Workers' Remittances and the Real Exchange Rate: A Paradox of Gifts

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ABSRACT: We test the impact of workers' remittances on the real exchange rate using a panel of 13 Latin American and Caribbean nations. Although gifts are intended to benefit their recipients, the analysis reveals that workers' remittances have the potential to inflict economic costs on receiving economies. In particular, we find that transfers in the form of workers' remittances result in real exchange rate appreciation. Our findings raise concerns parallel to those raised by the Dutch Disease or Resource Boom models where real exchange rate appreciation leads to the subsequent shifting of resources from the traded to the non-traded sectors of the economy, possibly inflicting substantial economic costs to these economies.

I. Introduction

Workers' remittances, the repatriated earnings of emigrant workers, have grown to be an important source of foreign exchange earnings for many countries. The figures in Table 1 compare the magnitude of these flows in 1987 to the flows experienced 10 years later for a sample of Latin American and Caribbean nations. In almost all cases, we observe that workers' remittances relative to GNP have grown significantly over the past decade. For example, while workers' remittances in El Salvador amounted to about 4.3 percent of GNP in 1987, they had grown to over 10 percent of El Salvador's national income by 1997. In this paper we attempt to better understand the magnitude of these flows and we explore one macroeconomic consequence on receiving economies.

Additional evidence of the increasing importance of workers' remittances is displayed in Table 2. The level of workers' remittances expressed in U.S. dollars is compared to the magnitude of foreign aid and service exports, other important sources of foreign exchange for developing economies. It is interesting to note that the foreign exchange "earned" via remittances rivals, and often exceeds, foreign exchange earnings obtained through the more traditional sources. In over half of these cases, transfers in the form of workers' remittances exceed gifts in the form of foreign aid and, in about a third of the cases remittance income approaches or surpasses the level of income earned from service exports. Given the rising share and rising importance of workers' remittances, we ask: what are the macroeconomic impacts of these flows? Do these transfers of purchasing power and wealth benefit or, rather paradoxically, do they hurt the receiving economies?[1]

[1] It is important to note that we are focusing on the macroeconomic impact of remittances on the receiving economies and not on their microeconomic impact. The latter has been the object of recent analyses of workers' remittances, such as a study by Cox Edwards and Ureta (1999) that finds that the receipt of remittances by the household – irrespective of the amount – reduces the likelihood of quiting school in rural areas.

The notion that transfers may have negative effects on receiving economies was originally debated by Keynes and Ohlin in 1929 in what has been dubbed the *transfer problem*. The upshot of this debate (which extends to the present) is that the theoretical welfare impacts are ambiguous, depending on various characteristics of the sending and receiving countries (Djajić, Lahari, and Raimondos-Møller; 1998).

A parallel body of empirical research has attempted to ascertain the broader macroeconomic impacts of foreign aid on receiving countries. However, these empirical macroeconomic studies have not resolved the question of whether using a macroeconomid perspective, these economies are better or worse off with the aid (Burnside and Dollar, 2000; Cassen, 1994; White 1992). Contradictory results are due to the various econometric issues that confound the true impact. For example, the simultaneity of the receiving country's income with the decision by donors to extend foreign aid has not normally been corrected for, making conclusions about the impact of aid impossible to derive from most studies.

In this study we also attempt to measure the effect of transfers on receiving economies, but we do so from a different angle. Instead of analyzing the impact of *public* aid on economic progress, we analyze how *private* disaggregated aid in the form of workers' remittances affects receiving economies.[2] In our analysis we account for the endogeneity of worker's remittances with the real exchange rate to correctly ascertain its impact on the economy.

In considering the impact of workers' remittances on the macro-economy, we are motivated by Obstfeld and Rogoff (1996). They propose that a positive transfer of resources to a country hurts its competitiveness in the world markets by reducing the range of goods it exports.

[2] Though there has been some discussion of the macroeconomic effects of foreign aid, almost no attention has been paid to the macroeconomic impact of workers' remittances. Exceptions are Kimbrough (1986), who builds into his theoretical model differential impacts of private versus public aid, and Rivera (1999) with his study of El Salvador.

