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# **International Business Cycles and Remittance Flows\***

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**Preliminary: Comments Welcome**

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## **International Business Cycles and Remittance Flows**

### **Abstract**

In this paper, we investigate the macroeconomic determinants and the effect of host country business cycles on remittance inflows. Estimating a dynamic panel data model by the system GMM, we document that remittance inflows are pro-cyclical to home country volatility but counter-cyclical to the volatility in host countries. This result does not hold for high income countries for which remittance inflows are acyclical to home country volatility but pro-cyclical to the volatility in host countries. For a host country, remittance outflows are counter-cyclical to the volatility of home countries. Trade openness is the single most important factor that determines both remittance inflows and outflows for the home and host countries, respectively.

**Keywords:** Remittance, volatility, international business cycle, dynamic panel data

**JEL Classification Codes:** C23, E32, F22, F24

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## International Business Cycles and Remittance Flows

“We're stuck here while our families back home in India face a dark future with no money. I don't have a single fils (cent)” Mohan, an Indian worker whose employer fled the UAE after the 2009 financial crises. (Quoted from *Dawn* Newspaper, Pakistan)

### 1 Introduction

Remittances account for the second largest foreign exchange inflow next to foreign direct investment and in some cases the largest (World Bank 2009). Remittance inflows to the developing countries have a number of positive impacts including reduction in poverty, consumption smoothing for low-income households, economic growth and reduction in output volatility, financial sector development, and social and political stability.<sup>1</sup> Although these effects of remittances are well documented, the macroeconomic determinants of remittance inflows are largely unknown.

Remittance<sup>2</sup> flows are also closely related to international business cycles. For example, remittance inflows to low and lower-medium income countries increased approximately twelve-fold from US\$ 19,929.98 million to US\$ 235,685.7 million over the 1990-2008 period, but the flows declined to US\$ 230,483.60 in 2009 when the developed economies were hit by recession. Total world remittance inflows also follow the same pattern increasing from US\$ 68,542.45 million in 1990 to US\$ 443,391.8 million in 2008 before falling to US\$ 413,678.3 in 2009.<sup>3</sup> However, this pro-cyclicality of remittance inflows is not commonly observed in other recessions, nor is the pattern similar for low and high income countries (shown in Figures 1-4). There are few studies that examine the relation between remittance inflows and output fluctuations in remittance-sending countries but these studies are limited to a pair of one home

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<sup>1</sup> For discussions on the effects of remittances, see Adams and Page (2003), Mundaca (2009), Kapur (2005), Chami et al. (2009), Giuliano and Ruiz-Arranz (2009).

<sup>2</sup> Remittances are defined as the sum of workers' remittances, compensation of employees and migrants' transfers (World Bank, 2009).

<sup>3</sup> Authors' own calculation from the World Bank data.

(remittance-receiving) and one host (remittance-sending) country.<sup>4</sup> Shorter time series do not allow one to incorporate the business cycle information of all host countries (the number of observations for a home country is smaller than number of host countries). This becomes more problematic for studies at the cross-country level.

In this paper, we employ an innovative approach to study the effects of the volatility of host countries vis-à-vis other macroeconomic determinants of remittance inflows at the cross-country level. For each home country, we construct a time series of the rest-of-the-world (ROW) volatility and include it as an explanatory variable in the regression. This ROW volatility is the weighted average of real GDP growth volatility of all host countries from where a home country receives remittances. The weight attached to a host country is its share in total remittance inflows to the home country. We also estimate the determinants of the remittance outflows to understand other macroeconomic factors of host countries that are responsible for remittance inflows to home countries. For the remittance sending countries, the rest-of –the-world (ROW) volatility is defined as the weighted average of real GDP growth volatility of all countries to which host countries send remittances. The weight attached to a home country is its share in total remittance outflows from the host country. Finally, we estimate the determinants of net remittance flows.

Using data for the 1970-2007 period for 116 countries, we estimate a dynamic panel data model by the system GMM method developed by Arellano and Bover (1995) and Blundell and Bond (1998) for datasets with many panels and few periods. The dependent variable(s) is (are) the ratio of remittance inflows (outflows and net flows) to GDP. The explanatory variables are the relevant macroeconomic factors considered to determine remittance flows including home and ROW volatility. The volatility of a series has been calculated as the non-overlapping five-year standard deviation; hence, other data are compressed by taking five-year averages.

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<sup>4</sup> For example, Akkoyunlu and Kholodilin (2008), Sayan (2004) and Sayan and Tekin-Koru (2008) have studied the case of Turkey and Germany, and Vargas-Silva (2008) and Sayan and Tekin-Koru (2008) have studied the case of Mexico and the USA.

The results show that remittance inflows are pro-cyclical to home country volatility but counter-cyclical to the volatility in host countries. This result also holds for low and lower-medium income countries. However, for high income countries, remittance inflows are acyclical to home country volatility and pro-cyclical to the volatility in host countries. Trade and capital account openness increase remittance inflows for both sets of countries. For a host country, remittance outflows are counter-cyclical to the volatility of home countries. Trade openness increases remittance outflows, so do better institutions in high income host countries. We also find that a larger investment share and lower interest rate (higher money supply) decrease net remittance flows in high income countries, and trade openness increases net remittance flows in both low and high income countries. Lastly, both net remittance flows and outflows are acyclical to host country volatility.

The rest of the paper proceeds as follows. Section 2 reviews the related literature and develops the motivations of the paper. The estimation method is discussed in Section 3 and empirical results reported in Section 4. Finally, Section 5 concludes.

## **2 Related literature and motivation of the study**

### 2.1 Literature review

Much of the theoretical work on remittances has been devoted to the primary motive of migrants to remit. Among the motives put forward, altruism, insurance and investment are widely documented in the literature (Lucas and Stark, 1985; Cox et al., 1998).

If remittances are sent with an altruistic motive, they are likely to be counter-cyclical with the output in the home country. The volume of remittance inflows will increase during an economic downturn in the home country, compensating families for the fall in income (Agarwal and Horowitz, 2002). On the other hand, if remittances are sent with a profit driven motive, such as investment or inheritance, they are likely to be pro-cyclical. Under this motive, the volume of remittance inflows will decline during an economic downturn in the home country (Giuliano and Ruiz-Arranz, 2009). However, an

increase in the migrants' income in the host country will lead to an increase in remittances under both motives.<sup>5</sup>

There are several empirical studies at the macroeconomic level that investigate the relationship between remittance inflows and output fluctuations in the home country. For example, in a study of over 100 countries covering the 1975-2002 period, Giuliano and Ruiz-Arranz (2009) document evidence that remittances are pro-cyclical in countries with less developed financial systems, providing evidence in favor of the investment motive. Chami et al. (2009), using data spanning the 1970-2004 period for a sample of 70 developed and developing countries, observe that remittance inflows help stabilize output fluctuations in the home country. In a panel study of 20 small island economies for the 1986-2005 period, Jackman et al. (2009) show that remittances have a stabilizing effect on output and consumption volatility in home countries. The emphasis of these studies has been on the causal effect of remittance inflows on output volatility.

A number of time-series studies investigate the remittance response to the output of both host and home countries but these are limited to remittance flows between a pair of countries. For example, Sayan (2004) employs quarterly time series data for 1987-2001, and documents cross correlations between the cyclical components of real GDP and remittances from Germany to Turkey. He finds that remittance receipts to Turkey are pro-cyclical with Turkish output, but acyclical with German output. Akkoyunlu and Kholodilin (2008), on the other hand, find that during 1962-2004 the volume of remittances sent by Turkish workers in Germany varied positively with changes in German output rather than Turkish output. Sayan and Tekin-Koru (2008) support Sayan (2004) that remittance receipts to Turkey from Germany are pro-cyclical. These authors also document that remittance inflows to Mexico from the USA are counter-cyclical. Their results are also supported by Durdu and Sayan (2008) who calibrate a small open economy model to the data for Mexico and Turkey for the 1987-2004 period and find that remittance inflows dampen business cycles in Mexico, but amplify in Turkey. Vargas-

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<sup>5</sup> Another motive closely tied to these motives and is based on the migration networks literature is the options motive (for a detailed discussion, see Roberts and Morris 2003).

