

# Migration and Remittances: Causes and Linkages<sup>1</sup>

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## *Abstract*

The paper empirically examines the determinants of remittance flows at the cross-country level. It considers, among other things, the significance of the level of migration, the education level of migrants and financial sector development in determining remittances. Given the potential endogeneity problems, the migration and financial development variables are instrumented in the estimation. The migration level is found to be the main driver of remittance flows even after controlling for the endogeneity bias through instrumental variable estimation. We find that the education level of migrants relative to the population in home countries, the size of the economy, and the level of economic development of recipient countries adversely affect remittance flows. While the effect of financial sector development is found to be positive, its significance was not strongly supported in our analysis.

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## **Non-technical summary**

The paper empirically examines the determinants of remittance flows at the cross-country level. It considers, among other things, the significance of the level of migration, the education level of migrants, and financial sector development of home countries in determining the amount of remittances sent internationally. One of the key issues that need to be addressed in this type of analysis is the potential endogeneity bias, or possible reverse causality between remittances and the stock of migrants as well as between remittances and financial sector development. The paper accounts for these endogeneity problems by instrumenting the level of migration and financial development by appropriate variables. The migration level is found to be the main driver of remittance flows even after controlling for the endogeneity bias through instrumental variable estimation. This implies that migration seems to provide an important source of foreign exchange much needed for economic development of home countries. We also find that the education level of migrants relative to the population in home countries adversely affects remittance flows, which indicates that migrants from less well-off families seem to be remitting more to their families. Moreover, poorer countries are found to be receiving relatively more remittances. These findings seem to suggest some possible positive impact of remittances on the welfare of recipient families and of home countries. Finally, while the effect of financial sector development is found to be positive, its significance was not strongly supported in our analysis.

## 1. Introduction

The recent years have witnessed a dramatic increase in migrant remittances to developing countries. Officially recorded remittances, measured as the sum of workers' remittances, compensation of employees, and migrant transfers, are estimated to have increased from US\$58 billion in 1995 to US\$167 billion in 2005. This growth rate has outpaced that of private capital flows and official development assistance (ODA) over the last decade, making remittances the second largest source of external funding for developing countries after foreign direct investment (FDI) (World Bank, 2005).

There are several factors that are said to explain for the recent increase in remittance flows. They include better data collection, growth in the number of migrants and their income, lower costs and wider networks in the industry that supports remittances, and government policies that improve banking access and the technology of money transfers, which promote transfers through official channels (World Bank, 2005). Whatever the reasons behind this surge, the growing importance of remittances as a source of foreign exchange has certainly attracted an increasing attention from policy-makers and academics as a potential means for economic development.

It is evidently important for developing countries to understand the determinants of remittances so that appropriate policies can be formulated to enhance access to remittances. The existing empirical research has, however, been rather limited and tended to be at the microeconomic level based on household surveys. Although there have been a number of studies that examine the response of remittance flows to macroeconomic factors (e.g. El-Sakka and McNabb, 1999; Aggarwal *et al.*, 2005; Freund and Spatafora, 2005), the work in this area is less established. The main aim of this paper is therefore to improve our current understanding of how remittance flows are determined at the macroeconomic level. It also attempts to address some of the econometric issues that are inherent in this type of analysis, which are often overlooked in the existing literature.

The rest of the paper is structured as follows. The next section reviews the existing work on the determinants of remittances, identifies some of their limitations and describes how the present paper can contribute to the current literature. Section 3 provides a brief description of the data employed for the empirical analysis and specifies the estimation models. Section 4 presents the estimation results. The final section summarizes the findings and draws out some policy implications.

## **2. Literature on Determinants of Remittances**

The existing literature on the determinants of remittances is largely based on microeconomic analyses. Lucas and Stark (1985), for instance, provided a pioneering work on the potential motives of migrant workers to remit home on the basis of the data drawn from the National Migration Study of Botswana. They consider several hypotheses for motivations to remit, ranging from pure altruism to pure self-interest. In the case of pure altruism, migrants send part of their income to their home countries to increase the well-being of family members by providing them with additional income. As for the case of pure self-interest, on the other hand, they remit in order to purchase durable goods and invest in housing, land, or business at home. In addition to these two cases, they propose tempered altruism or enlightened self-interest as a complementary alternative based on the view that remittances are part of a self-enforcing contractual arrangement between migrant and family, that are of mutual benefit. The migrant adheres to the arrangement as long as it is in his or her interest to do so, which may be either altruistic or more self-seeking (Lucas and Stark, 1985). Much of the existing work based on the micro data follows this approach (e.g. Aggarwal and Horowitz, 2002; Ilahi and Jafarey, 1998).

A macro-level analysis of remittances is, on the other hand, less established. Aggregate remittance flows are likely to reflect the underlying microeconomic considerations that determine individual decisions to remit (El-Sakka and McNaab, 1999). As a result, some of the macroeconomic variables that have been examined include those concerning the economic conditions of home country as well as investment variables such as interest rate

differentials between home and host country (e.g. El-Sakka and McNabb, 1999; Higgins *et al.*, 2004; Straubhaar, 1986; Swamy, 1981). Nonetheless, there is little consensus on the key macroeconomic determinants of remittance flows. Straubhaar (1986), for instance, finds that remittance flows to Turkey from Germany are not affected by exchange rate variations or by changes in the real rate of return on investment. On the other hand, using the data for Egypt, El-Sakka and McNabb (1999) find that both exchange rate and interest rate differentials are important in attracting remittances through official channels.