The reduction in competitiveness takes place because the transfer increases its real exchange rate. Therefore, letting q represent the real exchange rate (with a rise in q representing real exchange rate appreciation), letting W represent transfers in the form of workers' remittances, and letting X represent a vector of other determinants of the real exchange rate, we posit that workers' remittances will appreciate the real exchange rate or:

$$q = \underset{+}{f}(W, X) \qquad (1)$$

Countries receiving greater transfers of workers' remittances will experience appreciating currencies, all other things equal. There are various channels by which the receipt of remittances can be transformed into real exchange-rate appreciation. Workers may be prompted to purchase more leisure, or additional spending may take place unevenly impacting certain sectors of the economy. An increase in the relative prices of non-traded goods takes place, appreciating the real exchange rate.

Some cursory evidence of the relationship between the level of workers' remittances and the real exchange rate is displayed in Figure 1. Using a sample of 13 countries, we have plotted the average growth rate of workers' remittances against the average growth rate (appreciation) of the real exchange rate. The positive association between the two variables – workers' remittances and the real exchange rate – appears to be borne out by the scatter diagram. However, without controlling for the other factors thought to affect the real exchange rate (the vector X, in equation (1)) it is premature to make too much of this correlation.

In what follows we attempt to provide a more complete framework through which we can systematically explore the impacts of gifts, in the form of worker's remittances. By accounting for the variables in the vector X, we can isolate the effect of workers' remittances on

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Rivera suggests that remittances to El Salvador have resulted in Dutch Disease – shrinkage of the export sector due

the real exchange rate. We use this framework to examine this relationship in the case of 13 Latin American and Caribbean nations.

II. Determinants of the Real Exchange Rate

Our intent is to empirically test the hypothesis that remittances appreciate the real exchange rate in receiving economies. But in order to isolate the link between remittances and the real exchange rate, we need to account for all the other determinants of the real exchange rate – the vector *X* referred to in equation (1). In reviewing the literature of real exchange rate determination (e.g., Froot and Rogoff (1995), Edwards and Savastiano (1999), and Montiel (1999)), the following variables are thought to constitute additional determinants of the real exchange: 1) differential technological progress, 2) government expenditures, 3) the external terms of trade, and 4) the foreign interest rate. In what follows, we briefly describe the anticipated impacts of these variables on the real exchange rate.

To start, Balassa (1964) and Samuelson (1964) first noted that differences in technological progress could affect real exchange rates. In their studies, they argued that exchange-rate adjusted prices (real exchange rates) tend to be higher in richer countries relative to poorer countries. Various explanations have been offered for this observation with most suggesting that differences in productivity advances across countries contribute to this pattern in relative prices. According to Balassa and Samuelson, technological progress is more likely to take place in the traded relative to the non-traded sector of an economy. The increases in productivity in the traded goods sector raises wages in that sector, requiring that relative prices of non-traded goods increase. If the productivity bias between the traded and the non-traded sectors

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to the "boom" in remittances.

of the economy is felt to a greater extent in the richer countries, these economies will typically experience greater real exchange-rate appreciation.

In this paper we proxy for the Balassa-Samuelson effect (α_{diff}) using GDP per capita. We anticipate that countries with higher per capita incomes will experience appreciating currencies. Recent work has moved beyond using relative income as the explanatory variable for capturing the observed pattern in real exchange rates. Instead, many researchers have attempted to directly account for relative appreciation by controlling for differences in productivity growth – across sectors of the economy. However, the data requirements for directly measuring productivity growth across sectors of the economy far exceeds what is available for the countries we are examining and for the frequency of data that we require. Therefore, we use GDP per capita to proxy for the anticipated bias in productivity advances in relatively richer countries.

Differential productivity progress is one supply factor that can affect real exchange-rates. It may also be the case that demand factors influence relative prices. One such factor is relative government spending. The impact of fiscal expenditures on the real exchange rate depends on the sectoral composition of spending. If the expenditures fall disproportionately on non-traded goods, the relative price of non-traded goods will increase, causing real exchange rate appreciation. Therefore, countries experiencing greater amounts of government spending will also likely experience appreciating currencies (Froot and Rogoff, 1991). However, it is also conceivable that government spending falls disproportionately on the traded goods sector, and causes real depreciation instead (Montiel, p. 279). Hence, it is unclear what impact fiscal expenditures will ultimately have on the real exchange rate. In this study we account for the impact of fiscal expenditures using the share of government expenditures in GDP (G/Y).

