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Do Workers' Remittances Promote Financial Development? *

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Abstract

Workers' remittances to developing countries have become the second largest type of flows after foreign direct investment. This paper uses data on workers' remittance flows to 99 developing countries during 1975-2003 to study the impact of remittances on financial sector development. In particular, we examine whether remittances contribute to increasing the aggregate level of deposits and credit intermediated by the local banking sector. This is an important question considering the extensive literature that has documented the growth-enhancing and poverty-reducing effects of financial development. Our findings provide strong support for the notion that remittances promote financial development in developing countries.

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Do Workers' Remittances Promote Financial Development?

Remittances, funds received from migrants working abroad, to developing countries have grown dramatically in recent years from U.S. $2.98 billion in 1975 to close to U.S.$90 billion in 2003.[1] They have become the second largest source of external finance for developing countries after foreign direct investment (FDI), both in absolute terms and as a proportion of GDP (Figures 1 and 2). Relative to private capital flows, remittances tend to be stable and to increase during periods of economic downturns and natural disasters (see Yang, 2006). Furthermore, while a surge in inflows, including aid flows, can erode a country's competitiveness, remittances do not seem to have this adverse effect (see Rajan and Subramanian, 2005).

As researchers and policymakers have come to notice the increasing volume and stable nature of remittances to developing countries, a growing number of studies have analyzed their development impact along various dimensions, including: poverty, inequality, growth, education, infant mortality, and entrepreneurship.[2] However, beyond descriptive accounts of financial institutions' efforts to "bank" remittance recipients (e.g., Orozco and Fedewa, 2005), surprisingly little attention has been given to the question of whether remittances promote financial development in recipient countries.[3] Yet, this issue is important because financial systems perform a number of key economic functions and their development has been shown to foster growth and reduce poverty (for example, see King and Levine, 1993; Beck, Levine and Loayza, 2000a, b; and Beck, Demirguc-Kunt, and Levine, 2004). Furthermore, this question is relevant

[1] Estimates for 2005 put remittances at U.S. $142 billion (World Bank, 2006).
[2] A review of this literature can be found in Section II.
[3] In contrast, there is evidence that private capital flows can help relax financing constraints (see Harrison, Love, and McMillan, 2004).

since some argue that banking remittance recipients will help multiply the development impact of remittance flows (see Hinojosa-Ojeda, 2003; Terry and Wilson, 2005, and World Bank, 2006).

In this paper, we use balance of payments data on remittance flows received by 99 countries over the period 1975-2003 to study the impact of workers' remittances on financial development. We specifically examine whether remittances contribute to the development of the financial sector by increasing the aggregate level of deposits and/or the amount of credit to the private sector extended by the local banking sector.[4]

Whether and how remittances might affect financial development is a priori unclear. The notion that remittances can lead to financial development in developing countries is based on the concept that money transferred through financial institutions paves the way for recipients to demand and gain access to other financial products and services, which they might not have otherwise (Orozco and Fedewa, 2005). At the same time, providing remittance transfer services allows banks to "get to know" and reach out to unbanked recipients or recipients with limited financial intermediation. For example, remittances might have a positive impact on credit market development if banks become more willing to extend credit to remittance recipients because the transfers they receive from abroad are perceived to be significant and stable. However, even if bank lending to remittance recipients does not materialize, overall credit in the economy might increase if banks' loanable funds surge as a result of deposits linked to remittance flows.

Furthermore, because remittances are typically lumpy, recipients might have a need for financial products that allow for the safe storage of these funds, even if most of these funds are

[4] A recent survey of central banks in 40 countries reveals that most countries (90 percent of the sample to be exact) collect remittance statistics from commercial banks, while less than 40 percent gather information from money transfer companies and post offices (De Luna Martinez, 2005). Therefore, balance of payment statistics tend to better reflect the portion of remittances that is transferred through banks.

not received through banks. In the case of households that receive their remittances through banks, the potential to learn about and demand other bank products is even larger.

On the other hand, because remittances can help relax individuals' financing constraints, they might lead to a lower demand for credit and have a dampening effect on credit market development. Also, a rise in remittances might not translate itself into an increase in credit to the private sector if these flows are instead channeled to finance the government or if banks are reluctant to lend and prefer to hold liquid assets. Finally, remittances might not increase bank deposits if they are immediately consumed or if remittance recipients distrust financial institutions and prefer other ways to save these funds.

An important complication in empirically studying the impact of remittances on financial development is the potential for endogeneity biases as a result of measurement error, reverse causation, and omitted variables. Officially recorded remittances are known to be measured with error.[5] Estimates of unrecorded remittances range from 20 to 200 percent of official statistics on remittances (Freund and Spatafora, 2005). Reverse causality is also a concern since better financial development might lead to larger measured remittances either because financial development enables remittance flows or because a larger percentage of remittances are measured when those remittances are channeled through formal financial institutions. In addition, financial development might lower the cost of transmitting remittances, leading to an increase in such flows. Finally, omitted factors can explain both the evolution of remittances and of financial development, also leading to biases in the estimated impact of remittances on financial development.

[5] De Luna Martinez (2005) reports that balance of payment statistics produced by developing countries often neglect remittances received via money transfer operators and almost always exclude those transferred via informal means such as hawala operators, friends, and family members.

We address the above concerns, using several different empirical techniques to examine the relationship between remittance flows and financial development. First, we conduct fixed and random effects estimations to account for unobserved country effects, ignoring other sources of biases. Second, we obtain estimates of the impact of remittances over the last decade to account for the fact that recent remittances data are likely to be more accurate relative to statistics from the beginning of the sample, when less attention was given to these kinds of flows. Third, we present estimations including time dummies to control for unobserved time effects or common country shocks. Fourth, to mitigate concerns about reverse causality we run regressions lagging all regressors and we conduct dynamic system Generalized Method of Moments (GMM) estimations à la Arellano and Bover (1995), using lagged regressors as instruments. Finally, we perform instrumental variables (IV) estimations to address the potential endogeneity of remittances arising from measurement error, omitted factors, and/or reverse causation in a more direct and complete manner. In particular, we use economic conditions in the remittance-source countries (i.e., the countries where migrants sending remittances reside) to instrument for remittance flows received by countries in our sample.

Our empirical analysis provides support for a robust positive impact of remittances on financial sector development, even after controlling for other factors that affect financial development and after correcting our estimates for different potential sources of bias. The results are invariant to whether we measure financial development by the ratio of deposits or credit to GDP. All in all, our findings confirm yet another channel through which remittances can a have a positive influence on recipient countries' development.

The rest of the paper is organized as follows. Section I summarizes the main findings from the research on financial development and reviews the literature on the development impact

of remittances. Section II discusses the data used and the methodology pursued to study the impact of remittances on financial development. Section III presents the empirical results and Section IV concludes.

I. Literature Review

The determinants of financial development and its effect on growth have been studied extensively. The main findings from this literature can be summarized as follows. First, the level of inflation has a negative impact on financial sector development (Boyd, Levine, and Smith, 2001). Second, the degree of capital account openness and the liberalization of domestic financial systems help develop the financial sector (see Chinn and Ito, 2002; Demirguc-Kunt and Detragiache, 1998). Third, a country's legal origin affects both creditor rights and private credit, and the extent of creditor rights protection also has an independent effect on financial sector development (see La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997, 1998; Beck, Levine, and Loayza, 2000a; Beck, Demirguc-Kunt, and Levine, 2003; Djankov, McLeish, Shleifer, 2006). Fourth, a country's geography and initial endowment also influence the extent of financial sector development (see Acemoglu, Johnson, and Robinson, 2001, 2002). Finally, other country characteristics like the degree of ethnic diversity (Easterly and Levine, 1997) and the type of religion practiced by the majority of the population (Stulz and Williamson, 2003) also affect the level of financial development, but their impact is less robust (Beck, Demirguck-Kunt, and Levine, 2003) .

As for the economic impact of financial development, among others, King and Levine (1993), Levine and Zervos (1998) and Beck, Levine and Loayza (2000a,b) document how financial development is associated with greater growth across countries. Similar evidence also

exists at the firm and industry levels (Demirguc-Kunt and Maksimovic, 1998 and Rajan and Zingales, 1998). More recently, Beck, Demirguc-Kunt and Levine (2004) have shown that financial development also leads to lower levels of poverty and inequality.

By analyzing the impact of remittances on financial development, our paper not only examines an unexplored potential determinant of financial development, but also this study investigates a new channel through which remittances can affect economic development. Most studies on the development impact of remittances have focused on issues such as poverty, education, entrepreneurial activity, and health. Research on the impact of remittances on poverty using household data suggests that these transfers help reduce the level of poverty, but have an even greater influence on its severity, as measured by the poverty gap (e.g., Adams, 2004, on Guatemala; Lopez-Córdova, 2005, and Taylor, Mora, and Adams, 2005, on Mexico). In addition, Maimbo and Ratha (2005) find that in terms of poverty reduction, rural areas in developing countries tend to benefit the most because much of the world's migrants are drawn from these areas.

