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Consumption Effects of Foreign Remittances in Jamaica

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Abstract The term remittances refers to proceeds from the migration of labor that are sent to aid individuals remaining in the migrants' home communities. In this paper, we investigate whether remittances alter the consumption pattern of recipient households in Jamaica. We present results from an Engel curve estimation specifically using the Working (1943) approach and a two-part fractional response model with instrumental variables to account for selection bias and endogeneity of remittances. The dependent variables are a subsample of the categories of consumption as defined in the Jamaican Survey of Living Conditions and include expenditures on food, schooling, health, gambling, alcohol and donations. We find that receipt of remittances significantly alters the recipient households' expenditure allocations relative to other sources of income, although this effect occurs more through the participation decision. Overall, total effects of remittances are largest in the areas of luxury expenditures and home production, and to a lesser extent for education and grocery store purchases. These findings have significant implications for those remitting, those receiving, and governments looking to understand this large flow and less documented source of income.

Keywords Remittances · Two-part fractional response model · Jamaica

JEL Classification O50 · O54 · O57

Introduction

For most people, the thought of foreign aid conjures up one of several images. One might be that of a government in a developed country offering monetary assistance to the government in a less developed country. Another might be the workings of international non-governmental organizations in the implementation of humanitarian efforts. To some

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extent, foreign direct investment carries with it an element of foreign aid. But for many people, foreign aid is more personal. It is estimated that in 2010, individuals in developed countries sent more than \$525 billion in remittances to households in less developed nations (United Nations Department on Economic and Social Affairs (DESA) (2013)).

As the flow of this money is likely to increase, what do we, as researchers, actually know about the effect of remittances on recipient households? For example, to what extent are remittances improving educational opportunities or funding health care expenses? How likely is it that payment recipients are increasing expenditures for less desirable goods and activities such as alcohol, tobacco, or gambling? In this paper, using data from the Jamaican Survey of Living Conditions (SLC) and Labor Force Survey (2001–2007), we address these questions using a two-part fractional response model to estimate Working (1943) type Engel curves for a selection of expense categories including education, health, luxuries, and vices.

Remittances are a significant source of income for households in many developing countries, but in 2009, remittances comprised over 14 % of Jamaica's gross domestic product (GDP), making it the 14th most reliant country in the world (International Monetary Fund; Ratha et al. 2011). This reliance may result from the migration of Jamaica's college educated citizens. A recent study found that 82 % of college educated Jamaicans living abroad were trained in Jamaica (Thomas-Hope et al. 2009). Another study places the modes of cash amounts received around \$300 (USD) and the value of in-kind goods between \$60 and \$100 (USD) annually (Dade 2006).

With considerable migration and remittance flows, Jamaica is a reasonable choice for the study of how these in-kind and cash receipts affect consumption decisions by households. Figure 1 displays the growth of nominal and real remittances, along with remittances as a percentage of GDP.

The value of remittances dwarfs average receipts of the Programme of Advancement Through Health and Education (PATH) and the National Insurance Scheme, two government funded programs designed to help lower-income households by providing regular (but unearned) income. Furthermore, remittances now exceed tourism revenues and the value of bauxite exportation combined.
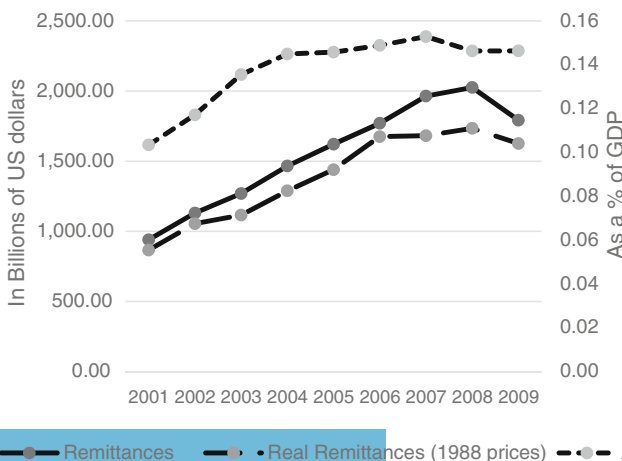