Although country-specific work such as those noted here is useful in its own right, this limits us from generalizing the findings. There have been a number of studies that examine the macroeconomic determinants of remittances using cross-country or panel data sets in recent years. Freund and Spatafora (2005), for example, estimate a model of the determinants of remittances to developing countries in order to assess the volume of informal remittance flows. They consider such variables as the cost of sending remittances through formal channels, the presence of exchange-rate and other economic distortions, migration levels, and other country characteristics. They find that the stock of migrants in OECD countries is the primary determinant of remittances based on a panel data analysis. They also find that money transfer fees and the presence of dual exchange rates reduce remittances. In addition, their results show that transactions costs are systematically related to concentration in the banking sector, lack of financial depth, and exchange rate volatility (Freund and Spatafora, 2005).

Similarly, Buch and Kuckulenz (2004) investigate the determinants of remittances as well as of private and official capital flows using panel data. They find that traditional variables such as economic growth, the level of economic development, and proxies for the rate of return on financial assets do not have a clear impact on remittance flows. They argue that this may be because workers' remittances share features of private and official capital flows, which are driven by different macroeconomic factors. These similarities are caused by the fact that remittances are to a large extent market-driven, but also influenced by social considerations of migrants (Buch and Kuckulenz, 2004).

Young (2005), on the other hand, examine the impact of hurricanes on various types of international financial flows to developing countries based on a panel data set. Their results show that greater hurricane exposure leads to large increases in foreign aid. For other types of international financial flows, they find the varying impact of hurricanes according to income level. In the poorer half of the sample, for instance, hurricane exposure is found to generate substantial increases in migrants' remittance flows.

These studies have certainly provided us with a broader view of how remittance flows are determined. However, there is still a great scope for improving our current understanding of the issue. One of the factors that deserve more attention is the impact of the education level of migrant workers on remittances at the cross-country level. If a larger proportion of migrants are highly educated, they are more likely to earn higher income and thus remit more. Yet it can be said that educated migrants tend to come from better-off families who rely less on remittances for their livelihood. It is therefore not clear as to which force dominates (Ozden, 2006).

Another important determinant we should examine is financial sector development of recipient countries. While several studies have examined investment or portfolio variables as noted above, there is little work that assesses the effect of financial development on remittance flows at the macroeconomic level. Exceptions are the studies carried out by Aggarwal *et al.* (2005) and Freund and Spatafora (2005), though the former looks at the impact of remittances on financial sector development of recipient countries instead. Based on a panel data analysis, the results from Aggarwal *et al.* (2005) show how the positive effects of remittances on the development of financial sector measured as the ratio of bank deposit or credit to GDP. They, however, also recognize the possibility that better financial development leads to larger measured remittances either because financial development enables remittance flows or a larger percentage of remittances are measured when those remittances flow through formal channels. Additionally, financial development might lower the transaction costs, which in turn increase remittances. Aggarwal *et al.* (2005) therefore account for this potential reverse causality through instrumental variable (IV) and Arellano-Bond Generalized Method of

Moments (GMM) estimations. It would thus be interesting to test the significance of financial sector development as a determinant of remittances. Freund and Spatafora (2005) do include the financial development variable in their panel regression of the determinants of remittances and find its positive and significant effect on remittance flows. However, they do not control for any reverse causality between financial sector development and remittance levels as found in Aggarwal *et al.* (2005).

Finally, a growing number of migrants is said to be partly responsible for the recent increase in remittance flows. Indeed, Freund and Spatafora (2005) find the stock of migrants to be the main determinant of remittances. Nevertheless, one of the crucial issues in the migration literature is that migrants are not a random sample of the underlying native population of home country. While the number of migrants abroad affects the level of remittances, the desire to remit also influences the migration level (Ozden, 2006). The possibility of this endogeneity bias is unfortunately not considered in Freund and Spatafora (2005) and it is important to see if their finding is consistent even after controlling for the endogeneity bias.

In sum, this paper aims to contribute to the existing literature by examining the impact on remittance flows of, among other things, the following three factors: (1) the education level of migrants; (2) financial sector development of recipient countries; and (3) the level of migration. The endogeneity issues regarding the latter two variables will be taken into account in our estimation.

### **3. Data and Econometric Specification**

The data used for our analysis covers 85 countries, for which we have observations for all the variables employed in the estimation. Although it would be ideal to have a panel data set, we will concentrate our analysis on a single point in time, 2000, given that there are no time-series data on the number of migrants abroad, their education level and the passport costs. Aggregate data on remittances come from the IMF's *Balance of Payment*

statistics, which are the sum of the three items, namely workers' remittances, compensation of employees, and migrants transfers. The number of migrants in OECD countries and the ratio of those with tertiary education among migrants and among the working population in home country come from Docquier and Marfouk (2005). The percentage of passport cost to GDP per capita is obtained from McKenzie (2005). Our financial sector development variables, namely the ratio of bank deposit and credit to GDP, are from the IMS's *International Financial Statistics*. The rest of the variables mostly come from the *World Development Indicators*. Appendix I provides a description of the variables and their sources in more details.