The finding that remittances help to reduce poverty is confirmed in cross-country studies. Based on a dataset of 74 low and middle-income developing countries, Adams and Page (2003) find that remittances have a statistically significant impact on reducing poverty. This result is also corroborated in a separate analysis for 101 countries over the period 1970-2003, reported in the IMF's 2005 World Economic Outlook.

Studies that analyze the impact of remittances on education such as Cox and Ureta (2003), for the case of El Salvador, Yang (2005), for the case of Philippines, and Hanson and Woodruff (2003) and López-Córdova (2005), for Mexico, find that by helping to relax household constraints, remittances are associated with improved schooling outcomes for children.

Remittances have also been shown to promote entrepreneurship (Massey and Parrado, 1998; Woodruff and Zenteno, 2001; Maimbo and Ratha, 2005; Yang, 2005). Furthermore, a number of studies on infant mortality and birth weight (Kanaiaupuni and Donato, 1999; Hildebrandt and McKenzie, 2005; Duryea et al., 2005; and López-Córdova, 2005) have documented that at least in the Mexican case, migration and remittances help lower infant mortality and are associated with higher birth weight among children in households that receive remittances.

Research on the effect of remittances on economic growth is scant so far and has yielded mixed results. Using a panel of 113 countries over almost three decades, Chami et al. (2003) find that remittances are negatively associated with economic growth. This result is consistent with their model in which remittances weaken recipients' incentives to work and, therefore, lead to poor economic performance. Solimano (2003), on the other hand, finds a positive association between remittances and growth for a panel of Andean countries, while the IMF's 2005 World Economic Outlook highlights the lack of correlation between these variables, at least at the country level.

Finally, two recent studies by Giuliano and Ruiz-Arranz (2005) and Mundaca (2005) show that the impact of remittances on growth can depend on the level of financial development in a country. However, these studies reach very different conclusions. Using a panel of more than 100 countries for the period 1975-2003, Giuliano and Ruiz-Arranz (2005) show that remittances help promote growth in less financially developed countries. They argue that this is evidence that agents compensate for the lack of development of local financial markets using remittances to ease liquidity constraints and to channel resources towards productive uses that foster economic growth. Mundaca (2005) analyzes the effect of workers' remittances on growth in countries in

Central America, Mexico, and the Dominican Republic using a panel data set over 1970 to 2003. She finds that controlling for financial development in the analysis strengthens the positive impact of remittances on growth and concludes that financial development potentially leads to better use of remittances, thus boosting growth. Neither study, however, investigates the impact of remittances on financial development. Our paper contributes to the literature by directly addressing this issue, exploring the impact of remittances on bank deposits and credit to the private sector.

II. Empirical methodology and data

We empirically examine the relationship between financial development and remittances by estimating a number of variants of equation (1), depending on the assumptions made about the error term and the exogeneity of remittances.

$$FD_{i,t} = \beta_1 Rem_{i,t} + \beta_2' X_{i,t} + \alpha_i + u_{i,t} \quad (1)$$

where *i* refers to the country and *t* refers to the time period from 1975 to 2003. However, data for the complete time period are not available for all countries and countries are only included if at least five years of data are available. A complete list of countries and time periods is given in Appendix 1. Table 1 provides definitions and sources for each of the variables in our estimations, while Table 2 presents descriptive statistics.

FD, financial development, refers either to the ratio of bank credit to the private sector or the share of bank deposits expressed as a percentage of GDP.[6] These are the standard measures of financial depth used in the literature (e.g., King and Levine, 1993). Data to construct these ratios come from the *International Financial Statistics* (IMF) and the *World Development Indicators* (World Bank). As shown in Table 2, there is considerable variation in financial

development for our sample of countries with the ratio of deposits to GDP ranging from 1.74% to 161.40% and the ratio of credit to GDP varying from 0.46% to 121.46%.

Rem refers to the ratio of remittances to GDP. The data on remittances are obtained from the IMF's 2005 World Economic Outlook. With some exceptions, these data are constructed as the sum of three items in the *Balance of Payment Statistics Yearbook* (IMF): *workers' remittances* (current transfers made by migrants who are employed and resident in another economy); *compensation of employees* (wages, salaries and other benefits earned by nonresident workers for work performed for resident of other countries); and *migrant transfers* (financial items that arise from the migration or change of residence of individuals from one economy to another).[7] Figures 3 and 4 show the top ten remittance recipient countries in our sample based on averages for the period 1975-2003, measured both in U.S. billion dollars and as a proportion of GDP. India ($U.S. 4.26 billion), Mexico ($U.S. 4.82 billion), Egypt ($U.S. 3.27 billion), Philippines ($U.S. 2.95 billion) and Turkey ($U.S. 2.44 billion) are among the largest recipients of remittances in absolute terms as shown in Figure 3. Relative to the size of the economy, remittances are especially high among low-income, small economies such as Jordan (18.61%), Tonga (17.86%), Moldova (11.66%), Haiti (10.09%), Vanuatu (8.03%), and El Salvador (8.01%) as shown in Figure 4.

The matrix *X* refers to a set of variables that the literature has found to affect financial development. In all estimations we control for country size, defined as the log of GDP in constant dollars, and the level of economic development, as measured by GDP per capita. These variables are included on the grounds that financial sector development requires paying fixed costs that become less important the larger the size of the economy and the richer the country.

[6] In Appendix 3 we also show estimates for financial development defined as the ratio of liquid liabilities to GDP.

Also, GDP per capita can proxy for the quality of legal institutions in the country which have been shown to have a positive impact on financial development.

In all models, we also control for inflation, measured as the annual percentage change in the GDP deflator. Studies have that shown that inflation distorts economic agents' decision-making regarding nominal magnitudes, discouraging financial intermediation, and promoting saving in real assets (Boyd, Levine, and Smith, 2001).

Current and capital account openness has also been found to have a positive effect on financial development (see Chinn and Ito, 2002). We include a number of variables to control for the degree of capital and current account openness.[8] First, we include a dummy for the presence of dual exchange rates regimes. Second, we include the ratio of capital inflows to GDP (including aid, FDI, and portfolio flows).[9] Lastly, we control for the share of exports to GDP.

Countries that have liberalized their domestic financial systems removing interest rate controls have been shown to be more financially developed (Demirguc-Kunt and Detragiache, 1998). Following earlier studies, we capture periods of domestic financial liberalization with a dummy that equals one in cases when there are no controls on domestic interest rates. More details on the sources used to identify such periods are provided in Table 1.

The importance of legal origin and creditor rights for the development of the financial sector has also been firmly established in the finance literature (e.g., La Porta, Lopes-de-Silanes, Shleifer, and Vishny 1997, 1998; Beck, Levine, and Loayza, 2000a; Beck, Demirguc-Kunt, and

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[7] Additions and adjustments to these data from national sources are required for some specific countries. Details are provided in Appendix 2.

[8] Chinn and Ito (2002) develop an openness index based on the first principal component of four variables capturing the absence of (1) multiple exchange rate regimes, (2) restriction on current account transactions, (3) restrictions on capital account transactions, and (4) requirements of the surrender of exports proceeds. Higher values of this index indicate greater openness. We prefer our three separate measures because they allow us to disentangle which aspects of openness are most critical for financial development. Also, our measures are largely de facto as opposed to de jure measures of openness as is the case with the index developed by Chinn and Ito (2002).

[9] We refer to this variable as *Other flows to GDP*.

Levine 2003; and Djankov, McLiesh, and Shleifer, 2006). To control for these factors we include an index of Creditor Rights (ranging from 0, weak, to 4, strong) developed by Djankov, McLiesh, and Shleifer (2006) and a dummy to control for countries with British legal origin (i.e., dummy equals 1 if legal system is based on Common Law). An alternative view of the determinants of financial development, stresses the importance of geography and initial endowments (Acemoglu, Johnson, and Robinson, 2001, 2002). To control for these factors, we include countries' absolute latitude, a frequently used proxy of endowments (Beck, Demirguc-Kunt, and Levine, 2003).[10] Since our measures of legal institutions and endowments do not vary over time, these variables are not included in the fixed effect estimations and only appear in the random effect regressions. [11]

We first examine the relationship between financial development and remittances by running fixed effects (FE) and random effects (RE) regressions, ignoring the potential for biases due to reverse causation, omitted factors, or measurement error. FE and RE estimations make different assumptions about the error term in equation (1). In the FE model, the error term is the sum of α_i and $u_{i,t}$ where α_i represents individual specific fixed parameters to be estimated and $u_{i,t}$ are independent and identically distributed errors with zero mean and constant variance In the RE regressions, both α_i and $u_{i,t}$ are independently distributed and, furthermore, both are assumed to be independent from the regressors in the equation. In conjunction with these estimations, we report F-tests for the joint significance of the fixed effects and Hausman tests comparing the efficiency of random vis-à-vis fixed effect estimates.

[10] The original paper by Acemoglu et al. (2001) uses settlers' mortality data as a measure of endowments. However, this information is only available for a subset of former colonies. Using this data restricts our sample of countries, therefore, we prefer to use absolute latitude as a proxy for endowments.