Fig. 1 Remittance trends in Jamaica 2001–09. Source of Data: International Financial Statistics, IMF

Literature Review

The literature on remittances spans both macroeconomics and microeconomics. In macroeconomic studies, scholars examine how remittances affect countries' overall economic performance. Some research suggests a positive effect with remittances serving as an alternative to formal credit markets (Ramirez 2013) as well as subsidizing the education sector in Southeast Asia (Cooray 2012). This finding, however, is far from conclusive given the contrary findings in other studies (Chami 2005; Solimano 2005), including one which links remittance receipts to government corruption (Ahmed 2012) and others linking remittances to currency appreciation (Roy and Dixon 2016; Hassan and Holmes 2013).

Researchers are also examining the effects of remittances at the household (or microeconomic) level. For example, loss of remittances during the Great Recession may have increased child labor and decreased school attendance in Mexico (Acosta 2006). Positive effects of remittances on school enrollment are confirmed in Ghana, particularly for female-headed households (Gyimah-Brempong and Asiedu 2015). In central America, remittances were found to increase the size of farms but not affect the type of farming or ranching currently underway (Davis and Lopez-Carr 2014). The effect of remittances on a household's expenditures in the areas of education, health, and durable goods is also a function of whether the remittances come from abroad or urban-rural migration in India (Mohanty et al. 2014). Lastly, households receiving remittances may have lower propensities to consume in expenditure areas other than those listed above (Davies et al. 2009).

While classic economic theory hypothesized that the source of income should not matter, numerous studies have disproven this notion (Thomas 1990; Imbens et al. 1999; Lundberg et al. 1997; Hawkins and Wallace 2006; Levin 1998). Thus, the case for separating remittances is well established in the literature, as described above.

Methodology

We begin constructing our model by specifying the consumption function using budget shares (Deaton and Muellbauer 1980; Hawkins and Wallace 2006) from which Engel equations are derived to test the differences in the marginal propensity to consume (MPC) across goods. The empirical approach is fully parametric as we use a standard Engel curve that has expenditure share on various goods as a function of total income while controlling for demographic and other characteristics of the household. While different functional forms are possible, we select a commonly used linear function (Working 1943).

When we transform the individual expenditures into budget shares and total income to its log, the joint density is approximately normally distributed, and the regression function treated as linear. The simple Working Engel curve can be extended to include various household characteristics as control variables, as well as indicators of the different income sources of interest (Deaton 1997).

Ordinary least squares (OLS) is commonly used to estimate Engel curves (Deaton 1997; Deaton and Muellbauer 1980), but the fractional nature of the data along with a large number of zeros require a different approach (Papke and Wooldridge 1996, 2008). Ramalho and Vidigal da Silva (2009) suggest the use of a two-part model able to handle extreme bunching at the endpoints (0 or 1) within the fractional response models of Papke and Wooldridge (1996). This approach is applicable given the budget shares we consider.

A second issue is the nature of the relationship between the dependent variables across different categories of expenditures. These dependent variables are budget shares, so the value of the budget that goes to one expenditure type affects how much is available to spend on other items. Although a seeming unrelated regression (SUR) approach could work, it is only feasible when examining all expense categories. Instead, we use OLS which is more parsimonious and consistent but not as efficient as SUR.

Two-part Fractional Response Modeling (FRM)

The method proposed by Papke and Wooldridge (1996) uses a generalized least squares method with no transformation needed for the dependent variable. The conditional mean takes the form

$$E(Y|X) = G(X\beta) \tag{1}$$

where G is a non-linear function. The two-part fractional response model proposed by Ramalho and Vidigal da Silva (2009) adequately accounts for a large number of zeros observed in the budget shares data. The first part of this model examines the participation decision whereby a non-zero budget share indicates participation. The second part of the model analyzes the effect of independent variables on the non-zero budget shares controlling for the probability of involvement. As a result, the $E(Y|X)$ can be divided into two parts:

$$E(Y|X) = E(Y|X, Y = 0) \times \Pr(Y = 0|X) + E(Y|X, Y \in (0, 1]) \times Pr(Y \in (0, 1]|X). \tag{2}$$