Shocks to the external terms of trade may also elicit real exchange rate movements. An increase in the relative price of exports relative to imports induces contraction of the non-traded goods sector and encourages labor flows to the export sector and real exchange rate appreciation. We employ the gross barter terms of trade – defined as the price of exports relative to the price of imports – as our terms of trade variable (*TOT*).

Finally, changes in external financial conditions, as represented by the world real interest rate (R_w), may also affect the real exchange rate. Higher world real interest rates causes net external lending (capital outflows) to take place. The country's net creditor position with respect to the rest of the world improves, resulting in real appreciation.

In sum, an implicit expression for the real exchange rate is given by:

$$q = f(W, \alpha_{diff}, G/Y, TOT, R_w), \qquad (2)$$
$$\quad + \quad + \quad + \quad + \quad +$$
$$\quad\quad\quad \text{or}$$
$$\quad\quad\quad -$$

where the anticipated direction of each variable's influence on the real exchange rate is specified beneath each variable. We expect real currency appreciation to take place following increases in workers' remittances inflows, with relative productivity advances in the traded goods sector, with improvements in the terms of trade and following increases in world real interest rates. Increases in govenment spending may cause either appreciation or depreciation.

III. Data

The variables required to estimate equation (2) and isolate the effect of remittances on the real exchang rate are fairly standard variables. Nonetheless, in a few instances, several alternative series can be employed to proxy for the variable of interest. Therefore, we provide a

brief discussion of each series, its construction, and the rationale for choosing that particular series versus other alternatives.[3]

The real exchange rate, q, was constructed in reference to the U.S. dollar. Given that the U.S. is a major, if not the major, trading partner of most countries in our sample, choosing dollar exchange rates seems appropriate. Nominal bilateral exchange rates (in the form of U.S. dollars per national currency unit) where transformed into real exchange rates using consumer price indexes for the US and the individual country.

Workers' remittances, W, is expressed in U.S. dollars. These are derived from the balance of payment statements released by national governments and reported in *International Financial Statistics* and compliled in *World Bank Indicators*. It is fairly well accepted that these figures probably underestimate the true volume of worker's remittances. Though central banks are fairly adept at tracking remittances that are transfers via "formal" channels (money orders, bank transfers, etc.), the sending of remittances through informal channels (cash in the mail, carried by persons) is often unaccounted for in the official statistics.[4]

Earlier we explained that the differential technological progress variable, α_{diff}, would be captured using GDP per capita. Though it is becoming more common to directly measure sectoral productivity growth (e.g. World Penn Tables), the data are still difficult to obtain at frequent intervals of time. Hence, we resort to the use of simple income per capita to capture anticipated productivity growth bias in the traded goods sector in higher income countries.

Total government consumption over GDP, G/Y, was used to capture the effects that governement spending may have on the economy. The gross barter terms of trade, TOT, defined

[3] See the data appendix for more details.
[4] See for example "Statistical Overview" in IRDB (2001). In the IRDB report, official workers' remittances figures were uniformly inflated by 15% to account for the underreporting of remittances flows. We do not account for underreporting and make no adjustment to the official figures reported by national governments.

as the price of exports relative to the price of imports was chosen over the income terms of trade because such a construction seemed to fit better with the real exchange rate determination literature. We used the U.S. real interest rate to represent the world interest rate R_w. The US CPI was used to convert the nominal US interest rate into a real interest rate.

Though we initially intended to include all Latin American and Caribbean nations, we were forced to limit our sample to 13 Latin American and Caribbean nations for which the data we required were available. These are: Argentina, Belize, Bolivia, Colombia, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Peru, Trinidad & Tobago. We attempted to obtain yearly data from 1979 through 1998 for each country. For many, however, only a shorter times series could be generated due to the lack of information on one or more of the variables used in the estimation process. The data appendix specifies the years used for each of the countries in our sample. To obtain a sufficient number of observations with which to estimate equation (2) with which to ascertain the impact of remittances, we pool the data for the 13 nations. An explanation of the estimation procedure used and the econometric issues encountered follows.