[11] Beck, Demirguc-Kunt, and Levine (2003) show that the impact of variables such as religion, ethnic diversity or political structure on financial development is neither significant nor very robust. Thus, we do not control for these factors when investigating the effect of remittances on financial development.

The fixed and random effects estimates described above can be biased due to measurement error, omitted variables, and reverse causality. The concern about reverse causation is justified, considering that our measure of remittances refers to balance of payment statistics that largely cover flows transferred through the formal financial system. Thus, it is conceivable that remittances may grow over time simply because financial development in the recipient countries allows banks to play a greater role in the remittance transfer process. Furthermore, biases might also occur because of common omitted variables driving the behavior of both remittances and financial development. Finally, measurement error, which is known to plague balance of payment statistics on remittances, will also likely bias our estimates.

We conduct a number of different estimations to address the concerns outlined above. First, we separately conduct estimations for the most recent period (1995-2003), because the potential for measurement error should be smaller in this period, since remittance statistics are likely to have improved over time. Second, we conduct estimations including time dummies to mitigate the concern for omitted relevant regressors. Third, we try to address the potential bias due to reverse causality by conducting estimations lagging regressors and, separately, by using lagged values of the regressors as instruments in a GMM dynamic framework à la Arellano and Bover (1995).

Two equations, (2) and (3), are estimated as part of the dynamic system GMM estimates

$$FD_{i,t} = \gamma FD_{i,t-1} + \beta_1 Rem_{i,t} + \beta_2' X_{i,t} + \alpha_i + u_{i,t} \quad (2)$$

$$FD_{i,t} - FD_{i,t-1} = \gamma(FD_{i,t-1} - FD_{i,t-2}) + \beta_1(Rem_{i,t} - Rem_{i,t-1}) + \beta_2'(X_{i,t} - X_{i,t-1}) + u_{i,t} - u_{i,t-1} \quad (3)$$

In equations (2) and (3), the use of instruments is required to deal with the likely endogeneity of the explanatory variables (most notably, remittances) and with the fact that in

both equations the error term is correlated with the lagged dependent variable. Assuming that (a) the error terms are not serially correlated, (b) the explanatory variables are weakly exogenous (i.e., explanatory variables are uncorrelated with future realization of the error terms), and (c) there is no correlation between the changes in the right hand side variables and the country specific effects, α_i, then the following moment conditions can be applied to obtain unbiased estimates of the regressors:

$$E[FD_{i,t-s}.(u_{i,t} - u_{i,t-1})]=0 \text{ for } s\geq 2;\ t=3,\ldots,T \quad (4)$$

$$E[Rem_{i,t-s}.(u_{i,t} - u_{i,t-1})]=0 \text{ for } s\geq 2;\ t=3,\ldots,T \quad (5)$$

$$E[X_{i,t-s}.(u_{i,t} - u_{i,t-1})]=0 \text{ for } s\geq 2;\ t=3,\ldots,T \quad (6)$$

$$E[(FD_{i,t-s.} - FD_{i,t-s-1})(\alpha_i + u_{i,t})]=0 \text{ for } s=1 \quad (7)$$

$$E[(Rem_{i,t-s} - Rem_{i,t-s-1)}.(\alpha_i + u_{i,t})]=0 \text{ for } s=1 \quad (8)$$

$$E[(X_{i,t-s} - X_{i,t-s-1)}.(\alpha_i + u_{i,t})]=0 \text{ for } s=1 \quad (9)$$

Hence, lagged values of the difference of regressors can be used as instruments to estimate the equation in levels (i.e., equation 2), and lagged values of the level of regressors can be used as instruments for the regressors in the equation in first differences (i.e., equation 3).

While using lagged values of the regressors as instruments can help deal with the problem of reverse causality, it does not address biases arising due to measurement error, since lagged values of the regressors (in particular, remittances) are likely to suffer from this problem as well. Therefore, we also present Instrumental Variables (IV) estimations where we use external as opposed to internal instruments. In particular, we use economic conditions – GDP per capita, real GDP growth, and the unemployment rate - in the top remittance-source countries

(i.e., the countries from which migrants send money) as instruments for the remittances flows received by the countries in our sample.

Economic conditions in the remittance-source countries are likely to affect the volume of remittance flows that migrants are able to send, but are not expected to affect financial development in the remittance receiving countries in ways other than through its impact on remittances or through the effect on other variables we already control for like exports or capital flows. Because bilateral remittance data are largely unavailable, we identify the top remittance-source countries for each country in our sample, using bilateral migration data from the OECD's *Database on Immigrants and Expatriates.* This dataset identifies the top five OECD countries that receive the most migrants from each remittance-recipient country.[12] Here we assume that these OECD countries receive the bulk of the migrants from the countries in our sample and account for the majority of the remittance flows sent to the countries in our sample. We construct three instruments by multiplying, respectively, the GDP per capita, the real GDP growth, and the unemployment rate, in each of the top five remittance-source countries by the share of migration to each of these five OECD countries.[13]

III. Empirical Results

Table 3 reports FE estimates of equation (1) for the share of deposits and credit to GDP, assuming that remittances are exogenous and adequately measured. In all regressions we control for the log of GDP, the level of GDP per capita, the inflation rate, the presence of dual exchange rates and for the extent of current and capital account openness. Because the variable capturing

[12] http://www.oecd.org/document/51/0,2340,en_2825_494553_34063091_1_1_1_1,00.html.

[13] Note that the bilateral migration data is only available for 2000, so the weights we use are constant. The time variation arises from the series on the GDP per capita, real growth rate, and unemployment rate in remittance-source countries.

periods of domestic financial liberalization is available for fewer countries, we report separate estimations including this variable along with the others.

Across all estimations, we find that remittances have a positive coefficient, but the size of the coefficient in the bank deposits to GDP regressions is almost twice as large the coefficient in bank credit to GDP regressions. Assuming a causal relationship, a one percentage point increase in the share of remittances to GDP suggests around a 0.5-0.6 percentage point increase in the ratio of deposits to GDP, while it leads to at most a 0.3 percentage point rise in the share of credit to GDP.

As expected, the results on Table 3 also confirm that financial development is positively affected by a country's size and level of income, but negatively influenced by inflation and the adoption of multiple exchange rate regimes. While the share of exports to GDP has a positive influence on financial development, the size of capital inflows appears to have no effect.

Random effects estimates shown in Table 4 yield similar results to the fixed effects results reported in Table 3. Remittances have a positive relationship with both deposits and credits and again the coefficient on the former is almost twice as large. Including controls such as latitude, legal origin and creditor rights, which do not change over time, does not affect the main results.[14] As before, country size, income, and exports have a positive impact on financial development, but inflation and the presence of dual exchange regimes have a negative impact. Though the findings from the RE estimates are very similar to the FE results, the Hausman tests at the bottom of Table 4 indicate that the FE specification is preferable so from now on we only report results based on FE estimates.

[14] A possible explanation for why these additional controls – legal origin, creditor rights, and latitude - are not themselves significant might be that they are highly correlated with GDP per capita also included in the estimations.

To verify the robustness of the FE results obtained thus far we conduct a number of additional estimations. First, to account for the presence of potential outliers we drop observations at the top 1 and bottom 1 percent of the distribution for each variable (see Table 5). Second, to limit concerns about measurement error we report results for the period 1995-2003 (see Table 6). We speculate that the degree of measurement error is likely to be smaller during this later period, as opposed to during the 1970s and 1980s, given that countries have taken steps over time to improve their balance of payments statistics and, in particular, to better measure remittances. Also, in recent years competition in the remittance market has led to a decline in the cost of formal remittances that might have led to an increase in measured remittances (i.e., informal remittances could have declined as a result). Third, to control for common time effects, we run a two-way fixed effect model including country and time dummies (see Table 7). Fourth, to address the potential for reverse causation we conduct FE estimations substituting regressors for their lags (see Table 8) and we report dynamic system GMM estimations à la Arellano and Bover (1995), where lags of the regressors are used as instruments for the variables in the model (see Table 9). The problem with estimations including lagged regressors (either directly or as instruments like in the GMM case) is that they cannot correct for biases arising from measurement error, since these would also affect lags of the questionable variable/s. Hence, finally, in order to correct for endogeneity biases that might arise due to measurement error, we present separate instrumental variables regressions using economic conditions in the remittance-source countries as instruments (see Table 10).

Removing potential outliers does not change our results in any significant way. Table 5 shows that both the significance and the magnitude of the remittance variable remain unchanged when we drop observations in the top and bottom one percent of the distribution for each

variable in the model. Remittances continue to have a positive effect on both credit and deposits and, as before, the impact on deposits appears to be twice as large. Similarly, the estimates for the period 1995-2003, shown on Table 6, also yield results similar to those encompassing the overall period.