Silva (2008) also documents that remittances vary counter-cyclically with Mexico's output.

## 2.2 Motivation

The above review suggests that research on macroeconomic determinants of remittance inflows is scant. Furthermore, volatility in host countries is important for understanding remittance inflows to the home country. In other words, international business cycles have an effect on remittance flows. But this important link has not been studied at the cross-country level.

To demonstrate the relation between international business cycles and remittance inflows, we plot the average remittance inflows over the 1970-2009 period and look particularly at the periods of recessions in the USA defined by the National Bureau of Economic Research. Average world remittance inflows are calculated as the total amount of annual remittance inflows in the world divided by the number of home countries. The reason for looking at average rather than total inflows is that the number of home countries in the data differs across years. We normalize the series at 1970. Vertical lines for the year 1974, 1982, 1991, 2001 and 2008 are drawn to mark the recession years in the USA.

Average remittance flows for the world are displayed in Figure 1. There is a trend of modest increase in average remittance inflows over the sample period with a sharp increase since 2001 followed by a dip in 2009. During other recessions, average remittance inflows either remained the same (1974 and 1982 recessions) or increased slightly than in previous periods. Average remittance inflows declined during the first Gulf war. This pattern suggests that remittance inflows are in general counter-cyclical to the US business cycle. We also observe a similar pattern for low and lower-medium income countries in Figure 2. However, the pattern reverses for high-income countries in Figure 3. The figure clearly shows that remittance inflows sharply declined during all recessions suggesting a strong pro-cyclical behavior. We observe the same pattern when upper-medium income countries are combined with high income countries (Figure 4).

Insert Figures 1-4 here



The figures and discussions above suggest that host country information is also crucial for understanding remittance inflows to home countries. However, the short time series do not permit incorporating the information of all host countries (number of observations for a home country is smaller than number of host countries). The problem is more acute for studies at the cross-country level.

We therefore take an alternative approach in our cross-country study to account for host country information. For each home country, we construct a rest-of-the-world (ROW) volatility series based on the information of growth volatility in all host countries and include it as an explanatory variable in the regression. Moreover, we estimate an additional equation for the determinants of remittance outflows to understand the macroeconomic factors of host countries responsible for remittance inflows to home countries. For the latter specification, we construct another ROW volatility series for each host country based on the information of growth volatility in all home countries.

The two ROW volatility series are constructed as follows. We first calculate, for each sample country, five-year non-overlapping standard deviations of the growth rate of per capita real GDP de-trended by the Hodrick Prescott (HP) filter. For a home country  $i$ , the ROW volatility in period (interval)  $t$  is the weighted average of the volatility of all host countries, defined as:

$$(\text{ROW volatility})_{i,t} = \sum_j \sigma_{j,t} s_{ij}, \quad \forall i \neq j, \quad \text{---(1)}$$

where  $\sigma_{j,t}$  is the growth volatility in host country  $j$  in period  $t$  calculated by the method mentioned above. The weight is calculated as  $s_{ij} = R_{ij} / \sum_j R_{ij}$ , where  $R_{ij}$  is the remittance inflows to country  $i$  from country  $j$ .  $s_{ik} = 0$  if no remittance comes from country  $k$ .

At the cross-country level, remittance inflow and outflow data are reported at the aggregate level without the sources and destinations. For a home country, the sources of annual inflows are not available. Similarly, for a host country, the destinations of annual outflows are not available. However, this detailed inflow-outflow information is available only for 2006 (Ratha and Shaw, 2007). The  $s_{ij}$  matrix is therefore calculated for 2006, which is then used to construct the ROW volatility in all periods. This is a limitation of

our ROW volatility series because the  $s_{ij}$  matrix is time invariant, which may not be strictly correct. Paucity of data does not allow testing the time series properties of the matrix at the cross-country level. However, there is evidence that for some countries it is more or less constant over time.<sup>6</sup>

We construct a similar ROW volatility series for each host country  $h$ , as

$$(\text{ROW volatility})_{h,t} = \sum_l \sigma_{l,t} s_{hl}, \quad \forall h \neq l, \quad \text{---(2)}$$

where  $\sigma_{l,t}$  is the growth volatility in home country  $l$  in period  $t$ . The weight is calculated as  $s_{hl} = R_{hl} / \sum_h R_{hl}$ , where  $R_{hl}$  is the remittance outflow to home country  $l$  from host country  $h$ .  $s_{hm} = 0$  if no remittance flows to country  $m$ . The  $s_{hl}$  matrix is also time invariant due to paucity of data.

### 3 Estimation strategy

We estimate the following dynamic panel model:

$$y_{i,t} = \alpha + \mu_i + \lambda_t + \delta y_{i,t-1} + \beta \mathbf{X}_{i,t} + \varepsilon_{i,t}, \quad \text{---(3)}$$

where  $y_{i,t}$  is the log of the ratio of remittance inflows (outflows and net flows) to GDP for country  $i$  in period (interval)  $t$ .  $\mu_i$  represents country fixed effects, the error term  $\varepsilon_{i,t}$  is assumed not be correlated across countries, and  $\lambda_t$  denotes time fixed effects which are captured by time dummies. The variables in the  $\mathbf{X}_{i,t}$  vector are the following.

- Growth volatility (log): This is five-year non-overlapping standard deviation of growth rate of per capita real GDP de-trended by the HP filter. This variable is included to determine the business cycle property of remittance inflows (outflows and net flows).

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<sup>6</sup> For example, the main host countries for Bangladesh are Saudi Arabia, Kuwait and the USA. During the 1998-2009 period, the share of remittance inflows from Saudi Arabia ranged between 0.3 and 0.4. For Kuwait, the share ranged between 0.1 and 0.13, and for the USA, the share ranged between 0.14 and 0.17 (Authors' own calculation using data from Bangladesh Bank).

- ROW volatility (log): This variable accounts for volatility in the host/home countries. If remittance inflows and net flows are the dependent variables, it is  $(\text{ROW volatility})_{i,t} = \sum_j \sigma_{j,t} S_{ij}$ , and if remittance outflows is the dependent variable, it is  $(\text{ROW volatility})_{h,t} = \sum_l \sigma_{l,t} S_{hl}$ .
- Inflation volatility (log): This variable has been calculated as a five-year non-overlapping standard deviation of the CPI inflation rate. Higher inflation can both be positively and negatively related to remittance flows depending on the motive to remit. For example, higher inflation volatility slows down growth and investment thus decreasing remittance flows. Conversely, higher inflation volatility increases economic burden on the migrant workers' family back home thus increasing remittances for family support.<sup>7</sup>
- Exchange rate volatility (log): This variable has also been calculated as a five-year non-overlapping standard deviation of the nominal exchange rate with the US dollar. The value of remittances in domestic currency depends on the market exchange rate, and therefore, remittance flows are likely to depend on exchange rate volatility.
- Capital account openness: This variable is constructed by Chinn and Ito (2008). The higher the capital account openness, the lower is the barrier to capital flows across borders, and therefore, more remittances will flow through official channels.

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<sup>7</sup> Inflation rate is nonstationary for many countries. For example, Beyer and Farmer (2007) document for the USA, and Koustas and Serletis (2003) document for several European Union countries. Inclusion of interest rate instead of inflation volatility makes the regression unbalanced since the dependent variable is remittance-GDP ratio, which is regarded as stationary. Exchange rate is also nonstationary.

