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Remittances, Financial Development, and Growth

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Remittances, Financial Development, and Growth

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Abstract

There has been little systematic empirical study on the relationship between remittances and growth. This paper attempts to examine this relationship. Using a newly constructed cross-country of data series for remittances covering a large sample of developing countries, we relate the interaction between remittances and financial development and its impact on growth. We analyze how a country's capacity to use remittances and its effectiveness in doing so might be influenced by local financial sector conditions. Given the difficulty of borrowing in developing countries, we explore the hypothesis that remittances can substitute for a lack of financial development and hence promote growth. The empirical analysis shows that remittances can promote growth in less financially developed countries. This relationship controls for the endogeneity of remittances and financial development using a Generalized Method of Moments (GMM) approach, does not depend on the particular measure of financial sector development used, and is robust to a number of sensitivity tests.

JEL Classification Numbers: F22, F43, O16

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I. INTRODUCTION

The past decade was marked by the increasing role of remittances in total international capital flows. For many developing countries, remittances represent a significant part of international capital flows, exceeding export revenues, Foreign Direct Investment (FDI) and aid. In the aggregate, remittances are currently the second largest source of foreign exchange, both in absolute terms and as a percentage of GDP (Figures 1 and 2). For some countries, remittances represent more than 10 percent of GDP. This is the case for small Caribbean and Pacific Islands, but also for some labor-exporting countries, such as Albania, El Salvador, and the Philippines (Figure 3).

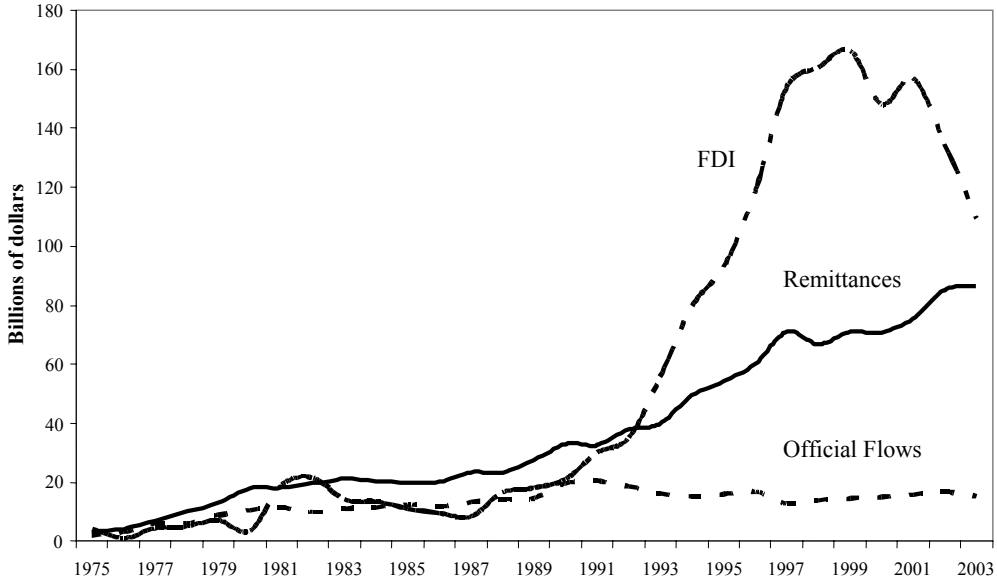
Given the magnitude of this source of foreign exchange, it is surprising that the relationship between remittances and growth has not received more systematic attention. Most of the work done on the macroeconomics of remittances and their impact on growth is qualitative. As emphasized by Rapoport and Docquier (2005), one constraint in analyzing the impact of remittances on growth has been the lack of comprehensive cross-country evidence. Our paper contributes to the debate over the impact of remittances on growth in two ways. On the one hand, we substantially expand data on remittance flows, to include a large number of developing countries. We use a newly constructed measure for remittances, which covers about 100 developing countries for the descriptive part and about 70 for the econometric analysis and which allows a more precise estimate of the impact of remittances on growth. On the other hand, we analyze the importance of remittances in promoting economic growth, looking specifically at the link between remittances and the financial sector. In particular, we ask three questions. First, what is the macroeconomic effect of remittances? Second, how does financial development influence the growth effect of remittances? Third, are remittances important for productive investment?

Remittances are private flows of foreign exchange, completely distinct in nature from the others, in that they are spent partly on consumption and partly on investment. A considerable part of the relevant literature argues that remittances are mostly spent on consumption, housing, and land, and are not used for productive investment that would contribute to long-run growth. There is no cross-country macroeconomic analysis supporting this assertion, and our paper attempts to fill this gap. Given the difficulties associated with borrowing and getting insurance in developing countries, particularly in rural areas, our main hypothesis is that voluminous migrant remittances can substitute for a lack of financial development and hence promote economic growth via investment.

Our paper will contribute to two strands of literature.[2] One relates to the development impact of remittances. The only cross-country study on remittances and growth, by Chami, Fullenkamp, and Jahjah (2003), finds a negative impact. Their idea is that remittances take place under asymmetric information and might generate moral hazard problems. Compared

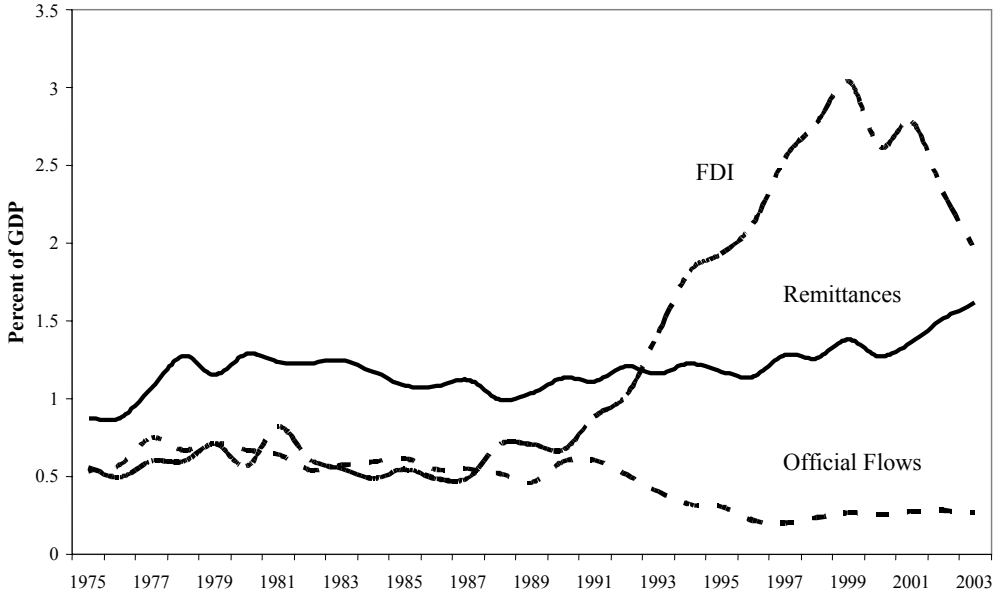
[2] For a comprehensive review of the literature on remittances, see Rapoport and Docquier (2005).

Figure 1. Remittances, Official Flows, and FDI, 1975-2003
(In billions of dollars)



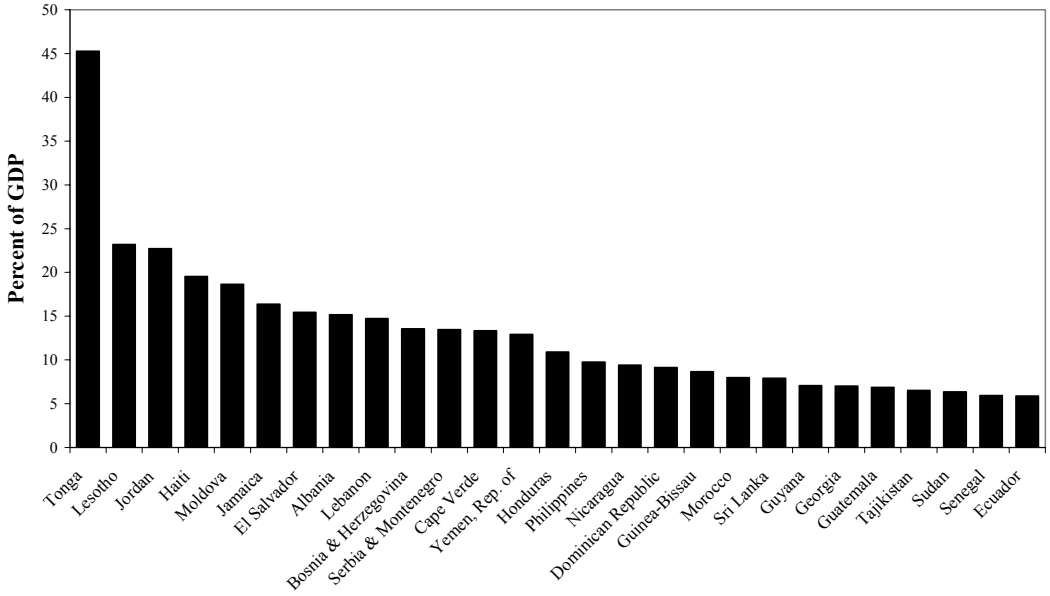
Source: IMF Balance of Payments Statistics and authors' calculations.