While remittances continue to have a positive and significant effect on financial development, including time dummies reduces the impact of remittances on deposits and credit (see Table 7). In particular, the size of the coefficient on deposits drops from close to 0.6 to 0.2-0.3. Similarly, introducing time dummies reduces the impact of remittances on credit from an average of 0.3 to closer to 0.2.

In order to deal with the possibility that remittances are endogenous due to reverse causation we conduct estimations lagging remittances (as well as other regressors) two periods (see Table 8) and we perform dynamic system GMM estimations where we use lags of the regressors as instruments (see Table 9). When we lag regressors, we continue to find that remittances have a positive impact on credit and deposits. In this case, a one percentage point increase in remittances leads to 0.4-0.5 percentage increase in the ratio of deposits and 0.3-0.4 rise in credit to GDP. Using lags as instrument in the GMM estimations, results in remittances having a lower impact on financial development. A one percentage point increase in remittances leads to at most a 0.19 percentage point rise in deposits and a 0.12 percentage point increase in credit. Furthermore, in the case of the credit estimations, once we control for financial liberalization, remittances are no longer significant in the credit equations, perhaps due to the smaller number of observations.

While lagging regressors or using lags as instrument might help deal with the problem of reverse causation, it does not address the concern that the estimates reported so far might be

biased due to measurement error. In order to address these issues directly, we conduct instrumental variable estimations where we use economic conditions in remittance-source countries as instruments. In particular, we include the GDP per capita, real growth rate, and unemployment rate of the five OECD countries that are the top recipients of migrants for each remittance-receiving country in our sample. Each of these variables is separately weighted by the share of migration from the corresponding country to each of those five OECD destinations.[15]

Table 10 shows the results from the instrumental variables estimations described above We conduct and report two tests to show the validity of our instruments. First, we present the F-statistic for weak instruments as suggested by Stock and Yogo (2002). This is a test of the significance of our instruments in predicting remittances. In every regression the F-statistics is above the critical value, at 5 percent significance, indicating that our estimates do not suffer from a weak instruments problem. Second, we report the Sargan test of overidenditfying restrictions. The joint null hypothesis in this case is that the instruments are uncorrelated with the error term and that excluded instruments are correctly excluded from the estimated equation. Again, these tests confirm the validity of our instruments.

As for the impact of remittances on financial development, we continue to find that they have a positive and significant impact on both credit and deposits to GDP. Though the size of the coefficients are in this case much larger than those obtained in previous estimations they are within a range that can be justified by the presence of measurement error in the remittance series.[16] These results confirm that the positive impact of remittances on financial development is not due to endogeneity biases.

[15] We focus exclusively on the top five OECD destinations for migrants for each country in our sample because the OECD data only provides bilateral migration data vis-à-vis 5 countries.

IV. Conclusions

Workers' remittances, flows received from migrant workers residing abroad, have become the second largest source of external finance for developing countries in recent years. In addition to their increasing size, the stability of these flows despite financial crises and economic downturns make them a reliable source of funds for developing countries. While the development potential of remittance flows is increasingly being recognized by researchers and policymakers, the effect of remittances on financial development remains largely unexplored. Better understanding the impact of remittances on financial development is important given the extensive literature on the growth enhancing and poverty reducing effects of financial development.

This paper is a first effort to try to fill this gap in the literature. Using balance of payments data on remittance flows to 99 countries for the period 1975-2003, we investigate the impact of remittances on bank deposits, as well as on bank credit to the private sector. We find that remittances have a significant and positive impact on bank deposits and credit to GDP. This result is robust to using different estimation techniques and accounting for endogeneity biases arising from omitted factors, reverse causation, and measurement error.

[16] See Appendix 4 for a discussion about coefficient biases due to measurement error.

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Table 1
Variable Definitions and Data Sources

Variable name	Variable definitions	Source
Remittances to GDP	Sum of remittances + migrant transfers + workers compensation, depending on the country (see the data appendix for details). Variable is expressed as a percentage of GDP.	Balance of Payments Statistics (IMF). Data reported in WEO (2005)
Bank credit to GDP	Deposit money banks' credit extended to the private sector expressed as a percentage of GDP.	International Financial Statistics (IMF)
Bank deposit to GDP	Deposit money banks' deposits expressed as a percentage of GDP.	Idem
GDP per capita	GDP per capita in thousands of constant 1995 US$.	World Development Indicators (World Bank)
Log of GDP	Log of GDP in constant 1995 US$.	Idem
Inflation	GDP deflator (annual %).	Idem
Exports to GDP	Total exports expressed as percentage of GDP.	Idem
Dual exchange rate	Dummy equals to 1 indicates the presence of multiple exchange rates.	Annual Report on Exchange Arrangements and Exchange Restrictions (IMF)
Financial liberalization	Dummy equals to 1 indicates liberalization in deposit and loan interest rates.	Annual Report on Exchange Arrangements and Exchange Restrictions (IMF), Demirgrüç-Kunt and Detragiache (1998), Abiad and Mody (2005), Bandiera et al (2000), Kaminsky and Schmukler (2004), Laeven (2003), Tornell, Westermann and Martinez (2004)
Other flows to GDP	Sum of foreign direct investment + non-FDI private inflows + aid flows. Variable expressed as a percentage of GDP	Balance of Payments Statistics (IMF)
Latitude	Absolute value of the latitude of a country, scaled between zero and one.	La Porta, López de Silanes, Shleifer and Vishny (1998)
British legal origin	Dummy equals to 1 indicates countries with Common Law legal origins.	World Development Indicators (World Bank)
Creditor rights	The index measures the legal rights that shareholders and creditors have that enable them to extract a return on their investment from the insiders. The creditor rights index varies between 0 (poor creditor rights) and 4 (strong creditor rights).	Djankov, McLeish and Shleifer (2005)
GDP per capita in remittance-source countries (in thousands)	GDP per capita of the five principal OECD recipients of migration for each country in our sample, weighted by share of total migration to these countries. Focusing on remittance receiving country Z, and assuming that the top five OECD countries that receive migrants from Z are countries A, B, C, D, and E, the weighted GDP per capita is constructed as: Sum over i[GDP per capita i *(migration of Z to i)/(sum of migration from Z received by A through E)], where i=A to E.	Database on Immigrants and Expatriates (OECD) and World Development Indicators (World Bank)
GDP growth in remittance-source countries	GDP growth of the five principal OECD recipients of migration for each country in our sample, weighted by share of total migration to these countries. Focusing on remittance receiving country Z, and assuming that the top five OECD countries that receive migrants from Z are countries A, B, C, D, and E, the weighted GDP per capita is constructed as: Sum over i[GDP per capita i *(migration of Z to i)/(sum of migration from Z received by A through E)], where i=A to E.	Idem
Unemployment in remittance-source countries	Unemployment of the five principal OECD recipients of migration for each country in our sample, weighted by share of total migration to these countries. Focusing on remittance receiving country Z, and assuming that the top five OECD countries that receive migrants from Z are countries A, B, C, D, and E, the weighted GDP per capita is constructed as: Sum over i[GDP per capita i *(migration of Z to i)/(sum of migration from Z received by A through E)], where i=A to E.	Idem

Table 2
Summary Statistics

Variable name	Number of observations	Mean	Standard deviation	Minimum	Maximum
Bank deposits to GDP (%)	1528	29.24	20.58	1.74	161.40
Bank credits to GDP (%)	1518	24.79	17.79	0.46	121.56
Remittances to GDP (%)	1528	2.95	4.52	0.00	41.17
Log of GDP (in constant US$)	1528	22.86	1.83	18.56	27.78
GDP Per Capita (in thousands US$)	1528	1.76	1.70	0.12	9.65
Inflation (%)	1528	36.35	380.10	-23.48	12338.66
Dual Exchange Rate	1528	0.20	0.40	0	1
Financial Liberalization	1209	0.37	0.48	0	1
Other flows to GDP (%)	1528	5.99	13.60	-312.81	169.27
Exports to GDP (%)	1528	34.07	23.68	4.31	329.92
Latitude	1528	0.21	0.14	0.01	0.66
British Legal Origin	1528	0.34	0.47	0	1
Creditor Rights	1295	1.55	1.14	0	4
GDP per capita in remittance-source countries	1502	21.93	4.03	7.49	31.94
GDP growth in remittance-source countries	1502	2.78	1.60	-5.65	7.25
Unemployment in remittance-source countries	1187	7.93	2.03	4.03	15.66
Liquid liabilities to GDP (%)	1523	37.53	23.62	3.51	152.14

Table 3
Panel Estimates of the Impact of Remittances on Financial Development
Fixed Effects Results