- Trade openness: This is the sum of exports and imports relative to GDP. An open economy interacts more with the rest of the world that creates greater scope for migration of its citizens.
- Investment-GDP ratio: As discussed in Section 2.2, one of the motives for remitting is investment.
- Money supply: This is the ratio of M2 to GDP. In macroeconomic research, this variable is sometimes used as a proxy for financial development. The ratio of private credit to GDP is a better proxy, but it reduces the number of sample countries in our data, therefore we use the ratio of M2 to GDP. Furthermore, M2-GDP ratio is negatively related to the interest rate. A higher interest rate in the home country is expected to increase remittance inflows, while a higher interest rate in the host country is expected to decrease remittance outflows.<sup>8</sup>
- Institutions: Remittance flows depend on a country's investment opportunities and social welfare systems, which in turn depend on its institutional development. Moreover, migrants from a country with oppressive institutions prefer to settle permanently in the host country and as a result remit less to the home country. We use the "polity2" score as a proxy for institutions. This variable captures the regime authority spectrum on a 21-point scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). It examines concomitant qualities of democratic and autocratic authority in governing institutions, rather than discreet and mutually exclusive forms of governance.
- Initial real GDP per capita: This variable accounts for the income level of a country. The motives for remitting vary across countries of different income categories.

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<sup>8</sup> Interest rate is not comparable across countries because different countries report different interest rates.

The reason for the dynamic specification is that the remittance-GDP ratio is quite persistent. The lagged dependent variable is also intended to account for the effects of networks on remittance flows. It is important to mention that remittance flows are directly related to the stock of migrants. Migrants remit, along with money, important information for the potential migrants; therefore, potential migrants choose to migrate to a country where there are already more migrants of their origin. Finding jobs also become easier for new migrants in the host country where there are networking opportunities.

The ROW volatility is treated as exogenous because world economic fluctuations are not influenced by a single home or host country. Polity2 is also treated as exogenous as we take its initial value for each interval. The investment ratio, volatility of growth, inflation, and exchange rates are endogenous as they are also likely to be influenced by remittance flows. Money supply is also treated as endogenous because remittance flows put pressure on the exchange rate and the central bank has to intervene in the domestic money market even if the exchange rate is not entirely fixed. The Central bank may also need to intervene if remittance flows put upward pressure on the inflation rate. It is not clear whether trade and capital account openness are influenced by remittance flows. However, it is likely that a host country may not attract migrant workers unless it removes constraints on capital outflows. It is also likely that remittance inflows pressurize a home country to open up its capital market when migrants want to invest in the portfolio market. Historically, workers migrate to countries having close cultural, religious or trade links with the home country. We therefore estimate the models treating the two openness variables alternatively as exogenous and endogenous. This also helps check robustness of the results.

Our sample period is 1970-2007 because remittance data are available from 1970 and data for some explanatory variables are available up to 2007. All volatility measures are calculated as five year non-overlapping standard deviations; therefore, other variables are five-year averages except initial GDP and polity2 for which initial values of each interval are taken. Therefore, we have seven time intervals—1970-74, 75-79, 80-84, 85-89, 90-94, 95-99 and 2000-07. Remittance (and also other explanatory variables) data are not available for many countries for different periods, so we deal with an unbalanced panel

data set. The number of countries differs in different specifications depending on the choice of both dependent and independent variables. Data sources are discussed in the Appendix.

We estimate equation (3) by the Arellano and Bover (1995)/Blundell and Bond (1998) system GMM, which has been designed for datasets with many panels and few periods. This method assumes that there is no autocorrelation in the errors and requires the initial condition that the panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable. We report the Arellano–Bond (1991) test statistic for serial correlation in the first-differenced errors. Rejecting the null hypothesis at the second order implies that there is no autocorrelation in the errors. The estimators are consistent only if the moment conditions are valid. We test whether the overidentifying moment conditions are valid by the Sargan statistic. But the asymptotic distribution of the Sargan statistic is unknown when the standard errors are corrected for heteroskedasticity. We therefore report the statistic by estimating the model without such a correction.

#### **4. Results**

We first provide a brief discussion of the descriptive statistics of the variables used in the regressions. The results are presented in Table 1.

Insert Table 1 here

The average remittance inflows are about 4% of GDP over the sample period. They are higher in low (and lower-medium) income countries (above 5%) than in (upper-medium and) rich countries (less than 2%). The average remittance outflows, on the other hand, are less than 1.5% of GDP. This result is conceivable given that remittances usually flow from high to low income countries. Average growth volatility is higher in low compared to high income countries. The ROW volatility for home countries is about 1.4 times larger for low compared to high income countries. Conversely, the ROW volatility for host countries is about 8 times larger for high than low income countries. In high income countries, capital account and trade are more open, inflation and exchange rates are less

volatile, the ratio of M2 to GDP is higher and institutional quality is better compared to low income countries.

#### 4.1 Determinants of remittance inflows

Now we turn to the regression results. The results for the determinants of remittance inflows for the full sample are presented in Table 2. In column 1, trade and capital account openness are treated as exogenous. In columns 2-5, the model is estimated treating openness as endogenous. In column 3, only two lags of both dependent and independent variables are used as instruments. In all cases, the Sargan statistic shows that the instruments are invalid. Column 4 re-estimates column 3 excluding polity2. This increases the number of countries as polity2 data are not available for several low income countries. The instruments are found to be valid and the AR (2) coefficient of the first-differenced errors is also insignificant suggesting no serial correlation. The autoregressive coefficient is 0.73. The result that remittance-GDP ratio is decreasing with growth volatility in the home country suggests a pro-cyclical behavior of remittance inflows. Remittance inflows decrease by about 6% for a 10% increase in growth volatility. On the other hand, the ROW volatility (given by equation (1)) is counter-cyclical; the remittance-GDP ratio increases by about 4% for a 10% increase in volatility in host countries.<sup>9</sup> Migrant workers remit more during economic downturns probably because of greater uncertainty in host countries. Both trade and capital account openness increase remittance inflows. Remittance inflows are also increasing with inflation volatility suggesting the altruistic motive of remittance inflows. This is our preferred model, so we check the robustness by also estimating the model by the two-step system GMM with the Windmeijer (2005) corrected robust standard errors (column 5). We find no meaningful change in the results.

Insert Tables 2-4 here

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<sup>9</sup> Growth volatility of a country may depend on the ROW volatility. However, in the data the correlation between the two volatilities is only 0.14, so we include both in the same regression.

We also estimate the model separately for low (and lower-medium) and (upper-medium and) higher income countries. Table 3 presents results for low income countries. The number of countries varies between 68 and 73 depending on the choice of explanatory variables. Columns 1-4 report the results for different combinations of the explanatory variables and instruments (replication of columns 1-4 in Table 2) but in all cases the overidentifying restrictions are invalid and the AR (2) coefficient of the first-differenced errors is significant, so we cast doubt on the validity of the results. In columns 5 and 6, the model is estimated by the two-step system GMM method; the AR (2) coefficient remains significant although the instruments are found to be valid.<sup>10</sup>

The instruments are valid and there is no serial correlation in the errors when the model is estimated for (upper-medium and) high income countries (Table 4). There are 38 such countries in the sample. We find that growth volatility in the home country does not affect the remittance inflows but the ROW volatility is negative and significant suggesting that remittance inflows are pro-cyclical to the ROW volatility. The remittance-GDP ratio decreases by about 4% when the ROW growth volatility increases by 10%. Both trade and capital account openness increase remittance inflows. Inflation volatility contributes positively but its effect is not robust. The ROW volatility becomes insignificant if the equation is estimated in two steps (column 4). It is also found that the coefficient of M2-GDP ratio is negative but not robustly significant in the two-step estimation. It is important to mention that the interest rate differential (M2-GDP ratio is a proxy for interest rate) between the home and host country is more important for higher than lower income countries in determining remittance inflows.

