



Remittances, financial development, and growth[☆]

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ABSTRACT

Despite the increasing importance of remittances in total international capital flows, the relationship between remittances and growth has not been adequately studied. This paper studies one of the links between remittances and growth, in particular how local financial sector development influences a country's capacity to take advantage of remittances. Using a newly-constructed dataset for remittances covering about 100 developing countries, we find that remittances boost growth in countries with less developed financial systems by providing an alternative way to finance investment and helping overcome liquidity constraints. This finding controls for the endogeneity of remittances and financial development, does not depend on the particular measure of financial sector development used, and is robust to a number of robustness tests, including threshold estimation. We also provide evidence that there could be an investment channel through which remittances can promote growth especially when the financial sector does not meet the credit needs of the population.

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1. Introduction

Remittances by international migrants to their countries of origin constitute the largest source of external finance for developing countries after foreign direct investment (FDI). Officially recorded remittance inflows amounted to \$125 billion in 2004, exceeding total development aid by 50% (Fig. 1). Despite the increasing importance of remittances in total international capital flows, the relationship between remittances and growth has not been adequately studied. This contrasts sharply with the extensive research on the relationship between growth and other sources of foreign capital, such as foreign direct investment (FDI) and official assistance flows.¹ Moreover, the conventional wisdom seems to be that, because remittances are used mostly for consumption, they have a minimal impact on long-term growth.

This paper attempts to fill a gap in the existing literature of the macroeconomic impact of remittances, contributing to the debate of

the impact of remittances on growth in two important ways. First, we construct a new measure for remittances, covering about 100 countries, substantially improving data limitations on remittance flows. Second, we analyze the importance of remittances in promoting economic growth, looking specifically at the interaction between remittances and the financial sector, an aspect ignored in the literature. In particular, we explore how local financial sector development influences a country's capacity to take advantage of remittances.

The relationship between remittances, financial development, and growth is a-priori ambiguous. On the one hand, well-functioning financial markets, by lowering costs of conducting transactions, may help direct remittances to projects that yield the highest return and therefore enhance growth rates. On the other hand, remittances might become a substitute for inefficient or nonexistent credit markets by helping local entrepreneurs bypass lack of collateral or high lending costs and start productive activities.² The empirical analysis finds strong evidence that the second channel works: remittances boost growth in countries with less developed financial systems by providing an alternative

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¹ See Alfaro et al. (2004) for an analysis of the relationship between FDI and growth and Easterly (2003) and Rajan and Subramanian (2005) for the link between aid and growth.

² 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 Townsend, 2000). Several 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 et al., 1999).

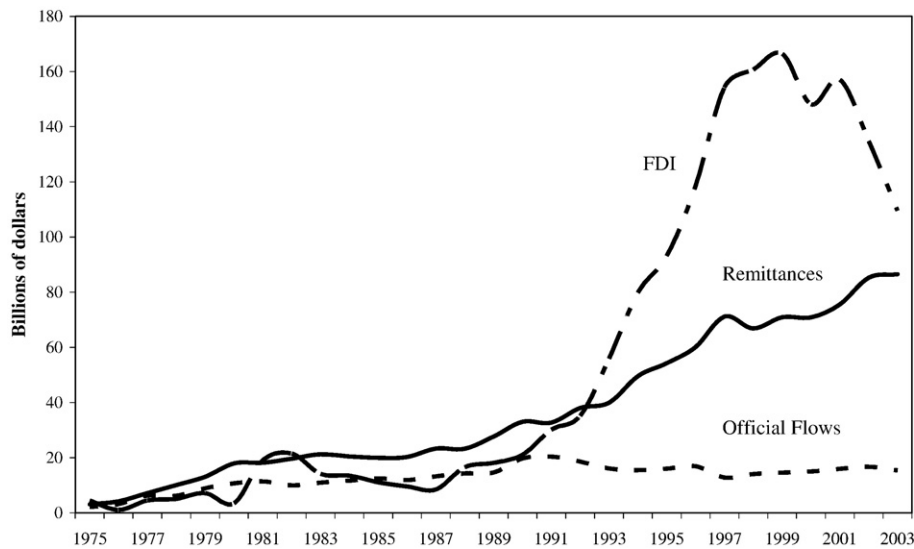


Fig. 1. Remittances, official flows and FDI, 1975–2003. Source: IMF balance of payments statistics and authors' calculations.

way to finance investment and helping overcome liquidity constraints.³ In contrast, while more developed financial systems seem to attract more remittances (the volumes of remittance inflows increase with lower transaction costs and fewer restrictions on payments), they do not seem to magnify their growth impact.