The regression equation estimated is of the form $FD_{i,t} = b_1 Rem_{i,t} + b_2 X_{i,t} + a_i + u_{i,t}$ where FD refers to financial development measured as the % of bank deposits and, separately, bank credit to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is a matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP; and *Exports to GDP*, the share of total exports as a % of GDP. Country dummies are included, but not shown. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP		**Bank Credit to GDP**	
Remittances to GDP	0.496	0.600	0.278	0.323
	[5.38]***	[6.25]***	[3.34]***	[3.36]***
Log of GDP	16.376	17.723	10.511	9.758
	[13.95]***	[13.74]***	[9.94]***	[7.59]***
GDP Per Capita	2.946	2.514	6.615	8.057
	[3.30]***	[2.22]**	[8.22]***	[7.12]***
Inflation	-0.002	-0.002	-0.001	-0.001
	[3.35]***	[3.39]***	[2.59]***	[2.39]**
Dual Exchange Rate	-1.797	-1.913	-2.181	-2.170
	[2.27]**	[2.39]**	[3.04]***	[2.70]***
Other Flows to GDP	-0.024	0.006	0.001	-0.001
	[1.37]	[0.34]	[0.07]	[0.07]
Exports to GDP	0.195	0.136	0.094	0.109
	[8.93]***	[4.00]***	[4.77]***	[3.21]***
Financial Liberalization		0.003		-0.483
		[0.01]		[0.76]
Constant	-357.749	-390.777	-230.538	-215.800
	[13.91]***	[13.77]***	[9.96]***	[7.63]***
Observations	1528	1209	1518	1206
Number of countries	92	62	92	62
Country dummies	Yes	Yes	Yes	Yes
Adj. R-squared	0.31	0.37	0.28	0.29
F-statistic for country fixed effects	52.40	39.55	53.51	51.74
P-value for country fixed effects	0.00	0.00	0.00	0.00

Table 4
Panel Estimates of the Impact of Remittances on Financial Development
Random Effects Results

The regression equation estimated is of the form $FD_{i,t} = b_1 Remi,t + b_2 Xi,t + a_i + u_{i,t}$ where FD refers to financial development measured as the % of bank deposits and, separately, bank credit to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is a matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP; *Exports to GDP*, the share of total exports as a % of GDP; *Latitude*, defined in absolute terms and scaled between 0 and 1; *British legal origin*, a dummy equal to 1 for countries with Common Law legal tradition, and *Creditor rights*, an index of creditor rights as defined by Djankov, McLiesh and Shleifer (2006). Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP				**Bank Credit to GDP**			
Remittances to GDP	0.627	0.706	0.695	0.723	0.342	0.333	0.364	0.335
	[6.67]***	[7.15]***	[7.41]***	[7.15]***	[4.09]***	[3.43]***	[3.88]***	[3.28]***
Log of GDP	7.305	8.830	10.937	10.194	6.305	7.634	7.465	7.733
	[10.00]***	[11.60]***	[13.78]***	[12.32]***	[9.70]***	[9.27]***	[8.40]***	[7.84]***
GDP Per Capita	5.541	4.226	1.118	0.276	6.213	5.794	6.008	5.117
	[8.40]***	[5.34]***	[1.32]	[0.31]	[10.58]***	[6.95]***	[6.59]***	[4.94]***
Inflation	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001
	[3.40]***	[3.48]***	[3.61]***	[3.49]***	[2.68]***	[2.46]**	[2.48]**	[2.37]**
Dual exchange rate	-2.824	-3.015	-3.323	-3.507	-2.916	-2.913	-3.194	-3.279
	[3.47]***	[3.62]***	[4.31]***	[4.12]***	[4.00]***	[3.56]***	[4.14]***	[3.82]***
Other flows to GDP	-0.026	-0.002	-0.002	-0.004	0.003	-0.002	-0.006	-0.008
	[1.41]	[0.09]	[0.12]	[0.19]	[0.17]	[0.08]	[0.33]	[0.39]
Exports to GDP	0.240	0.256	0.267	0.298	0.123	0.179	0.194	0.234
	[11.02]***	[7.77]***	[8.47]***	[8.50]***	[6.36]***	[5.47]***	[6.08]***	[6.46]***
Financial liberalization		0.484		0.676		-0.584		-0.429
		[0.74]		[1.01]		[0.91]		[0.64]
Latitude			-15.030	5.958			-30.351	7.667
			[1.61]	[0.43]			[2.64]***	[0.41]
British legal origin			4.323	4.246			3.345	2.922
			[1.13]	[1.13]			[0.71]	[0.58]
Creditor rights			0.103	-0.277			-0.205	-1.033
			[0.07]	[0.19]			[0.12]	[0.54]
Constant	-156.774	-192.251	-236.244	-222.930	-135.374	-165.733	-158.175	-169.297
	[9.70]***	[11.32]***	[13.38]***	[12.36]***	[9.42]***	[9.05]***	[7.98]***	[7.86]***
Observations	1528	1209	1295	1109	1518	1206	1285	1106
Number of countries	92	62	75	56	92	62	75	56
Adj. R-squared	0.13	0.22	0.29	0.31	0.15	0.16	0.19	0.19
Hausman test	156.7	162.96	-[a]	-[a]	106.77	153.84	-[a]	-[a]
P-value for Hausman test	0.00	0.00			0.00	0.00		

[a] The Hausman test cannot be performed in this case, because it is impossible to estimate the fixed effects model when we include time time invariant variables such as creditor rights, legal origin, and latitude.

Table 5
Panel Estimates of the Impact of Remittances on Financial Development
Fixed Effects Results Removing Potential Outliers

The regression equation estimated is of the form $FD_{i,t} = b_1 Rem_{i,t} + b_2 X_{i,t} + a_i + u_{i,t}$ where FD refers to financial development measured as the % of bank deposits and, separately, bank credit to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is a matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP and *Exports to GDP*, the share of total exports as a % of GDP. Outliers, observations in the top and bottom 1 percent of the distribution for each variable, are removed. Country dummies are included, but not shown. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP		**Bank Credit to GDP**	
Remittances to GDP	0.581	0.596	0.242	0.255
	[6.46]***	[6.09]***	[2.88]***	[2.67]***
Log of GDP	15.231	15.461	8.753	8.755
	[14.48]***	[12.56]***	[8.77]***	[7.39]***
GDP Per capita	2.289	1.823	5.130	5.239
	[2.78]***	[1.66]*	[6.60]***	[4.94]***
Inflation	-0.009	-0.018	-0.006	-0.013
	[1.86]*	[2.68]***	[1.44]	[1.99]**
Dual exchange rate	-0.593	-0.609	-2.475	-2.339
	[0.85]	[0.81]	[3.72]***	[3.17]***
Other flows to GDP	-0.019	-0.003	0.130	0.128
	[0.44]	[0.06]	[3.09]***	[2.53]**
Exports to GDP	0.142	0.143	0.039	0.071
	[4.82]***	[4.31]***	[1.37]	[2.13]**
Financial liberalization		0.423		-0.934
		[0.73]		[1.64]
Constant	-330.654	-337.366	-187.260	-187.728
	[14.38]***	[12.48]***	[8.59]***	[7.22]***
Observations	1392	1117	1388	1108
Number of countries	87	59	89	60
Country dummies	Yes	Yes	Yes	Yes
Adj. R-squared	0.32	0.35	0.22	0.23

Table 6
Panel Estimates of the Impact of Remittances on Financial Development
Fixed Effects Results for 1995-2003

The regression equation estimated is of the form $FD_{i,t} = b_1 Rem_{i,t} + b_2 X_{i,t} + a_i + u_{i,t}$ where FD refers to financial development measured as the % of bank deposits and, separately, bank credit to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is a matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP and *Exports to GDP*, share of exports as a % of GDP. Country dummies are included, but not shown. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP		**Bank Credit to GDP**	
Remittances to GDP	0.618	0.603	0.287	0.323
	[6.66]***	[6.04]***	[3.10]***	[3.19]***
Log of GDP	18.379	19.511	10.876	8.963
	[15.39]***	[13.83]***	[9.15]***	[6.30]***
GDP per capita	2.764	0.925	7.368	10.085
	[2.99]***	[0.70]	[8.00]***	[7.58]***
Inflation	-0.002	-0.002	-0.001	-0.001
	[3.34]***	[3.28]***	[2.25]**	[2.19]**
Dual exchange rate	-1.874	-1.875	-2.837	-2.658
	[2.25]**	[2.08]**	[3.40]***	[2.90]***
Other flows to GDP	0.008	0.009	0.004	-0.002
	[0.42]	[0.50]	[0.24]	[0.12]
Exports to GDP	0.121	0.131	0.097	0.120
	[3.70]***	[3.65]***	[2.98]***	[3.30]***
Financial liberalization		0.201		-0.156
		[0.29]		[0.22]
Constant	-406.038	-431.061	-243.145	-202.14
	[15.47]***	[13.90]***	[9.31]***	[6.46]***
Observations	1268	1041	1258	1038
Number of countries	70	49	70	49
Country dummies	Yes	Yes	Yes	Yes
Adj. R-squared	0.38	0.39	0.31	0.32

Table 7
Panel Estimates of the Impact of Remittances on Financial Development
Two Way Fixed Effects Estimates Including Country and Time Dummies