The results that ROW volatility is counter-cyclical when both low and high income countries are combined but pro-cyclical in high income countries implies that ROW volatility is counter-cyclical in low income countries. We also observe this result in Table 3 but cannot confirm because of insufficient validity of the model for low income

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<sup>10</sup> The results are, to a large extent, similar to those for the full sample with the exceptions that growth volatility and capital account openness are not robustly significant in one- and two-step estimations. Inflation volatility is insignificant. The ROW volatility is pro-cyclical as before and robustly significant.



countries. This is also evident in Figure 2 where we observe that average remittance inflows to low income countries did not decline during or after the recessions.

#### 4.2 Determinants of remittance outflows

Now we investigate the determinants of remittance outflows. Note that the sample countries do not match the remittance inflow countries because several countries report either remittance inflows or outflows.

The results for the full sample are presented in Table 5. The ROW volatility for the host country is now given by equation (2). In columns 1-6, we estimate the model in one step. The overidentifying restrictions of the instruments are rejected in all cases—treating the openness measures both as exogenous and endogenous, combinations of explanatory variables and reducing the number of instruments. However, the instruments are found to be valid (and no serial correlation of the residual) when the model is estimated in two steps and excluding the investment-GDP ratio. The autoregressive coefficient ranges between 0.62 and 0.78 (column 7-8). Other than the lagged dependent variable, the only two variables found to (positively) affect remittance outflows are the ROW volatility and trade openness variables although their significance is not robust. The first result implies that remittance outflows from a host country increase when volatility in home countries increases suggesting counter-cyclical behavior. For low income countries, the instruments are also found to be valid only when the model is estimated in two steps (columns 7-8 in Table 6). For this set of countries, none of the explanatory variable can explain remittance outflows, even the lagged dependent variable is weakly significant. This is probably because low income countries are net remittance recipients.

Insert Tables 5-7 here

However, when the model is estimated for high income countries (Table 7), the instruments are valid and there is no serial correlation in the errors. The autoregressive coefficient ranges from 0.59 to 0.78 and significant at the 1% level. Trade openness significantly increases remittance outflows and is robust to all specifications. Better

institutions of the host country are found to reduce remittance outflows. This result deserves attention, although not robust in all specifications. Migrants save money in a host country with better institutions probably because they prefer to permanently settle there.

#### 4.3 Determinants of net remittance flows

Finally, we investigate the determinants of net remittance flows.<sup>11</sup> The number of countries now decreases because, as mentioned earlier, several countries report either remittance inflows or outflows. We consider only those countries for which net remittance flows are positive.

The results for the full sample are presented in Table 8. The overidentifying restrictions are valid only if two lags of the dependent and independent variables are used as instruments (columns 3-4 for the one-step and columns 5-6 for the two-step estimation). Trade openness is again found to be positively and robustly significant. The important finding is that investment-GDP ratio is negative and significant (although robustness does not survive in the two-step estimation). The coefficient is around 0.03 suggesting that a 10% increase in investment-GDP ratio reduces net remittance flows by 6.7% (evaluated at the mean value of investment-GDP ratio at 21.78). One possible explanation is that the investment-GDP ratio is larger in developed countries which also have a higher capital stock and consequently lower marginal product of capital. Therefore, a higher investment-GDP ratio attracts lower remittances.

Insert Tables 8-10 here

The results are also similar when the model is estimated for low income countries (Table 9). For high income countries, in addition to trade openness, money supply is negative and significant (Table 10) suggesting that higher interest rates (lower money supply) attract larger remittance flows to the high income countries. The net flows are

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<sup>11</sup> (Remittance inflows — Remittance outflows) / GDP.

counter-cyclical but not robust when trade and capital account openness are treated as endogenous, and so are capital account openness and investment-GDP ratio.

The above results indicate that remittance inflows are pro-cyclical to home country volatility. On the other hand, for a host country, remittance outflows are counter-cyclical to the volatility of home countries. Both results are consistent with the investment motive in that when volatility in the home country increases, migrants will remit less money back home. Trade openness is the single most important factor that increases both remittance inflows and outflows for the home and host countries, respectively.

## **5. Concluding remarks**

This paper investigates the macroeconomic determinants of remittance inflows vis-à-vis the role of business cycle fluctuations in host countries. These two important issues have been ignored in the previous literature. The key innovation of the paper is to incorporate business cycle information of all host countries by constructing a rest-of-the-world volatility index for each home country. A separate model for remittance outflows has been estimated to understand the macroeconomic factors of host countries responsible for remittance inflows to home countries. The model is estimated by the dynamic panel system GMM method. The results show that remittance inflows are pro-cyclical to home country volatility but counter-cyclical to the volatility in host countries. The above results also hold for low income countries. This result is consistent with the investment motive. But for high income countries, remittance inflows are acyclical to home country volatility but pro-cyclical to the volatility in host countries. Trade and capital account openness increase remittance inflows for both low and high income countries. On the other hand, for a host country, remittance outflows are counter-cyclical to the volatility of home countries. This once again is consistent with the investment motive in that when volatility in the home country increases, migrants will remit less money back home. Trade openness increases while better institutions decrease remittance outflows in high income countries. The latter result indicates that migrants remit less if the host country has better institutions probably because they want to permanently settle there. Finally, the model is estimated for net remittance flows, the results show that

higher interest rates (lower money supply) increases net remittance flows in high income countries. Trade openness has been found to positively impact on both remittance inflows and outflows and for both low and high income countries. Lastly, both net remittance flows and outflows are acyclical to host country volatility.

The results suggest that remittance flows depends on both home and host country characteristics, and that the macroeconomic determinants cannot be generalized for low and high income countries.

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## Tables

Table 1: Descriptive Statistics

Variables	Country income category		
	All	Low and lower medium income	Upper medium and high income
Remittance inflow/GDP	0.036 (0.079)	0.051 (0.100)	0.018 (0.033)
Remittance outflow/GDP	0.014 (0.024)	0.014 (0.023)	0.013 (0.025)
Remittance net flow/GDP	0.022 (0.098)	0.037 (0.133)	0.005 (0.027)
Volatility of GDP growth	4.268 (4.317)	4.743 (4.329)	3.762 (4.260)
Volatility of the ROW GDP growth-1*	1.891 (1.360)	2.147 (1.634)	1.575 (0.822)
Volatility of the ROW GDP growth-2**	2.572 (10.167)	0.579 (1.525)	4.616 (14.366)
Capital account openness	-0.053 (1.453)	-0.558 (1.137)	0.519 (1.550)
Trade openness	78.206 (45.446)	66.747 (36.142)	91.470 (51.123)
Inflation volatility	52.893 (486.185)	84.394 (687.971)	23.338 (108.646)
Exchange rate volatility	49.087 (271.222)	87.375 (373.807)	9.775 (50.061)
Money supply (M2)/GDP	50.745 (297.270)	48.647 (392.765)	53.521 (36.323)
Polity2 score	-0.500 (7.434)	-3.044 (5.978)	2.873 (7.829)
Investment-GDP ratio	21.780 (13.008)	18.452 (13.803)	25.542 (10.952)
Number of countries	117	68	49

Figures in the parentheses are standard deviations. \* Calculated by the formula in equation (1) in the text.

\*\* Calculated by the formula in equation (2) in the text.