Table 1 summarizes the mean values of some of the key variables by regions in order to provide an overview of the variations across countries. The ratio of remittances to GDP is found to be the highest in the Middle Eastern and North African countries, followed by the Sub-Saharan countries. As for the level of migration, in terms of its ratio to the population, Western Europe has the highest level and the Americas are the second largest source of migrants. The positive figures for the difference between the ratio of people with tertiary education among migrants and the ratio among the working population in home country indicate the higher level of education among migrants for all the regions. The difference is found to be the greatest for Sub-Saharan Africa and South Asia. In addition, we observe the expected variations in GDP per capita, the ratio of bank deposit/credit to GDP across the regions. If we were to examine the variation across countries, they would be even greater.

Our empirical analysis will thus examine whether the following factors explain some of the observed variation in remittance flows.

### ***Stock of migrants abroad***

As Freund and Spatafora (2005) find in their work, the level of migration is likely to be the most important determinant of the size of remittances. This variable will be expressed as the logarithm of migrants abroad in our estimation. The key issue that needs to be properly addressed is the endogeneity bias since the desire to send remittances is among



the main reasons behind the migration decision of most people. We control for the endogeneity bias through the IV estimation. The female labor market participation rate, the population density, the percentage of urban population, and the passport cost as a share of GDP per capita of home country are employed as an instrument for the level of migration.

### ***Education level of migrants***

We construct a variable which is the difference between the percentage of tertiary educated among the migrants and the percentage of tertiary educated among the whole population in the sending country. This variable, in a sense, captures the relative educational bias of the migrants. If it is high, it means the migrants are positively selected from the higher end of the education distribution. The expected sign of its effect is unclear as there are some countervailing forces. On the one hand, a higher level of education among migrants relative to the people in their home countries enables migrants to earn more and thus remit more. On the other hand, it implies that these migrants are likely to come from better-off households relative to the rest of the population and thus there is less need to send money to their families at home. In addition, it is easier for educated migrants to obtain legal residency in the destination country and bring their immediate families over with them, which would decrease the incentives to remit money back home (Ozden, 2006).

### ***Financial Sector Development***

The more developed and efficient the financial sector of recipient countries is, the more likely that it allows migrants to send money through formal channels as it lowers the transaction costs and also increases the accessibility of recipients to the money sent through the formal banking system. Hence we will assess whether financial sector development has any positive impact on remittance flows using the ratio of both the bank deposit and credit to GDP separately. Recall, however, that the recent work by Aggarwal *et al.* (2005) shows that the level of remittances also has a positive impact on the development of the financial sector of recipient countries. We therefore control for the possible endogeneity bias by instrumenting these financial development variables by

inflation rate, a dummy variable for the existence of dual exchange rate arrangements, and another dummy for controlling for countries with British legal origin (i.e., whether their legal system is based on Common Law) as they are suggested in Aggarwal *et al.* (2005) as the determinants of financial sector development.

***Economic conditions of recipient countries***

As a proxy for the general state of the development and size of recipient countries' economy, we will also include the logarithm of GDP per capita and of total GDP. The former measures the level of economic development of recipient countries and the expected sign of the coefficient would be negative because migrants from wealthier countries are likely to have less incentive to remit. As for the logarithm of GDP, which captures the size of recipient countries' economy, we would again expect the sign to depend on the dependent variable. For example, if the dependent variable is the (natural log of) remittances, then this should increase with the size of the country since larger countries, such as China or India, receive more in absolute amount. If the dependent variable is remittance/GDP ratio, we would expect this to decrease with the country size. There is much evidence that argues smaller and isolated small economies are less likely to sustain many economic activities, which induces their citizens to migrate. In addition to these variables, the rate of economic growth of recipient countries is included in the estimation equation. Its expected impact on remittance flows is not very clear. It can be argued that the growing economy reduces the incentives to migrate and hence implies less remittances to those countries. Yet it is equally possible that the high economic growth rate induces migrants to invest more at home and thus increases remittance inflows to home countries.

In order to empirically examine the significance of these factors as the determinants of remittance flows, the following equation will be estimated:

$$(1) \quad REM_i = \alpha + \beta_1^1 MIG_i + \beta_1^2 FD_i + \beta_1^3 GDP_i + \beta_1^4 GDPgrowth_i + \beta_1^5 Edu_i + u_i$$

where  $i$  refers to the remittance recipient country  $i$ . For our dependent variable,  $REM_i$ , we will try three different variables, namely the ratio of remittances to GDP, the logarithm of GDP, and the logarithm of remittances in per-capita terms.  $MIG_i$  is the level of migration from country  $i$ . We express this either as the logarithm of migrants abroad or as the ratio to population size of home country  $i$ .  $FD_i$  is financial sector development variables of country  $i$ , which are either the ratio of bank deposit or credit to GDP. As for  $GDP_i$ , both the logarithm of GDP and of GDP per capita are employed.  $GDPgrowth_i$  is the growth rate of GDP of country  $i$  and  $Edu_i$  is the difference between the ratio of people with tertiary education among migrants and the ratio among the working population in their home countries.  $\alpha_i$  and  $\beta_i$  are parameters to be estimated and  $u_i$  is the error term. Table 2 summarizes all the variables employed for the estimation.<sup>2</sup>

We start by estimating equation (1) by Ordinary Least Squares (OLS) by ignoring any possible endogeneity problems. We will then estimate it through the IV estimation, first only instrumenting the migration variables and then instrumenting both the migration and financial development variables.