The first product on the right-hand side drops out because it is equal to zero. The two parts that need estimation are participation and the shares conditional on participation. Assuming a logistic function for both parts, the marginal effect of Xj on participation is:

$$\frac{\partial \Pr(Y^* = 1|X)}{\partial x_j} = \theta_j \frac{e^{x\theta}}{(1 + e^{x\theta})^2} \tag{3}$$

and the marginal effect of Xj on the share conditional on participation is:

$$\frac{\partial E(Y|X, Y \in (0, 1])}{\partial x_j} = \gamma_j \frac{e^{X\gamma}}{(1 + e^{X\gamma})^2}. \tag{4}$$

The total effect (whether the expense share is zero or positive) then becomes:

$$\frac{\partial E(Y|X, Y \in (0, 1])}{\partial x_j} = \gamma_j \frac{e^{X\gamma}}{(1 + e^{X\gamma})^2} \frac{e^{x\theta}}{(1 + e^{x\theta})} + \theta_j \frac{e^{x\theta}}{(1 + e^{x\theta})^2} \frac{e^{X\gamma}}{(1 + e^{X\gamma})} \tag{5}$$

The total effect consists of two parts. The first expression on the right-hand side of Eq. 5 shows the marginal effect of remittance receipts on each budget share weighted

by the probability of participating in that expenditure type. The second expression displays the marginal effect of remittance receipts on the likelihood of participation weighted by the average budget share for those who have some spending on that expenditure category.

Accounting for Endogeneity of Remittances

In addition to model specification, we also consider the possibility that remittance receipt may be endogenous or that omitted variables from the budget-share equations may correlate with remittances. For example, the recipients' forecast of remittances is unobserved. Is the stream of outside income likely to remain stable or is it volatile? Also, reverse causality may arise if greater expenses in specific categories induce larger remittances. For these reasons, we instrument for remittances.

Researchers have used a variety of instrumental variables for remittances. Acosta (2006), for example, uses village level characteristics to estimate the likelihood of receiving remittance payments, and Abdih et al. (2012) uses proximity to the coast.

In a country as geographically small as Jamaica (less than 150 miles long and 50 miles wide), geographical distinctions may be difficult to find without some other parameter helping to differentiate areas. Thus, we adopt the following strategy. First we identify the 164 enumeration districts in Jamaica. (These districts are geographic areas determined in part by location and part by population density). For each of these districts, we calculate the total receipt of remittances as a fraction of total district level expenditures in 2003 and use this as an instrument for remittances for the years 2001–2007, excluding 2003. This year is excluded from analysis due to problems with missing data on employment and earned income.

This new variable is an index that captures whether a district is a high remittance receiving district. These areas might be areas with strong ties to the USA, Canada, and the UK, the primary sources of Jamaica's remittance flows. The index is expected to correlate with actual remittances receipts but not with household level consumption and any omitted variables, except through household remittances. We show the correlation of the index with household remittances in the results section, but there is no way of examining the association with unobservables.

We use an instrumental variable probit model for the participation part of the two-part approach. For the second part of the model, we adjust for endogeneity using the two-step IV procedure for fractional response models (Wooldridge 2010). In the first step, we estimate an OLS regression of remittance share on the instrumental variable and all exogenous variables in the model and save the residuals(v). In the second step, we include the saved residuals from the first step as one of the exogenous variables.

The Data

Using a unique household identifier, we merge two panel data sources, the SLC and the Jamaican Labor Force Survey (LFS), to create a single, more detailed panel dataset. The SLC places greater emphasis on evaluating imme-diate effects of public policy. Questions pertain to education, crime, and health,

with particular modules focusing on food and non-food expenditures as well as remittances. The labor force survey provides data on employment and income.

Both surveys are conducted quarterly with the second quarter considered most stable. For this reason, we use second quarter data for years 2001–2007, excluding 2003. (The 2003 LFS is incomplete, but we use the remittance data for that year to construct the instrumental variable, as discussed above.) We aggregate all income and expenditure categories for members within the same household, including remittances and education expenditures.