IV. Estimation and Results

Before estimating equation (2), it is necessary to perform several operations on our data. With the exceptions of the the world real interest rate and GDP per capita, we first transformed the series into logarithmic form. The pooled data (spanning over different time periods from 1979 through 1998 depending on data availability) for the 13 countries in our sample is then

tested for the presence of a unit root. If a unit root is detected, the type of nonstationarity in the series is determined. We use the Im et al. (1997) panel unit root test.[5]

Table 3 displays the results from the panel unit root tests for each of the series in equation (2). The tests are conducted including a drift term as well as with and without a trend. The third column of Table 3 indicates whether the series have a unit root and, in that event, the fourth column of Table 3 allows us to test whether the nontationary series are difference or trend stationary. Therefore, the information contained in the fourth column guides us in choosing the necessary transformation to attain stationarity.

We conclude from Table 3 that the log of workers' remittances and the log of GDP per capita appear to be trend-stationary processes while the log of the terms of trade and the log of government expenditures to GDP are difference-stationary processes. The remaining series in our analysis – the log of the real exchange rate and the world real interest rate – do not display unit roots. Following these findings, we appropriately transformed the nonstationary processes to a stationary form by detrending the log of workers' remittances and the log of GDP per capita, and by differencing the log of the terms of trade and the log of government expenditures to GDP.

Since the log of the real exchange rate, the dependent variable, appears to be stationary, we do not continue to test for the existence of any long-run relationship or cointegration between the dependent variable and the regressors.

[5] It is well-known that ADF tests have low power in the presence of short time series, being biased towards the acceptance of the null hypothesis of a unit root in the series. Therefore, a series of panel unit root tests have been recently devised in the econometric literature. Fleissig and Strauss (2000) review four of the most popular panel unit root tests – those developed by Abuaf and Jorion (1990), Levin and Lin (1993), Im et al. (1997), and Maddala and Wu (1997). The first two panel unit root tests impose an identical first order autoregressive coefficient on all series in the panel. The tests by Im et al. (1997) and Maddala and Wu (1997) allow for heterogeneous first order coefficients that allow each of the individual series to adjust at different rates. We use the easy to implement t-bar test from Im et al. (1997) to examine whether the series are nonstationarity and to ascertain the type of nonstationarity. In order to avoid reductions in the power of the tests, the cross-sectional means for the panel are first subtracted from each series so as to introduce time effects that correct for any contemporaneous and serial correlation. ADF regressions for each of the series in our model are performed using p=1, 2 lags – depending on the

With the series being transformed as specified by the unit root tests, we proceed to estimating equation (2) assuming country fixed-effects to account for country heterogeneity. However, one objection that might arise in estimating equation (2) using fixed-effects OLS is that the level of remittances observed at any one point in time is not exogenous. Remittances may be responding, for example, to general economic conditions in the country of origin of the remitter. In this instance, if the home country is experiencing recession, we might expect emigrants to respond to the needs of family members "back home" with greater remittances flows. In order to account for this potential endogeneity issue, we use migration volumes as an instrument for workers' remittances and estimate equation (2) using an IV method. We reason that migration volumes are expected to be highly correlated with migration volumes[6] and use the log of emigrants in each of the countries in the sample as an instrument for workers' remittances.[7] In this way, we account for the endogeneity of workers' remittances with macroeconomic conditions, an issue that has tended to plague the work that assesses the impact of foreign aid on receiving economies.

The results of estimating equation (2) are presented in Table 4. As discussed earlier, we attempted to collect data from 1979-1998, but not all years were available for all the series for each country. We were successful in obtaining the requisite infomation over the 20 year period for some of the countries in our sample, but for others, only a shorter time span was available .

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lag length minimizing Akaike's information criterion – to remove any serial correlation. The *t-bar* statistic is defined as follows: $t\text{-}bar = \Sigma_{i=1 \text{ to } N} t_i$, where $t_i=\rho_i/[\text{Var}(\rho_i)]^{1/2}$ is from T observations.