#### 4. Estimation Results

The estimation results are reported in Tables 3-6. All the columns headed by (1) imply that the ratio of bank deposit to GDP is used as a variable for financial sector development, while those headed by (2) imply that the ratio of bank credit to GDP is employed for the estimation. In order to check the validity of our set of instruments, the Hansen J statistics for the overidentification test are reported at the bottom of the tables (Tables 4, 5 and 6). The results support the validity of our instruments, i.e., they are uncorrelated with the error term and excluded instruments are correctly excluded from the estimated equation.<sup>3</sup>

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<sup>2</sup> These dependent variables are constructed based on the average value of remittances to country  $i$  during the period between 1998 and 2002.

<sup>3</sup> The regression presented in column 8 of Table 5 marginally fails the overidentification test and this should be taken into account when discussing the results.

The effect of the level of migration on remittance flows seems rather ambiguous if we look at the results from the OLS estimation (Table 3). However, if we instrument the migration variables, the coefficient uniformly becomes greater and significant (Table 4). According to our OLS estimates, if the number of migration increases by one percent, this would increase remittance flows by about 0.4 percent (column 3 of Table 3), while it is found to increase remittances by about one percent based on the IV estimation results (column 3 of Table 4). This seems to support our argument that the endogeneity issues need to be addressed in the estimation. Note that if we instrument both the migration and financial development variables, the impact of the level of migration on remittances is somewhat attenuated. Based on these results, a one percent increase in the number of migrants would result in a 0.7 percent increase in remittance flows (column 3 of Table 5). This implies that an increase in the level of migration would decrease remittances sent by each migrant, which is likely to be due to family reunification effect. Similar patterns are also observed when using the ratio of the number of migrants to the population size as our migration variable (columns 7-10 of Tables 3-5).

The impact of the financial sector development of recipient countries is not as clear as in the case of the migration level (Tables 3-5). When controlling for the endogeneity bias, the coefficients become greater, but significant only marginally (Column 1, 2, 5 and 6 of Table 5). The effect of the financial sector development on remittances seems positive as claimed in the existing literature, but further work seems needed to examine its significance in determining remittance flows.

As far as the education level of migrants is concerned, its effect is not always significant. However, when it is significant, the difference between the ratio of people with tertiary education among migrants and the ratio among the working population of home country adversely affects remittance flows. In other words, the higher the education level of migrants relative to the population in their home countries, the lower the amount of money sent home. This in turn underlines the notion that if migrants come from relatively

better-off families, they remit less as their family rely less on remittances for their livelihood.

As for the economic condition of recipient countries, the economic growth rate of home country does not seem to have any effect on remittance flows. This is consistent with some of the existing literature (e.g. Buch and Kuckulenz, 2004). This is likely to be due to the fact that the two countervailing forces described above – high economic growth may reduce the incentives to migrate and hence less remittances, but it can also induce migrants to invest more at home – cancel out.

Based on the IV estimation results (Table 5), as we would expect, the size of the domestic economy measured as the logarithm of GDP is found to positively affect the overall flow of remittances, but it is negatively correlated with remittances relative to GDP. In other words, the smaller domestic economy has relatively limited opportunities for economic activities, and migrants have to remit more to support their families at home. The effect of the level of economic development expressed as the logarithm of GDP per capita is negative and significant with the exception where we normalize remittances by population. This implies that migrants from poorer countries remit a greater amount of money to their families at home as would be expected.

One of caveats of our analysis, however, is that our data on migration only includes the migrants in OECD countries. As a consequence, for those countries that send their migrants to non-OECD countries, to the Gulf countries for example, the number of migrants is certainly underestimated. In order to assess its effect, we repeated some of the IV estimation based on the sample excluding Bangladesh, India, Pakistan, the Philippines, and Sri Lanka which are thought to be sending a relatively large number of migrants to non-OECD countries. The results are presented in Table 6. The results do not change significantly with the exception of the coefficient on the migration level in one specification (column 5 in Table 6) that loses its significance when estimated on the sub-sample. Hence the robustness of our findings is generally supported.

In sum, the results presented in this paper highlight the critical role played by the level of migration in determining remittance flows. The education level of migrants, the size of the domestic economy, the level of economic development of recipient countries, and financial sector development, though a smaller extent, also explain some of the variations observed in remittance flows across the countries. The results also underline the importance of controlling for the endogeneity bias in estimating the determinants of remittances.

## **5. Conclusion and Policy Implications**

The paper has examined empirically the significance of some of the key factors in determining remittance flows based on the cross-country data. The results show that the level of migration is the main driver of remittances even after controlling for the endogeneity bias through the IV estimation. Among the other variables we have examined, the education level of migrants, the size of the domestic economy, the level of economic development of recipient countries are found to play a role in determining the flow of remittances. Financial sector development seems to have a positive impact on remittances, but its significance is found to be less clear. Our findings also illustrate the importance of accounting for the potential endogeneity bias in the estimation.