The regression equation estimated is of the form $FD_{i,t} = b_1 Rem_{i,t} + b_2 X_{i,t} + a_i + u_{i,t}$ where FD refers to financial development measured as the % of bank deposits and, separately, bank credit to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is a matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP and *Exports to GDP*, the share of total exports as a % of GDP. Country dummies are included, but not shown. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP		**Bank Credit to GDP**	
Remittances to GDP	0.182	0.367	0.207	0.293
	[1.83]*	[3.48]***	[2.27]**	[2.73]***
Log of GDP	6.890	12.337	10.521	11.023
	[3.55]***	[5.27]***	[5.95]***	[4.68]***
GDP per capita	3.523	2.829	5.819	7.314
	[3.76]***	[2.31]**	[6.81]***	[5.89]***
Inflation	-0.002	-0.002	-0.001	-0.001
	[3.23]***	[3.25]***	[2.45]**	[2.30]**
Dual exchange rate	-0.014	0.013	0.004	0.003
	[0.80]	[0.70]	[0.24]	[0.16]
Other flows to GDP	0.201	0.147	0.099	0.110
	[9.30]***	[4.34]***	[5.02]***	[3.20]***
Exports to GDP	-1.410	-1.398	-2.016	-2.086
	[1.79]*	[1.76]*	[2.78]***	[2.57]**
Financial liberalization		2.790		2.178
		[3.52]***		[2.70]***
Constant	-134.589	-260.538	-226.933	-242.849
	[3.05]***	[4.87]***	[5.65]***	[4.51]***
Observations	1528	1209	1518	1206
Number of countries	92	62	92	62
Adj. R-squared	0.34	0.40	0.29	0.30
Country dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
F-statistic for country fixed effects	53.32	39.09	53.68	51.62
P-value	0.00	0.00	0.00	0.00
F-statistic for time fixed effects	2.82	2.74	1.54	1.51
P-value	0.00	0.00	0.04	0.04

Table 8
Panel Estimates of the Impact of Remittances on Financial Development
Fixed Effect Estimates Lagging Regressors 2 years

The regression equation estimated is of the form $FD_{i,t} = b_1 Rem_{i,t-2} + b_2 X_{i,t-2} + a_i + u_{i,t}$ where FD refers to financial development measured as the % of bank deposits and, separately, bank credit to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is a matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP and *Exports to GDP*, the share of total exports as a % of GDP. Time and country dummies are included, but not shown. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP		**Bank Credit to GDP**	
Remittances to GDP	0.418	0.544	0.310	0.372
	[3.74]***	[4.76]***	[3.04]***	[3.18]***
Log of GDP	13.481	17.460	11.732	10.403
	[8.61]***	[9.88]***	[8.30]***	[5.85]***
GDP per capita	3.221	0.514	7.302	9.826
	[3.06]***	[0.39]	[7.61]***	[7.23]***
Inflation	-0.002	-0.001	-0.001	-0.001
	[2.71]***	[2.35]**	[1.73]*	[1.54]
Dual exchange rate	-1.231	-0.890	-1.572	-1.358
	[1.51]	[1.09]	[2.09]**	[1.62]
Other flows to GDP	0.037	0.049	0.058	0.058
	[2.10]**	[2.72]***	[3.62]***	[3.15]***
Exports to GDP	0.184	0.121	0.078	0.056
	[9.00]***	[3.43]***	[4.15]***	[1.54]
Financial liberalization		2.270		2.279
		[2.79]***		[2.74]***
Constant	-289.571	-378.758	-256.553	-230.162
	[8.42]***	[9.70]***	[8.26]***	[5.86]***
Observations	1398	1123	1392	1120
Time dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Adj. R-squared	0.31	0.37	0.29	0.31

Table 9
GMM Dynamic System Estimates of the Impact of Remittances on Financial Development

Results reported below are obtained by estimating the following system of equations $FD_{i,t}= b_1FD_{i,t-1}+ b_2Rem_{i,t} + b_3 X_{i,t} + a_i + u_{i,t}$ and $FD_{i,t}-FD_{i,t-1}=b_1(FD_{i,t-1}-FD_{i,t-2})+ b_2(Rem_{i,t}-Rem_{i,t-1}) + b_3(X_{i,t}-X_{i,t-1}) + u_{i,t}-u_{i,t-1}$. To compute the system estimator, variables in differences are instrumented with lags of their own levels, while variables in levels are instrumented with lags of their own differences. FD refers to financial development measured as the % of bank deposits and bank credit to GDP. Remittances to GDP is the share of remittances as a % of GDP. X is a matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP and *Exports to GDP*, the share of total exports as a % of GDP. Time dummies are included, but not shown. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP		**Bank Credit to GDP**	
Remittances to GDP	0.194	0.148	0.124	0.058
	[2.45]**	[2.79]***	[2.00]**	[0.67]
Log of GDP	1.532	0.680	1.963	2.215
	[1.51]	[0.94]	[2.66]***	[1.92]*
GDP per capita	0.062	0.072	0.322	-0.372
	[0.19]	[0.15]	[0.87]	[0.36]
Inflation	-0.001	-0.001	-0.002	-0.002
	[1.15]	[1.39]	[1.16]	[1.20]
Dual exchange rate	-2.011	-0.996	0.063	-0.043
	[2.03]**	[1.42]	[0.06]	[0.04]
Other flows to GDP	0.055	0.018	0.001	-0.011
	[1.05]	[1.50]	[0.05]	[0.70]
Exports to GDP	0.095	0.027	0.022	-0.040
	[3.64]***	[1.38]	[0.78]	[0.91]
Financial liberalization		-0.269		-2.725
		[0.40]		[2.08]**
Lag 1 of deposits to GDP	1.270	1.205		
	[19.24]***	[20.64]***		
Lag 2 of deposits to GDP	-0.346	-0.205		
	[4.73]***	[2.11]**		
Lag 3 of deposits to GDP	0.055	0.000		
	[1.42]	[0.00]		
Lag 1 of credit to GDP			1.426	1.440
			[19.29]***	[19.16]***
Lag 2 of credit to GDP			-0.627	-0.630
			[5.25]***	[5.01]***
Lag 3 of credit to GDP			0.163	0.155
			[2.15]**	[1.98]*
Constant	-39.458	-17.373	-48.046	-50.802
	[1.67]*	[1.08]	[2.90]***	[2.07]**
Observations	1211	1019	1182	1013
Time dummies	Yes	Yes	Yes	Yes
Sargan test for overidentifying restrictions	19.4	12.39	26.25	12.09
P-value Sargan test	0.62	0.98	0.24	0.99
Test for 2nd order autocorrelation	1.21	1.2	1.11	1.32
P-value for test for 2nd order autocorrelation	0.23	0.23	0.27	0.19

Table 10
Panel Estimates of the Impact of Remittances on Financial Development
Instrumental Variables Fixed Effects Estimates
Economic conditions in the remittance-source countries are used as instrument for remittances

The regression equation estimated is of the form $FD_{i,t} = b_1 Rem_{i,t} + b_2 X_{i,t} + a_i + u_{i,t}$ where FD refers to financial development measured as the % of bank deposits and, separately, bank credit to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is matrix of controls including: *GDP per capita*, measured in constant dollars; *Log of GDP*, stated in constant dollars; Inflation, defined as the % change in the GDP deflator; *Dual exchange rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial liberalization*, a dummy identifying periods of liberalization in domestic interest rates; *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP and *Exports to GDP*, the share of total exports as a % of GDP. GDP per capita, real GDP growth, and unemployment rates in remittance-source countries, weighted by migration, are used as instruments. Time and country dummies are included, but not shown. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Bank Deposits to GDP		**Bank Credit to GDP**	
Remittances to GDP	4.905	4.228	4.899	5.443
	[5.62]***	[5.51]***	[5.76]***	[5.77]***
Log of GDP	26.349	31.716	33.006	47.587
	[4.47]***	[4.78]***	[5.70]***	[5.83]***
GDP per capita	4.844	2.566	5.325	1.920
	[2.73]***	[1.26]	[3.07]***	[0.77]
Inflation	-0.003	-0.002	-0.002	-0.002
	[2.92]***	[3.21]***	[1.94]*	[1.74]*
Dual exchange rate	0.943	0.374	-1.313	-1.950
	[0.67]	[0.29]	[0.95]	[1.22]
Other flows to GDP	-0.026	0.021	-0.020	0.004
	[0.78]	[0.68]	[0.62]	[0.11]
Exports to GDP	0.167	0.065	0.030	-0.102
	[4.76]***	[1.16]	[0.87]	[1.48]
Financial liberalization		3.669		4.286
		[2.91]***		[2.77]***
Constant	-514.466	-775.204	-763.790	-1176.806
	[4.66]***	[4.67]***	[5.81]***	[5.77]***
Observations	1181	927	1174	927
Number of Countries	86	60	86	60
Country dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Cragg Donald F-statistic for weak instruments	15.02	14.57	14.96	14.57
Sargan test of overidentifying restrictions	0.43	0.34	2.44	3.99
P-value for Sargan test	0.81	0.85	0.30	0.14