Table 2: Determinants of remittance inflows: Log of remittance inflow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)	(3)	(4)	(5)
Lag of the dependent variable	0.640*** (7.57)	0.623*** (8.08)	0.666*** (7.56)	0.726*** (8.45)	0.763*** (8.73)
Growth volatility (log)	-0.490*** (-3.66)	-0.392*** (-3.48)	-0.503*** (-2.87)	-0.609*** (-3.59)	-0.591*** (-3.22)
ROW growth volatility (log)	0.294* (1.80)	0.257* (1.65)	0.301* (1.83)	0.360** (2.04)	0.406* (1.88)
Capital account openness	0.144* (1.95)	0.195*** (3.01)	0.189** (2.21)	0.174* (1.95)	0.153 (1.61)
Trade openness	0.011*** (2.64)	0.010*** (3.26)	0.009** (2.59)	0.007** (2.02)	0.006* (1.66)
Inflation volatility (log)	0.154* (1.85)	0.147** (1.96)	0.203* (1.90)	0.226** (2.20)	0.225** (2.41)
Exchange rate volatility (log)	-0.055 (- 1.13)	-0.061 (- 1.36)	-0.059 (- 0.93)	-0.041 (- 0.62)	-0.043 (- 0.58)
Money supply	-0.0004 (- 0.09)	-0.001 (- 0.15)	-0.001 (- 0.34)	-0.004 (- 1.16)	-0.003 (- 0.82)
Initial Polity2	-0.014 (- 1.13)	-0.011 (- 0.92)	-0.011 (- 0.88)		
Initial GDP (log)	-0.550** (- 2.50)	-0.566*** (-2.97)	-0.518** (- 2.47)	-0.351* (- 1.67)	-0.309 (- 1.46)
Investment-GDP ratio	-0.016 (- 1.10)	-0.013 (- 0.97)	-0.010 (- 0.77)	-0.008 (- 0.62)	-0.008 (- 0.59)
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.124	0.082	0.124	0.166	0.124
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.028	0.012	0.023	0.258	0.390
Number of instruments	131	169	93	92	92
Number of countries	106	106	106	116	116
Total number of observations	353	353	353	383	383

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-4: All variables except ROW growth volatility, polity2, and initial income are endogenous.

Columns 3-4: Only two lags are used as instruments.

Column 5: Replicates column 4 by two-step estimation with Windmeijer (2005) corrected robust *t*-statistics.

ROW growth volatility is calculated by the formula in equation (1).

Table 3: Determinants of remittance inflows for low- and lower-medium income countries: Log of remittance inflow/GDP is the dependent variable (system GMM estimation of equation 3)

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Lag of the dependent variable	0.610*** (8.66)	0.615*** (9.99)	0.660*** (8.97)	0.650*** (9.22)	0.652*** (5.94)	0.649*** (7.42)
Growth volatility (log)	-0.476*** (-4.12)	-0.346*** (-3.82)	-0.384** (-2.40)	-0.459*** (-2.85)	-0.460 (- 0.90)	-0.501 (- 2.11)
ROW growth volatility (log)	0.315* (1.76)	0.336** (2.00)	0.334** (1.98)	0.346* (1.90)	0.358* (1.73)	0.347* (1.86)
Capital account openness	0.209** (2.07)	0.143* (1.87)	0.135 (1.61)	0.115 (1.27)	0.244** (2.16)	0.150 (1.59)
Trade openness	0.011** (2.35)	0.009** (2.47)	0.010** (2.51)	0.010** (2.39)	0.008 (1.63)	0.009** (2.59)
Inflation volatility (log)	0.107 (1.41)	0.086 (1.28)	0.137 (1.36)	0.133 (1.35)	0.097 (0.63)	0.155 (1.34)
Exchange rate volatility (log)	0.032 (0.58)	0.039 (0.72)	0.076 (1.09)	0.068 (0.96)	0.009 (0.12)	0.046 (0.41)
Money supply	0.007 (0.93)	0.008 (1.21)	0.007 (1.12)	0.006 (1.00)	0.005 (0.59)	0.006 (0.87)
Initial Polity2	-0.008 (- 0.57)	0.006 (0.43)	0.011 (0.71)		-0.010 (- 0.42)	
Initial GDP (log)	-0.046 (- 0.20)	0.032 (0.17)	0.164 (0.82)	0.134 (0.66)	-0.028 (- 0.08)	0.035 (0.13)
Investment-GDP ratio	-0.017 (- 1.21)	-0.011 (- 0.96)	-0.011 (- 0.89)	-0.011 (- 0.95)	-0.016 (- 0.80)	-0.011 (- 0.77)
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.031	0.024	0.022	0.030	0.081	0.043
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.000	0.000	0.000	0.000	1.000	0.922
Number of instruments	131	169	93	92	131	92
Number of countries	68	68	68	73	68	73
Total number of observations	234	234	234	246	234	246

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-4: All variables except ROW growth volatility, polity2, and initial income are endogenous.

Columns 3-4: Only two lags are used as instruments.

Columns 5 and 6: Replicate columns 1 and 4, respectively, by two-step estimation with Windmeijer (2005) corrected robust *t*-statistics.

ROW growth volatility is calculated by the formula in equation (1).

Table 4: Determinants of remittance inflows for upper-medium and high income countries: Log of remittance inflow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)	(3)	(4)
Lag of the dependent variable	0.551*** (7.20)	0.549*** (7.44)	0.606*** (8.50)	0.641*** (6.58)
Growth volatility (log)	-0.138 (- 1.10)	-0.151 (- 1.15)	-0.130 (- 0.76)	-0.003 (- 0.02)
ROW growth volatility (log)	-0.356* (- 1.89)	-0.344* (- 1.76)	-0.355* (- 1.71)	-0.276 (- 1.23)
Capital account openness	0.096 (1.31)	0.142** (2.26)	0.207*** (2.76)	0.204* (1.65)
Trade openness	0.011*** (3.11)	0.011*** (5.06)	0.011*** (4.02)	0.011** (2.38)
Inflation volatility (log)	0.140* (1.84)	0.119 (1.43)	0.178** (2.01)	0.144 (1.10)
Exchange rate volatility (log)	-0.095 (- 1.25)	-0.081 (- 1.15)	-0.062 (- 0.95)	-0.102* (-1.92)
Money supply	-0.005 (- 1.46)	-0.006* (- 1.78)	-0.005 (- 1.40)	-0.006 (- 0.96)
Initial Polity2	0.021 (0.93)	0.026 (1.11)	0.029 (1.15)	0.048 (1.27)
Initial GDP (log)	-0.865*** (-2.81)	-0.803*** (-2.84)	-0.800*** (-2.38)	-0.793 (- 1.24)
Investment-GDP ratio	0.010 (0.55)	0.007 (0.51)	0.002 (0.11)	-0.015 (- 0.63)
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.586	0.570	0.591	0.922
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.849	0.840	0.742	1.00
Number of instruments	109	119	90	90
Number of countries	38	38	38	38
Total number of observations	119	119	119	119

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-3: All variables except ROW growth volatility, polity2, and initial income are endogenous.

Column 3: Only two lags are used as instruments.

Column 4: Replicates column 3 by two-step estimation with Windmeijer (2005) corrected robust *t*-statistics.

ROW growth volatility is calculated by the formula in equation (1).

Table 5: Determinants of remittance outflows: Log of remittance outflow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)	(3)	(4)	(5)	(6)
Lag of the dependent variable	0.636*** (6.39)	0.691*** (7.58)	0.799*** (7.97)	0.845*** (9.95)	0.628*** (5.17)	0.758*** (5.95)
Growth volatility (log)	0.122 (0.98)	0.030 (0.26)	0.061 (0.39)	0.042 (0.29)	0.032 (0.24)	-0.013 (- 0.07)
ROW growth volatility (log)	0.155 (1.19)	0.058 (0.56)	0.063 (0.63)	-0.026 (- 0.33)	0.366** (2.00)	0.223* (1.65)
Capital account openness	0.153** (2.11)	0.073 (1.30)	0.012 (0.15)	0.009 (0.12)	0.132* (1.70)	0.006 (0.07)
Trade openness	0.009*** (3.17)	0.006** (2.41)	0.005* (1.81)	0.003 (1.12)	0.006* (1.82)	0.007*** (2.88)
Inflation volatility (log)	0.043 (0.80)	0.069 (1.19)	-0.033 (- 0.50)	-0.028 (- 0.42)	0.057 (0.91)	-0.029 (- 0.38)
Exchange rate volatility (log)	0.045 (0.78)	0.048 (1.08)	-0.007 (- 0.13)	-0.034 (- 0.73)	-0.025 (- 0.41)	-0.063 (- 1.10)
Money supply	0.005 (1.26)	0.006 (1.62)	0.004 (1.17)	0.002 (0.93)	0.000 (0.01)	-0.001 (- 0.33)
Initial Polity2	0.008 (0.48)	-0.002 (- 0.10)	0.010 (0.56)		-0.003 (- 0.18)	-0.001 (- 0.04)
Initial GDP (log)	-0.161 (- 0.57)	-0.040 (- 0.17)	-0.068 (- 0.32)	-0.082 (- 0.47)	-0.283 (- 1.01)	-0.175 (- 0.89)
Investment-GDP ratio	-0.023 (- 1.28)	-0.017 (- 1.17)	-0.015 (- 1.01)	-0.011 (- 0.90)		
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.202	0.219	0.210	0.290	0.303	0.369
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.001	0.008	0.002	0.009	0.001	0.002
Number of instruments	131	169	93	92	111	83
Number of countries	92	92	92	100	92	92
Total number of observations	291	291	291	316	291	291

Table 5 continues in next page.