Some important policy implications can be drawn from these findings. Firstly, the negative influence of the difference in the education level of migrants and the population in home countries indicates that migrants from less well-off families seem to be remitting more to their families. Moreover, poorer countries are found to be receiving relatively more remittances. These findings seem to suggest some possible positive impact of remittances on the welfare of recipient families and of recipient countries, though a more detailed microeconomic analysis is obviously required to make any definitive conclusion. Finally, based on the findings that the migration level is one of the main determinants of remittance flows, migration seems to provide an important source of foreign exchange much needed for economic development of recipient countries. However, as the number

of migrants increases, the amount of money sent home per migrant is found to decrease due, partly, to the family reunification effects.

Further analysis is obviously required to examine the robustness of the findings presented in this paper. Despite the limited availability of data, a panel data analysis certainly merits future work. Moreover, our empirical estimation was conducted based on the officially measured remittance data. We are therefore not able to generalize our findings on the determinants of remittance flows to the case of remittances transferred through informal channels. Because of their particular relevance to the economic development of developing countries, more empirical work on informal remittance flows is certainly required. This in turn indicates the need for further efforts in collecting data on migration and remittances.

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## Appendix I Variable Definitions and Sources

Variable name	Description	Source
<b>Remittances to GDP</b>	Ratio of remittances to GDP (%), where remittances are defined as the sum of “workers’ remittances”, “compensation of employees” , and “migrants’ transfers” (see Appendix A in Freund and Spatafora (2005)).	Balance of Payments Statistics (IMF)
<b>Log of remittances</b>	Log of remittances (constant 2000 US\$), which are calculated by multiplying the ratio of remittances to GDP by GDP figures.	Remittances: Balance of Payments Statistics (IMF) GDP: World Development Indicators
<b>Log of remittances per capita</b>	Log of remittances per capita (constant 2000 US\$).	Remittances: Balance of Payments Statistics (IMF) Population: World Development Indicators
<b>Log of migrants abroad</b>	Log of total number of migrants in OECD countries.	Docquier and Marfouk (2005)
<b>Ratio of migrants to population</b>	Ratio of total number of migrants in OECD countries to the population size of home countries (%).	Migrants: Docquier and Marfouk (2005), Population: World Development Indicators
<b>Difference between ratio of people with tertiary education among migrants and the ratio among the working population in home country</b>	Difference between the ratio of people with tertiary education among migrants and the ratio among the working population in home country (%).	Docquier and Marfouk (2005)
<b>Bank credit to GDP</b>	Bank credit to GDP calculated as: $\{(0.5)*[F(t)/P_e(t) + F(t-1)/P_e(t-1)]\}/[GDP(t)/P_a(t)]$ where F is credit by bank deposit money to the private sector (lines 22d), GDP is line 99b, P_e is end-of-period CPI (line 64) and P_a is the average CPI for the year.	International Financial Statistics (IMF)
<b>Bank deposit to GDP</b>	Bank deposit to GDP calculated as: $\{(0.5)*[F(t)/P_e(t) + F(t-1)/P_e(t-1)]\}/[GDP(t)/P_a(t)]$ where F is demand and time and saving deposits, and the rest as defined as above.	International Financial Statistics (IMF)
<b>Dual exchange rate</b>	Dual exchange rate (1 indicates the presence of multiple exchange rates).	Annual Report on Exchange Arrangements and Exchange Restrictions (IMF)
<b>British legal origin</b>	British legal origin (1 indicate countries with Common Law origin).	La Porta, López de Silanes, Shleifer and Vishny

		(1998)
<b>Log of GDP</b>	Log of GDP (constant 2000 US\$).	World Development Indicators
<b>Log of GDP per capita</b>	Log of GDP per capita (constant 2000 US\$).	World Development Indicators
<b>GDP growth</b>	GDP growth (annual %).	World Development Indicators
<b>Inflation</b>	Inflation, consumer prices (annual %).	World Development Indicators
<b>Passport cost to GDP per capita</b>	Passport cost normalized by the country's GDP per capita expressed in US dollars, inflation adjusted: (passport cost/ GDP current dollars per capita)*100/((1+inflation90/100)(1+inflation91/100)...((1+inflation2004/100))	Passport cost: McKenzie (2005)*; GDP: World Development Indicators
<b>Female labor market participation rate</b>	Female labor market participation rate (%) – percentage of female population aged 15-64 who are in labor market.	World Development Indicators
<b>Population density</b>	Population density (people per sq km).	World Development Indicators
<b>Urbanization</b>	Urban population (%) – percentage of population living in the urban sector.	World Development Indicators