Figure 2. Remittances, Official Flows, and FDI, 1975-2003
(In percent of GDP)



Source: IMF Balance of Payments Statistics and authors' calculations.

Figure 3. Largest Recipients of Remittances in 2002



Source: IMF Balance of Payments Statistics and authors' calculations.

to their work, we look into the impact on investment, a channel completely disregarded by these authors. Moreover, our remittance series covers a much larger number of developing countries, and our empirical approach deals with endogeneity.

The second strand is the one that links remittances to the financial development of a country. This literature has looked at the conditions under which the financial sector infrastructure, and in particular transaction costs, influences the propensity to remit. Authors emphasize the importance of promoting competition among money transfer firms to reduce transaction costs and promote remittances through formal channels. The creation of innovative financial products or the promotion of microfinance institutions, which encourage recipients to save and invest part of the remittance flows, has also been extensively analyzed. Rather than looking at the importance of the financial institutions to increase flow of remittances, we take a different perspective and analyze how a country's capacity to use remittances and its effectiveness in doing so might be influenced by local financial sector conditions.[3] To the best of our knowledge, nobody has looked at the complementarity/substitutability of remittances and financial development in promoting growth.

[3] The relation between financial market and growth has been studied extensively. A large number of papers have reached positive conclusions: namely, that well-developed financial markets promote economic growth (King and Levine, 1993; Beck, Levine, and Loayza, 2000 and Levine, Loayza, and Beck, 2000).

The relationship between remittances, financial development, and growth is a priori ambiguous. On one hand, well-functioning financial markets, by lowering costs of conducting transactions, may help direct remittances to projects that yield the highest returns and therefore enhance growth rates. On the other hand, remittances can compensate for a bad financial system: by loosening liquidity constraints, potential entrepreneurs could use remittances whenever the financial system does not help them start productive activities due to lack of collateral or because of high lending costs. Entrepreneurs in developing countries confront much less efficient credit markets, and available evidence indicates that access to credit is among their biggest concerns (Paulson and Towsend, 2000). Several recent papers also suggest that credit constraints play an especially critical role in determining growth prospects in economies characterized by a high level of income inequality (Banerjee and Newman, 1993; Aghion and Bolton, 1997; Aghion, Caroli and Garcia-Penalosa, 1999). Where credit markets are imperfect, individuals possessing little wealth must forgo potentially profitable investment opportunities. In this paper, we try to prove that where access to credit is limited, individuals might use remittances to release such credit constraints. This would be reflected in higher growth. Although this mechanism has not been studied in a macro context, there is some evidence at the micro level. Dustmann and Kirchamp (2001) find that the savings of returning migrants may be an important source of start-up capital for micro enterprises. They find that 50 percent of a sample of Turkish emigrants returning from Germany started a micro enterprise within four yeas of resettling in Turkey using money saved while working abroad. Similarly, Massey and Parrado (1998), examine enterprise formation in a sample of 30 communities in central-west Mexico, including five large cities. They conclude that earnings from work in the United States provided an important source of start-up capital in 21 percent of the new business formations. Woodruff and Zenteno (2001) also find that remittances are responsible for almost 20 percent of the capital invested in micro enterprises throughout urban Mexico.

Our empirical analysis suggests that agents compensate for the lack of development of local financial markets using remittances to ease liquidity constraints, channel resources toward productive investments, and hence promote economic growth. In an economy in which the financial system does not work, remittances give entrepreneurs who lack collateral, credit histories, and connections, the instrument to start high-return projects. Therefore, remittances help alleviate credit constraints on the poor, substituting for financial development, improving the allocation of capital, and therefore accelerating economic growth. This is not unlikely, given that in developing countries, people are more likely to rely on informal family connections for capital.

To assess the merits of our guess, we analyze the interaction of remittances and financial development using a large sample of developing countries. We use standard financial market indicators and employ them in growth regressions to study the impact of the interaction between these variables and remittances on economic growth. We find that remittances may play a significant role in promoting growth in countries with shallower financial systems. This result holds true after addressing concerns regarding endogeneity.

The structure of the paper is as follows. Section II describes the data; Section III is devoted to the empirics of remittances and growth; Section IV includes several robustness tests. Section V analyzes the cyclical behavior of remittances, and Section VI concludes.

II. DATA

This section describes the data on remittances, financial development, and economic growth, as well as the control variables used in the growth regressions.

The new data series for remittances constructed in this study covers a sample of over 100 countries for the 1975-2002 periods. The data represent an improvement over existing remittance series in several dimensions. Remittances are generally defined as the sum of three items in the IMF's Balance of Payment Statistics Yearbook (BOPSY) (all the details are in Appendix 1): workers' remittances, compensation of employees, and migrant transfers. This is, for instance, the standard definition in the World Development Indicators and the Global Development Finance databases of the World Bank.

As a first step, we followed the country-specific notes in the BOPSY, which provide many detailed definitions and description of estimation methodologies. This initial country-by-country inspection provided some interesting insights. We found out that the compensation of employees item needed to be excluded in about 20 countries, since this category does not qualify as remittance flows in those countries.[4] Some other countries do not classify remittances separately from other current transfers in the BOP. In such cases, the standard definition understates the true flows. Thus, to estimate flows more accurately and to obtain data for a larger number of countries, as a second step, we contacted IMF desk economists and country authorities to improve our sample. Some countries have only recently started to systematically produce and report remittances statistics. In these cases, it is common that the IMF desks or country authorities have more data and for a longer time period than those reported in the BOPSY. Furthermore, in cases where the country notes in BOPSY were insufficient to assess how remittances were measured, they were able to provide clarification regarding definitions and classification of remittances under various BOP items.

We obtained information for more than 29 countries (the list is reported in Appendix I). This increased our sample in a substantial way and improved it qualitatively. Compared to previous studies, we are able to include a much larger number of developing countries for the remittance variable. All regressions employ the ratio of remittances to GDP (REM/GDP).

[4] There is no consensus among policymakers and academics regarding how broad the definition of remittances should be. Whenever possible, we decided to exclude from the measure of remittances those inflows included in compensation of employees that refer to pensions received by currently retired expatriate workers and earnings of locals working for foreign embassies and international institutions in the home country.

The recent literature on financial development includes several indicators to proxy for the ability of financial intermediaries to identify profitable projects, monitor and control managers, ease risk management, and facilitate resource mobilization. Usually, scholars concentrate on credit to private firms and household from banks and nonbank financial intermediaries (Greenwood and Jovanovic, 1990) or access to loans (as in Banerjee and Newmann, 1993; Galor and Zeira, 1993). More generally, proxies for financial development can be classified into two broad categories: those relating to the banking sector and those relating to the stock market (see Levine, Loayza, and Beck, 2000; and King and Levine, 1993). In this study we use four variables as a measure of financial development, all of them related to the banking sector. First, liquid liabilities of the financial system (M2/GDP). They equal currency plus demand and interest bearing liabilities of banks and nonfinancial intermediaries divided by GDP. It is considered the broadest measure of financial intermediation and includes three types of financial institutions: the central bank, deposit money banks, and other financial institutions. Second, the sum of demand, time, saving, and foreign currency deposits to GDP (DEP/GDP). It measures the ability of banks to attract financial savings and provide a liquid store of value. Third, claims on the private sector divided by GDP (LOAN/GDP). They measure the extent to which the private sector relies on banks to finance consumption, working capital, and investment. Finally, credit provided by the banking sector to GDP (CREDIT/GDP), which measures how much intermediation is performed by the banking system, including credit to the public and private sectors. The data for the definitions of the variables are obtained from the International Financial Statistics (IFS) of the International Monetary Fund and from the World Development Indicators (WDI) of the World Bank. The number of developing countries for which we have data on financial development is also larger than the one used so far (for credits to the private sector all the other datasets have data for only 44 developing countries, compared to our data for 73).

For the first set of regressions, the dependent variable is the growth rate of output, measured as the growth of the real per capita GDP in constant dollars from the WDI. Our set of controls includes the following (see Table 1 for a definitions and sources of our variables). *Inflation,* measured as the annual percentage change in the consumption price index. *Openness* to international trade, defined as the ratio of the sum of exports plus imports of goods to total output. *Human capital,* measured as the average number of years of secondary schooling, obtained from Barro and Lee, series. *Government fiscal balance and investment ratio* defined, respectively, as the ratio of central government fiscal balance to GDP and gross fixed capital formation to GDP. Finally, *population growth*. All control variables, except inflation and fiscal balance, are specified in natural logs.

