*Macroeconomic Determinants of Workers' Remittances: Host vs. Home Country's Economic Conditions**

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Abstract

This study examines the determinants of worker's remittances. Variance decompositions, impulse response functions and Granger causality tests derived from a vector error correction model are used to test if remittances are affected by the macroeconomic conditions of the host (remittance sending) or home (remittance receiving) country. Data from Brazil, Colombia, the Dominican Republic, El Salvador, Mexico and the U.S. are used. The results indicate that remittances respond more to changes in the macroeconomic conditions of the host country, than to changes in the macroeconomic conditions of the home country.

Key Words: Remittances, Migration, International Flows, Balance of Payments

JEL Classifications: F16, F22, J61, O15

1. Introduction

In recent decades remittances have become an important source of income for many developing countries. Remittances are not only used as a mechanism for the survival of the poor in developing countries but also as a risk sharing mechanism, a stable source of investment and for future consumption smoothing (Ratha, 2003). The increase in the value of remittances flows around the world has made the study of its determinants and socio-economic consequences important for understanding a broad array of issues from migration to terrorism.

In a presentation prepared for the Federal Reserve Bank of Atlanta, John Taylor, Secretary of Treasury for International Affairs of the George W. Bush administration, outlined why the U.S. government considers remittances to be important (Taylor, 2004). First, the U.S. wants to increase the amount of remittances going to developing countries because it can promote economic growth in these countries, as remittances are commonly used for investment. Furthermore, the sending of remittances through formal channels is a business that may attract the banking industry to developing countries. Also, the U.S. government wants to track remittances flows to deter money laundering and financing of terrorist activities.

Lucas and Stark (1985) discuss the determinants of remittances in Botswana. Emigrants enjoy remitting home because they care about household consumption,[1] but pure altruism is not enough to explain the dynamics of remittances. There is also the case of pure self-interest with three examples provided by the authors. First, an emigrant may remit because he/she is expecting to inherit from the household's fortune. Second, the emigrant remits because he/she is investing in assets in his/her home area and expects the household to take care of them. Third, the emigrant expects

to return home in the future and can benefit from the household gratitude from having sent remittances.

Lucas and Stark (1985) propose enlightened self-interest as a complementary alternative to pure altruism and pure self-interest. Here the emigrant and the household have a contractual agreement in which they share risk. The emigrant supports the household in bad economic times in the rural areas (or home country) and the household supports the emigrant if he/she becomes unemployed in the urban area (or host country).

In their study Lucas and Stark (1985) used microeconomic level data to conduct their empirical estimations.[2] In this paper we use macroeconomic level data. One of the first studies to use macro level data to test for the determinants of remittances is Swamy (1981). Using data from Greece, Turkey and Yugoslavia Swamy finds no significant impact of most home and host country macroeconomic variables on remittances. Straubhaar (1986) using data of remittances from Germany to Turkey obtains similar results (see Sayan (2004) and Tuncay *et al*. (2005) for other studies related to Turkey). Straubhaar finds that only variables like the wage level in Germany (indicator of the host country economic situation) are significant. These two papers find no evidence that exchange rates or interest rates have an effect on remittances.

However, more recent papers find that macroeconomic variables have an impact on remittances. For example El-Sakka and Mcnabb (1999) in a study for Egypt find that the black market premium and interest rate differentials are important variables explaining remittances (see Feiler (1987) and Wahba (2003) for other studies related to Egypt). In the same way, Elbadawi and Rocha (1992) using data for six countries show that macroeconomic variables play an important role in

determining remittances. In their paper Elbadawi and Rocha (1992) used fixed effects panel estimation techniques. Recently, also using fixed effect panel estimation techniques Higgins *et al.* (2004) found that exchange rate uncertainty (a measure of risk) is an important determinant of remittances. Their results also show that unemployment in the host country and the exchange rate are significant determinants of remittances.

Faini (1994) concentrates on the issue of the effect of real exchange rate depreciation on remittances. His main contribution is that real exchange rate depreciation of the home currency has a positive effect on remittances (see also Garson (1994)). Other findings indicate that home country income is negatively related to remittances.

Katseli and Glytsos (1986) in a study using data from Greece find that remittances are negatively related to inflation in the home country, host country income and host country interest rates. In another study, Glytsos (1997) distinguishes between remittances sent by temporary migrants and remittances sent by permanent migrants. His results suggest that temporary migrants are more likely to remit for investment and future consumption smoothing. Permanent migrants are more likely to remit for altruistic purposes (see Glytsos (1988) and Djajic (1989) for more on temporary vs. permanent migration).

