table 3).

### *3.3. Model in changes, corrected for self-selection bias in the reception of remittances*

The finding that remittances received increase contemporary consumption is not too surprising and it is consistent with the literature. However, the real issue whether this more than temporary relief, i.e., whether remittances have permanent positive effects by allowing households to invest in productive assets (both physical and human).

If remittances have positive dynamic effects, we would expect the consumption levels of remittance receiving households to increase faster than the consumption levels of non-remittance receiving households. This is investigated in Table 5 where the dependent variable is the change in log consumption. The results show that the expected effect is absent. Indeed, remittances appear to have a negative effect on the subsequent increase in consumption, although the result is not statistically significant. Note that this result is corrected for the self-selection bias in the receipt of remittances, and that the selection bias is now statistically significant.

*Table 5: Heckman two-step cross section regression analysis for 2001 using changes in log consumption between 2001 and 2005 as the dependent variable*

Explanatory variable – step 2	Coefficient	z-value
Ln(remittances per capita) in 2001	-0.0084	-0.63
Ln(remittances per capita) <sup>2</sup> in 2001	----	----
Number of migrants abroad in 2001	-0.0554	-1.62
Number of migrants abroad <sup>2</sup> in 2001	----	----
Highest education level in 2001	0.0013	0.19
Number of household members 2001	0.0329	2.94
Urban dummy 2001	-0.0101	-0.15
Female household head dummy 2001	0.0421	0.76
Constant	0.1662	0.85
Lambda	-0.1534	-1.98
Explanatory variable – step 1	Coefficient	z-value
Highest education level in 2001	0.0510	6.33
Migrant in the US in 2001	1.1744	7.19
Migrant in Costa Rica in 2001	0.9230	6.52
Number of migrants abroad in 2001	0.4088	5.92
Constant	-1.7949	-25.62
No. obs. = 2763	Uncensored obs. = 389	

Note: ---- The quadratic terms were excluded because of statistical insignificance.

### *3.4. Model in changes, corrected for self-selection bias in the receipt of remittances as well as in the migration decision*

The selection corrections applied so far are for the endogeneity of receipt of remittances, following Acosta (2006). However, there are really two endogenous choices being made. There is the decision to send a migrant abroad in the first place. Secondly, there is the choice of receiving remittances. The first choice, that of sending a migrant, is the one depending more directly on the household's level of income, education, etc, as it is an investment decision. Receipt of remittances is likely more need based, and involves a comparison of who needs the funds more – the migrant or the family back home. It is

therefore of interest to separate the decisions to send a migrant and to accept remittances, and study their separate causes and consequences.

Clearly, while separate, the two decisions are not entirely independent, and this must be allowed for in the analysis. To this end, we estimate a bivariate probit model, accounting for the correlation between the underlying factors driving the two choices. Formally, let  $D_m$  be the dummy variable indicating whether or not the household has a migrant abroad, i.e.,  $D_m = 1$  if there is a migrant, and  $D_m = 0$  if not. Similarly, let  $D_r$  be the indicator for receipt of remittances. Write  $Z_m$  and  $Z_r$  for the explanatory variables relevant for the two decisions. We assume that the underlying unobserved variables determining the migration and remittance choices are  $m$  and  $r$ , respectively, so that either choice is made if the associated variable is positive, i.e.,

$$D_m = \begin{cases} 1, & m = Z_m \gamma_m + u_m > 0 \\ 0, & \text{otherwise} \end{cases}$$

$$D_r = \begin{cases} 1, & r = Z_r \gamma_r + u_r > 0 \\ 0, & \text{otherwise} \end{cases}$$

$$\text{corr}(u_m, u_r) = \theta$$

This specification for  $D_r$  in isolation is the same as in the standard (univariate) probit from the first step in Heckman's two-step procedure used above. Thus, the underlying unobserved factor  $r$  driving the choice depends linearly on observed regressors  $Z_r$ , with coefficients  $\gamma_r$ , and  $u_r$  is the household's idiosyncratic error independent of  $Z_r$ . With normality of  $u_r$ , this has, without loss of generality, zero mean and unit standard error. Our bivariate probit model adopts an analogous specification for the migration choice, possibly with different observed characteristics  $Z_m$ , and the dependence between the choices given regressors is governed by the correlation,  $\theta$ , between the error terms.

With these specifications, the joint probability distribution of  $D_m$  and  $D_r$  is readily expressed in terms of the standard bivariate normal c.d.f., thus facilitating maximum likelihood estimation. Results of this analysis appear in Table 6.