In the investment regressions, we proxy the user cost of capital by one of two alternative measures: the lending interest rate and the interest rate spread, which is the difference between the lending rate and the deposits rate. Both variables are taken from the WDI dataset.

Table 1. Definition and Source of the Variables

Variable	Description
Growth	Growth of real per capita GDP in constant dollars. *Source*: World Development Indicators, World Bank.
Remittances/GDP	Remittances are defined as sum of three components. Details on Appendix 1. *Source:* Balance of Payments Yearbook, International Monetary Fund.
Investment/GDP	Gross Fixed Capital Formation as a share of GDP. *Source*: World Development Indicators, World Bank.
Fiscal Balance/GDP	Fiscal balance of the central government as a share of GDP. *Source*: World Development Indicators, World Bank.
Openness	Exports plus imports as a share of GDP. *Source*: World Development Indicators, World Bank.
Inflation	Annual Percentage change in CPI. *Source*: World Economic Outlook, International Monetary Fund
Population growth	Log difference of Population. *Source*: World Development Indicators, World Bank
Years of Education	Human Capital measured as the average years of secondary schooling in total population. *Source*: Barro and Lee (1996). See update version at: http://www.cid.harvard.edu/ciddata.ciddata.html
Loans/GDP	Claims on the private sector, divided by GDP. *Source:* International Financial Statistics, International Monetary Fund
Credit/GDP	Domestic credit provided by banking sector divided by GDP. *Source*: World Development Indicators, World Bank.
M2/GDP	This measure includes the liquidity liabilities of the financial system: it equals currency plus demand and interest-bearing liabilities of banks and nonfinancial intermediaries divided by GDP. *Source*: World Development Indicators, World Bank.
Deposits/GDP	This measure is defined as the sum of demand deposits, time, saving, and foreign currency deposits divided by GDP. *Source:* International Financial Statistics, International Monetary Fund

Note: This table describes the variables collected for our study. The first column gives the names of the variables as we use it; the second column describes the variables and provides the source from which it was collected.

Our sample consists of 73 developing countries with annual data for the period 1975-2002.[5] Following most empirical cross-country studies, we work with a panel of five-year averages of all the variables. Table 2 provides descriptive statistics of the variables of interest.

There is considerable variation in the ratio of remittances to GDP across countries, ranging from less than 1 percent of GDP (Chile) to 23 percent for Jordan in 2002.[6] Financial development variables also range extensively: The deposits variable is on average 32 percent of GDP but with big variation across countries and time periods, from a low of 6 percent (Niger) to a high of 142 percent (China). Liquidity is on average 38 percent of GDP in our sample, with a low of 8 percent (Brazil) and a high of 164 percent (Malta). Finally, the average level of claims to the private sector is 28 percent of GDP—ranging from 2 percent (Sudan) to 133 percent (China)—and credit provided by the banking sector amounts to 47 percent of GDP, with a low of 1 percent (Botswana) to a high of 194 percent (Nicaragua).

Table 3 shows bivariate correlations among the variables of interest. Growth, as expected, is positively correlated with investment, government fiscal balance, years of education, and our measure of openness, and negatively correlated with inflation. As for our variables of interest, higher remittances are associated with higher growth. Moreover, the correlation between growth and all the measures of financial development is positive, consistent with previous results on the impact of financial development on growth. In turn, remittances are positively associated with investment and openness and negatively correlated with inflation, suggesting that a high rate of domestic inflation may act as a proxy for uncertainty and risk and therefore discourage the flow of remittance earnings. All these results are consistent with previous findings in the literature.[7]

Finally, the correlation between remittances and the financial development variables is positive across the four indicators, though very small for loans and bank credit. Although these correlations provide a good initial description of the interrelation among variables, they do not control for other country characteristics and do not imply causality in either direction.

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[5] We started with a larger dataset, but data for all variables was only available for 73 countries. Furthermore, some observations were excluded following an analysis of outliers.

[6] An analysis of outliers was performed and some observations were dropped from the econometric analysis, among them Lesotho, where remittances have accounted for over 50 percent of GDP in some years.

[7] See El-Sakka and Mcnabb (1999) and Detragiache, Gupta and Tressel (2005).

Table 2. Summary Statistics, Five-Year Averages for the Period 1975-2002

Variable	Mean	Median	Standard Deviation	Minimum	Maximum	Number of Observations
GDP growth	1.2	1.3	3.4	-14.2	11.0	306
LogInvgdp	3.0	3	0.3	1.6	3.8	306
GovFiscalBal	-4.1	-3.6	4.3	-28.1	15.2	306
Inflation	16.8	9.5	28.5	-2.3	273.6	306
LogOpeness	3.8	3.8	0.6	2.4	5.2	306
LogPopGrowth	0.6	0.8	0.7	-2.8	1.6	306
LogYearEdu	1.2	1.4	0.7	-2.0	2.4	306
Rem/GDP	2.9	1.5	4.0	0	22.6	306
Loan/GDP	27.7	22.6	20.4	2.4	133.3	305
Credit/GDP	47.1	31.8	31.8	0.9	193.8	306
M2/GDP	37.8	30.9	25.1	8.1	164.5	306
Dep/GDP	32.2	27.7	20.6	5.8	142.5	306

Note: This table reports the summary statistics of the main regression variables. Definition and data sources of the variables are in Table 2. Outliers have been excluded.

Table 3. Bivariate Correlations of Variables of Interest

	GDP growth	Log Invgdp	Gov Fiscal Balance	Inflation	Log Openness	Log PopGrowth	LogYearEdu	Rem/ GDP	Loan/ GDP	Credit/ GDP	M2/ GDP	Dep/ GDP
GDP growth	1											
LogInvGdp	0.43*	1										
GovFiscalBal	0.12*	0.09	1									
Inflation	-0.26*	-0.04	-0.00	1								
LogOpenness	0.15*	0.39*	0.11*	-0.28*	1							
LogPopGrowth	0.10*	-0.11*	-0.06	-0.22*	-0.19*	1						
LogYearEdu	0.06	0.34*	0.14*	0.12*	0.32*	-0.48*	1					
Rem/GDP	0.14*	0.19*	-0.19*	-0.16*	0.27*	0.14*	0.04	1				
Loan/GDP	0.18*	0.38*	0.06	-0.10*	0.33*	-0.23*	0.41*	0.07	1			
Credit/GDP	0.05	0.28*	-0.17*	0.06	0.22*	-0.15*	0.35*	0.06	0.69*	1		
M2/GDP	0.23*	0.40*	-0.09*	-0.25*	0.42*	-0.19*	0.37*	0.27*	0.76*	0.64*	1	
Dep/GDP	0.21*	0.39*	-0.08	-0.18*	0.41*	-0.27*	0.47*	0.22*	0.83*	0.67*	0.95*	1

Note: This table reports the correlation matrix of the main regression variables. Definitions and data sources of the variables are in Table 2. Stars denote significance at 10 percent level or better.

III. EMPIRICAL ANALYSIS

A. Estimation Methodology

To explore the relationship between remittances, financial development and growth, we work with a pooled (cross-country, time series) dataset consisting of 73 developing countries. Following the vast majority of cross-country empirical studies, we split the sample period 1975-2002 into six nonoverlapping five-year periods (except for the last period for which we average our data for only three years). We use five-year periods rather than shorter time spans because, although the financial development data are available on a yearly basis for most countries in our sample, they might be subject to business cycle fluctuations, which we control for by averaging over longer time periods.

As a starting exercise, we estimate the impact of remittances on economic growth by ordinary least squares (OLS). For comparison purposes, we do not include in our first regression the interaction between remittances and financial development or the financial development variables.

We estimate the following equation:

$$GDP_{it} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 \mathrm{Rem}_{it} + \beta_3 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \qquad (1)$$

where $GDP_{i,t-1}$ denotes the (logarithm of) initial level of GDP per capita, *Rem* is equal to remittances over GDP, X_{it} is the matrix of control variables described in the previous section, μ_t is a time specific effect, η_i is an unobserved country-specific fixed effect, and ε_{it} is the error term.[8] We are interested in testing whether the marginal impact of remittances on growth, β_2, is statistically significant.