The techniques used by the papers mentioned above to test the relationship between remittances and macroeconomic variables include least squares, fixed effect panel estimation and seemingly unrelated regressions (SUR) models. In this paper we use vector error correction models (VECM) to study the relationship between remittances and other macroeconomic variables. The use of VECM models can solve the endogeneity problem between remittances and other macroeconomic variables

(e.g. home country GDP). This endogeneity appears to be present because while some studies have found that macroeconomic variables in the home country affect remittances, other studies have found that remittances affect the macroeconomic variables in the home country.[3]

The goal of this paper is to determine whether the host and/or the home country's macroeconomic conditions are the ones affecting remittances. We do this using variance decompositions, impulse response functions and Granger causality tests derived from VECM. Here we ask ourselves: Does an emigrant consider mainly the host country economic conditions when deciding how much to remit? Or does the emigrant focus instead on the home country economic conditions when deciding how much to remit? Do both home and host country economic conditions have important effects on remittances?

To test the hypothesis regarding home and host country economic factors we construct two data sets. The first data set considers net aggregate remittances flows between the U.S. and the rest of the world (ROW). The second data set considers remittances sent from the U.S. to Mexico only.

The variables in the first data set includes U.S. net aggregate remittances, U.S. Federal Funds Rate (U.S. FFR), U.S. money supply (U.S. M2), U.S. consumer price index (U.S. CPI), U.S. unemployment and two indexes of economic conditions in the ROW. Economic conditions in the ROW are measured with data from Brazil, Colombia, the Dominican Republic, El Salvador and Mexico. These countries are the five largest recipients of remittances from the U.S. One index of economic conditions in the ROW is based on the exchange rate with the dollar (ER Index) and the second index is based on the inflation rate of the home countries (PI Index).

The second data set considers remittances sent to Mexico as the main variable of interest. This set also includes the U.S. FFR, U.S. M2, U.S. CPI, and U.S. unemployment. In place of weighted averages of economic conditions in the home countries, we use Mexico's GDP, CPI and exchange rate with the U.S. dollar to reflect economic conditions in Mexico. Using this second data set we avoid the complications that arise on account of using aggregate data from a number of countries. But more importantly we circumvent the use of a net measure of remittances. Even if remittances inflows to the U.S. are small compared to outflows this can have some effect in the results.

There are four possible outcomes for this research. First, it is possible that neither the home country nor the host country's macroeconomic factors are driving remittances. In this case it is possible that remittances are driven by demographic factors and they are not responsive to macroeconomic variables. In addition, there is also a literature that argues that remittances are fixed loan payments that the emigrant is making to the household. Therefore remittances should not respond to changes in the macroeconomic conditions of the host and/or home country (see Poirine (1997) and Rapoport and Docquier (2005) for more on the loan repayment hypothesis).

Second, it is possible that in the presence of both home and host country economic conditions, host country economic conditions dominate the decision to send remittances. An improvement in the host country economic condition would be most likely accompanied by an improvement in the economic condition of the emigrant. If household consumption is a normal good for the emigrant, then remittances will increase.

Third, it is possible that remittances are mostly driven by factors in the home country. If the emigrant is remitting for altruistic reasons and the home country

economic conditions improve, probably the household economic condition will also improve and the emigrant will remit less. The opposite happens if the economic condition of the home country gets worse. Similarly, if the emigrant and the household share a contractual insurance agreement and the economic situation of the household deteriorates the emigrant will send more money home (insurance payment). On the other hand, previous studies have argued that better economic conditions in the home country are accompanied by better investments opportunities in the home country. In this case an improvement in the home country economic condition should attract more remittances.

Finally, it is possible that both factors in the home and host country are affecting the emigrant's decision to send remittances at similar levels. In this case multiple motivations may be responsible for the sending of remittances, without one necessary being more important than the other.

Our results suggest that host country (U.S.) factors seem to be more important in driving remittances. In the presence of host and home country macroeconomic conditions, remittances respond more to the host country macroeconomic variables. The results are robust to the use of the two data sets.

2. Theoretical Background

In this section we develop a model that yields testable predictions about the effect that changes in the macroeconomic variables of the host and home country have on remittances. The model that we present has the same basic implications of most other remittances models (see Rapoport and Docquier (2005) for a review of the literature). The difference is that we establish explicitly the relationship of remittances with home country and host country macroeconomic conditions. We use a two period model in which remittances are sent in the first period.

Assume that we have an individual (emigrant) living in a foreign (host) country. In the remittances literature it is common to assume that the emigrant's utility depends on his/her consumption and the household consumption (e.g. Bougha-Hagbe, 2004; Funkhouser, 1995; Lucas and Stark, 1985). Following the literature we assume that the utility function of the emigrant in the first period depends on two factors his/her consumption in the host country (c^1) and the consumption of the household in the home country (c^*). The utility function of the representative individual in the first period can be represented as $U(c^1, c^*)$ with $U_1 > 0, U_{11} < 0, U_2 > 0$ and $U_{22} < 0$.[4] For simplicity we also assume that utility is additively separable.

The consumption of the household depends on income and remittances received (αr). Here the parameter α represents the cost associated with sending remittances ($\alpha \leq 1$). The emigrant sends r dollars back home but the household only gets a fraction αr.