Figure 1
Inflows to Developing Countries (billions of USD)
1975-2003

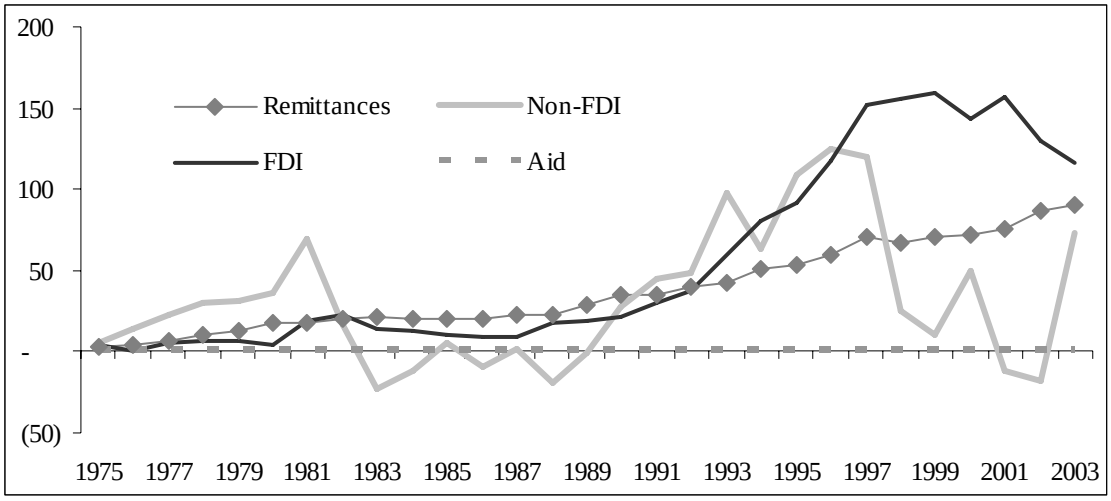


Figure 2
Inflows to Developing Countries (% of GDP)
1975-2003

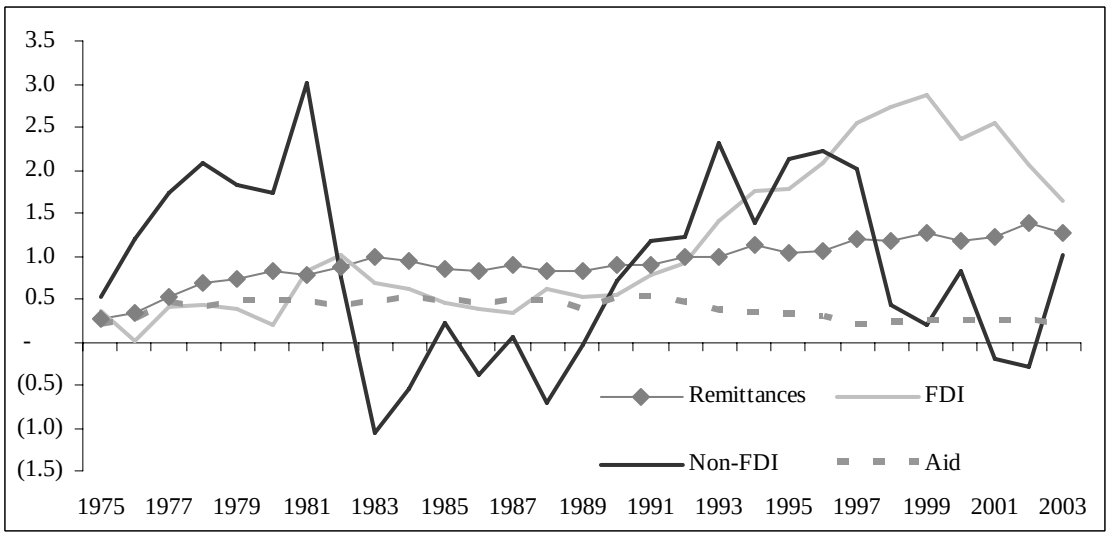


Figure 3
10 Largest Recipients of Remittances (in billions of USD)
1975-2003 (Average)

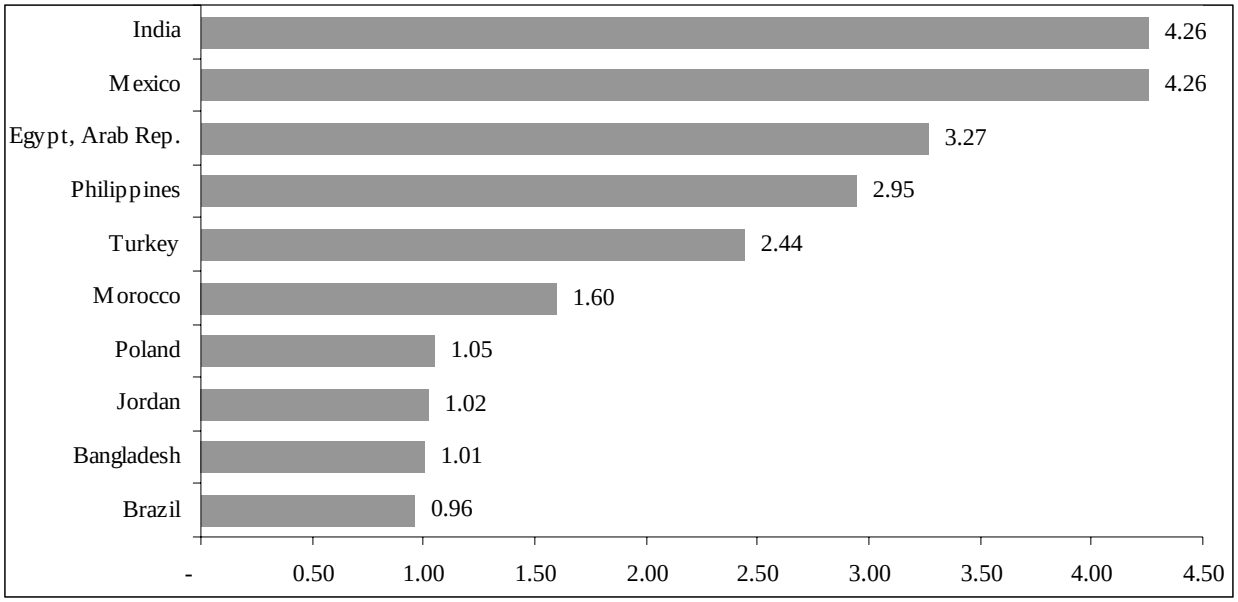
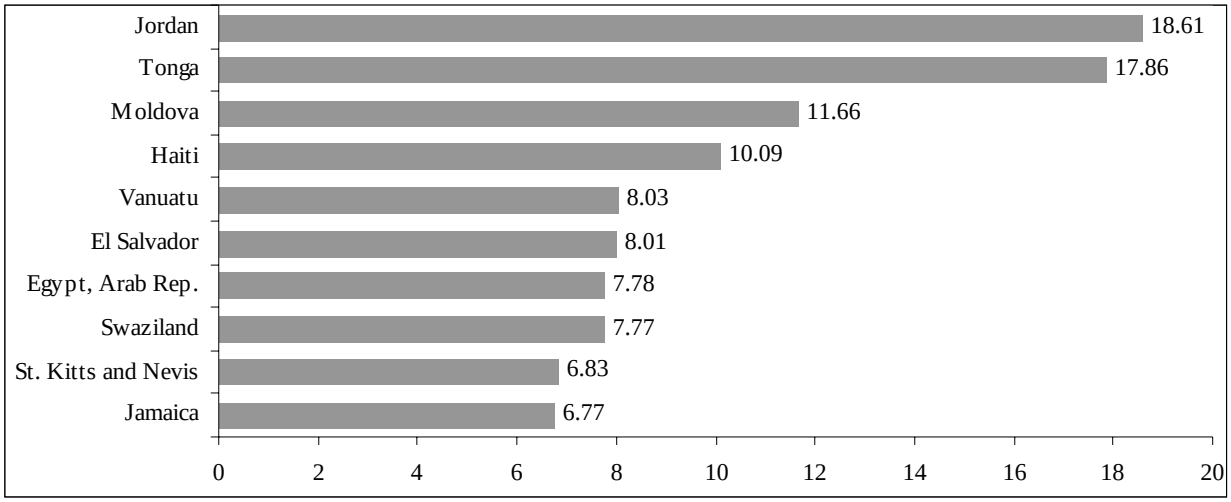


Figure 4
10 Largest Recipients of Remittances (in % of GDP)
1975-2003 (Average)