In a second set of regressions, we examine the role of remittances on growth through financial markets. The hypothesis we would like to test is whether the recipient country's financial depth could influence the impact of remittances on growth. To this end, we interact the remittance variable with an indicator of financial depth and test for the significance of the interacted coefficient.[9] A negative coefficient would indicate that remittances are more effective in countries with shallower financial systems; in other words, evidence of substitutability between remittances and financial instruments. On the other hand, a positive

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[8] Note that equation (1) can be alternatively written with the growth rate as a dependent variable as: $Growth_{it} = GDP_{it} - GDP_{i,t-1} = \beta_0 + (\beta_1 - 1)GDP_{i,t-1} + \beta_2 \mathrm{Rem}_{it} + \beta_3 X_{it} + \mu_t + \eta_i + \varepsilon_{it}$, where $(\beta_1 - 1)$ is the convergence coefficient.

[9] In order to ensure that the interaction term does not proxy for remittances or the level of development of financial markets, these variables are also included in the regression separately.

interaction would imply that the growth effects of remittances are enhanced in deeper financial systems, supporting complementarity of remittances and other financial flows.

The regression to be estimated is the following:

$$\begin{aligned} GDP_{it} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 \operatorname{Re}m_{it} + \beta_3 \text{FinDev}_{it} + \\ + \beta_4 (\text{Rem}_{it} \cdot \text{FinDev}_{it}) + \beta_5 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \end{aligned} \tag{2}$$

Our first sets of OLS regressions, with or without the interaction with financial development, do not address issues regarding endogeneity. Theoretically, however, it is plausible, and also very likely, that both the magnitude of remittances and the efficiency of financial markets increase with higher growth rates. This would lead to an overstatement of the effect of each of the two variables and their interaction with growth. There has been an extensive search for good instruments for financial development. In the literature, variables not subject to reverse causality, such as origins of a country's legal systems and creditor rights (La Porta et al., 1997), are commonly used. These variables suffer from the drawback that they do not vary over time, so we cannot use them in a panel framework. Therefore, we address the endogeneity problem looking at panel *system Generalized Method of Moments* regressions (SGMM), following Arellano and Bover (1995).

Taking advantage of the panel nature of the data, GMM estimators are based on differencing regressors to control for unobserved effects. Taking into account time-specific effects, we obtain:

$$GDP_{i,t} - GDP_{i,t-1} = \beta_1 \left(GDP_{i,t-1} - GDP_{i,t-2} \right) + \beta \left(X_{i,t} - X_{i,t-1} \right) + \left(\varepsilon_{it} - \varepsilon_{i,t-1} \right) \tag{3}$$

where $X_{i,t}$ is now the set of explanatory variables, also including remittances, financial development, and the interaction term. Estimation of (3) requires an instrumental variable procedure to correct for the endogeneity of the columns of X as well as the correlation between the new error term and the lagged difference of the dependent variable. While strictly exogenous instruments are in general hard to come by, it is possible to construct internal predetermined instruments using lagged values of the right-had side variable. In particular, if one if willing to assume that $E[\varepsilon_{it} \mid X_{is}] = 0$ for all $t>s$ (but not otherwise), then second- and higher-order lags of the columns of X can be used as instruments in the estimation of (3). This condition is likely to hold if ε_{it} is serially uncorrelated, in which case the second- and high-order lags of the endogenous variables are likewise valid instruments. Using these internal instruments, a GMM estimator can be constructed. This approach, used to compute the so-called *difference estimator*, has some drawbacks. First, differencing the equation removes the long-run cross-country information present in the levels of the variables. Second, if the columns of X display persistence over time, their lagged levels will

be poor instrument of their differences. Under additional assumptions,[10] it is possible to construct an alternative GMM estimator that overcomes these problems, using suitably lagged differences of the dependent and independent variables as instruments. Specifically, if ε is serially uncorrelated, once-lagged differences of regressors are valid instruments. Combining the level and first-difference specifications, one can construct a system GMM estimator that outperforms the difference estimator (see Arellano and Bover, 1995; and Blundell and Bond, 1997).

B. Estimation Results

This section presents ordinary least square (OLS) and SGMM estimates of the parameters in equations (1) and (2). As discussed in the introduction, remittances have the potential to affect growth through a host of channels. For instance, through investment (in physical and human capital) by alleviating liquidity constraints, but also through the conventional Keynesian multiplier from increased internal demand. Table 4 reports estimates of equation (1) using various econometric techniques (OLS, fixed effects (FE) and SGMM). It shows that the impact of remittances on growth is practically nil when the remittance variable is simply added as an additional explanatory variable in a standard growth regression. While the coefficient estimates increase and become marginally significant when investment is dropped from the specification,[11] the empirical evidence in favor of a positive role of remittances on growth seems to be at most fragile. These results contrast with some recent literature at the micro level, which has identified positive effects of remittances on consumption, investment, years of education, and health outcomes. This poses the question of whether the impact of remittances is homogeneous across countries or whether it varies along a dimension, which has not been properly accounted for in the estimated specification. We next investigate this avenue. In particular, we explore whether the financial development of the recipient country influences the specific uses given to remittances and their capacity to influence growth.

To this end, we estimate equation (2), which allows the impact of remittances on growth to vary across levels of financial development in the recipient country. The sign of the interacted coefficient provides information regarding the nature of remittances. More specifically, a positive interaction term reveals that they are complementary and that a well-functioning financial system enhances the impact of remittances. On the other hand, a negative sign indicates that remittances and financial depth are used as substitutes to promote growth.

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[10] Specifically, if one is willing to adopt the stationarity assumption that $E[\eta_i \mid X_{it}] = E[\eta_i \mid X_{is}]$ and $E[\eta_i \mid GDP_{it}] = E[\eta_i \mid GDP_{is}]$ for all *t* and *s*.

[11] This is done in an attempt to better capture the impact of remittances by omitting one of the channels though which remittances are likely to affect growth, that is investment. The results are available upon request from the authors.

Table 4. Linear Growth Effects of Remittances
(Dependent variable is GDP per capita growth)

	OLS	FE	SGMM
LogInGDP	-0.698***	-5.896***	-1.059
	(0.244)	(0.992)	(1.038)
LogPopGrowth	0.214	-0.911	0.057
	(0.404)	(0.806)	(0.544)
GovFiscalBal	0.119**	0.156**	0.209
	(0.050)	(0.064)	(0.180)
LogInvGDP	4.698***	5.232***	5.039***
	(0.571)	(0.795)	(1.138)
LogYearEdu	0.668*	-0.631	1.246
	(0.363)	(0.854)	(1.664)
LogOpennes	-0.338	1.171*	-1.147*
	(0.316)	(0.687)	(0.634)
Inflation	-0.022**	-0.007	-0.035**
	(0.010)	(0.007)	(0.015)
Rem/GDP	0.043	0.022	0.010
	(0.051)	(0.087)	(0.096)
Constant	-4.921**	35.507***	0.034
	(2.425)	(8.892)	(8.442)
Observations	315	315	315
R-squared	0.35	0.68	0.31
Number of countries			73
AR(1) test			0.00
AR(2) test			0.52
P-value Hansen test			0.55

Note: Robust standard errors in parentheses, * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. All regressions include time dummies.

Tables 5 and 6 present OLS and SGMM estimates of (2) respectively. We focus our discussion on the latter, but it is worth noting that the two are qualitatively and quantitatively very similar. In all regressions, two lags of all endogenous variables are used as instruments for all strictly nonexogenous variables, including the remittances and financial depth indicators. In addition, autocorrelation tests and the Hansen test of overidentifying restrictions are performed to assess the validity of the instruments employed. We estimate (2) for each of our measures of financial depth and find that results are consistent across the four indicators (i.e., across columns in the table).

The main results are easily summarized. We find strong evidence of a positive and significant coefficient of remittance flows and of a negative interaction between remittances and financial depth. These findings suggest that the marginal impact of remittances on growth is decreasing with the level of financial development. In other words, remittances have contributed to promote growth in countries with shallower financial systems. In contrast, remittances-driven growth is less important the more developed the financial system is. By relaxing liquidity constraints, remittances have compensated for the lack (or the inefficiency) of the financial system and have helped to channel resources toward productive investments. Remittances have de facto act as a substitute for financial services in promoting growth, by offering the response to the needs for credit and insurance that the market has failed to provide.

Table 7 indicates that remittances have a positive impact on growth at both the mean and median levels of financial development but this becomes zero—and eventually turns negative—in countries with well developed financial systems (above the 75th percentile of the distribution of the financial variable). In terms of magnitude, an increase by one percentage point in the deposits to GDP ratio from the median level of 29 percent would enhance growth by 0.18 percentage points. Similarly, the marginal effect of remittances is 0.19 at the median loans to GDP ratio, 0.09 at the median banking sector credit ratio, and 0.20 at the median M2 to GDP level.[12] However, these effects can be twice as large in the presence of stringent lending and borrowing restrictions.