We separate household income into two components. The first component is the fraction of household income that is not susceptible to changes in the macroeconomic conditions of the home country (y^*). The second component is the fraction of household income (πY^*) that is susceptible to changes in the macroeconomic conditions of the home country (Y^*). The parameter π reflects the relationship between the economic conditions in the home country and the household income. In general we assume $\pi \geq 0$, an improvement in the economic conditions of the home country is associated with an improvement in household income (though the size of π does not have to be the same across households). Household consumption is given by $c^*((y^* + \pi Y^*), \alpha r)$. We assume that household consumption is additively separable and that $c_1^* > 0, c_2^* > 0, c_{11}^* < 0$ and $c_{22}^* < 0$.

In addition to consuming and sending remittances, the emigrant saves a percentage of his income in the home country (s). The income restriction of the individual in the first period is then given by:

$$y^1 + \upsilon Y^1 = c^1 + r + s \quad \upsilon \geq 0 \tag{1}$$

In this case y^1 is the fraction of emigrant's income in the first period that is not susceptible to changes in the macroeconomic conditions of the host country. Similarly, υY^1 is the fraction of household income that is susceptible to changes in the economic condition of the host country (Y^1). Here υ represents the relationship between the emigrant's income and the economic conditions of the host country.

In the second period the household migrates to the host country and joins the emigrant. Similar results can be obtained assuming that in the second period the emigrant returns to the home country and joins the household. The emigrant's maximization problem is then:

$$\begin{aligned} &\underset{\{c,r,s\}}{\text{Max}} \quad U(c^1, c^*) + \beta V(c^2) \\ &\text{st.} \quad y^1 + \upsilon Y^1 = c^1 + r + s \\ &\qquad \text{and} \\ &\qquad c^2 = y^2 + \upsilon Y^2 + (1+i)s \end{aligned}$$

Where $V(c^2)$ is the utility from second period consumption ($V_1 > 0, V_{11} < 0$), i is the interest rate of the home country, β is a discount factor, and y^2 and Y^2 have similar interpretations to y^1 and Y^1 but for the second period. The first order conditions (FOC) for this problem imply that:

$$U_1 = \beta V_1 (1+i) \tag{2}$$

$$\alpha U_2 c_r^* = \beta V_1 (1+i) \tag{3}$$

Using (2) and (3) we can get the derivative of r with respect to Y^1 (host country income):

$$\frac{\partial r}{\partial Y^1} = \frac{\nu\beta U_{11} V_{11}(1+i)^2}{D} \geq 0 \qquad (4)$$

Where D is the determinant of the matrix of second derivatives.[5] Equation (4) is non-negative. Suppose that Y increases, the economic condition of the host country improves. The emigrant sends more money home because his/her economic condition also improves (remember $\upsilon \geq 0$). If we consider household consumption to be a normal good this is what we expect.

Also from the FOC we can show that an improvement in the economic condition of the home country will be accompanied by a decrease in remittances. This is:

$$\frac{\partial r}{\partial Y^*} = (-)[\frac{\alpha\pi U_{22} c_r^* c_{y*}^* [U_{11} + \beta V_{11}(1+i)^2]}{D}] \leq 0 \qquad (5)$$

Equation (5) is non-positive. If the emigrant is remitting for altruistic purposes he/she sends less money home because the household is better off ($\pi \geq 0$). Finally we have that:

$$\frac{\partial r}{\partial i} = [\frac{-\beta U_{11}[V_1 + V_{11}(1+i)s]}{D}] \qquad (6)$$

Without further assumptions we cannot sign (6). We have two opposite effects. First, as a result of the increase in host country interest rates the emigrant can consume more in the second period. This has a positive effect on remittances. On the other hand, there is a higher return to savings in the host country. As a result the emigrant may reduce remittances and increase savings in the host country.

The model presented above allows us to hypothesize how remittances respond to changes in the economic conditions of the host and home country. In the empirical section of this paper we will be estimating those responses. We expect an improvement in the economic conditions of the host country to have a positive effect

on remittances, while improvements in the economic conditions of the home country will impact remittances negatively.

3. What kind of variables can we use to represent Y and Y^*?

Let's first discuss the variables that we are using to represent Y, the economic conditions of the host country. We denote the host country as the U.S. Two of the variables we use to represent Y are U.S. unemployment and the U.S. CPI. Notice that we use the U.S. unemployment rather than the U.S. GDP. According to Higgins *et al.* (2004) because of the possible social marginalization of the emigrants the unemployment rate is a better reflection of the income generating opportunities of emigrants than the GDP.

We also use variables related to U.S. monetary policy because these variables can reflect expected future changes in the host country economic conditions. First we include the U.S. FFR. According to Bernanke and Blinder (1992) this is the best measure of monetary policy available. An increase in the FFR (contractionary monetary policy) can affect remittances in two ways. First, it should have a negative effect on the economic conditions of the host country which leads to a decrease in remittances. Second, it has a positive effect on the U.S. interest rates and this has an indeterminate effect on remittances.