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 startup capital for microenterprises. Similarly, in a study of 30 communities in West-Central Mexico, *Massey and Parrado (1998)* conclude that earnings from work in the United States provided an important source of startup capital in 21% of the new business formations. *Woodruff and Zenteno (2001)* also find that remittances are responsible for almost 20% of the capital invested in microenterprises throughout urban Mexico.

This paper is at the crossroads of two strands of literature. One is the development impact of remittances.⁴ Most of the work done on the macroeconomics of remittances and their impact on growth is qualitative and tends to suggest that remittances are mostly spent on consumption, and are not used for productive investment that would contribute to long-run growth. The second strand of literature looks at the determinants of remittances and how the financial sector infrastructure, and in particular transaction costs, influences the propensity to remit. Authors stress the need to promote competition among money transfer operators to reduce transaction costs and stimulate remittances through formal channels. To the best of our knowledge, this is the first paper that analyzes the evidence of complementarity/substitutability between remittances and financial development in promoting growth.

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. To assess the

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

We also provide evidence that there could be an investment channel through which remittances can promote growth where the financial sector does not meet the credit needs of the population. First, we show that remittances indeed boost investment, especially in countries with a less developed financial sector; second, in two thirds of the countries in our sample remittances appear to be mostly procyclical, an indication that they tend to respond to investment opportunities at least as much as to altruistic or insurance motives.

The structure of the paper is as follows. Section 2 describes the data. Section 3 presents the empirical analysis and results. Section 4 identifies possible channels through which remittances affect growth, by looking at the impact of remittances on investment and their cyclicity. Section 5 concludes.

2. Data

This section describes the data used in the growth regressions. The new remittances variable constructed in this study considers a sample of over 100 countries for the 1975–2002 period. The variable represents an improvement over existing remittances series in several dimensions. Previous studies have generally used a broad definition of remittances that includes the following three items of the IMF's Balance of Payment Statistics Yearbook (BOPSY) (all the details are in Appendix A): workers' remittances, compensation of employees, and migrant transfers. The use of this definition across the board entails the risk of including flows, such as earnings of locals working for foreign embassies and international organizations, which do not conform with the view that remittances typically refer to transfers of money by foreign workers to their home countries. Some other countries do not classify remittances separately from other current transfers in the balance of payments (BOP). In such cases, the standard definition understates the true flows. For these reasons, we decided to adopt a country-specific measure of remittances as opposed to a standardized one.

As a first step, we followed the country specific notes in the BOPSY, where in many cases, detailed definitions and description of

³ In recent years, securitizing future flows has become increasingly common among emerging market issuers as a way of accessing international capital markets (*Ratha 2003*.) Future-flows of workers' remittances have been used by banks in many emerging countries (Turkey and Brazil most notably) to raise billions of dollars of capital from international markets, thus directly contributing to financial deepening, avoid credit rationing and raise external financing (see *Ketkar and Ratha, 2001*).

⁴ *Lundhal (1985)*, *Stark (1991)*, and *Kirwan and Holden (1986)*.

estimation methodologies are provided. This initial country-by-country inspection concluded that the compensation of employees' item needed to be excluded in about 20 countries,⁵ since this category did not qualify as remittance flows. As a second step, to estimate flows more accurately and to obtain data for a larger number of countries, we contacted IMF desk economists and country authorities. Some countries have only recently started to produce and report remittances statistics systematically. In these cases, it is common that the IMF desks or country authorities have more information and for a longer time period than the one 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 A). These additions increased our sample coverage in a substantial way and improved it qualitatively, compared to previous studies. All regressions employ the ratio of remittances to GDP (REM/GDP).⁶