[6] Though many questions remain regarding what prompts variations in the level of worker's remittances, it is well established that the stock of emigrants is a good predictor of remittances flows.

[7] Typically, countries do not keep track of emigration to the degree that they monitor immigration. As a result, immigration numbers tend to be more reliable. We assume that most of the emigrants of these countries migrate to the United States. U.S. immigration figures, broken down by source country, are then used to construct emigration series for these 13 Latin American and Carribean countries. Further details of that construction are provided in the data appendix.

This gave rise an unbalanced panel. Therefore, we calculated robust standard errors to account for the heteroscedasticity that may inflict our panel.

As anticipated, we find that increases in workers' remittances appreciate the real exchange rate. In particular, the coefficient on W is positive and statistically significant, suggesting that a doubling of workers' remittances raises the real exchange rate by 14 percent. The signs for the remaining variables in the regression equation seem consistent with our model. A rise in the world real interest rate is expected to cause real exchange rate appreciation. The positive and significant coefficient on R_w seems to confirm this. Similarly, increased government consumption appears to significantly contribute to the appreciation of the real exchange rate. Our results indicate that the exchange rate appears to be unaffected by the terms of trade and by differential technological progress. Specifically, while the signs on the coefficients on technological progress and on the terms of trade are the expected ones, they are not statistically significant. In sum, the results appear to lend support to the notion that remittances appreciate the real exchange rate, all other things equal.

Because some may object to the possible endogeneity introduced by using per capita GDP to proxy technological progress, we re-estimate our model using the proportion of illiterate male adults aged 15 and above and the rate of vaccination coverage of children under one year of age as instruments for technological growth.[8] As in the case of workers' remittances and each country's volume of emigration, we verified that a significant degree of correlation of illiteracy with per-capita income and vaccinations with per-capita income exists. We also tested for over-identification of our model due to the inclusion of multiple instruments for sectoral productivity growth. As shown in Table 5, the over-identification test rejects the hypothesis of endogeneity of the instruments, as indicated by the fact that the test-statistic does not exceed the 5 percent

critical value of a Chi-square with 1 degree of freedom. Overall, and in conjunction with our earlier results, Table 5 reaffirms that remittances continue to significantly appreciate the real exchange rate.

IV. Concluding Remarks

Although gifts are intended to benefit their recipients, workers' remittances have the potential to inflict economic costs on receiving economies. We find that transfers in the form of workers' remittances result in real exchange rate appreciation in our panel of 13 Latin American and Caribbean nations. Real exchange rate appreciation, with its associated loss in external competitiveness, imposes an unintended economic cost on the recipient nation of the gift. This parallels the concern raised in Dutch Disease or Resource Boom models with real exchange rate appreciation and the subsequent shifting of resources from the traded to the non-traded sectors of the economy.

Our findings complement and expand on previous microeconomic level studies, which examine the impact of workers' remittances at the household level. In some cases these studies suggest that remittances benefit the economy while, in other instances, the studies hint at detrimental impacts of remittances inflows. For example, Funkhouser (1992) finds both positive and negative effects of remittances inflows on the Nicaraguan and Salvadorian labor markets. In particular, Funkhouser finds that while remittances tend to depress overall labor force participation rates, they also promote self-employment. In some cases, the income supplements from abroad reduce the need for some family members to participate in the labor market while, in other instances, they help ease the financial constraints resulting from imperfections in the credit markets that relatives in the home country face when starting their own business.

[8] Detailed descriptions of the instruments are provided in the data appendix.

Similarly, Cox Edwards and Ureta (1999) find beneficial impacts of remittances as evidenced by the reduction in the likelihood of dropping out of school for children from rural Salvadorian families receiving remittances from relatives abroad.

Overall, our study points to the need to further understand the impact of workers' remittances. We raise the possibility and provide evidence that remittances have an overall harmful macroeconomic impact on receiving economies by reducing the receiving nation's competitiveness in world markets. It is paradoxical that the generosity of immigrants toward their family members may, in turn, have detrimental effects on their home countries' economies. Such a finding suggests that it would be useful to further study the link between remittances inflows and their macroeconomic consequences so that governements can be prepared to channel the inflows in ways that benfit the overall economy.