On the other hand, with limited capital market imperfections, remittances are not essential to finance investment, as the needs for credit and insurance can be met by a well functioning banking system. In this case, remittances are more likely to be devoted to nongrowth-generating activities, such as conspicuous consumption, or might even discourage labor supply on the side of the recipients and hence reduce growth. This can explain why the impact of remittances declines with financial depth. In turn, the possibility of the marginal impact becoming negative at very high levels of financial development can be argued on moral hazard grounds, along the paper by Chami, Fullenkamp, and Jahjah (2003).

[12] These magnitudes seem plausible in comparison with the expected impact of aid on growth. Rajan and Subramanian (2005a) argue that the theoretical aid coefficient in a growth regression should be 0.16, assuming all aid is invested, or close to 0.1 if some aid is wasted or consumed.

Table 5. Growth, Remittances, and Financial Development, OLS estimates
(Dependent variable is GDP per capita growth)

	DEP/GDP	LOAN/GDP	CREDIT/GDP	M2/GDP
LogInGDP	-0.654**	-0.661***	-0.661***	-0.734***
	(0.254)	(0.255)	(0.245)	(0.244)
LogPopGrowth	0.368	0.262	0.242	0.333
	(0.418)	(0.419)	(0.413)	(0.419)
GovFiscalBal	0.134***	0.116**	0.090	0.133**
	(0.052)	(0.050)	(0.055)	(0.053)
LogInvGDP	4.255***	4.312***	4.580***	4.091***
	(0.701)	(0.668)	(0.611)	(0.624)
LogYearEdu	0.524	0.573	0.695*	0.651*
	(0.371)	(0.368)	(0.368)	(0.364)
LogOpennes	-0.477	-0.356	-0.477	-0.493
	(0.340)	(0.341)	(0.344)	(0.324)
Inflation	-0.019**	-0.019**	-0.023**	-0.018**
	(0.009)	(0.009)	(0.010)	(0.009)
RemGDP	0.253**	0.228**	0.213*	0.197*
	(0.106)	(0.113)	(0.112)	(0.100)
DepGDP	0.032***			
	(0.012)			
RemGDP*DepGDP	-0.004**			
	(0.002)			
LoanGDP		0.024**		
		(0.010)		
RemGDP*LoanGDP		-0.005**		
		(0.002)		
CreditGDP			0.008	
			(0.008)	
RemGDP*CreditGDP			-0.003*	
			(0.002)	
M2GDP				0.025***
				(0.009)
RemGDP*M2GDP				-0.003**
				(0.001)
Constant	-4.253	-4.612*	-4.967*	-3.156
	(2.780)	(2.695)	(2.559)	(2.606)
Observations	306	305	307	314
R-squared	0.36	0.35	0.34	0.35

Note: Robust standard errors in parentheses, * significant at 10 percent; ** significant at 5 percent; ***significant at 1 percent**.** All regressions include time dummies.

Table 6. Growth, Remittances, and Financial Development, SGMM Estimates
(Dependent variable is GDP per capita growth)

	DEP/GDP	LOAN/GDP	CREDIT/GDP	M2/GDP
LogInGDP	-1.394*	-2.462***	-1.482*	-1.974**
	(0.745)	(0.897)	(0.755)	(0.827)
LogPopGrowth	0.114	-0.141	-0.066	0.240
	(0.527)	(0.561)	(0.604)	(0.556)
GovFiscalBal	0.397**	0.354**	0.284*	0.306*
	(0.180)	(0.150)	(0.153)	(0.155)
LogInvGDP	3.200***	2.626**	4.041***	3.629***
	(0.974)	(1.304)	(1.219)	(1.164)
LogYearEdu	1.245	2.555**	1.198	2.516*
	(1.120)	(1.268)	(1.238)	(1.362)
LogOpennes	-1.425*	-1.444	-1.083*	-1.463*
	(0.732)	(0.935)	(0.603)	(0.775)
Inflation	-0.029**	-0.024**	-0.034**	-0.027**
	(0.013)	(0.011)	(0.013)	(0.013)
RemGDP	0.406**	0.397**	0.251*	0.389**
	(0.170)	(0.166)	(0.134)	(0.153)
DepGDP	0.070***			
	(0.022)			
RemGDP*DepGDP	-0.008***			
	(0.003)			
LoanGDP		0.084***		
		(0.026)		
RemGDP*LoanGDP		-0.009***		
		(0.003)		
CreditGDP			0.034***	
			(0.012)	
RemGDP*CreditGDP			-0.005***	
			(0.002)	
M2GDP				0.047***
				(0.015)
RemGDP*M2GDP				-0.006***
				(0.002)
Constant	7.874	15.870**	4.840	9.466
	(6.419)	(7.863)	(7.566)	(7.529)
Observations	306	305	307	314
Number of countries	72	71	73	73
AR(1) test	0.00	0.00	0.00	0.00
AR(2) test	1.00	0.78	0.91	0.75
P-value Hansen test	0.86	0.77	0.77	0.57
R-squared	0.23	0.10	0.24	0.21

Note: Robust standard errors in parentheses, * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. All regressions include time dummies.

Table 7. Marginal Effect of Remittances on Growth by Levels of Financial Depth

	DEP/GDP	LOAN/GDP	CREDIT/GDP	M2/GDP
Financial Depth at with mg. effect of remittances is zero:				
With investment	50.8	44.1	50.2	64.8
Without investment	57.2	45.1	74.4	72.1
Marginal effect of remittances at:				
Median level of Financial Depth				
With investment	0.18	0.19	0.09	0.20
Without investment	0.27	0.23	0.21	0.29
Mean level of Financial Depth				
With investment	0.15	0.15	0.02	0.16
Without investment	0.23	0.17	0.14	0.24

Notes: These statistics are based on SGMM estimates and are statistically significant at 5 percent significance level.

Consistent with previous literature, we also find that financial development facilitates economic growth. With regards to the effect of the other variables in the regression, they are all consistent with standard growth regression results. The coefficient estimates for population growth, inflation, and the initial level of GDP are negative and significant, whereas investment, years of schooling, and fiscal balances help boost economic growth.

In all the different specifications used, the Hansen test and the second-order autocorrelation tests indicate that we cannot reject the validity of the moment conditions assumed for the estimation.

In an attempt to identify the channels through which remittances affect growth, we also estimate the growth regressions dropping investment as an explanatory variable[13]. If the marginal impact of remittances becomes larger, this would provide indirect evidence of a channel working through productive investment. Table 7 shows that this is indeed the case. The marginal impact of remittances at the median and mean levels of financial development increases by about 50 percent in the case of deposits and M2 to GDP. The increase is between two and six times larger in the case of total credit from the banking sector. These

[13] The financial development variable is likely to be affected when investment is eliminated from the regression as well. According to Barro (1997), the investment ratio can bias the results due to reverse causality. Some studies on financial development include the investment variable (see Alfaro and others, 2004); while others decide to leave it out (see Loayza and Ranciere, 2004).

results suggest that an important channel through which remittances influence growth is the volume of investments. The other potential channels may be the efficiency of investments, investment in human capital, as well as multiplicative effects from higher savings and internal demand.

To explore the empirical relation between remittances and investment in a more direct way, we estimate the following investment equation:

$$\begin{aligned} INVGDP_{it} = \beta_0 + \beta_1 INVGDP_{i,t-1} + \beta_2 \operatorname{Re}m_{it} + \beta_3 \text{FinDev}_{it} + \\ + \beta_4 (\text{Rem}_{it} \cdot \text{FinDev}_{it}) + \beta_5 Z_{it} + \mu_t + \eta_i + \varepsilon_{it} \end{aligned} \tag{4}$$

where $INVGDP$ is total investment to GDP and Z is a matrix of controls, which includes per capita real GDP growth to capture the accelerator effect and a measure of the user cost of capital, proxied by the lending interest rate. The remaining variables are defined as above. One expects that growth exerts a positive effect on investment and that higher lending rates hamper the rate of capital accumulation. We have also estimated this equation adding other potential determinants of investment, in particular inflation and openness, but the main results hold across different variations of the basic specification. In the interest of simplicity, we discuss the results that emerge from the estimation of equation (4), which uses the most conventional determinants of investment only.

Estimation results are reported in Table 8. For each column, indicating the use of a different financial development indicator, the estimated coefficient of the lagged investment variable is large and positive. In turn, the output growth elasticity of investment is also positive and significant. While the coefficient corresponding to the lending interest rate carries the anticipated negative sign, this is not statistically significant. We get similar results if we use the interest rate spread—the difference between the lending rate and the deposits rate—as a measure of the user cost of capital. Regarding the remittance variable, it is remarkable that this is positive and significant across all specifications. Also in accordance with the results previously found, the interaction between remittances and financial depth is negative and significant. These results imply that the marginal impact of remittances on investment is positive across largely all levels of financial development.[14] However, the largest remittances-driven increases in investment have taken place in less financially developed countries. While the marginal impact of remittances on investment ranges between 0.2 and 0.4 at the median level of financial development, the impact can surpass 0.5 at the lowest quartile of the distribution of financial development. Unlike the growth regressions, the investment regressions do not show an independent, statistically positive effect of financial development.