Our definition does not include remittances through informal channels such as in kind remittances, or money carried by friends or family members or through informal systems of money transfer (hawala). Informal remittances are estimated to be very high, in the range of 10 to 50% of recorded remittances (see Ratha (2003), Puri and Ritzema (1999) and El-Qorchi et al. (2003)). It should be noted, however, that according to Ratha (2003), it is not clear if informal remittances should be considered as such or as imports (he gives the example of gold taken to India by international passengers, most recently considered as part of imports). Moreover, efforts to fight money laundering should have reduced the unrecorded part substantially, at least in the most recent period. It is difficult to judge how this informal part could change the findings of our paper. This is however a common problem for all papers on remittances. Everything else being equal, we would expect unrecorded remittances being higher in economies with less developed financial markets. Therefore, their impact on growth should be even magnified if remittances tend to be productive when the financial system does not work.

In this study we use a variety of measures to proxy for financial development. First, liquid liabilities of the financial system (M2/GDP). They equal currency plus demand and interest bearing liabilities of banks and non-bank financial 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.

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:

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 as the ratio of central government fiscal balance to GDP and gross fixed capital formation to GDP, respectively, and *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, defined as the difference between the lending rate and the deposits rate. Both variables are taken from the WDI dataset.

Our sample consists of 73 developing countries with annual data for the period 1975–2002.⁷ Descriptive statistics are reported in Table A1.

3. Empirical analysis

3.1. Estimation methodology

To explore the relationship between remittances, financial development, and growth, we split the sample period 1975–2002 into 6 non-overlapping 5-year periods⁸ (except for the last period for which we average our data for only three years).

As a starting exercise, we estimate the impact of remittances on economic growth by ordinary least squares (OLS). For illustrative purposes, we do not include in our first regression any variable for financial development. We estimate the following equation:

$$GDP_{it} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 Rem_{it} + \beta_3 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \quad (1)$$

where $GDP_{i,t-1}$ denotes the (logarithm of) initial level of GDP per capita, Rem is equal to remittances over GDP and 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.⁹ We are interested in testing whether the marginal impact of remittances on growth, β_2 , is statistically significant.

While remittances have the potential to affect economic activity through a host of channels, in a second set of regressions we examine one specific link between remittances and growth, specifically the one working through financial markets. The hypothesis we would like to test is whether the level of financial depth in the recipient country affects the impact of remittances on growth. To this end, we interact the remittances variable with an indicator of financial depth and test for the significance of the interacted coefficient.¹⁰ A negative coefficient would indicate that remittances are more effective in boosting growth in countries with shallower financial systems. In other words, a negative interaction provides evidence of substitutability between remittances and financial instruments. On the other hand, a positive interaction would imply that the growth effects of remittances are enhanced in deeper financial systems, supporting complementarity of remittances and other financial flows.

⁷ 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.

⁸ We use 5-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 can be controlled for by averaging over longer time periods.

⁹ Note that Eq. (1) can be alternatively written with the growth rate as dependent variable as: $Growth_{it} = GDP_{it} - GDP_{i,t-1} = \beta_0 + (\beta_1 - 1)GDP_{i,t-1} + \beta_2 Rem_{it} + \beta_3 X_{it} + \mu_t + \eta_i + \varepsilon_{it}$, where $(\beta_1 - 1)$ is the convergence coefficient.

¹⁰ 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.

⁵ See the Appendix A for details.

⁶ We compared our series with remittances data as reported in the World Development Indicators of the World Bank. The correlation between the two series is 0.92.