*Table 6: Biprobit regression explaining migration and remittance decisions in 2001*

Migration decision	Coefficient	z-value
Highest education level in 1998	0.0173	1.76
Ln(consumption per capita) 1998	0.2964	5.35
Household members 1998	0.0896	7.74
Urban dummy 1998	0.2005	2.80
Constant	-3.6955	-10.60
Remittance decision	Coefficient	z-value
Highest education level in 2001	0.0186	2.10
Ln(consumption per capita) 2001	0.3704	6.12
Migrant in the US 2001	0.4348	2.20
Migrant in Costa Rica 2001	0.4433	2.33
Number of migrants abroad 2001	0.3069	4.17
Female headed household 2001	0.1841	2.66
Household members 2001	0.0257	1.80
Urban dummy 2001	0.2472	3.26
Constant	-4.0546	-10.10

Whether the household has a migrant abroad in 2001 depends mostly on past actions and conditions, so we use explanatory variables from 1998 for the first decision. The results show that richer, better educated, larger, urban households are more likely to send a migrant.

Whether the household receives remittances in 2001 depends mostly on the current situation, so we use explanatory variables from the same year for this decision. Here we include current consumption, since the dependent variable in the second step below is consumption growth through 2005. The results show that richer, better educated, female headed, urban households with several migrants abroad are more likely to receive remittances.

The correlation between the migration and remittance accept decisions is positive, as expected, with a point estimate of 0.35, which is significantly different from 0, showing that the two decisions are not independent.

While of interest in their own right, the bivariate probit estimates in addition allow a more complete selectivity correction of the consumption growth regression. Thus, in the previous regressions, the dummy for having a migrant abroad has been simply treated as an exogenous explanatory variable. Clearly, the endogeneity of the migration decision should be accounted for in the consumption growth regression. Indeed, the migration decision logically comes before the remittance receipt decision, is more directly made by the household, and presents probably a greater endogeneity problem than the remittance receipt variable itself. The bivariate probit results can be used to construct a joint selectivity correction for both variables in the consumption growth regression, now treating migration and the receipt of remittances in a symmetric fashion.

The idea is to build selectivity correction terms for the consumption growth regression that generalize the standard inverse Mill's ratio terms from the univariate probit in the first step of Heckman's procedure to the case of a bivariate probit in the first step. For robustness against possible non-normality, we follow the Newey (1991) approach and the application of this in Martins (2001) and adopt a semiparametric approximation to the second step

selectivity terms. Specifically, let  $\mu(v, \alpha) = \sum_{j=0}^k \alpha_j v^j$  be a  $k$ 'th order polynomial in  $v$ , with

coefficients  $\alpha = (\alpha_0, \dots, \alpha_k)$ . The selectivity term is approximated as  $\mu(Z\gamma, \alpha)$ , where  $Z$  are the first step regressors. The polynomial order  $k$  serves a role similar to a bandwidth parameter in kernel estimation, and the procedure yields consistent selectivity corrected second step estimation (see Newey (1991)).

In our case, the second step regression may be written

$$\Delta c = X\beta + \mu(Z_m \gamma_m, \alpha_m) + \mu(Z_r \gamma_r, \alpha_r) + \alpha_{mr} Z_m \gamma_m Z_r \gamma_r + \varepsilon$$

Following Martins (2001), we use  $k = 2$ , so the polynomials include terms up to second order, and  $\alpha_{mr}$  is the coefficient on the cross-term in our generalization to the bivariate case. Newey (1991) considered the univariate first step case and so had a single polynomial  $\mu$  and no cross-term in the second step. He also considered semiparametric alternatives to probit in the first step, yielding alternative estimates of  $\gamma$  for the second step. For simplicity, we stay with the basic bivariate probit estimates from above for  $\gamma_m$  and  $\gamma_r$ , but our generalized procedure does retain some robustness against departures from joint normality through the semiparametric second step.

Newey (1991) considered the case of two distinct subsamples, the selected and the not selected subsample, corresponding to a single bivariate endogenous choice, and restricted estimation of the second step regression to the selected subsample. As a further generalization of the approach, we do not restrict the second step regression to the selected sample. As we have data for all four subsamples defined by the endogenous choices of whether or not to send a migrant abroad and whether or not to accept remittances, we estimate the second step regression separately for each of the four subsamples. In particular, this allows the bivariate selectivity terms  $\mu(Z\gamma, \alpha)$  to take different functional forms by subsample. To understand why this is necessary for consistency, it suffices to consider the analogous case of the standard Heckman procedure. Here, the correction term only takes the well-known inverse Mill's ratio form  $\mu = \Phi/\phi$  for the selected subsample, whereas the correct specification for the not selected subsample is  $\mu = (1 - \Phi)/\phi$ .