Data Appendix

World Real interest rate (R_w): Lending interest rate adjusted for inflation as measured by the GDP deflator. From *World Development Indicators* CD (*WDI*), 2000.

Government consumption as a share of GDP (G/Y): Current spending for purchases of goods and services (including wages and salaries) by govenment divided by GDP. From *WDI*, 2000.

Workers' remittances (W): Current transfers by migrants in US dollars deflated by the US CPI. Both are from *WDI*, 2000.

Terms of trade (TOT): Net barter terms of trade calculated using export and import price deflators obtained from the national accounts. From the World Bank. We are grateful to Eric Swanson for providing us with these data.

Technological progress (alpha-diff): Proxied with the rate of growth of GDP (in US dollars). From *WDI,* 2000.

Real exchange rate (q): Constructed as (nominal official exchange rate in $US_{\$ \text{ per LCU}}$*CPI)/ CPI_{US}. The nominal exchange rates and price indexes are from *WDI*, 2000.

Illiteracy Rate, adult male: Defined as "the proportion of male adults aged 15 and above who cannot, with understanding, read and write a short, simple statement on their everyday life (WDI tables 1.3 and 2.12)."

Immunization, DPT: Defined as "the rate of vaccination coverage of children under one year of age. A child is considered appropriately immunized against diphtheria, pertussis (or whooping cough), and tetanus (DPT) after receiving two or three doses of vaccine, depending on the immunization scheme (WDI table 2.15)."

Migration: Measured as the stock of emigrants in the U.S. To calculate the stock of immigrants in the U.S. for each of the Latin American and Caribbean nations in our data set, the following procedure was used. The US immigration and Naturalization Service's *Statistical Yearbook*, reports on the annual flow of immigrants to the US by country of birth. These are immigrants who have legally entered the US or have adjusted their status in that year. The US Census population reports every 10 year the stock of foreign-born population by region and country. For those countries in our sample that have a time span starting before the year 1990, we refer to the 1980 census data. We then add the immigration flow for each year between 1980 and 1990 to the 1980 stock of foreig–born population. For example, the stock of immigrants in the US from Mexico for 1981 is set equal to the stock of Mexican-origin population living in the US in 1980 (obtained from the 1980 decennial cenus) plus the flow of Mexican immigrants for 1980 (obtained from the INS *Statistical Yearbook*). In order to calculate the stock of Mexican emigrants in the US in 1982 , we add the flow of Mexican immigrants in 1982 to the stock for 1981. For those countries in our sample whose series began in 1990 or later, we make the necessary calculations using the initial stock of immigrants from that country as reported in the 1990 census. After obtaining the stock of immigrants for each year and for each country, we add the number of temporary workers, trainees and intercompany transferees for that year. Since

these are temporary workers, they are added to the stock of immigrants only for the year they were accepted in the US. Illegal immigrants are not specifially considered in this calculation insofar as they are not contained in the the annual INS reports. However, illegal immgrants are (presumably) counted in the decennial census.

Undoudtedly, our numbers are deficient for several reasons: 1) not all illegal immigrants are necessarily counted, and 2) since we do not have yearly information on return immigration, adjustment for these flows is not taken into consideration. Finally, we are also assuming that all emigration from these Latin American nations is to the US. This is certainly not the case, although it may be reasonably close to reality for a great majority of the countries in our sample.

Overall, we argue that, despite the aforementioned limitations, these numbers still are able to provide us with reasonable estimates of the level of emigration from those nations.

Panel: The panel was constructed using the following countries and the corresponding number of yearly observationservations: Argentina: 3 observations, Belize:13 observations, Bolivia: 8 observations, Colombia: 17 observations, Dominican Republic: 16 observations, El Salvador: 17 observations, Guatemala: 9 observations, Honduras: 10 observations, Jamaica: 17 observations, Mexico: 17 observations, Nicaragua: 5 observations, Peru: 7 observations, and Trinidad & Tobago: 17 observations. That results in a total of 156 observations.