The regression to be estimated is the following:

$$GDP_{it} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 Rem_{it} + \beta_3 FinDev_{it} + \beta_4 (Rem_{it} \cdot FinDev_{it}) + \beta_5 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \quad (2)$$

3.2. Endogeneity

Our first set of OLS regressions, with or without the interaction with financial development, does 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 on 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 system and creditor rights (La Porta et al., 1997) are commonly used. Rajan and Subramanian (2005) use the distance from the country of origin as an instrument for remittances. 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 as best as we can by using *system Generalized Method of Moments* regressions (SGMM), following Arellano and Bover (1995).¹¹

3.3. Estimation results

Table 1 (columns 1a and 1b) reports OLS and SGMM results of the impact of remittances on growth. It shows that the impact of remittances on growth is practically nil when the remittances variable is simply added as an additional explanatory variable in a standard growth regression. Although the coefficient estimates increase and become marginally significant when investment is dropped from the specification,¹² 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 Eq. (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. Table 1 (columns 2a and 2b) present OLS and SGMM estimates using Deposit/GDP as a measure of financial development. We focus our discussion on the SGMM specification but it is worth noting that the two are qualitatively and quantitatively very similar.¹³

¹¹ For a discussion of the reason why a system GMM estimator outperforms a difference GMM estimator see Arellano and Bover (1995) and Blundell and Bond (1998).

¹² This is done in an attempt to better capture the impact of remittances by omitting one of the channels through which remittances are likely to affect growth, that is investment. The results are available upon request from the authors.

¹³ Two lags of all endogenous variables are used as instruments for all non strictly exogenous 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. In all the different specifications used, the Hansen test and the second order correlation tests indicate that we cannot reject the validity of the moment conditions assumed for the estimation.

Table 1
Remittances, financial development, and growth.

	(1a)	(1b)	(2a)	(2b)
	OLS	SGMM	OLS	SGMM
LogInGDP	-0.698*** (0.244)	-1.059 (1.038)	-0.654** (0.254)	-1.394* (0.745)
LogPopGrowth	0.214 (0.404)	0.057 (0.544)	0.368 (0.418)	0.114 (0.527)
GovFiscalBal	0.119** (0.050)	0.209 (0.180)	0.134*** (0.052)	0.397** (0.180)
LogInvGDP	4.698*** (0.571)	5.039*** (1.138)	4.255*** (0.701)	3.200*** (0.974)
LogYearEdu	0.668* (0.363)	1.246 (1.664)	0.524 (0.371)	1.245 (1.120)
LogOpennes	-0.338 (0.316)	-1.147* (0.634)	-0.477 (0.340)	-1.425* (0.732)
Inflation	-0.022** (0.010)	-0.035** (0.015)	-0.019** (0.009)	-0.029** (0.013)
Rem/GDP	0.043 (0.051)	0.010 (0.096)	0.253** (0.106)	0.406** (0.170)
DepGDP			0.032*** (0.012)	0.070*** (0.022)
RemGDP*DepGDP			-0.004** (0.002)	-0.008*** (0.003)
Constant	-4.921** (2.425)	0.034 (8.442)	-4.253 (2.780)	7.874 (6.419)
Observations	315	315	306	306
R-squared	0.35	0.31	0.36	0.23
Number of countries		73		72
AR(1) test		0.00		0.00
AR(2) test		0.52		1.00
p-value Hansen test		0.55		0.86

Dependent variable is GDP per capita growth.

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

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, in more developed financial systems, remittances do not seem to magnify their growth impact. By relaxing liquidity constraints, remittances appear to have compensated for the lack (or the inefficiency) of the financial system and have contributed to channel resources toward productive investments. Remittances have *de facto* acted 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.

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.

Table 2 estimates Eq. (2), for both OLS and SGMM, for each of our measures of financial depth. The results are consistent across the three additional indicators.

3.4. Robustness: threshold estimation

In light of the main results of the empirical analysis, a simple robustness test consists of splitting the sample according to the level of financial development and comparing the impact of remittances across sub-samples. We should find a larger impact of remittances in the sub-sample 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 2
Remittances, financial development, and growth: alternative measures of financial development.