The results from the second step selection corrected estimation are exhibited in Table 7. Since there are many insignificant variables, Stata's StepWise procedure was used to systematically remove one by one (starting with the least significant) all the variables that were not statistically significant at the 10% level.

The results for the case of both migration and receipt of remittances,  $D_m = D_r = 1$ , are presented in the first column. Here, the size of remittances is now entirely insignificant, suggesting that the amount received does not impact consumption growth. On the other hand, the larger the number of migrants abroad, the higher the consumption growth of the

household left behind. This effect is significant, with a t-statistic of 2.69, and the point estimate shows that each additional migrant abroad increases the rate of consumption growth by about 14 percentage points, which is considerable.

*Table 7: Consumption growth regressions with bivariate selection correction, reduced models*

	Group 1: Remittances and migrant	Group 2: No remittances, no migrant	Group 3: No remittances, migrant	Group 4: Remittances, no migrant
Explanatory variable – step 2	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
Ln(remittances per capita) in 2001	----	X	X	----
Ln(remittances per capita) <sup>2</sup> in 2001	----	X	X	----
Number of migrants abroad in 2001	0.1418 (2.69)	X	0.2012 (3.16)	X
Number of migrants abroad <sup>2</sup> in 2001	----	X	----	X
Highest education level in 2001	0.0365 (3.56)	0.0425 (10.77)	----	0.0233 (2.16)
Number of household members in 2001	----	-0.0106 (-2.30)	----	----
Urban dummy 2001	0.2191 (2.09)	0.3596 (11.96)	0.3930 (3.45)	----
Female household head dummy in 2001	----	0.2520 (9.97)	----	0.2215 (2.76)
Constant	-0.6282 (-3.08)	-1.4524 (-8.64)	-0.9573 (-5.27)	-0.9060 (-2.25)
$Z_m\gamma_m$	----	0.4318 (2.73)	----	----
$(Z_m\gamma_m)^2$	----	-0.240 (-2.26)	----	-1.6353 (-3.21)
$Z_r\gamma_r$	-0.5256 (-3.81)	-0.9670 (-6.19)	-0.5278 (-4.02)	-1.0700 (-1.82)
$(Z_r\gamma_r)^2$	----	----	----	-1.1816 (-2.56)

$Z_m\gamma_m Z_r\gamma_r$	----	0.3800 (3.02)	----	2.4487 (2.60)
No. obs.	217	1738	131	170
R <sup>2</sup>	0.1134	0.2449	0.2167	0.1934

Notes: X: variable dropped since constant within group by construction.

----: variable dropped by Stata because of statistical insignificance.

Group 2 consists of households that neither had migrants abroad nor received remittances, so for this group it is logically impossible to estimate the effect of migrants and remittances. For Group 3, households that do not receive remittances despite having at least one migrant abroad, we also find that migrants abroad contribute to higher consumption growth. Indeed the estimated effect, at 20 percentage points, is larger than for Group 1 households that do receive remittances. Finally, for Group 4, households that receive remittances despite not having any migrant abroad, we do not find any significant effect of remittances. This is consistent with what we found for Group 1, where remittances were insignificant too. In sum, it appears that it is beneficial for households to have migrants abroad, but not because of the financial remittances received from them.

It is possible to unite the 4 separate regressions in one final model by multiplying the selectivity terms with dummies for inclusion in each of the respective four groups. Thus, instead of five selectivity correction terms, we have 20, and instead of one constant term, we have four (see Table 8 – Column (a)). Submitting this regression to Stata’s Stepwise procedure in order to systematically remove the least significant variables until all have p-values lower than 0.1 yields the final result presented in Column (b) of Table 8. Many of the selection correction terms turn out highly significant, thus indicating significant selection bias.