[14] The marginal effect of remittances only becomes zero at very high levels of financial depth, beyond the 90-95 percentile of the distribution.

Table 8. Investment, Remittances, and Financial Development, SGMM estimates
(Dependent variable is investment to GDP)

	DEP/GDP	LOAN/GDP	CREDIT/GDP	M2/GDP
Lagged InvGDP	0.874***	0.837***	0.865***	0.854***
	(0.110)	(0.095)	(0.104)	(0.110)
Real GDP Growth	0.534**	0.518***	0.555***	0.528**
	(0.214)	(0.181)	(0.189)	(0.208)
Lending rate	-0.014	-0.015	-0.021	-0.005
	(0.019)	(0.020)	(0.019)	(0.014)
RemGDP	0.398*	0.710**	0.507**	0.690**
	(0.231)	(0.341)	(0.242)	(0.295)
DepGDP	0.027			
	(0.038)			
RemGDP*DepGDP	-0.006**			
	(0.003)			
LoanGDP		0.052		
		(0.047)		
RemGDP*LoanGDP		-0.012**		
		(0.006)		
CreditGDP			0.017	
			(0.026)	
RemGDP*CreditGDP			-0.005*	
			(0.003)	
M2GDP				0.054
				(0.039)
RemGDP*M2GDP				-0.008**
				(0.003)
Constant	-1.471	-1.726	-0.974	-2.405
	(2.054)	(2.476)	(2.554)	(2.302)
Observations	343	344	343	350
Number of countries	109	110	112	112
AR(1) test	0.00	0.00	0.00	0.00
AR(2) test	0.83	0.78	0.89	0.87
P-value Hansen test	0.81	0.76	0.80	0.81
R-squared	0.58	0.54	0.56	0.58

Note: Robust standard errors in parentheses, * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent**.** All regressions include time dummies.

Finally, the diagnostic tests (Hansen and first- and second-order autocorrelation) reveal no evidence against the validity of the instruments used by the SGMM estimator.

To summarize the empirical exercise of this section, the econometric analysis reveals a significant positive impact of remittances on growth and investment once the interaction with financial development is accounted for. The overriding result is the statistical negative significance of the interaction term, indicating that remittances and financial development have been used as substitutes to promote economic growth.

The presence of liquidity constraints impinges on investment in physical and human capital, in particular in those developing countries where access to credit and insurance is limited and expensive. Remittances have played the role of alleviating these liquidity constraints, by financing investment and enhancing growth, and might have also been instrumental in achieving insurance and consumption smoothing. In contrast, where the financial system was developed enough, remittances have had a much lower impact on growth, even possibly negative. In this case, the financial system was sufficient to meet financing needs for investment, and remittances were used for purposes that did not foster growth.

IV. ROBUSTNESS: THRESHOLD ESTIMATION

A simple robustness test consists of splitting the sample according to the level of financial development and comparing the impact of remittances across subsamples. In light of the main result of the empirical analysis, we should find a larger impact of remittances in the subsample of countries where the financial system is less developed. We split the sample in two ways, first, exogenously according to the median level, and second, based on an endogenously determined threshold.

Table 9 presents SGMM growth estimates for countries above and below the median of financial development. These results tend to reinforce our previous findings. More specifically, we find that the impact of remittances is positive for the sample of countries with low financial development (below the median level) and it is nil or negative for countries with deeper financial systems. Nonetheless, using a standard t-test, we are only able to reject the hypothesis that the marginal impact of remittances is equal across subsamples in one case.

Following Hansen (1996 and 2000),[15] we use threshold estimation as an alternative robustness test. Threshold estimation has been applied for nonparametric function estimation as well as for empirical sample splitting when the sample is based on a continuously distributed variable. Instead of (exogenously) selecting the subsamples based on the median level of financial development, threshold estimation allows us to endogenously determine the threshold level of financial development at which the sample should be split. Therefore, this

[15] Gauss codes of the applications in these papers can be found at http://www.ssc.wisc.edu/~bhansen/.

Table 9. Marginal Impact of Remittances on Growth Below and Above the Median Level of Financial Depth

	DEP/GDP		LOAN/GDP		CREDIT/GDP		M2/GDP	
	Above Median	Below Median	Above Median	Below Median	Above Median	Below Median	Above Median	Below Median
LogInGDP	-0.619	-0.596	-1.140**	-0.295	-0.949*	-1.050	-1.140*	-1.542**
	(0.607)	(0.757)	(0.451)	(0.609)	(0.554)	(0.758)	(0.580)	(0.691)
LogPopGrowth	-0.480	1.098	0.518	2.128**	0.041	1.348	-0.055	1.018
	(0.407)	(1.669)	(0.585)	(0.985)	(0.685)	(1.110)	(0.465)	(0.937)
GovFiscalBal	0.086	0.323*	0.354**	0.005	0.236	0.201	0.077	0.280**
	(0.112)	(0.166)	(0.132)	(0.156)	(0.150)	(0.215)	(0.136)	(0.124)
LogInvGDP	5.433***	3.641***	6.541***	5.139***	4.424***	3.624***	5.880***	4.729***
	(1.628)	(1.207)	(1.794)	(0.933)	(0.966)	(1.240)	(1.054)	(1.389)
LogYearEdu	0.251	-0.002	3.312**	0.432	1.614	1.594	3.436***	1.375
	(1.269)	(1.016)	(1.487)	(0.740)	(1.462)	(0.952)	(1.250)	(0.880)
LogOpennes	-0.826	-0.859	-1.211**	-1.037	-1.160**	-0.684	-1.570***	-1.997**
	(0.590)	(1.061)	(0.592)	(0.826)	(0.545)	(0.820)	(0.546)	(0.736)
Inflation	-0.100***	-0.002	-0.017*	-0.010	-0.037**	-0.015	-0.065**	-0.010
	(0.023)	(0.008)	(0.009)	(0.014)	(0.017)	(0.025)	(0.024)	(0.008)
RemGDP	**-0.093**	**0.113**	**-0.107**	**0.121**	**-0.134***	**0.035**	**-0.129****	**0.264****
	(0.070)	**(0.143)**	**(0.084)**	**(0.161)**	**(0.068)**	**(0.154)**	**(0.061)**	**(0.122)**
FD/GDP	-0.003	0.017	-0.005	-0.041	0.017	0.022	-0.004	0.020
	(0.014)	(0.053)	(0.018)	(0.049)	(0.010)	(0.032)	(0.014)	(0.057)
Constant	-3.654	-0.933	-5.383	-8.498	0.763	-0.166	-2.444	5.177
	(6.800)	(9.574)	(7.429)	(6.687)	(6.464)	(7.761)	(5.729)	(6.655)
Observations	151	155	150	155	151	156	156	158
Number of countries	38	34	35	36	38	35	36	37
AR(1) test	0.06	0.00	0.20	0.01	0.10	0.01	0.03	0.01
AR(2) test	0.94	1.00	0.87	0.33	0.34	0.32	0.68	0.42
P-value Hansen test	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
R-squared	0.35	0.33	0.09	0.36	0.19	0.29	0.28	0.37
T-stat Ho: Above Med =Below Med		1.3		1.3		1		2.9

Note: Robust standard errors in parentheses, * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. All regressions include time dummies.

is a better strategy to determine the threshold level of financial development at which the relation between growth and remittances changes, its confidence interval, and the impact of remittances across regimes. Threshold estimation takes the form:

$$GDP_{it} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 \mathrm{Rem}_{\mathrm{it}} + \beta_3 FinDev_{it} + \beta_4 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \quad FinDev_{it} \leq \gamma \qquad (5)$$

$$GDP_{it} = \alpha_0 + \alpha_1 GDP_{i,t-1} + \alpha_2 \mathrm{Rem}_{\mathrm{it}} + \alpha_3 FinDev_{it} + \alpha_4 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \quad FinDev_{it} > \gamma \qquad (6)$$

where $FinDev$ is the threshold variable used to split the sample into two groups,[16] and γ is the endogenously determined threshold level. This model allows the regression parameters to differ depending on the value of $FinDev$. Hansen (2000) derives an asymptotic approximation to the distribution of the least-squares estimate of the threshold parameter, which allows testing for the existence of a threshold. [17]

Estimates of the threshold model, including the threshold parameter and the least-square coefficients on each subsample, are reported in Table 10. We compute confidence intervals for the regression parameters and the threshold coefficient, and provide an asymptotic simulation test of the null of linearity against the alternative of a threshold. The estimated threshold of deposits is 22.6 percent of GDP, with a 95 percent confidence interval [11, 73]. That of claims to the private sector is 20.8, with a 95 percent confidence interval [16, 22]. The estimated threshold of banking credit occurs at 30 percent and the confidence interval is [29, 33]. Finally, estimation using M2 to GDP produces a threshold at 20.8 percent, with a confidence interval [16, 22]. Incidentally, the estimated threshold levels are relatively similar to the median values of the corresponding financial development variables, except for M2/GDP, where it is lower.