**Table 1: Summary Statistics by Regions (mean)**

	Rem/GDP (%)	Mig/Pop (%)	Difference in ratio of tertiary edu. (%)	Bank deposit/GDP (%)	Bank credit/GDP (%)	GDP per capita (US\$)	GDP growth rate (%)
<b>Americas</b>	1.44	2.41	25.5	25.1	24.9	3191	2.09
<b>Western Europe</b>	0.48	3.60	15.7	75.0	98.1	21432	3.23
<b>Eastern and Central Europe</b>	0.88	1.55	27.5	25.2	17.7	2931	3.83
<b>Middle East and North Africa</b>	3.37	2.09	21.0	53.2	38.7	4827	3.84
<b>Sub-Saharan Africa</b>	2.94	0.39	51.9	22.1	21.3	940	3.03
<b>South Asia</b>	2.47	0.21	50.9	39.6	25.5	463	5.39
<b>East Asia and Pacific</b>	0.59	0.36	43.3	101.9	97.7	7376	5.50
<b>Total</b>	1.46	0.92	40.3	64.0	59.3	7374	4.64

**Note:** Figures are weighted by the population. They are based on the mean values for the period between 1998-2002 except for logarithm of migrants abroad, the ratio of migrants to population, and the difference between the ratio of people with tertiary education among migrants and the ratio among the working population in home country, which are the figures for the year 2000

**Table 2: List of Dependent and Explanatory Variables**

	Mean	S.D.
<i>Dependent variables</i>		
Ratio of remittances to GDP (%)	2.839	4.601
Logarithm of remittances	19.488	1.985
Logarithm of remittances per capita	3.262	1.586
<i>Independent variables</i>		
Logarithm of migrants abroad	12.188	1.620
Ratio of migrants abroad to population size	4.902	7.587
Ratio of bank deposit to GDP	0.475	0.299
Ratio of bank credit to GDP	0.485	0.375
Logarithm of GDP	24.171	2.229
Logarithm of GDP per capita	7.946	1.508
GDP growth rate (%)	3.470	2.218
Difference between the ratio of people with tertiary education among migrants and the ratio among the working population in home countries (%)	22.371	15.297
<i>Instrumental variables</i>		
Female labor market participation rate (%)	55.955	13.471
Population density (people per sq km)	140.547	191.142
Urbanization (%)	57.335	21.632
Passport cost (% of GDP per capita)	3.003	5.698
Inflation rate (%)	8.110	13.723
Dummy for dual exchange rate	0.059	
Dummy for British legal origin	0.329	

Note: All the variables are the mean values for the period between 1998-2002 except for logarithm of migrants abroad, the ratio of migrants to population, and the difference between the ratio of people with tertiary education among migrants and the ratio among the working population in home country, which are the figures for the year 2000.

**Table 3: Regression Results: OLS Estimation**

	Rem/GDP		Log of Rem		Log of Rem per capita		Rem/GDP		Log of Rem	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<b>Log of migrants abroad</b>	0.592 [0.811]	0.644 [0.791]	0.427*** [0.811]	0.444*** [0.791]	-0.007 [0.811]	0.008 [0.791]				
<b>Migrants/Population</b>							0.174 [0.116]	0.181 [0.111]	0.054** [0.024]	0.058** [0.025]
<b>Bank deposit/GDP</b>	1.464 [1.329]		0.609 [0.667]		0.798 [0.773]		0.663 [1.392]		0.551 [0.690]	
<b>Bank credit/GDP</b>		0.670 [0.995]		0.490 [0.512]		0.447 [0.649]		0.190 [1.009]		0.416 [0.535]
<b>Log of GDP</b>	-1.012** [0.468]	-1.035** [0.457]	0.538*** [0.110]	0.527*** [0.105]			-0.220 [0.341]	-0.199 [0.326]	0.920*** [0.116]	0.928*** [0.118]
<b>Log of GDP per capita</b>	-0.721 [0.461]	-0.644 [0.453]	-0.400** [0.165]	-0.410** [0.174]	0.229 [0.148]	0.245 [0.174]	-1.298*** [0.323]	-1.266*** [0.336]	-0.683*** [0.178]	-0.701*** [0.195]
<b>GDP growth</b>	-0.232 [0.254]	-0.221 [0.259]	-0.05 [0.066]	-0.048 [0.067]	-0.039 [0.075]	-0.033 [0.074]	-0.192 [0.258]	-0.184 [0.263]	-0.041 [0.069]	-0.038 [0.071]
<b>Diff. in the ratio of tertiary edu.</b>	-0.04 [0.039]	-0.036 [0.038]	-0.011 [0.011]	-0.011 [0.011]	-0.033*** [0.011]	-0.031*** [0.012]	-0.058* [0.030]	-0.056* [0.029]	-0.026*** [0.010]	-0.026*** [0.010]
<b>Constant</b>	26.961*** [7.960]	26.485*** [7.863]	4.648** [1.868]	4.807** [1.858]	2.172 [1.838]	1.974 [1.972]	19.480** [8.147]	18.845** [7.833]	3.022 [2.298]	3.002 [2.344]
<b>Observations</b>	85	85	85	85	85	85	85	85	85	85
<b>R2</b>	0.285	0.280	0.636	0.635	0.289	0.281	0.321	0.320	0.618	0.617
<b>F-statistic (p-value)</b>	5.73 (0.00)	5.33 (0.00)	22.05 (0.00)	22.60 (0.00)	8.08 (0.00)	7.93 (0.00)	5.06 (0.00)	5.01 (0.00)	20.53 (0.00)	20.72 (0.00)

Note: Figures in parentheses are robust standard errors. \*\*\*significant at 1% level, \*\*significant at 5% level, and \*significant at 10% level.