We also include U.S. M2 as a measure of U.S. monetary policy. This variable has been shown to reflect U.S. monetary policy in the past (see Friedman and Kuttner, 1991). A positive shock to U.S. M2 (expansionary monetary policy) affects remittances through two channels. First, it should be related with better economic conditions in the host country, which increases remittances. Second, it has a negative effect on the U.S. interest rates and again this has an indeterminate effect on remittances.

Now we can discuss the variables included to represent Y^*, the economic conditions of the home country. In this paper when referring to the home country, we will be referring either to Mexico or to the ROW. In our case, the ROW is a weighted average of the five largest recipients of remittances from the U.S. Details about this are given in Section 4. The variables included for the home country are its GDP, CPI and exchange rate with respect to the U.S. dollar. [6]

4. Data

The data used in this paper are in real terms and in quarterly frequency.[7] With the exception of the U.S. unemployment and the U.S. FFR all the variables are used in logarithms. Two data sets are used, both covering from 1981:1 (year 1981, quarter 1) to 2003:4. The dependent variable in the first data set is U.S. net aggregate remittances flows with the rest of the world. This variable was obtained from the U.S. Balance of Payments. In the second data set the dependent variable is remittances received in Mexico. This variable was obtained from the Mexican Balance of Payments.

The variable U.S. net aggregate remittances refers to "Private Remittances and other Transfers" from the U.S. Balance of Payments. This is the amount of remittances sent from the U.S. minus the amount of remittances received from the rest of the world. U.S. net remittances are positive, which means that individuals residing in the U.S. are sending more money abroad than what they are receiving from the rest of the world. Since 1981, taxes paid by U.S. residents to foreign governments have been added to the "Private Remittances and other Transfers".

U.S. net aggregate remittances are used as a proxy for U.S. remittances outflows. U.S. remittances outflows are not published in a quarterly basis. Given the

large difference between U.S. remittances outflows and inflows we think that this is a good proxy.[8]

The data on the U.S. M2, U.S. FFR, U.S. CPI and U.S. unemployment is obtained from the Federal Reserve Bank of St. Louis. These variables were originally in monthly frequency and were transformed into quarterly frequency.

To avoid the problems related to using a net variable for U.S. remittances we also explore how host and home country's economic factors affect Mexico's inward remittances. The variable we use for Mexico's inward remittances is Mexico's "Current Transfer Credit". This variable comes from the International Monetary Fund, International Financial Statistics (IFS) CD-ROM. According to the IMF Dissemination Standards Bulletin Board for Mexico, in this transfer variable "the most important heading is family remittances, which consist of resources sent by Mexicans residing in the United States to their families in Mexico. The data is mainly obtained from companies that specialize in the transfer of such funds".[9] The data on Mexico's exchange rates, CPI and GDP are also obtained from the IFS.

U.S. net aggregate remittances flows with the ROW and Mexico's remittances inflows across time are shown in Figure 1. Both of these variables are increasing overtime. Also the U.S. net aggregate remittances flows with the rest of the world are usually greater than Mexican remittances inflows.[10]

<< Figure 1 >>

In order to construct the indexes of the economic condition of the ROW for the data set that attempts to explain U.S. net aggregate flows we constructed one index based on the exchange rate of the home countries (ER Index). The exchange rates are defined as home currency per dollar. A second index is based on the inflation rate of the home economies (PI Index). In order to calculate these indexes, the

variables (inflation and the exchange rate) of the five biggest recipients of remittances from the U.S. are used. According to the U.S. Department of Commerce, the five biggest recipients of U.S. remittances in 2003 were Mexico, Brazil, Colombia, El Salvador and the Dominican Republic. In order to construct the index we gave weights (P) to the variables of these countries based on their share of remittances received. Specifically we divided the amount of remittances sent to each country by the total amount of remittances of these five countries, this is:

$$P_i = \frac{R_i}{\sum_{j=1}^{5} R_j} \qquad i = 1,2,3,4,5$$

Table 1 contains the results of this calculation.

<< Table 1 >>

From Table 1 we can see that Mexico is the biggest recipient of U.S. remittances with almost 51%. None of the other countries is even close to Mexico. This shows the importance of Mexico and justifies the use of a second data set that only includes Mexican data.

Using the percentages in Table 1 we construct an index for the economic conditions of the home countries. For example, the index based on the CPI of the home countries is equal to:[11]

$$IndexCPI_t = .5089 * (CPIMEX_t) + .1995 * (CPIBRA_t) + .1177 * (CPICOL_t)$$
$$+ .0889 * (CPISAL_t) + .0850 * (CPIDR_t)$$

We use the same methodology to construct the index for the exchange rate of the five countries.