Table 5 (continued): Determinants of remittance outflows: Log of remittance outflow/GDP is the dependent variable (system GMM estimation of equation 3)

Explanatory variables	(7)	(8)		
Lag of the dependent variable	0.6241*** (3.37)	0.776*** (4.30)		
Growth volatility (log)	0.058 (0.13)	-0.033 (- 0.09)		
ROW growth volatility (log)	0.358* (1.67)	0.197 (1.26)		
Capital account openness	0.137 (1.24)	0.026 (0.26)		
Trade openness	0.005 (1.24)	0.007** (2.44)		
Inflation volatility (log)	0.053 (0.80)	-0.007 (- 0.05)		
Exchange rate volatility (log)	-0.006 (- 0.07)	-0.047 (- 0.77)		
Money supply	-0.000 (- 0.01)	-0.001 (- 0.17)		
Initial Polity2	-0.002 (- 0.06)	-0.001 (- 0.06)		
Initial GDP (log)	-0.242 (- 0.84)	-0.185 (- 0.69)		
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.309	0.442		
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.977	0.374		
Number of instruments	111	83		
Number of countries	92	92		
Total number of observations	291	291		

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-4: All variables except ROW growth volatility, polity2, and initial income are endogenous.

Columns 3-4: Only two lags are used as instruments.

Columns 5 and 6 replicate columns 1 and 3, respectively, but exclude investment-output ratio.

Columns 7 and 8: Replicate columns 5 and 6, respectively, by two-step estimation with Windmeijer (2005) corrected robust *t*-statistics.

ROW growth volatility is calculated by the formula in equation (2).

Table 6: Determinants of remittance outflows for low- and lower medium income countries: Log of remittance outflow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)	(3)	(4)	(5)	(6)
Lag of the dependent variable	0.537*** (3.78)	0.640*** (5.08)	0.668** (5.23)	0.712*** (6.23)	0.529*** (3.12)	0.626*** (4.05)
Growth volatility (log)	-0.136 (- 0.98)	-0.166 (- 1.27)	-0.269 (- 0.99)	-0.344 (- 1.29)	-0.184 (- 1.02)	-0.339 (- 1.14)
ROW growth volatility (log)	0.187 (1.62)	0.077 (0.80)	0.046 (0.47)	-0.049 (- 0.62)	0.311* (1.84)	0.247 (1.38)
Capital account openness	0.360*** (2.79)	0.241** (2.58)	0.289*** (2.91)	0.294*** (2.85)	0.314** (2.30)	0.245* (1.86)
Trade openness	0.010** (2.13)	0.009** (2.11)	0.012** (2.54)	0.011*** (2.72)	0.010* (1.87)	0.012** (2.54)
Inflation volatility (log)	0.069 (0.82)	0.042 (0.56)	0.005 (0.07)	-0.001 (- 0.01)	0.058 (0.72)	-0.011 (- 0.13)
Exchange rate volatility (log)	0.043 (0.47)	0.040 (0.44)	0.048 (0.50)	0.063 (0.76)	0.057 (0.60)	0.062 (0.57)
Money supply	0.016 (1.35)	0.013 (1.40)	0.010 (1.03)	0.013* (1.75)	0.007 (0.58)	-0.005 (- 0.38)
Initial Polity2	0.006 (0.33)	0.008 (0.49)	0.016 (0.86)		0.002 (0.14)	0.009 (0.50)
Initial GDP (log)	-0.614 (- 1.64)	-0.346 (- 1.02)	-0.368 (- 1.08)	-0.299 (- 0.95)	-0.368 (- 1.05)	-0.122 (- 0.38)
Investment-GDP ratio	-0.020 (- 0.97)	-0.025 (- 1.34)	-0.038* (-1.84)	-0.049** (-2.30)		
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.753	0.589	0.873	0.905	0.644	0.814
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.007	0.097	0.068	0.080	0.003	0.014
Number of instruments	130	151	91	90	111	82
Number of countries	53	53	53	57	53	53
Total number of observations	164	164	164	175	164	164

Table 6 continues in next page.

Table 6 (continued): Determinants of remittance outflows for low- and lower medium income countries: Log of remittance outflow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(7)	(8)		
Lag of the dependent variable	0.550 (1.15)	0.691* (1.87)		
Growth volatility (log)	-0.301 (-0.94)	-0.323 (-0.34)		
ROW growth volatility (log)	0.247 (1.30)	0.183 (0.34)		
Capital account openness	0.388 (0.66)	0.163 (0.33)		
Trade openness	0.010 (1.15)	0.010 (0.89)		
Inflation volatility (log)	0.016 (0.08)	-0.022 (-0.07)		
Exchange rate volatility (log)	0.052 (0.18)	0.065 (0.47)		
Money supply	-0.004 (-0.14)	-0.000 (-0.02)		
Initial Polity2	-0.003 (-0.07)	0.006 (0.23)		
Initial GDP (log)	-0.362 (-0.32)	-0.170 (-0.28)		
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.964	0.671		
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	1.000	0.998		
Number of instruments	111	82		
Number of countries	53	53		
Total number of observations	164	164		

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-4: All variables except ROW growth volatility, polity2, and initial income are endogenous.

Columns 3-4: Only two lags are used as instruments.

Columns 5 and 6 replicate columns 1 and 3, respectively, but exclude investment-output ratio.

Columns 7 and 8: Replicate columns 5 and 6, respectively, by two-step estimation with Windmeijer (2005) corrected robust *t*-statistics.

ROW growth volatility is calculated by the formula in equation (2).

Table 7: Determinants of remittance outflows for upper-medium and high income countries: Log of remittance outflow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)	(3)	(4)	(5)
Lag of the dependent variable	0.645*** (9.81)	0.693*** (10.08)	0.770*** (9.63)	0.588*** (9.71)	0.697*** (8.72)
Growth volatility (log)	0.130 (0.90)	0.148 (0.93)	0.223 (1.39)	0.081 (0.54)	0.163 (0.90)
ROW growth volatility (log)	0.083 (0.92)	0.068 (1.13)	0.085 (1.60)	0.073 (0.66)	0.074 (0.90)
Capital account openness	0.046 (0.54)	0.076 (0.81)	0.097 (0.93)	0.035 (0.37)	0.074 (0.72)
Trade openness	0.010*** (3.52)	0.006*** (3.09)	0.005** (2.34)	0.009*** (2.82)	0.005** (2.09)
Inflation volatility (log)	0.089 (1.32)	0.127 (1.63)	0.059 (0.71)	0.167*** (2.66)	0.097 (1.40)
Exchange rate volatility (log)	-0.043 (- 0.71)	-0.003 (- 0.06)	0.016 (0.30)	-0.082 (- 1.05)	-0.024 (- 0.36)
Money supply	0.003 (1.15)	0.003 (0.98)	0.002 (0.74)	0.002 (0.95)	0.002 (0.77)
Initial Polity2	-0.031* (- 1.94)	-0.028 (- 1.97)	-0.015 (- 1.03)	-0.041** (-2.34)	-0.021 (- 1.32)
Initial GDP (log)	0.017 (0.08)	0.118 (0.62)	0.020 (0.08)	0.216 (1.08)	0.169 (0.68)
Investment-GDP ratio	0.001 (0.04)	0.008 (0.54)	0.008 (0.56)		
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.999	0.922	0.735	0.848	0.886
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.399	0.489	0.774	0.494	0.680
Number of instruments	115	125	91	107	82
Number of countries	39	39	39	39	39
Total number of observations	127	127	127	127	127

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-3: All variables except ROW growth volatility, polity2, and initial income are endogenous.