The test of the null hypothesis of no threshold against the alternative of threshold is performed using a Wald test under the assumption of homoskedastic errors.[18] Using 1000 bootstrap replications, the p-value for the threshold model is very close to zero in each case.

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[16] The threshold variable could be the dependent variable, a regressor, or a third variable, not included in the regression, and it is assumed to have a continuous distribution.

[17] This approach derives OLS estimates and does not correct for endogeneity. We are not aware of any attempt to find such a distribution for SGMM estimates. Nevertheless, the exercise still provides interesting insights, especially in view of the similarities between OLS and SGMM estimates suggested by our previous findings.

[18] We also compute heteroskedastcity-consistent Lagrange multiplier tests for a threshold, as in Hansen (1996). In general, they suggest the same sample split as the tests assuming homoskedasticity. We present the latter ones because the threshold which maximizes the Wald statistic under homoskedasticity is the same as the one which minimizes the least-squares criterion.

Table 10. Threshold Estimation

	DEP/GDP		LOAN/GDP		CREDIT/GDP		M2/GDP	
				(In Percent)				
Estimated threshold	>22.6	≤22.6	>20.8	≤20.8	>30	≤30	>20.8	≤20.8
LogInGDP	-0.407	-1.707***	-0.608**	-0.598	-0.661**	-1.259**	-0.727***	-1.577**
	(0.297)	(0.440)	(0.304)	(0.375)	(0.265)	(0.484)	(0.266)	(0.615)
LogPopGrowth	0.105	2.460**	-0.376	2.182***	-0.320	2.325***	-0.137	2.918**
	(0.431)	(0.977)	(0.361)	(0.721)	(0.377)	(0.817)	(0.410)	(1.110)
GovFiscalBal	0.062	0.294***	0.123	0.065	0.048	0.277**	0.094	0.382**
	(0.069)	(0.074)	(0.089)	(0.065)	(0.059)	(0.123)	(0.058)	(0.146)
LogInvGDP	5.536***	3.264**	5.184***	4.951***	5.825***	3.648***	4.546***	3.656**
	(0.788)	(1.244)	(0.878)	(1.037)	(0.756)	(0.696)	(0.729)	(1.574)
LogYearEdu	0.832	0.984	0.458	0.786	0.374	1.374**	0.601	1.145
	(0.515)	(0.622)	(0.549)	(0.527)	(0.528)	(0.578)	(0.397)	(0.877)
LogOpennes	-0.275	-1.919***	-0.509	-0.598	-0.158	-1.570**	-0.173	-1.541
	(0.374)	(0.648)	(0.376)	(0.630)	(0.362)	(0.645)	(0.342)	(1.093)
Inflation	-0.018	0.011	-0.022*	-0.010	-0.017*	0.001	-0.016	0.012
	(0.012)	(0.012)	(0.012)	(0.011)	(0.010)	(0.015)	(0.013)	(0.016)
RemGDP	**0.027**	**0.212**	**0.052**	**0.178**	**-0.004**	**0.216****	**0.018**	**0.467****
	(0.053)	**(0.161)**	**(0.058)**	**(0.119)**	**(0.052)**	**(0.104)**	**(0.052)**	**(0.195)**
FD/GDP	0.006	0.152*	0.007	-0.124**	-0.012*	-0.058	0.011	0.069
	(0.010)	(0.089)	(0.010)	(0.061)	(0.007)	(0.051)	(0.009)	(0.142)
Constant	-10.569***	7.417	-5.683*	-6.542	-8.289***	5.030	-5.336*	4.247
	(2.988)	(5.573)	(3.289)	(4.260)	(2.912)	(4.378)	(2.820)	(7.776)
Observations	199	107	169	137	206	101	247	67
R-squared	0.33	0.56	0.38	0.41	0.41	0.48	0.31	0.58
F-test for no threshold	32.16		38.94		56.25		42.14	
Bootstrap P-value	0.017		0.004		0.000		0.000	

Note: Threshold estimation based on Hansen (2000). Robust standard errors in parentheses, * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. All regressions include time dummies.

There is, therefore, evidence for a regime change at the determined level of financial development. Estimates of the growth regression model for each subsample indicate that the marginal impact of remittances is not statistically different from zero in the high financial development regime. On the other hand, remittances have a larger positive impact, and often statistically significant, in the low- financial development subsample. It is worth noting that most of the controls in the growth regression, not only the remittance variable, behave differently across subsamples.

To summarize, our robustness checks consisted of splitting the sample according to the degree of financial depth and comparing the impact of remittances on growth across subsamples. First, we split countries in the sample in an exogenous manner, more specifically, according to the median level of financial development. Second, we split the observations in our sample according to an endogenously determined threshold. Results are consistent across methodologies and confirm the findings of the previous section, namely that remittances have a larger impact on growth in shallower financial systems. On the other hand, remittances do not seem to have an impact on financially developed countries.

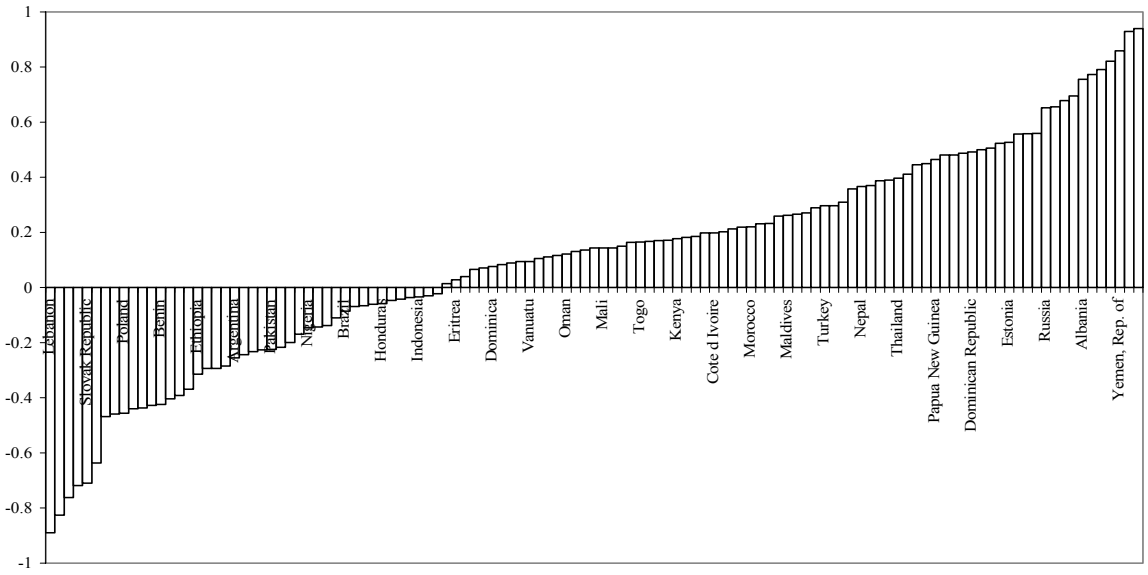
V. Cyclical Behavior of Remittances: Profit-Driven Capital Flows or Compensatory Transfers?

Remittances have traditionally been considered more stable and less affected by economic cycles in the recipient country than other capital flows. However, there is no rigorous analysis supporting this evidence. The aim of this section is, on one hand, to present the first systematic effort to document empirically the cyclical properties of remittances. And on the other, to explore how the cyclicality of remittances is associated the depth of the financial system. Are remittances more likely to be procyclical in more or less financially developed countries? In other words, does financial development smooth or amplify the cyclicality of remittances?

If remittances are more compensatory in nature (i.e., if they are sent for altruistic reasons in order to help the family in the home country), they should be negatively correlated with the home country GDP. In contrast, if they are profit-driven, they should be positively correlated with GDP. To assess the cyclical properties of remittance flows, we follow the Hodrick-Prescott filtering technique, commonly used in the literature and consisting of decomposing the time series of output and remittances into their stochastic trend and cyclical component. Following Kaminsky, Reinhart, and Végh (2004), we define remittances as *countercyclical*, *procyclical or acyclical* when the correlation between the cyclical component of remittances and output is negative/positive, or not statistically significant, respectively.