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
	OLS	SGMM	OLS	SGMM	OLS	SGMM
RemGDP	0.228** (0.113)	0.397** (0.166)	0.213* (0.112)	0.251* (0.134)	0.197* (0.100)	0.389** (0.153)
LoanGDP	0.024** (0.010)	0.084*** (0.026)				
RemGDP*LoanGDP	−0.005** (0.002)	−0.009*** (0.003)				
CreditGDP			0.008 (0.008)	0.034*** (0.012)		
RemGDP*CcreditGDP			−0.003* (0.002)	−0.005*** (0.002)		
M2GDP					0.025*** (0.009)	0.047*** (0.015)
RemGDP*M2GDP					−0.003** (0.001)	−0.006*** (0.002)
LogInGDP	−0.661*** (0.255)	−2.462*** (0.897)	−0.661*** (0.245)	−1.482* (0.755)	−0.734*** (0.244)	−1.974** (0.827)
LogPopGrowth	0.262 (0.419)	−0.141 (0.561)	0.242 (0.413)	−0.066 (0.604)	0.333 (0.419)	0.240 (0.556)
GovFiscalBal	0.116** (0.050)	0.354** (0.150)	0.090 (0.055)	0.284* (0.153)	0.133** (0.053)	0.306* (0.155)
LogInvGDP	4.312*** (0.668)	2.626** (1.304)	4.580*** (0.611)	4.041*** (1.219)	4.091*** (0.624)	3.629*** (1.164)
LogYearEdu	0.573 (0.368)	2.555** (1.268)	0.695* (0.368)	1.198 (1.238)	0.651* (0.364)	2.516* (1.362)
LogOpennes	−0.356 (0.341)	−1.444 (0.935)	−0.477 (0.344)	−1.083* (0.603)	−0.493 (0.324)	−1.463* (0.775)
Inflation	−0.019** (0.009)	−0.024** (0.011)	−0.023** (0.010)	−0.034** (0.013)	−0.018** (0.009)	−0.027** (0.013)
Constant	−4.612* (2.695)	15.870** (7.863)	−4.967* (2.559)	0.251* (0.134)	−3.156 (2.606)	0.389** (0.153)
Observations	305	305	307	307	314	314
R-squared	0.35	0.10	0.34	0.24	0.35	0.21
Number of countries		71		73		73
AR(1) test		0.00		0.00		0.00
AR(2) test		0.78		0.91		0.75
P-value Hansen test		0.77		0.77		0.57

Dependent variable is GDP per capita growth.

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

Table 3
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 (0.607)	−0.596 (0.757)	−1.140** (0.451)	−0.295 (0.609)	−0.949* (0.554)	−1.050 (0.758)	−1.140* (0.580)	−1.542** (0.691)
LogPopGrowth	−0.480 (0.407)	1.098 (1.669)	0.518 (0.585)	2.128** (0.985)	0.041 (0.685)	1.348 (1.110)	−0.055 (0.465)	1.018 (0.937)
GovFiscalBal	0.086 (0.112)	0.323* (0.166)	0.354** (0.132)	0.005 (0.156)	0.236 (0.150)	0.201 (0.215)	0.077 (0.136)	0.280** (0.124)
LogInvGDP	5.433*** (1.628)	3.641*** (1.207)	6.541*** (1.794)	5.139*** (0.933)	4.424*** (0.966)	3.624*** (1.240)	5.880*** (1.054)	4.729*** (1.389)
LogYearEdu	0.251 (1.269)	−0.002 (1.016)	3.312** (1.487)	0.432 (0.740)	1.614 (1.462)	1.594 (0.952)	3.436*** (1.250)	1.375 (0.880)
LogOpennes	−0.826 (0.590)	−0.859 (1.061)	−1.211** (0.592)	−1.037 (0.826)	−1.160** (0.545)	−0.684 (0.820)	−1.570*** (0.546)	−1.997** (0.736)
Inflation	−0.100*** (0.023)	−0.002 (0.008)	−0.017* (0.009)	−0.010 (0.014)	−0.037** (0.017)	−0.015 (0.025)	−0.065** (0.024)	−0.010 (0.008)
RemGDP	−0.093 (0.070)	0.113 (0.143)	−0.107 (0.084)	0.121 (0.161)	−0.134* (0.068)	0.035 (0.154)	−0.129** (0.061)	0.264** (0.122)
FD/GDP	−0.003 (0.014)	0.017 (0.053)	−0.005 (0.018)	−0.041 (0.049)	0.017 (0.010)	0.022 (0.032)	−0.004 (0.014)	0.020 (0.057)
Constant	−3.654 (6.800)	−0.933 (9.574)	−5.383 (7.429)	−8.498 (6.687)	0.763 (6.464)	−0.166 (7.761)	−2.444 (5.729)	5.177 (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	

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

Table 3 presents SGMM growth estimates for countries above and below the median of financial development. These results tend to reinforce our previous findings. 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 sub-samples in one case.