*Table 8: Joint consumption growth regression with simultaneous bivariate selection correction, full model and reduced model*

	(a) Full model	(b) Reduced model
Explanatory variable – step 2	Coefficient (t-value)	Coefficient (t-value)

Ln(remittances per capita)	0.0379 (0.75)	0.0743 (3.16)
Ln(remittances per capita) <sup>2</sup>	-0.0041 (-0.89)	-0.0073 (-2.71)
Number of migrants abroad	0.3180 (4.40)	0.2413 (9.61)
Number of migrants abroad <sup>2</sup>	-0.0078 (-0.78)	----
Highest education level	0.0362 (10.58)	0.0351 (11.11)
Number of household members	-0.0039 (-0.92)	----
Urban dummy	0.3373 (11.95)	0.3426 (12.45)
Female household head dummy	0.2211 (9.73)	0.2157 (9.68)
Constant* $D_{r=1,m=1}$	0.2769 (1.14)	----
$Z_m\gamma_m D_{r=1,m=1}$	-0.7383 (-3.41)	-0.6675 (-6.09)
$(Z_m\gamma_m)^2 D_{r=1,m=1}$	0.3599 (1.86)	0.4641 (3.49)
$Z_r\gamma_r D_{r=1,m=1}$	0.0469 (0.39)	----
$(Z_r\gamma_r)^2 D_{r=1,m=1}$	-0.2475 (-2.08)	-0.2836 (-2.67)
$Z_m\gamma_m Z_r\gamma_r D_{r=1,m=1}$	0.3775 (1.85)	0.5296 (5.47)
Constant	-1.2730 (-7.71)	-1.1791 (-13.52)
$Z_m\gamma_m D_{r=0,m=0}$	-0.7268 (-3.44)	-0.7685 (-10.65)
$(Z_m\gamma_m)^2 D_{r=0,m=0}$	0.2969 (0.98)	----
$Z_r\gamma_r D_{r=0,m=0}$	-0.0417 (-0.61)	----
$(Z_r\gamma_r)^2 D_{r=0,m=0}$	0.1010 (0.57)	----

$Z_m\gamma_m Z_r\gamma_r D_{r=0,m=0}$	0.0878 (0.45)	----
Constant* $D_{r=0,m=1}$	0.3162 (0.89)	----
$Z_m\gamma_m D_{r=0,m=1}$	-1.0144 (-3.39)	-0.8050 (-8.95)
$(Z_m\gamma_m)^2 D_{r=0,m=1}$	0.6444 (0.94)	----
$Z_r\gamma_r D_{r=0,m=1}$	0.0104 (0.07)	----
$(Z_r\gamma_r)^2 D_{r=0,m=1}$	0.3159 (0.82)	----
$Z_m\gamma_m Z_r\gamma_r D_{r=0,m=1}$	-0.1668 (-0.47)	----
Constant* $D_{r=1,m=0}$	0.0875 (0.22)	----
$Z_m\gamma_m D_{r=1,m=0}$	-0.9793 (-1.78)	----
$(Z_m\gamma_m)^2 D_{r=1,m=0}$	0.6751 (1.01)	----
$Z_r\gamma_r D_{r=1,m=0}$	-1.1579 (-2.46)	----
$(Z_r\gamma_r)^2 D_{r=1,m=0}$	-1.4327 (-2.66)	-0.8916 (-6.45)
$Z_m\gamma_m Z_r\gamma_r D_{r=1,m=0}$	2.7799 (2.99)	1.2094 (9.05)
No. obs.	2256	2256
R <sup>2</sup>	0.2170	0.2121

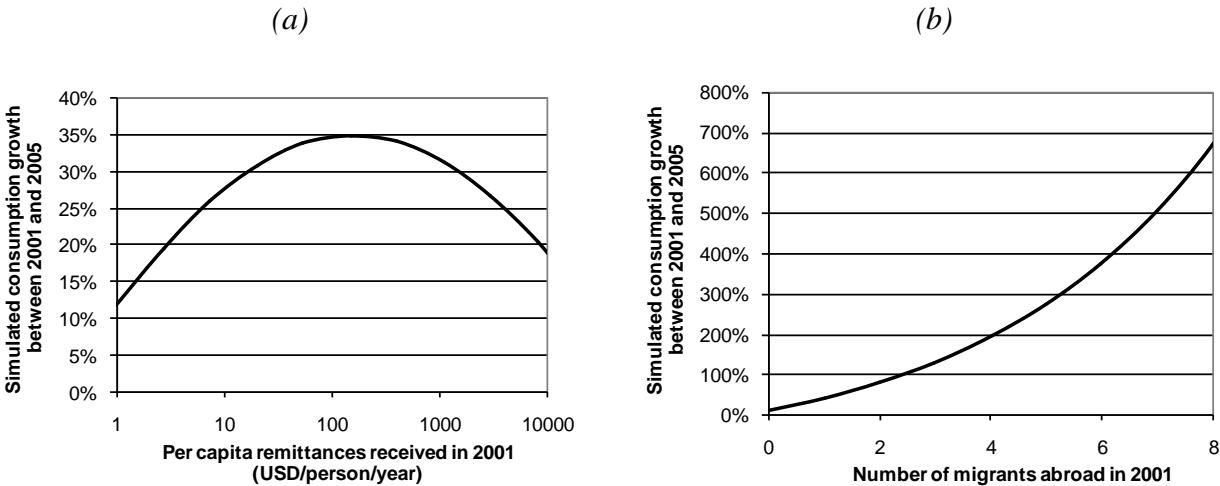
Note: ----: variable dropped because of statistical insignificance.