5. Econometric Estimation

In this paper we use impulse response functions, variance decompositions, Granger causality tests and cointegration tests.

First we conduct a series of Dickey and Fuller (1979) unit root tests. All our variables fail to reject the null hypothesis of one unit root at the 1 percent level of significance. A likelihood ratio test with Sims (1982) small sample correction is used to determine the optimal number of lags in the vector autoregressive model (VAR).[12] The results indicate that 4 lags are optimal for both samples. Next we use the Johansen (1991) test to check for cointegration among the variables. The result indicated the presence of cointegration in both samples. To account for the existence of cointegration we used VECM,[13] instead of unconditional VARs.

The Granger causality results are shown in Table 2. Each equation includes remittances (from the U.S. or Mexico data), U.S. FFR, U.S. M2, U.S. CPI, U.S. unemployment, and either one of the two indexes for the ROW economic condition or a Mexico's economy variable. In the case of the Mexican data the actual variable is always used instead of an index.

<< Table 2 >>

The results using U.S. net aggregate remittances flows with the ROW as the dependant variable show that the U.S. CPI is the only variable that Granger causes remittances. There is no evidence that any home country variable Granger causes the U.S. net aggregate remittances.

There are some possible explanations for the lack of significance of the variables. First, it is possible that remittances do not respond to macroeconomic variables and are determined by demographic factors. Others may argue that remittances are use to make a fix loan payment to the household.

A more credible explanation relates to the proxy we use for remittances. The measure of U.S. net aggregate remittances includes remittances flows with the ROW. The explanatory home country variables contain information for only five of the

ROW countries. Migrants from different countries can be reacting differently to the changes in the economic conditions of the host and home country. As a consequence using these aggregate data could be affecting our results. Another issue related to this data set is that it uses net remittances and not remittance outflows. Even if the difference is small for the U.S., this can have some effects on the results. Finally, this remittances measure also contains "other transfers" which includes taxes paid by U.S. residents to foreign governments.

While the aggregate net data presents some challenges to isolating the determinants of remittances, we are lucky because we also have a data set for remittances received in Mexico only. The results of the Granger causality tests when we use the Mexican data set are reported in the lower portion of Table 2.

The results using Mexican remittances inflows as the dependant variable indicate that the U.S. CPI and the U.S. FFR are significant at the one percent in all specifications. The U.S. unemployment rate is also significant in all the specifications. When Mexico's GDP is included U.S. M2 becomes significant. There is no evidence that the home country variables are Granger causing Mexico's inward remittances.

The variance decomposition results are reported in Tables 3 and 4. The results for the ROW data are reported in Table 3. The results in Table 3 show that U.S. M2 and U.S. unemployment are the variables explaining a higher share of the variance. U.S. M2 explains about 7 percent of the variance and the U.S. unemployment rate about 8 percent.

<< Table 3 >>

The variance decompositions results for the Mexican data are reported in Table 4. In this case U.S. M2 explains about 20 percent of the variance in remittances after 8 periods (more than any other variable). Again the U.S. unemployment rate

accounts for some of the variance in remittances (around 12 percent after 8 periods). From the three home country economic variables (Mexico's GDP, CPI and exchange rate), Mexico's CPI explains a bigger share of the variance. When included Mexico's CPI comes second in the share of the variance that it explains, just behind the U.S. M2.

<< Table 4 >>

In the variance decompositions, U.S. M2 explains more of the variance in remittances than any other variable. We can expect a positive shock to U.S. M2 to be related with more income in the host country, but also with lower interest rates in the home country. To see the effect that U.S. M2 is having on remittances let's examine the impulse response function of U.S. net aggregate remittances and Mexican inward remittances after a positive shock to the U.S. M2. These results are shown in Figure 2 and Figure 3.

<< Figure 2 >>

<< Figure 3 >>

The results in Figure 2 demonstrate that U.S. net aggregate remittances flows with the ROW respond positively to a shock in U.S. M2. The response dies out and becomes insignificant after approximately two periods. The results in Figure 3 demonstrate that Mexico's inward remittances respond positively to a shock in U.S. M2. The response becomes significant after two periods and remains significant for more than ten periods. For both measures of remittances, a shock to U.S. M2 is having a positive and significant effect on remittances.

6. Interpreting the Results

Host country economic conditions seem to be the most important factor driving remittances. This result is especially clear from the Mexican data. In the

presence of host country economic factors, none of the home country economic factors was found to have a significant effect on remittances.

In the variance decompositions U.S. M2 is the host country variable that explains a larger percent of the variance in remittances. A positive shock to U.S. M2 can be related with higher income and lower interest rates in the host country. In the impulse response functions after a positive shock to U.S. M2 both measures of remittances responded positively. In this case remittances can be another channel by which U.S. monetary shocks are getting transmitted to developing countries.