Creation of the dependent variables is also discussion worthy. For instance, *education* includes expenses on school supplies, money for school lunch, and tuition. *Luxury* refers to eating out plus visits to the hair salon. *Home production* places value on items such as vegetables and fruits grown by the household for their personal consumption. *Grocery store food* refers to purchases of food items excluding restaurant expenses. *Vices* refer to the sum of tobacco, gambling and alcohol expenditures. *Health* includes expenditures on visits to medical professionals or medications, and *donation* represents amounts given as gifts by the household. Tables 1 and 2 present descriptive statistics for the data used in this study.

While Table 1 provides descriptive statistics for the entire sample, Table 2 includes a disaggregation of the data. The top half of the table compares the expenditure shares between recipients and non-recipients of remittances. The bottom half reports the proportion of households that report positive (or non-zero) values for expenses in each one of these areas. Overall, *grocery store purchases* comprise the largest expenditure category with half of the average household's expenditures allocated here and 99 % of all households reporting actual spending. Interestingly, *vices*, including tobacco, alcohol, and gambling, comprise only 2 % of total purchases, on average, but over one-third of households report expenditure in this area.

The summary statistics, albeit interesting, are insufficient in explaining all of the dynamics. For example, families without children are unlikely to report *education expenses*. At the same time, almost one-third of the sample received remittances for children. It is not surprising, therefore, that 50 % of households receiving remittances report spending money on school while only 40 % of households who did not receive remittances report positive values for *school expenses*. The participation data also

Table 1 Descriptive statistics

Explanatory variables	N	Mean	Std. Dev.	Min	Max
Remittances to total expenditure ratio	18,100	0.13	0.26	0.00	1.65
Age of head of household	24,003	48.74	17.05	15.00	98.00
Household size	24,003	2.30	2.35	1.00	28.00
Number of children 5yo and under	21,084	0.20	0.51	0.00	4.00
Number of children 6yo and over	21,084	0.57	1.02	0.00	8.00
Male	21,084	0.56	0.50	0.00	1.00
Married (=1)	23,968	0.33	0.47	0.00	1.00

Source: Jamaica Survey of Living Conditions, 2001 to 2007 and Jamaican Labor Force Survey, 2001 to 2007

Table 2 Descriptive statistics of expenditure variables by recipient status

	Variable	Recipients			Non-recipients		
		Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Shares	Total expenditure	9159	3514	2353	9118	3441	2292
	Education	9174	0.10	0.13	9155	0.08	0.12
	Vices	5570	0.02	0.04	6436	0.02	0.04
	Luxury	9054	0.14	0.13	8975	0.14	0.14
	Home Production	8864	0.06	0.07	8978	0.05	0.07
	Grocery Store Purchases	9226	0.50	0.19	9200	0.51	0.19
	Health	6953	0.02	0.04	7048	0.01	0.04
	Donation	5668	0.01	0.02	6604	0.01	0.02
Participation	Education	9174	0.50	0.50	9155	0.40	0.49
	Vices	5570	0.35	0.48	6436	0.36	0.48
	Luxury	9054	0.78	0.42	8975	0.76	0.43
	Home Production	8864	0.73	0.44	8978	0.59	0.49
	Grocery Store Purchases	9226	0.99	0.10	9200	0.99	0.10
	Health	6953	0.25	0.43	7048	0.17	0.37
	Donation	5668	0.46	0.50	6604	0.31	0.46

Source: Jamaica Survey of Living Conditions, 2001 to 2007 and Jamaican Labor Force Survey, 2001 to 2007

reveal that households receiving remittances are significantly more likely to report positive values of *home production*, *donations*, and *health expenses*.

Thinking about the mean expenditure shares and participation in an expense category jointly adds another level of insight. For example, consider the expense category of *donations*. Regarding average levels donated, both recipients and non-recipients donate an average of 1 % of their income. However, recipients of remittances are much more likely to report making *donations*. With fewer donors proportionately, this suggests that the *donations* made by non-recipients who do donate must be larger as a share of their expenses than the *donations* made by households receiving remittances on average. Giving *donations* differs from an expense category like *vices*, for which average expenditures and participation rates are almost identical. To better determine the extent that reliance on remittances affects household consumption behavior, the next section of this paper presents results from the two-part fractional response model with an instrument for remittances.