Column 3: Only two lags are used as instruments.

Columns 4 and 6 replicate columns 1 and 3, respectively, but exclude investment-output ratio.

ROW growth volatility is calculated by the formula in equation (2).



Table 8: Determinants of net remittance flows: Log of net remittance flow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)	(3)	(4)	(5)	(6)
Lag of the dependent variable	0.557*** (5.30)	0.550*** (5.70)	0.597*** (5.31)	0.602*** (5.77)	0.621*** (2.83)	0.609*** (3.47)
Growth volatility (log)	0.046 (0.30)	0.056 (0.38)	-0.086 (- 0.38)	0.007 (0.03)	-0.050 (- 0.04)	-0.055 (- 0.05)
ROW growth volatility (log)	0.039 (0.12)	0.054 (0.18)	0.037 (0.12)	-0.018 (- 0.07)	0.070 (0.21)	-0.051 (- 0.16)
Capital account openness	0.202 (1.58)	0.160 (1.49)	0.099 (0.94)	0.104 (0.96)	0.106 (0.63)	0.143 (0.55)
Trade openness	0.010* (1.85)	0.011** (2.41)	0.009** (2.13)	0.007* (1.90)	0.008* (1.68)	0.008 (1.10)
Inflation volatility (log)	0.056 (0.50)	0.019 (0.19)	0.031 (0.29)	-0.034 (- 0.35)	0.067 (0.26)	0.007 (0.03)
Exchange rate volatility (log)	-0.032 (- 0.47)	-0.050 (- 0.79)	-0.034 (- 0.48)	-0.042 (- 0.59)	-0.056 (- 0.24)	-0.047 (- 0.17)
Money supply	-0.004 (- 0.60)	-0.006 (- 0.87)	-0.003 (- 0.51)	-0.007 (- 1.07)	-0.005 (- 0.70)	-0.008 (- 0.70)
Initial Polity2	-0.036* (-1.67)	-0.029 (- 1.41)	-0.025 (- 1.16)		-0.031 (- 0.66)	
Initial GDP (log)	-0.416 (- 1.37)	-0.373 (- 1.51)	-0.383 (- 1.57)	-0.489** (-2.25)	-0.312 (- 0.51)	-0.474* (-1.98)
Investment-GDP ratio	-0.035* (-1.94)	-0.035** (-1.99)	-0.033** (-2.10)	-0.030** (-2.05)	-0.029 (- 1.29)	-0.028 (- 1.26)
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.414	0.428	0.680	0.937	0.776	0.999
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.089	0.040	0.212	0.120	0.993	0.977
Number of instruments	127	144	91	91	91	91
Number of countries	67	67	67	72	67	67
Total number of observations	173	173	173	189	173	173

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-4: All variables except ROW growth volatility, polity2, and initial income are endogenous.

Columns 3-4: Only two lags are used as instruments.

Columns 5 and 6: Replicate columns 3 and 4, respectively, by two-step estimation with Windmeijer (2005) corrected robust *t*-statistics.

ROW growth volatility is calculated by the formula in equation (1).

Table 9: Determinants of net remittance flows for low- and lower medium income countries: Log of net remittance flow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)	(3)	(4)	(5)
Lag of the dependent variable	0.512*** (5.99)	0.509*** (6.91)	0.479*** (5.78)	0.490*** (5.76)	0.469 (1.54)
Growth volatility (log)	0.192 (1.25)	0.186 (1.18)	0.123 (0.61)	0.036 (0.19)	-0.056 (- 0.08)
ROW growth volatility (log)	0.275 (1.05)	0.298 (1.28)	0.279 (1.27)	0.282 (1.25)	0.226 (0.49)
Capital account openness	0.298* (1.82)	0.157 (1.52)	0.137 (1.22)	0.094 (0.93)	0.157 (0.76)
Trade openness	0.013** (2.58)	0.010*** (2.95)	0.012*** (3.46)	0.011** (2.62)	0.011 (1.56)
Inflation volatility (log)	-0.041 (- 0.39)	-0.047 (- 0.45)	-0.091 (- 0.86)	-0.090 (- 0.95)	-0.050 (- 0.21)
Exchange rate volatility (log)	0.012 (0.18)	0.008 (0.14)	0.019 (0.35)	-0.035 (- 0.61)	-0.051 (- 0.29)
Money supply	0.011 (1.08)	0.007 (0.90)	0.010 (1.12)	0.006 (0.92)	0.008 (0.51)
Initial Polity2	-0.008 (- 0.33)	0.007 (0.26)	0.015 (0.50)		
Initial GDP (log)	0.098 (0.41)	0.164 (0.95)	0.116 (0.59)	0.125 (0.62)	0.065 (0.17)
Investment-GDP ratio	-0.052** (-2.01)	-0.04* (- 1.88)	-0.044** (-2.29)	-0.042** (-2.35)	-0.044*** (-3.01)
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.647	0.617	0.605	0.861	0.935
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.077	0.104	0.140	0.069	0.999
Number of instruments	103	113	86	85	85
Number of countries	45	45	45	48	48
Total number of observations	120	120	120	127	127

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Columns 2-4: All variables except ROW growth volatility, polity2, and initial income are endogenous. Columns 3-4: Only two lags are used as instruments.

Column 5: Replicates column 4 by two-step estimation with Windmeijer (2005) corrected robust *t*-statistics.

ROW growth volatility is calculated by the formula in equation (1).

Table 10: Determinants of net remittance flows for upper-medium and high income countries: Log of net remittance flow/GDP is the dependent variable (system GMM estimation of equation 3)

<b>Explanatory variables</b>	(1)	(2)
Lag of the dependent variable	0.547*** (3.30)	0.610*** (4.69)
Growth volatility (log)	-0.143 (-0.71)	-0.219 (-1.01)
ROW growth volatility (log)	-0.320 (-0.86)	-0.496* (-1.69)
Capital account openness	0.354** (2.56)	0.132 (1.04)
Trade openness	0.016*** (2.63)	0.008** (2.04)
Inflation volatility (log)	0.055 (0.30)	-0.011 (-0.07)
Exchange rate volatility (log)	-0.019 (-0.14)	-0.054 (-0.58)
Money supply	-0.023*** (-3.80)	-0.015** (-2.21)
Initial Polity2	-0.019 (-0.29)	-0.017 (-0.39)
Initial GDP (log)	-0.195 (-0.34)	-0.703 (-1.63)
Investment-GDP ratio	-0.077** (-2.00)	-0.032 (-1.20)
AR(2) coefficient of the first-differenced errors ( <i>p</i> -value)	0.562	0.710
Sargan statistic of overidentifying restrictions ( <i>p</i> -value)	0.892	0.964
Number of instruments	62	71
Number of countries	22	22
Total number of observations	53	53

Figures in the parentheses are Arellano-Bond robust *t*-statistics. \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10% level, respectively. All equations contain a constant and time dummies but they are not reported. Column 1: All variables except ROW growth volatility, polity2, trade openness, capital account openness, and initial income are endogenous.

Column 2: All variables except ROW growth volatility, polity2, and initial income are endogenous. Only two lags are used as instruments.

ROW growth volatility is calculated by the formula in equation (1).