In the Granger causality tests U.S. FFR, U.S. inflation and the U.S. unemployment rate Granger cause Mexico's inward remittances in all equations. An increase in prices in the U.S. decrease the emigrant's real income and he/she may remit less. The U.S. unemployment rate also Granger causes Mexico's inward remittances. In this case we expect that a decrease in unemployment will be accompanied by an improvement in the economic condition of the emigrant. If household consumption is a normal good this will result in an increase in remittances.

In the case of Mexico's variables, Mexico's GDP is the variable that accounts for the bigger share of the variance in Mexican inward remittances. But this variable was not significant in the Granger causality tests and variance decompositions.

7. Concluding Remarks

The aim of this paper was to identify whether the host or the home country's macroeconomic factors affected remittances. To test the hypothesis regarding home and host country economic factors we constructed two data sets. The first data set considered net aggregate remittances flows between the U.S. and the rest of the world. The second data set considered Mexico's inward remittances only. Variance

decompositions, impulse response functions and Granger causality tests derived from a vector error correction model are used for the empirical estimation.

Our results support the idea that remittances respond more to changes in the macroeconomic factors of the host country than to changes in the macroeconomic factors of the home country. In the presence of host country economic conditions, changes in the home country economic condition do not seem to have a big effect on remittances. Migrants focus more on the economic situation of the host country relative to the economic situation of the home country when deciding how much to remit.

These results have important policy implications. First, if receiving countries want to increase the amount of remittances received they should focus more on individual and demographic variables as remittances do not seem to be that responsive to home country macroeconomic variables. Second, given the responsiveness of remittances to host country monetary policy shocks, receiving countries should be aware that another channel by which U.S. monetary policy shocks are going to be transmitted is through remittances. This is especially important for those countries that receive large inflows of remittances.

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Figure 1 – U.S. Net Aggregate Remittances Flows with the Rest of the World and Mexican Remittances Inflows (nominal, million of U.S. dollars).

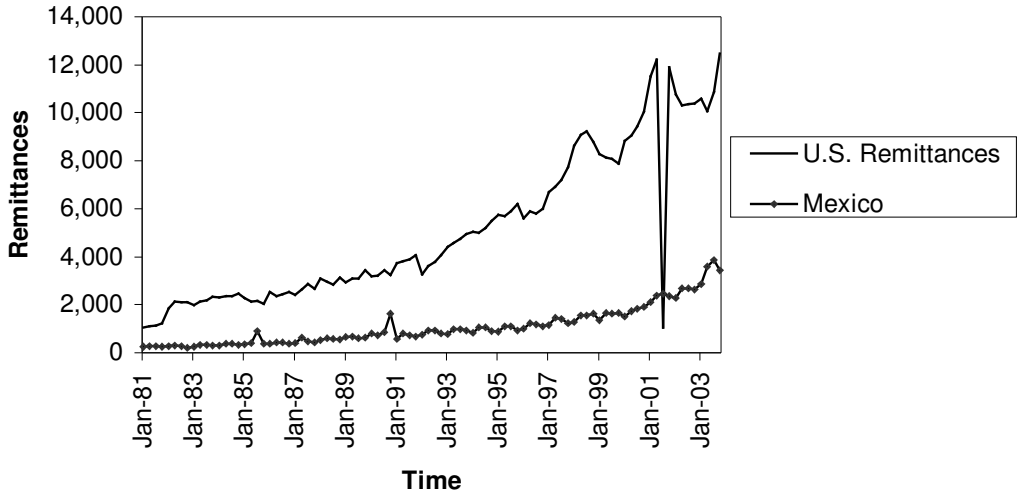
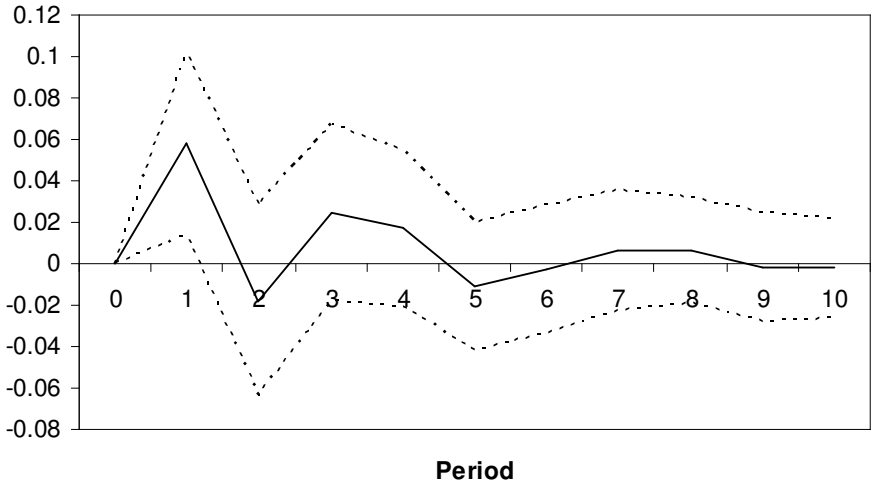
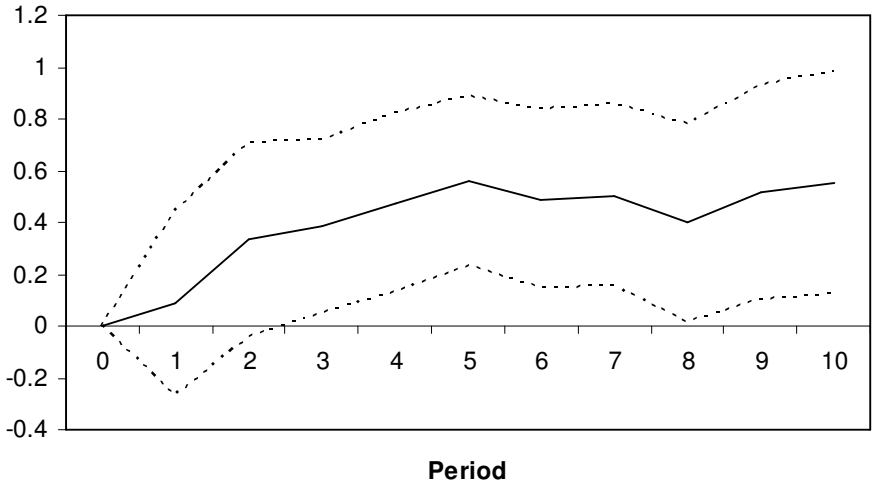