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Table 1
Workers' Remittances as a percentage of National Income in 1987 and in 1997

Country	***WR/GNP in 1987***	***WR/GNP in 1997***
Argentina	0.00	0.01
Belize	5.88	2.84
Bolivia	0.01	0.03
Colombia	1.76	0.62
Dominican Republic	4.90	7.62
El Salvador	4.36	10.70
Guatemala	0.00	2.30
Honduras	0.71	3.55
Jamaica	2.04	15.86
Mexico	1.11	1.40
Nicaragua	0.00	8.90
Peru	0.38	0.70
Trinidad &Tobago	0.06	0.60

Notes: WR represents workers' remittances receipts, obtained from *World Development Indicators* CD (*WDI*). GNP was also obtained from *World Development Indicators* CD (*WDI*)

Table 2
Workers' Remittances, Aid and Service Exports in U.S. dollars in 1997

Country	***WR***	***Aid***	***Service Exports***
Argentina	41,000,000	94,970,000	4,510,000,128
Belize	18,950,000	14,160,000	137,840,000
Bolivia	232,954,906	698,400,000	246,690,000
Colombia	483,000,000	194,540,000	2,163,000,064
Dominican Republic	1,326,000,000	70,970,000	2,446,599,936
El Salvador	1,337,521,024	272,470,016	291,677,408
Guatemala	456,500,000	263,000,000	588,800,000
Honduras	220,000,000	296,830,016	334,900,000
Jamaica	659,200,000	71,070,000	1,714,599,936
Mexico	5,626,999,808	99,080,000	11,399,999,488
Nicaragua	200,000,000	410,100,000	167,600,000
Peru	400,000,000	393,460,000	1,540,999,936
Trinidad & Tobago	44,567,528	32,960,000	546,461,312

Notes: AID represents official foreign aid receipts, obtained from *WDI*. Service exports were obtained from *WDI*.

Table 3: Panel Unit Root Tests

Variable	***Unit Root Test without a Trend: Nonstationarity Test***	***Unit Root Test with a Trend: Type of Nonstationarity***
Log of Real Exchange Rate	-2.91	No unit root
Log of Remittances	-0.71	-2.77
World Real Interest Rate	-3.10	No unit root
Log of Terms of Trade	-1.90	-2.27
Log of (Government Expenditures/GDP)	-1.81	-1.79
Log of GDP per capita	-0.73	-2.85

Notes: The countries missing from the tests due to their limited number of individual series observations are Argentina, Nicaragua, and Peru. Therefore, at the 5% level of significance, the critical value for the test without trend is -1.92. The critical value for the test with a trend is -2.57. These critical values are taken from Table 4 in Im et al. (1997).

Table 4: Fixed-Effects and IV Regression Estimates
(instrumenting for Remittances)

Dependent Variable: Log of the Real Exchange Rate (q)		
Regressors	***Coefficient***	***Robust SE***
Remittances (W)	0.136***	0.054
World Real Interest Rate (R_w)	0.024**	0.013
Terms of Trade (TOT)	0.025	0.142
Government Expenditures/GDP (G/Y)	0.267*	0.148
Technological Growth (α_{diff})	0.231	0.189
N	156	
F (5, 150)	4.61	
Prob > F	0.0006	

Notes: ***indicates statistical significance at the 1% level, **indicates significance at the 5% level, and *indicates significance at the 10% level. The regressions include a constant term.

Table 5: Fixed-Effects and IV Regression Estimates
(instrumenting for Remittances and Technological Growth)

Dependent Variable: Log of the Real Exchange Rate (q)		
Regressors	***Coefficient***	***Robust SE***
Remittances (*W*)	0.211**	0.098
World Real Interest Rate (r)	0.015	0.022
Terms of Trade (*TOT*)	-0.115	0.299
Government Expenditures/GDP (*G/Y*)	0.553	0.506
Technological Growth (α_{diff})	-2.484	4.228
N	156	
F (5, 150)	2.41	
Prob > F	0.0392	
Over Identification Test	$0.796<\chi^2(1) = 3.84$	

Notes: ***indicates statistical significance at the 1% level, **indicates significance at the 5% level, and *indicates significance at the 10% level. The regressions include a constant term.

Figure 1
Fitted Values for the Mean Growth Rate of the Real Exchange Rate and the Mean Growth Rate of Workers' Remittances over GDP