## Figures

Figure 1: Average remittance inflows (1970=100)

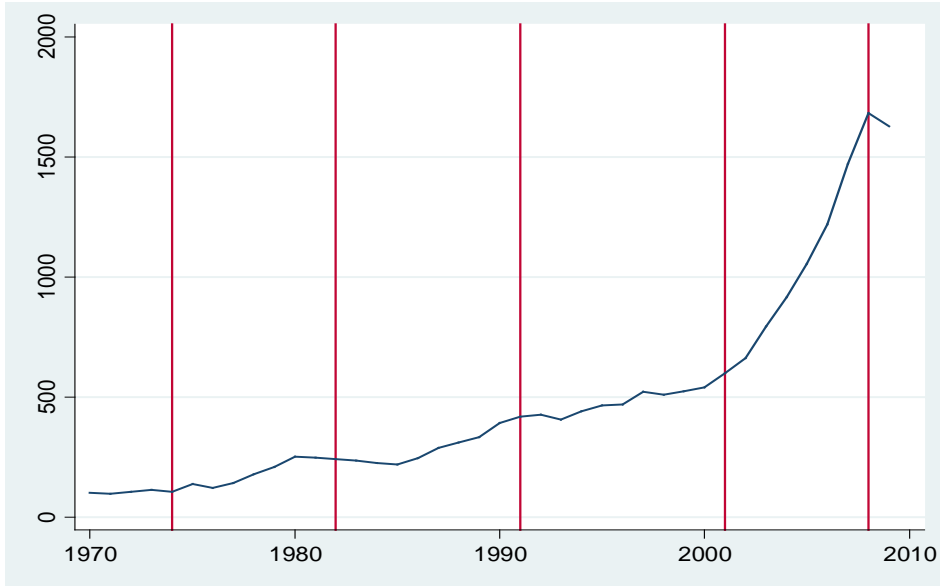


Figure 2: Average remittance inflows to low and lower-medium income countries (1970=100)

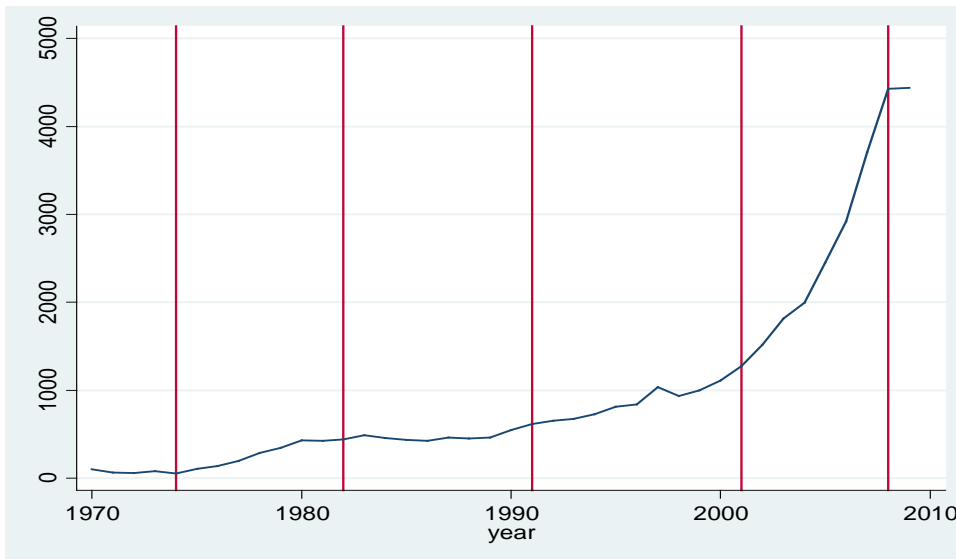


Figure 3: Average remittance inflows to high-income countries (1970=100)

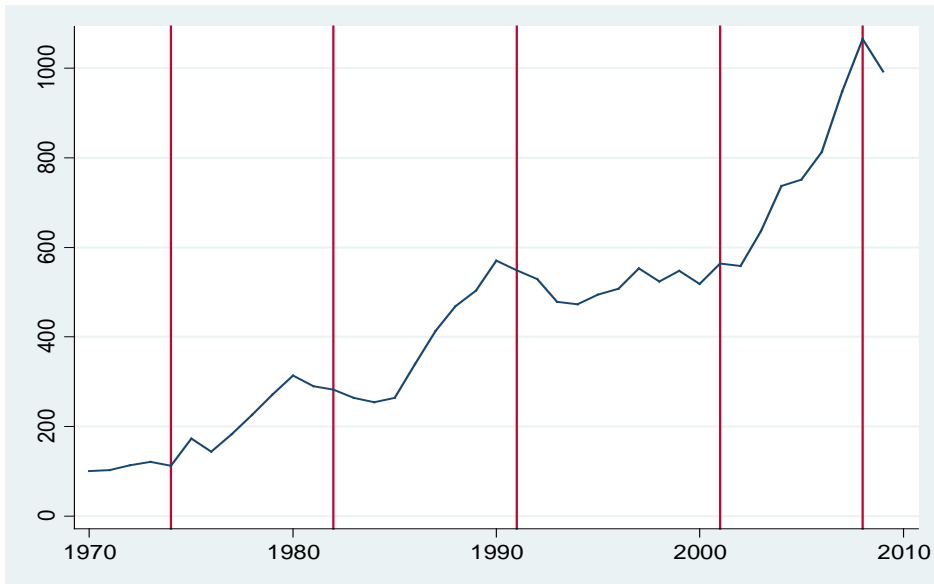
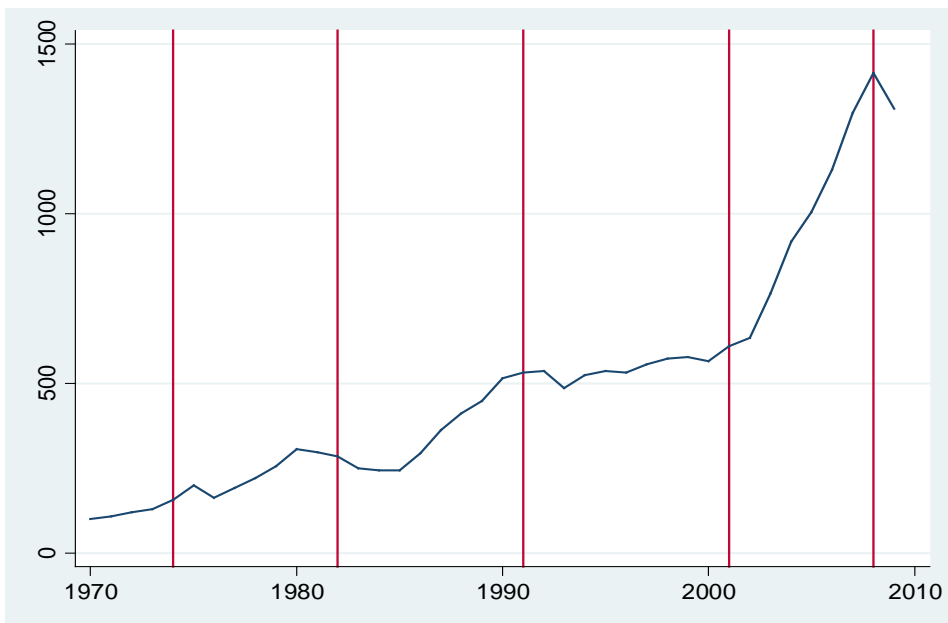


Figure 4: Average remittance inflows to upper-medium and high-income countries (1970=100)



**Appendix:**

<b>Variables</b>	<b>Data source</b>
Remittance flows	World Bank
Real GDP	Penn World Table 6.2
Investment-GDP ratio	Penn World Table 6.2
Openness (X + M as a % GDP)	World Bank
Nominal exchange rate	World Bank
M2-GDP ratio	World Bank
CPI inflation	World Bank
Capital account openness	Chinn and Ito (2008)
Polity2	Polity IV Project: Political Regime Characteristics and Transitions, 1800-2007