Figure 2 – Response of U.S. Net Aggregate Remittances Flows with the ROW to a shock in U.S. M2.



Notes: estimated regressions use four lags of each variable. Confidence intervals are computed via Monte Carlo simulation with 500 draws. Ranges indicated represent 95 % confidence intervals. The Cholesky decomposition ordering is: U.S. Remittances, U.S. FFR, U.S. M2, U.S. CPI, U.S. unemployment, Mexico's GDP

Figure 3 – Response of Mexican Remittances Inflows to a shock in U.S. M2.



Notes: estimated regressions use four lags of each variable. Confidence intervals are computed via Monte Carlo simulation with 500 draws. Ranges indicated represent 95 % confidence intervals. The Cholesky decomposition ordering is: Mexico Remittan`ces, U.S. FFR, U.S. M2, U.S. CPI, U.S. unemployment, Mexico's GDP.

Table 1 – Percentage Weight for Each Country

Mexico	50.89 %
Brazil	19.95 %
Colombia	11.77 %
El Salvador	8.89 %
Dominican Republic	8.50 %

Table 2 – Marginal Significance Value Levels of Economic Variables from Host and Home Countries for Forecasting Remittances (1981:1 to 2003:4)

A. Dependant Variable is the U.S. Net Remittances Flows with the ROW

Variable	ER Index Included	PI Index Included	Mexico GDP Included	Mexico ER Included	Mexico CPI Included
U.S. FFR	.3011	0.4058	0.2995	0.5367	0.4211
U.S. M2	0.4412	0.6210	0.3807	0.1768	0.4085
U.S. CPI	0.3807	0.2616	0.2421	0.0698***	0.1585
U.S. Unemployment	0.4379	0.5780	0.4996	0.2532	0.5641
Index Included	0.9132	0.9419	-	-	-
Mexico Variable	-	-	0.3947	0.2150	0.6156

B. Dependant Variable is the Mexican Remittances Inflows

Variable	Mexico GDP Included	Mexico ER Included	Mexico CPI Included
U.S. FFR	0.0000*	0.0008*	0.0028*
U.S. M2	0.0342**	0.7286	0.8632
U.S. CPI	0.0000*	0.0000*	0.0004*
U.S. Unemployment	0.0007*	0.0159**	0.0519***
Mexico Variable	0.2159	0.3866	0.3538

Notes: estimated regressions use four lags of each variable. The significance levels for the chi-squared statistic of VECM pairwise Granger causality tests are reported. Degrees of freedom are equal to 4. *Statistically significant at the $P \leq 0.01$ level; **Statistically significant at the $P \leq 0.05$ level; ***Statistically significant at the $P \leq 0.10$ level.

Table 3 – Decomposition of U.S. Net Aggregate Remittances Flows with the ROW

A. Including the ROW Economic Condition Indexes as Home Country Variables

	Exchange Rate Index Included		Price Index Included	
Variable	8 period horizon	12 period horizon	8 period horizon	12 period horizon
U.S. FFR	3.91 (4.1)	3.83 (4.0)	3.48 (4.0)	3.58 (4.1)
U.S. M2	3.72 (4.4)	3.76 (4.5)	7.36 (5.4)	7.92 (5.3)
U.S. CPI	2.75 (3.7)	2.72 (3.7)	3.88 (4.6)	4.14 (4.9)
U.S. Unemployment	8.88 (6.4)	8.82 (6.2)	8.38 (6.1)	8.38 (6.1)
ER Index	2.99 (3.4)	4.59 (3.8)	-	-
PI index	-	-	0.52 (2.7)	0.55 (2.8)

B. Results for Mexico's Economic Variables When Included as Home Country Variables (other coefficients do not change significantly).