Results

All results in this section are derived from the two-part fractional response model with an endogenous covariant as described in the methodology section. Table 3 contains the results of the OLS first stage regression of the endogenous variable (*remittances ratio*) on the exogenous variables and the instrument, district level remittances as a share of

total district expenditures in 2003. There is a strong relationship between the instrument and the endogenous variable, the first sign of a good instrument. Districts receiving large amounts of remittances in 2003 are viewed as areas with a high propensity to remit.

Next, we calculate the two-part fractional response model using our instrument and *remittances*. The first step is the participation decision, where participation is an indicator variable equal to one if there are expenditures in a category. We report the results for this set of regressions in Table 4.

Even when controlling for household size, the presence of children, gender, age of the head of household, and marital status, we find that the share of a household's income derived from remittances has significant effects on the likelihood that it spends in most of the expense categories considered in this paper. In all cases with statistical significance, we find positive effects. Specifically, we observe that a household entirely reliant on remittances is 16.8 % more likely to report *education expenses* than households without remittances, ceteris paribus. Similarly, sole dependence on remittances increases the likelihood of making *donations* by 27.3 % or producing things for home consumption by 55.1 % compared to non-recipients.

Recipients can also use these transfers for less desirable expenses. For example, complete reliance on remittances relative to receiving no remittances, ceteris paribus, increases the likelihood a household reports spending on *vices* by 23.3 % and *luxury* items by 25.9 %. After controlling for income, reliance on remittances appears to have no significant effect on the decision to spend on either *health* or *grocery store purchases*.

Although remittances have significant effects on a household's decision to spend in each category, the second part of the fractional response model yields less statistical significance, as noted in Table 5. Controlling for total expenditures, household size, demographics, and the participation decision in each category, reliance on remittances had significant effects only on *education* and *vices*. Compared to not receiving remittances, complete dependence on remittances is expected to increase the share of total expenses devoted to school-related expenditures by just under 1 %, ceteris paribus. Similarly, complete reliance on remittances decreases the proportion spent on *vices* by 0.4 %, all else constant.

Whereas Table 4 presents partial effects on participation in each expenditure category and Table 5 presents the partial effects on expenditure shares conditional on

Table 3 Regression of the endogenous variable on the instrument and other exogenous variables

	Remittance share
District level remittance share	1.105***
	(0.032)
R^2	0.14
N	15,402

Additional controls include the variables in Table 1 as well as parish and year indicators. Standard errors are in parentheses. *** indicates $p < 0.01$

Source: Jamaica Survey of Living Conditions, 2001 to 2007 and Jamaican Labor Force Survey, 2001 to 2007

Table 4 Participation equations for expense categories (Marginal effects)

	Education	Vices	Luxury	Home Prod.	Grocery Store	Health	Donation
Remittance share	0.168***	0.233***	0.259***	0.551***	0.023	−0.027	0.273***
	(0.043)	(0.058)	(0.046)	(0.062)	(0.015)	(0.052)	(0.054)
Athrho		−0.246***	−0.272***	−0.320***	−0.237**	0.070	−0.123***
		(0.046)	(0.048)	(0.047)	(0.108)	(0.047)	(0.046)
N	15,043	9233	14,794	14,685	14,584	11,451	9446

Additional controls include the variables in Table 1 as well as parish and year indicators. Standard errors are in parentheses. ** indicates $p < 0.05$; and *** indicates $p < 0.01$ *Athrho* is the correlation between the errors in the probit equation and the reduced-form equation for the endogenous regressor. If rho is significant, we can reject the null that there is no endogeneity issue

Source: Jamaica Survey of Living Conditions, 2001 to 2007 and Jamaican Labor Force Survey, 2001 to 2007

participation, Table 6 presents the total effects as calculated by Eq. 5. There is no indication of statistical significance because these are calculated effects using results from the previous tables. Instead, we use magnitude as an indicator of importance. For the average household, complete reliance on remittances is expected to increase *education expenditures* by 2 %, *luxury expenses* by 3.7 %, groceries by 1.2 %, and 2.9 % for *home production* relative to households receiving no remittances. Expenditure shares for households that rely completely on remittances compared to those that receive no remittances differ by less than one-half of a percent in the remaining categories analyzed with almost no difference at all in the area of *health*.