The ratio of bank deposit to GDP is used in (1) and the ratio of bank credit to GDP is used in (2).

**Table 4: Regression Results: IV Estimation (1)**

	Rem/GDP		Log of Rem		Log of Rem per capita		Rem/GDP		Log of Rem	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<b>Log of migrants abroad</b>	2.663***	2.689***	1.046***	1.070***	0.619**	0.650**				
	[0.787]	[0.778]	[0.317]	[0.300]	[0.312]	[0.272]				
<b>Migrants/Population</b>							0.716***	0.620***	0.269**	0.232***
							[0.245]	[0.210]	[0.111]	[0.087]
<b>Bank deposit/GDP</b>	-0.168		0.121		0.060		-3.275		-1.010	
	[1.274]		[0.721]		[1.212]		[2.351]		[1.331]	
<b>Bank credit/GDP</b>		-0.003		0.285		-0.062		-1.492		-0.253
		[1.128]		[0.561]		[0.942]		[1.518]		[0.825]
<b>Log of GDP</b>	-2.165***	-2.182***	0.193	0.176			1.217**	0.956**	1.490***	1.387***
	[0.657]	[0.659]	[0.213]	[0.202]			[0.536]	[0.433]	[0.254]	[0.204]
<b>Log of GDP per capita</b>	0.152	0.139	-0.139	-0.171	0.196	0.211	-2.316***	-2.181***	-1.086***	-1.064***
	[0.504]	[0.505]	[0.231]	[0.228]	[0.182]	[0.206]	[0.628]	[0.610]	[0.260]	[0.265]
<b>GDP growth</b>	-0.203	-0.205	-0.041	-0.044	-0.003	0.001	-0.041	-0.083	0.019	0.002
	[0.286]	[0.293]	[0.076]	[0.079]	[0.087]	[0.090]	[0.348]	[0.328]	[0.114]	[0.105]
<b>Diff. in the ratio of tertiary edu.</b>	0.041	0.041	0.013	0.013	-0.015	-0.013	-0.040	-0.046	-0.019*	-0.022**
	[0.049]	[0.047]	[0.017]	[0.016]	[0.014]	[0.013]	[0.040]	[0.035]	[0.012]	[0.011]
<b>Constant</b>	20.916***	21.023***	2.842	3.136	-5.567	-6.060	-9.135	-3.921	-8.319*	-6.045
	[6.916]	[7.094]	[2.104]	[2.109]	[4.172]	[3.799]	[10.772]	[8.563]	[5.185]	[4.116]
<b>Observations</b>	85	85	85	85	85	85	85	85	85	85
<b>R2</b>	0.071	0.065	0.548	0.543	-0.009	-0.04	-0.198	-0.042	0.244	0.355
<b>F-statistic (p-value)</b>	4.06 (0.00)	4.10 (0.00)	18.93 (0.00)	19.01 (0.00)	7.74 (0.00)	6.97 (0.00)	3.24 (0.01)	3.56 (0.00)	12.01 (0.00)	13.12 (0.00)
<b>Overidentification <math>\chi^2</math> (p-value)</b>	3.84 (0.28)	3.74 (0.29)	3.63 (0.30)	3.28 (0.35)	5.66 (0.13)	5.35 (0.15)	1.06 (0.79)	1.13 (0.77)	0.47 (0.92)	0.83 (0.84)

Note: Figures in parentheses are robust standard errors. \*\*\*significant at 1% level, \*\*significant at 5% level, and \*significant at 10% level.

Only the migration variables are instrumented. The ratio of bank deposit to GDP is used in (1) and the ratio of bank credit to GDP is used in (2).