Figure 4 shows the correlations of the cyclical components of remittances and output for about a hundred developing countries. It is apparent from the figure that remittances are procyclical—to different degrees—for two thirds of the countries.[19] In principle, this correlation could have any sign, since migrants could send remittances when their home country is booming in order to take advantage of the good state of the economy; or in bad times, for altruistic and insurance motives, to help out their family members. There is, thus, some indication that migrants tend to send remittances when the economic situation in the country of origin is favorable, possibly in search of investment opportunities. This investment channel is probably the most important channel to explain our results about the positive link between remittances and growth, although it raises issues of endogeneity and reverse causality.

Figure 4. Country Correlations between the Cyclical Components of Remittances and GDP, 1975-2002



Souce: IMF Balance of Payment Statistics and authors' calculations.

To the extent that a larger procyclicality of remittances is associated with the search of investment opportunities (i.e., profit-driven remittances) rather than with an insurance or altruistic motive to remit (i.e., compensatory transfers), we would expect remittances to have a greater impact on growth where remittances are more procyclical. In turn, our previous findings suggest that remittances are most effective in less financially developed countries.

[19] At the aggregate level, the average correlation across all countries, weighing them equally, is about 0.1. While remittances might be weakly procyclical at the aggregate level, there is a large variation across countries.

Therefore, we should expect remittances to be more procyclical in countries with shallower financial systems. The hypothesis that cyclicality of remittances is larger in shallower financial systems is tested computing correlation coefficients between the following two indicators: one, the median over the 1975-2002 period of financial development—measured by deposits, banking credit, claims to the private sector, or M2 to GDP—and two, the series of correlations displayed in Figure 4, representing the cyclical behavior of remittances with respect to output. We also estimate bivariate regressions of the cyclical indicator of remittances on each of the financial development measures. This is a simple way to examine the association between financial depth and the cyclicality of remittances. Nevertheless, it is very informative and provides a good complement to the evidence presented in the previous section.

Table 11 shows that all correlations and estimation coefficients are negative across all measures of financial development and range from −0.13 to −0.35. Furthermore, all coefficients are significant at the 10 percent level, except for those associated with the banking credit variable. This indicates that countries where remittances are more procyclical are associated with less developed financial systems, and it is consistent with the main conclusion of the paper, that there is substitutability between remittances and the financial sector.

It is worth noting that this evidence suggests a rather interesting and a priori paradoxical result, namely that remittances tend to be more countercyclical—that is, more compensatory in nature—in countries with deeper financial systems, where agents could, in principle, get insured against bad shocks more easily. On the other hand, remittances are more likely to seek investment opportunities by responding to the home-country economic conditions in countries with less developed financial sectors, where doing business could be more difficult. Thus, financial depth smooths, rather than amplifies, the cyclicality of remittances.

Table 11. Cyclical Behavior of Remittances and Financial Depth

	DEP/GDP	LOAN/GDP	CREDIT/GDP	M2/GDP
Correlations 1/	-0.18*	-0.16*	-0.13	-0.17*
Reg Estimates 2/	-0.29*	-0.35*	-0.18	-0.23*

1/ Displays pair wise correlation coefficients between the cyclical indicator of remittances in Figure 4 and the median over the period 1975-2002 of each of the financial depth (FD) variables for 116 developing countries.
2/ Displays regression estimates from OLS regressions of the cyclical indicator of remittances and each of the FD variables. A star denotes significance at the 10 percent level or better.

VI. CONCLUSIONS

What is the macroeconomic impact of remittances? Is there evidence that remittances foster productive investment? How does financial development influence the growth effects of remittances? To shed some light on these important questions, in this paper we analyzed the relationship between remittances and growth and its interaction with the financial development in the recipient country. We used a newly constructed cross-country data series for remittances covering a large number of developing countries over the period 1975-2002. We find that remittances have promoted growth in less financially developed countries. This finding controls for the endogeneity of remittances and financial development using a SGMM approach, does not depend on the particular measure of financial sector development used, and is robust to a number of robustness tests. Our results suggest that remittances help alleviate credit constraints on the poor, substituting for the lack of financial development, improving the allocation of capital, and therefore accelerating economic growth. The findings suggest that there is an investment channel through which remittances can promote growth where the financial sector does not meet the credit needs of the population.

These findings do not, however, give insights on all the channels through which remittances may affect growth. In particular, we did not explore other possible measures of countries' characteristics, including institutional aspects that may explain this effect. It is possible, for example, that factors other than the degree of financial development may explain why remittances can have an impact on growth. Although this type of omitted variable problem is reduced given our specification, we cannot eliminate the possibility that omitted variables drive some of the results. We did not explore in great detail the potential moral hazard implications of remittances either. Nonetheless, we interpret the nil or even negative impact of remittances at high levels of financial development as suggestive evidence that remittances are more likely to discourage labor supply in more financially developed countries.

We have also documented the cyclical properties of remittance flows and how they are associated with financial development. We found a large variation in the cyclical behavior of remittances across countries. Furthermore, there is evidence that remittances tend to be more procyclical where the financial system is less developed. To the extent that procyclical remittances are more likely to be motivated by investment opportunities rather than by altruistic reasons, it is then not surprising that remittances have a larger impact on shallower financial systems. Overall, our empirical analysis provides the first macroeconomic evidence of how remittances and financial development may interact in promoting growth.

Definitions of the Remittance Variable

The analysis of the impact of remittances uses a panel of 70 developing countries, during the period 1975-2002.

Unless otherwise indicated, total remittances are constructed as the sum of three items in the IMF's *Balance of Payment Statistics Yearbook* (BOPSY): "Workers' Remittances," "Compensation of Employees," and "Migrant Transfers."

Workers' Remittances (part of current transfer in the current account) are current transfers made by migrants who are employed and resident in another economy. This typically includes those workers who move to an economy and stay, or are expected to stay, a year or longer.

Compensation of Employees (part of the income component of the current account) instead comprises wages, salaries, and other benefits (cash or in kind) earned by nonresident workers for work performed for residents of other countries. Such workers typically include border and seasonal workers, together with some other categories, e.g., local embassy staff.

Migrant Transfer (part of the capital account) includes financial items that arise from the migration (change of residence) of individuals from one economy to another.

Following the country-specific notes in the BOPSY, *Compensation of Employees* is excluded from total remittances for the following countries: Argentina, Azerbaijan, Barbados, Belize, Benin, Brazil, Cambodia, Cape Verde, China, Côte d'Ivoire, Dominican Republic, Ecuador, El Salvador, Guyana, Panama, Rwanda, Senegal, Seychelles, Turkey, and Venezuela.

Moreover, the BOPSY specifies that migrants, transfers are recorded under *"Other Current Transfers"* for Kenya, Malaysia, and the Syrian Arab Republic.

Additional adjustments or additions to the series were made on the basis of information received from IMF country desks and national authorities, as follows:

1. Bosnia and Herzegovina: Desk provided data from 1998-2003.
2. Bulgaria: Other current transfers are included in remittances.
3. Caribbean:[20] Desk provided data for 1991-2002.

[20] The Caribbean region includes Antigua and Barbuda, Barbados, Belize, Dominica, the Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

4. I.R. of Iran: Other current transfers are used as figure for remittances.
5. Lebanon: Desk provided data for 1997-2003.
6. Lesotho: Desk provided data for 1982-2003.
7. Macedonia, FYR: Desk provided data for 1993-1997.
8. Moldova: Desk provided data for 2000.
9. Niger: Desk provided data for 1995-2003.
10. Romania: Desk provided data for 2000-2003.
11. Slovak Republic: Desk provided data for 1999-2003.
12. Tajikistan: Desk provided data for 1997-2001.
13. Ukraine: Desk provided data for 2000.
14. Venezuela: Desk provided data for 1997-2003.

Sample of Countries

Country	
Argentina	Mexico
Barbados	Mozambique
Benin	Nepal
Bolivia	Nicaragua
Botswana	Niger
Brazil	Pakistan
Cameroon	Panama
Chile	Paraguay
China	Peru
Colombia	Philippines
Costa Rica	Poland
Croatia	Romania
Dominica	Russia
Dominican Republic	Samoa
Ecuador	Senegal
Egypt	Seychelles
El Salvador	Sierra Leone
Eritrea	Slovak Republic
Estonia	Slovenia
Ethiopia	South Africa
Guatemala	Sri Lanka
Guyana	St. Kitts and Nevis
Haiti	St. Lucia
Honduras	Sudan
Hungary	Swaziland
India	Syrian Arab Republic
Indonesia	Thailand
Iran, Islamic Republic of	Togo
Jamaica	Tonga
Jordan	Trinidad and Tobago
Kenya	Tunisia
Malawi	Turkey
Malaysia	Uruguay
Mali	Venezuela
Malta	Zimbabwe
Mauritania	
Mauritius	

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