Appendix Table 1
Countries and Periods Included

Country	Years	Country	Years	Country	Years
Algeria	1980 - 1988	Ghana	1979 - 1997	Nigeria	1977 - 1993
Argentina	1978 - 2003	Grenada	1986 - 1990	Pakistan	1976 - 2003
Armenia	1995 - 2003	Guatemala	1977 - 2001	Panama	1980 - 2002
Bangladesh	1994 - 2003	Haiti	1975 - 2003	Papua New Guinea	1976 - 2001
Barbados	1975 - 2002	Honduras	1975 - 2003	Paraguay	1975 - 2003
Belarus	1995 - 2003	Hungary	1995 - 2003	Peru	1990 - 2003
Belize	1984 - 2002	India	1975 - 2002	Philippines	1977 - 2003
Benin	1992 - 2001	Indonesia	1983 - 2003	Poland	1994 - 2003
Bolivia	1976 - 2003	Jamaica	1976 - 2003	Romania	1994 - 2003
Botswana	1975 - 2002	Jordan	1977 - 2003	Rwanda	1976 - 2002
Brazil	1980 - 2003	Kazakhstan	1995 - 2003	Senegal	1975 - 2002
Bulgaria	1992 - 2003	Kenya	1975 - 2003	Seychelles	1989 - 2002
Burkina Faso	1983 - 2001	Kyrgyz Republic	1996 - 2003	Sierra Leone	1980 - 2001
Cameroon	1979 - 1995	Lao PDR	1988 - 2001	Slovak Republic	1994 - 2003
Central African Republic	1982 - 1993	Latvia	1996 - 2003	South Africa	1985 - 2001
Chad	1985 - 1994	Lithuania	1994 - 2003	Sri Lanka	1975 - 2003
Chile	1983 - 2003	Madagascar	1975 - 2003	St. Kitts and Nevis	1986 - 1990
China	1987 - 2001	Malawi	1994 - 2000	Sudan	1984 - 1997
Colombia	1975 - 2003	Malaysia	1975 - 2003	Suriname	1978 - 1994
Congo, Rep.	1995 - 2002	Maldives	1996 - 2003	Swaziland	1975 - 2002
Costa Rica	1977 - 2003	Mali	1988 - 2002	Syrian Arab Republic	1992 - 2002
Cote d'Ivoire	1975 - 2002	Mauritania	1986 - 1997	Thailand	1975 - 2003
Croatia	1994 - 2003	Mauritius	1981 - 2003	Togo	1975 - 2002
Dominica	1986 - 2002	Mexico	1979 - 2001	Tonga	1985 - 1993
Dominican Republic	1975 - 2003	Moldova	1995 - 2001	Trinidad and Tobago	1983 - 2002
Ecuador	1976 - 2001	Morocco	1976 - 2003	Tunisia	1988 - 2003
Egypt, Arab Rep.	1977 - 2003	Mozambique	1996 - 2002	Turkey	1987 - 2003
El Salvador	1977 - 2003	Namibia	1991 - 2001	Vanuatu	1982 - 2001
Estonia	1994 - 2003	Nepal	1996 - 2001	Venezuela, RB	1997 - 2002
Fiji	1979 - 1988	Nicaragua	1977 - 1993	Zimbabwe	1980 - 1993
Gabon	1978 - 1999	Niger	1975 - 1995		

Appendix 2: Remittance Data

Unless otherwise indicated, total remittances are the sum of three components: compensation of employees (under income balance of current account), workers' remittances (under current transfers) and migrant transfers (under capital account). These data were primarily obtained from the International Monetary Fund (IMF) *Balance of Payments Statistics Yearbook,* reported in the IMF's 2005 *World Economic Outlook.*

Compensation of employees should not be part of total remittances for Argentina, Australia, Azerbaijan, Barbados, Belize, Benin, Bosnia-Herzegovina, Brazil, Cambodia, Cape Verde, China, Cote d'Ivoire, Dominican Republic, Ecuador, El Salvador, Guyana, Italy, Panama, Rwanda, Senegal, Seychelles, Singapore, Turkey, and Venezuela

In general, "other current transfers" are NOT included in the definition of total remittances, except for Kenya, Malaysia, and Syria, where the Balance of Payment Yearbook specifies explicitly that migrants' remittances are recorded under "other current transfers".

For countries for which data were not available, IMF desk economists were contacted and the following data and/or information were provided:

1. Bulgaria: Other current transfers should be included in the remittances figure.
2. Haiti: Added remittances inflows data for 1991-2003.
3. Iran: Other current transfers should be used as the figure for total remittances.
4. Moldova: Added remittances data for 2000.
5. Niger: Added remittances inflows data for 1995-2003.
6. Romania: Added remittances data for 2000-2003.
7. Slovak Republic: Added remittances data for 1999-2003.
8. Ukraine: Added remittances data for 2000.
9. Venezuela: Added remittances inflows data for 1997-2003.

Appendix Table 3
Panel Estimates of the Impact of Remittances on Financial Development
Fixed Effects Results with Liquid Liabilities

The regression equation estimated is of the form $FD_{i,t} = b_1 Rem_{i,t} + b_2 X_{i,t} + a_i + u_{i,t}$ where in this case FD refers to financial development measured as the % of liquid liabilities to GDP. *Remittances to GDP* is the share of remittances as a % of GDP. X is a matrix of controls including: GDP per capita, measured in constant dollars; *Log of GDP*, stated in constant dollars; *Inflation*, defined as the % change in the GDP deflator; *Dual Exchange Rates*, a dummy capturing periods when multiple exchange rates were in effect; *Financial Liberalization*, a dummy identifying periods of liberalization in domestic interest rates, *Other flows to GDP*, defined as foreign direct investment + Non-FDI private inflows + aid expressed as a % of GDP and *Exports to GDP*, the share of total exports as a % of GDP. Absolute value of t statistics are in brackets. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Liquid liabilities to GDP							
	With Time Dummies				Without Time Dummies			
Remittances to GDP	0.425	0.399	0.467	0.431	0.317	0.371	0.418	0.321
	[6.11]***	[6.01]***	[6.80]***	[6.36]***	[4.42]***	[5.44]***	[5.89]***	[4.56]***
Log of GDP	15.362	14.862	14.833	13.020	9.827	18.020	16.557	8.010
	[13.36]***	[12.28]***	[11.44]***	[11.05]***	[4.98]***	[8.01]***	[7.04]***	[4.04]***
GDP Per Capita	3.678	5.468	3.034	3.943	4.437	4.031	2.121	4.324
	[4.41]***	[5.14]***	[2.66]***	[4.39]***	[4.95]***	[3.40]***	[1.70]*	[4.53]***
Inflation	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	[2.59]***	[2.73]***	[2.89]***	[2.91]***	[2.69]***	[2.79]***	[2.93]***	[2.97]***
Dual Exchange Rate	-2.276	-0.865	-1.032	-0.960	-2.275	-0.706	-0.808	-0.910
	[2.95]***	[1.13]	[1.29]	[1.23]	[2.95]***	[0.93]	[1.01]	[1.15]
Financial Liberalization		0.259	0.120			3.881	4.044	
		[0.42]	[0.19]			[5.11]***	[5.07]***	
Other Flows to GDP			-0.008	-0.033			0.004	-0.022
			[0.43]	[1.85]*			[0.20]	[1.20]
Exports to GDP			0.254	0.312			0.248	0.315
			[7.41]***	[14.18]***			[7.30]***	[14.28]***
Constant	-318.748	-316.622	-319.326	-277.962	-188.464	-384.567	-353.938	-159.411
	[12.62]***	[11.79]***	[11.19]***	[10.76]***	[4.22]***	[7.46]***	[6.60]***	[3.55]***
Observations	1867	1367	1257	1586	1867	1367	1257	1586
Number of Countries	103	66	65	96	103	66	65	96
Time Dummies	No	No	No	No	Yes	Yes	Yes	Yes
Adj. R-squared	0.19	0.28	0.32	0.31	0.21	0.31	0.35	0.32

Appendix 4: Note on the impact of measurement error

Given $y_{i,t} = \beta x_{i,t} + v_{i,t}$, $x_{i,t} = x^*_{i,t} + u_{i,t}$ and $\text{cov}(x^*, u) = 0$

where x is measured with error and x^* is the true value of x, it can be shown that

$$b = \frac{\text{var}(x^*)}{\text{var}(u) + \text{var}(x^*)}\beta$$

where *b* is the estimated value of the coefficient.

Furthermore, given that $\text{var}(x^*) = \text{var}(x) - \text{var}(u)$, *b* can be expressed as

$$b = \frac{\text{var}(x) - \text{var}(u)}{\text{var}(x)}\beta$$

or

$$\frac{b}{\beta} = 1 - \frac{\text{var}(u)}{\text{var}(x)}$$

From our FE estimates for bank deposits $b \cong 0.6$ and from our IV estimations $\beta \cong 4$, implying that:

$$\frac{b}{\beta} = 0.15 = 1 - \frac{\text{var}(u)}{\text{var}(x)} \text{ or } \frac{\text{var}(u)}{\text{var}(x)} = 0.85 \text{ or } \frac{std.dev(u)}{std.dev(x)} = \sqrt{0.85}$$

Given that in our sample standard deviation of x (or the standard deviation of remittances) equals 4.52 then this implies that std.dev(*u*) would equal 4.17. Considering that the mean of *x* is 2.95, this suggests that the size of the measurement error of x, remittance, could be close to 142% of x. This number is within the existing estimates of the size of informal remittances which range between 20 and 200% of formal remittances.