Variable	8 period horizon	12 period horizon	8 period horizon	12 period horizon	8 period horizon	12 period horizon
Mexico GDP	1.39 (2.9)	2.94 (3.6)	-	-	-	-
Mexico ER	-	-	6.98 (5.7)	9.76 (6.6)	-	-
Mexico CPI	-	-	-	-	1.37 (4.0)	1.80 (4.0)

Notes: estimated regressions use four lags of each variable. These numbers are point estimates and standard errors are in parenthesis. 500 bootstrap simulations are used to construct the standard errors. A * indicates that the point estimate is at least twice as large as it standard error. The Cholesky decomposition ordering is: U.S. Remittances, U.S. FFR, U.S. M2, U.S. CPI, U.S. unemployment, Index or Mexico's variable.

Table 4 – Decomposition of Mexican Remittances Inflows

	Mexico GDP Included		Mexico ER Included		Mexico CPI Included	
Variable	8-quarter horizon	12-quarter horizon	8-quarter horizon	12-quarter horizon	8-quarter horizon	12-quarter horizon
U.S. FFR	2.23 (4.0)	2.21(4.8)	1.82 (4.8)	1.61 (5.1)	4.65 (4.1)	6.04 (5.5)
U.S. M2	19.61 (8.8)*	23.75 (10.7)*	14.12 (7.8)	15.57 (9.5)	19.55 (7.8)*	27.73 (10.4)*
U.S. CPI	2.85 (3.2)	2.07 (3.5)	2.91 (3.5)	2.50 (3.9)	4.65 (3.8)	4.59 (5.0)
U.S. Unemp.	11.95 (7.3)	18.69 (9.0)*	12.55 (7.4)	17.45 (10.2)	4.71 (3.9)	6.73 (5.4)
Mexico GDP	5.94 (4.5)	5.77 (4.7)	-	-	-	-
Mexico ER	-	-	3.46 (4.5)	3.08 (4.6)	-	-
Mexico CPI	-	-	-	-	4.87 (5.3)	7.23 (7.1)

Notes: estimated regressions use four lags of each variable. These numbers are point estimates and standard errors are in parenthesis. 500 bootstrap simulations are used to construct the standard errors. A * indicates that the point estimate is at least twice as large as it standard error. The Cholesky decomposition ordering is: Mexico Remittances, U.S. FFR, U.S. M2, U.S. CPI, U.S. unemployment, Mexico's Variable.

Notes

[1] In this case household refers to the emigrant's family in his country of origin. Host country is the country to which the individual emigrated. Home country is the emigrant's country of origin.
[2] Other papers testing the determinants of remittances using microeconomic level data include Agarwal and Horowitz (2002), Brown (1994, 1997), de la Brière *et al.* (2002), Hoddinott (1994) and Merkle and Zimmerman (1992).
[3] For example Amuedo-Dorantes and Pozo (2004) found that remittances appreciate the real exchange rate of the receiving countries.
[4] In this case U_1 is the derivative of utility with respect to home country consumption.
[5] $D = U_{11}\beta V_{11}(1+i)^2 + \alpha^2\beta V_{11}(1+i)^2[U_{22}c_r^* + U_2 c_{rr}^*] + U_{11}\alpha^2((c_r^*)^2 U_{22} + c_{rr}^* U_2) > 0$ for a maximum.
[6] Because of data limitations the receiving country's GDP is used only for the Mexican case and not for the ROW case. Interest rate differentials were included in the estimation but were not found to be significant.
[7] All the series are seasonally adjusted and were tested for seasonal unit roots.
[8] We also constructed a quarterly series of U.S. remittances outflows interpolating annual U.S. remittances outflows using quarterly U.S. net aggregate remittances. Main results did not change. See Russell (1986) for more data issues related to remittance measures.
[9] Dissemination Standards Bulletin Board, Mexico Summary Methodology for the Balance of Payments, at www.imf.org.
[10] The only exception is the quarter that includes September 11, 2001. We conducted our estimations excluding this quarter from our data and results did not change.
[11] CPIMEX is Mexico's CPI, CPIBRA is Brazil's CPI, CPICOL is Colombia's CPI, CPISAL is El Salvador's CPI and CPIDR is the Dominican Republic's CPI.
[12] The Cholesky decomposition ordering is remittances, U.S. FFR, U.S. M2, U.S. CPI, U.S. unemployment, and the home country variable. For robustness we also estimated the model with the home country variable first in the ordering, there was not a big differences in the results.
[13] See Engle and Granger (1987) for more details on the estimation of vector error correction models.