The results in the final, joint, reduced consumption growth model (Table 8, Column (b)) indicate a non-linear effect of remittances on consumption growth once the various selection biases are adequately corrected for. Figure 4a shows the simulated non-linear effect, which is positive and increasing for amounts up to about US\$ 150 per person per year. For amounts larger than that, the effect becomes smaller and smaller. The receipt of \$150 per person per year is estimated to cause an increase in consumption levels between

2001 and 2005 of about 35% compared to 12% for households that do not receive any remittances. The results concerning remittances are not very robust, however. In the full model (Table 8, Column (a)), both the linear and the quadratic term are statistically insignificant.

In contrast, having a migrant abroad has a very robust and positive effect on consumption growth. Indeed, having one or more migrants abroad is found to have a much larger positive effect on consumption growth than the receipt of remittances (see Figure 4b). Having one migrant abroad on average increase consumption growth between 2001 and 2005 to 42%. For two migrants abroad the average increase is 81%. The effect of migrants abroad increases exponentially, so a household with 5 migrants abroad would experience consumption growth of 274% compared to just 12% for households without any migrant abroad.

Figure 4: Simulated effects of remittances and migrants abroad on household consumption growth



**4. Discussion**

The empirical results presented above suggest that the migration strategy is very favorable for the Nicaraguan households that apply this strategy, but that the benefits do not primarily

arise from the monetary remittances received from abroad. Indeed, remittances seem to *crowd out* other sources of income, so that the net effect on consumption is very limited.

So, in what way can a migrant abroad be beneficial to a household in Nicaragua, if it is not through the money sent back? A limited literature on social remittances suggests that migrants adopt new values, attitudes, and practices at their destination, and that some of these values and practices get transmitted to the family at home (Levitt 1996, 1998, 2001; Newland & Patrick 2001; Gakunzi 2006). The social remittances transferred to the family of origin can be very concrete, directly applicable business ideas, such as a new product or service discovered abroad, a more effective design or attractive packaging, or a new way of advertising. But social remittances can also be much more subtle. Levitt (1998) notes the strong impact of migration on gender identity in the Dominican Republic. Migrant women modify their ideas about women's role in society in response to their more active engagement in the labor market abroad, and transmit these new ideas back to family and friends in the Dominican Republic. Non-migrant women then use these social remittances to construct new visions of womanhood, creating a marked change in attitudes towards male-female relations and the division of labor. Such changes in gender perceptions may cause non-migrant women to choose to have fewer children and instead engage in labor market activities, both of which would help increase consumption per household member. This hypothesis is consistent with the surprisingly dramatic decrease in fertility rates that Nicaragua has experienced during the last 15 years, just when emigration boomed (Andersen 2007).

The effects of social remittances are not limited to the household of origin, but may spread to society at large. A study of the African diaspora in the Netherlands and Portugal find that the social remittances transferred to Africa include innovative ideas, valuable transnational networks, knowledge, sound political contributions, policy reforms, valuable democratic habits and attitudes, appropriate peace-making ideas and practices, new technological skills, norms of behavior, work ethics, social values, and cultural influence (Gakunzi 2006).

## 5. Conclusion

In this paper we develop and apply a new method for simultaneously correcting the consumption growth regression for selectivity biases in both the migration choice and the choice to receive remittances.

The empirical results, using a three-wave Nicaraguan household survey spanning 7 years, indicate that financial remittances are not nearly as beneficial to the recipients as recent research has suggested, and that emigration may not be as damaging as claimed in the brain drain literature. The findings presented here lend strong empirical support to the concept of social remittances.

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