**Table 5: Regression Results: IV Estimation (2)**

	Rem/GDP		Log of Rem		Log of Rem per capita		Rem/GDP		Log of Rem	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<b>Log of migrants abroad</b>	1.084**	1.618***	0.685***	0.815***	0.350*	0.630**				
	[0.500]	[0.570]	[0.237]	[0.234]	[0.213]	[0.254]				
<b>Migrants/Population</b>							0.205	0.297**	0.163**	0.177***
							[0.142]	[0.135]	[0.074]	[0.065]
<b>Bank deposit/GDP</b>	7.342*		1.770		3.111**		5.323		-0.133	
	[3.939]		[1.299]		[1.456]		[4.054]		[1.805]	
<b>Bank credit/GDP</b>		6.325*		1.475		3.277*		2.574		-0.795
		[3.282]		[1.148]		[1.679]		[2.736]		[1.521]
<b>Log of GDP</b>	-1.362***	-1.683***	0.378**	0.300*			-0.198	0.058	1.208***	1.254***
	[0.521]	[0.583]	[0.184]	[0.179]			[0.340]	[0.303]	[0.190]	[0.169]
<b>Log of GDP per capita</b>	-1.320***	-1.415**	-0.467**	-0.480*	-0.173	-0.478	-1.983***	-2.050***	-0.901***	-0.804***
	[0.508]	[0.578]	[0.236]	[0.268]	[0.240]	[0.407]	[0.480]	[0.538]	[0.200]	[0.282]
<b>GDP growth</b>	-0.321	-0.311	-0.067	-0.064	-0.058	-0.051	-0.258	-0.203	-0.012	0.001
	[0.286]	[0.309]	[0.082]	[0.085]	[0.121]	[0.139]	[0.267]	[0.277]	[0.089]	[0.089]
<b>Diff. in the ratio of tertiary edu.</b>	-0.046	-0.028	-0.007	-0.002	-0.034**	-0.031*	-0.076**	-0.067**	-0.023*	-0.020
	[0.037]	[0.038]	[0.014]	[0.013]	[0.016]	[0.018]	[0.033]	[0.032]	[0.012]	[0.014]
<b>Constant</b>	31.775***	33.667***	5.256**	5.629**	-0.065	-1.307	22.738**	17.456*	-2.624	-4.403
	[9.075]	[10.062]	[2.440]	[2.643]	[3.069]	[3.298]	[9.553]	[9.389]	[4.551]	[4.576]
<b>Observations</b>	85	85	85	85	85	85	85	85	85	85
<b>R2</b>	0.153	0.101	0.595	0.582	0.024	-0.319	0.247	0.266	0.522	0.486
<b>F-statistic (p-value)</b>	4.03 (0.00)	3.78 (0.00)	21.66 (0.00)	20.78 (0.00)	7.14 (0.00)	6.36 (0.00)	4.91 (0.00)	5.18 (0.00)	17.10 (0.00)	16.33 (0.00)
<b>Overidentification <math>\chi^2</math> (p-value)</b>	7.25 (0.20)	7.26 (0.20)	3.87 (0.57)	3.86 (0.57)	8.05 (0.15)	6.43 (0.27)	8.88 (0.11)	9.26 (0.10)	4.10 (0.54)	3.72 (0.59)

Note: Figures in parentheses are robust standard errors. \*\*\*significant at 1% level, \*\*significant at 5% level, and \*significant at 10% level.

Both the migration and financial development variables are instrumented. The ratio of bank deposit to GDP is used in (1) and the ratio of bank credit to GDP is used in (2).



**Table 6: Regression Results: IV Estimation (3)**

	Instrumenting migration variable only				Instrumenting both migration and FD variables			
	Rem/GDP		Log of Rem		Rem/GDP		Log of Rem	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<b>Log of migrants abroad</b>	2.589*** [0.945]	2.586*** [0.916]	0.829** [0.347]	0.854** [0.336]	0.737 [0.507]	1.162** [0.570]	0.559** [0.253]	0.611*** [0.236]
<b>Bank deposit/GDP</b>	-0.132 [1.290]		0.280 [0.633]		5.469 [3.341]		0.678 [1.096]	
<b>Bank credit/GDP</b>		-0.019 [1.144]		0.352 [0.483]		5.142* [2.906]		0.648 [1.062]
<b>Log of GDP</b>	-2.139*** [0.711]	-2.138*** [0.701]	0.279 [0.203]	0.262 [0.193]	-1.223** [0.479]	-1.479*** [0.541]	0.417*** [0.159]	0.385*** [0.149]
<b>Log of GDP per capita</b>	0.176 [0.512]	0.162 [0.513]	-0.164 [0.203]	-0.188 [0.200]	-1.048** [0.469]	-1.207** [0.544]	-0.288 [0.221]	-0.310 [0.259]
<b>GDP growth</b>	-0.218 [0.293]	-0.220 [0.299]	-0.064 [0.074]	-0.065 [0.077]	-0.335 [0.275]	-0.332 [0.297]	-0.075 [0.072]	-0.074 [0.075]
<b>Diff. in the ratio of tertiary edu.</b>	0.038 [0.055]	0.037 [0.053]	0.002 [0.019]	0.003 [0.018]	-0.058 [0.039]	-0.046 [0.039]	-0.010 [0.016]	-0.008 [0.016]
<b>Constant</b>	21.062*** [6.900]	21.172*** [7.129]	3.867* [2.258]	4.108* [2.258]	31.656*** [8.659]	33.658*** [9.714]	4.999** [2.255]	5.266** [2.570]
<b>Observations</b>	80	80	80	80	80	80	80	80
<b>R2</b>	0.053	0.054	0.572	0.567	0.229	0.176	0.615	0.609
<b>F-statistic (p-value)</b>	3.02 (0.01)	3.03 (0.01)	18.20 (0.00)	18.07 (0.00)	3.64 (0.00)	3.37 (0.01)	21.49 (0.00)	21.01 (0.00)
<b>Overidentification <math>\chi^2</math> (p-value)</b>	3.12 (0.37)	3.11 (0.38)	4.03 (0.26)	3.93 (0.27)	6.82 (0.23)	6.78 (0.24)	5.46 (0.36)	5.12 (0.40)

Note: Figures in parentheses are robust standard errors. \*\*\*significant at 1% level, \*\*significant at 5% level, and \*significant at 10% level.

The estimation is based on the sample excluding Bangladesh, India, Pakistan, the Philippines, and Sri Lanka. For the first four columns, only the migration variables are instrumented. For the next four columns, both the migration and financial development variables are instrumented. The ratio of bank deposit to GDP is used in (1) and the ratio of bank credit to GDP is used in (2).