Conclusion

Remittances are a significant source of income to many households in developing countries, but there remains a lack of knowledge regarding the full effect of remittances on recipients' behavior. This paper builds on the small set of research already analyzing the effect of remittances on recipient households. Classical theory suggests that households' expenditure allocation is independent of the source of income, and yet this paper,

Table 5 The effect of remittance reliance on expense category share

	Education	Vices	Luxury	Home Prod.	Grocery	Health	Donation
Remittance share	0.009**	−0.004*	−0.005	−0.000	−0.005	−0.003	−0.000
	(0.004)	(0.002)	(0.004)	(0.001)	(0.004)	(0.002)	(0.000)
N	7019	3401	11,631	9794	15,123	2406	3684

Additional controls include the variables in Table 1 as well as parish and year indicators. Standard errors are in parentheses. * indicates $p < 0.1$; ** indicates $p < 0.05$

Source: Jamaica Survey of Living Conditions, 2001 to 2007 and Jamaican Labor Force Survey, 2001 to 2007

Table 6 Total partial effect with endogenous remittances

	Remittances Share
Education	0.019788
Vices	0.003114
Luxury	0.037457
Home Production	0.029304
Grocery Store Purchases	0.011653
Health	−0.00042
Donation	0.002091

This table gives total partial effects calculated using Eq. 5

like several others before it, finds evidence that receipt of a non-earned income source has a small effect on expenditure decisions.

We find, for example, that reliance on remittances increases the likelihood of household spending on education, vices, luxuries, home production, and donations. Conditional on spending, the effects on shares are much smaller and less significant. When completely reliant on remittances, the share devoted to education is expected to increase, and even this increase is less than 1 %. The share spent on vices also changes significantly, but this time decreasing by less than half a percent. Combining the participation part and the share estimation, we conclude that the largest total effects accrue in the areas of luxuries and home production, with smaller effects in education and grocery store purchases.

Given our findings that remittances affect a diverse set of expenditure categories, policy recommendations are more difficult to make. For example, to the extent that remittances increase expenditure shares for schooling, we want to encourage remittances, but how? The idea of matching school expenditures only for those using remitted money, for example, creates a horizontal inequity against those earning their income.

Attempts to tax remittances in an effort to make the system more horizontally equitable would in turn reduce effects in the positive expenditure categories such as education and home production. At the same time, we recognize that the largest total change occurs in luxury spending. Such spending positively affects the economy, but again, there is clearly a different mentality when spending earned rather than unearned income. Finally, although not the focus of this paper, we reiterate the inconclusive nature of the macroeconomic research.

Perhaps the best approach for a country such as Jamaica is a more sweeping set of reforms. For purposes of greater horizontal equity, all remittances could be taxed at a rate equal to that of earned income. We acknowledge that more money will flow through informal channels, but we contend that this is still a step in the right direction. The alternative is to abolish the income tax or increase the standard deduction significantly and rely more heavily on a sales tax, but these approaches, too, have their issues such as regressivity or reliance on large and potentially growing informal sectors. In return for higher taxes, Jamaica would increase the subsidization of secondary education, making it more affordable for the average household. Such a move would also

increase performance in primary schools, as more students can look forward to advanced levels of education. By removing (or reducing) education expenditures for all households, the taxation of remittances and the effects it would have on categories such as luxury spending are less concerning.

Regardless of policy changes, we suspect remittances will still flow frequently from higher income to lower income countries. As such, research in this area must continue. Understanding how the flow of remittances affects a recipient country at the macro-level and households at the micro-level may prove key to even larger discussions of economic development, health, education, and the reduction of global poverty.

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