Following Hansen (1996, 2000), we use threshold estimation as an alternative robustness test (Table 4). Threshold estimations have 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 sub-samples based on the median level of financial development, threshold estimations allow to endogenously determine the threshold level of financial development at which the sample should be split. Therefore, this 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 estimations take the form:

$$GDP_{it} = \beta_0 + \beta_1 GDP_{it-1} + \beta_2 Rem_{it} + \beta_3 FinDev_{it} + \beta_4 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \quad FinDev_{it} \leq \gamma \quad (3)$$

$$GDP_{it} = \alpha_0 + \alpha_1 GDP_{it-1} + \alpha_2 Rem_{it} + \alpha_3 FinDev_{it} + \alpha_4 X_{it} + \mu_t + \eta_i + \varepsilon_{it} \quad FinDev_{it} > \gamma \quad (4)$$

where *FinDev* is the threshold variable used to split the sample into two groups, 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.¹⁴

¹⁴ 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.

Table 4
Threshold estimation.

	DEP/GDP		LOAN/GDP		CREDIT/GDP		M2/GDP	
	>22.6%	≤22.6%	>20.8%	≤20.8%	>30%	≤30%	>20.8%	≤20.8%
Estimated threshold								
LogInGDP	-0.407 (0.297)	-1.707*** (0.440)	-0.608** (0.304)	-0.598 (0.375)	-0.661** (0.265)	-1.259** (0.484)	-0.727*** (0.266)	-1.577** (0.615)
LogPopGrowth	0.105 (0.431)	2.460** (0.977)	-0.376 (0.361)	2.182*** (0.721)	-0.320 (0.377)	2.325*** (0.817)	-0.137 (0.410)	2.918** (1.110)
GovFiscalBal	0.062 (0.069)	0.294*** (0.074)	0.123 (0.089)	0.065 (0.065)	0.048 (0.059)	0.277** (0.123)	0.094 (0.058)	0.382** (0.146)
LogInvGDP	5.536*** (0.788)	3.264** (1.244)	5.184*** (0.878)	4.951*** (1.037)	5.825*** (0.756)	3.648*** (0.696)	4.546*** (0.729)	3.656** (1.574)
LogYearEdu	0.832 (0.515)	0.984 (0.622)	0.458 (0.549)	0.786 (0.527)	0.374 (0.528)	1.374** (0.578)	0.601 (0.397)	1.145 (0.877)
LogOpennes	-0.275 (0.374)	-1.919*** (0.648)	-0.509 (0.376)	-0.598 (0.630)	-0.158 (0.362)	-1.570** (0.645)	-0.173 (0.342)	-1.541 (1.093)
Inflation	-0.018 (0.012)	0.011 (0.012)	-0.022* (0.012)	-0.010 (0.011)	-0.017* (0.010)	0.001 (0.015)	-0.016 (0.013)	0.012 (0.016)
RemGDP	0.027 (0.053)	0.212 (0.161)	0.052 (0.058)	0.178 (0.119)	-0.004 (0.052)	0.216** (0.104)	0.018 (0.052)	0.467** (0.195)
FD/GDP	0.006 (0.010)	0.152* (0.089)	0.007 (0.010)	-0.124** (0.061)	-0.012* (0.007)	-0.058 (0.051)	0.011 (0.009)	0.069 (0.142)
Constant	-10.569*** (2.988)	7.417 (5.573)	-5.683* (3.289)	-6.542 (4.260)	-8.289*** (2.912)	5.030 (4.378)	-5.336* (2.820)	4.247 (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	

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

Estimates of the threshold model, including the threshold parameter and the least square coefficients on each sub-sample, are reported in Table 3. 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 estimates for each of the financial development indicators and their corresponding 95% confidence interval are as follows¹⁵:

	Threshold Estimate	Confidence Interval
Deposits/GDP	22.6	[11,73]
Loan/GDP	20.8	[16,22]
Credit/GDP	30	[29,33]
M2/GDP	20.8	[16,22]

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.¹⁶ Using 1000 bootstrap replications, the *p*-value for the threshold model is very close to zero in each case. There is, therefore, evidence for a regime change at the determined level of financial development. Estimates of the growth regression model for each sub-sample 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 sub-sample. It is worth noting that most of the controls in the growth regression, not only the remittances variable, behave differently across sub-samples.

To summarize, our robustness checks of splitting the sample according to the degree of financial depth, in both an exogenous manner and according to an endogenously determined threshold, 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 in financially developed countries.

4. Remittances and growth: a closer look at the investment channel

In an attempt to identify how remittances affect growth, in this section we provide additional evidence on the investment channel. We

do this in two ways. First, we show that remittances indeed boost investment, especially in countries with a less developed financial sector. Second, we show that in two thirds of the countries in our sample remittances appear to be mostly pro-cyclical, an indication that remittances tend to respond to investment opportunities at least as much as to altruistic or insurance motives.

To understand the relationship between remittances and investment, we start by estimating the growth regressions dropping investment as an explanatory variable.¹⁷ If the marginal impact of remittances becomes larger, this would provide indirect evidence of a channel working through productive investment. Table 5 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% in the case of deposits and M2 to GDP. The increase is between 2 and 6 times larger in the case of total credit from the banking sector. These results suggest that an important channel through which remittances influence growth is the volume of investments.

It is worth emphasizing that investment is not the only channel since remittances remain significant when investment is controlled for in the regression. Besides making investment in physical capital easier, remittances may also help households in countries with less developed financial systems smooth consumption and purchase insurance, health, and education, thereby promoting growth. Remittances could also provide a source of income and consumption in old age or temporarily in periods of unemployment. Banks, insurance companies, pension funds, and financial safety nets pick up these roles in more financially advanced countries. Other potential channels may be increased efficiency of investment and labor productivity, dimensions which are difficult to account for in our econometric analysis.

In order to assess the investment channel, we also look at the empirical relation between remittances and investment in a more direct way, by estimating the following investment equation:

$$INVGD\dot{P}_{it} = \beta_0 + \beta_1 INVGD\dot{P}_{i,t-1} + \beta_2 Rem_{it} + \beta_3 FinDev_{it} + \beta_4 (Rem_{it} \cdot FinDev_{it}) + \beta_5 Z_{it} + \mu_t + \eta_i + \varepsilon_{it} \quad (5)$$

where *INVGD*P is total investment to GDP and *Z* is a matrix of controls, which includes per capita real GDP growth¹⁸ 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

¹⁵ Incidentally, the estimated threshold levels are relatively similar to the median values of the corresponding financial development variables, except for M2/GDP, where is lower.

¹⁶ We also compute heteroskedasticity-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.

¹⁷ The financial development variable is likely to be affected when investment is eliminated from the regression as well. According to Barro, the investment ratio can bias the results due to reverse causality. Some studies on financial development include the investment variable (see Alfaro et al., 2004), while others decide to leave it out (see Loayza and Ranciere, 2004).

¹⁸ We also estimate an alternative specification of the investment regression, by excluding GDP per capita. The results are virtually unchanged.

Table 5
Marginal effect of remittances on growth by levels of financial depth.

	DEP/GDP	LOAN/GDP	CREDIT/GDP	M2/GDP
Financial Depth at which 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% significance level.

expects that growth exerts a positive effect on investment and that higher lending rates hamper the rate of capital accumulation.¹⁹

Estimation results are reported in Table 6, where the estimated coefficient of the lagged investment variable is large and positive, for each indicator of financial development. 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 remittances 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. Our results suggest that the marginal impact of remittances on investment is positive across largely all levels of financial development.²⁰ 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.

Another way of investigating the link between remittances and investment is to look at their procyclicality. If these capital flows are profit-driven, they should be positively correlated with GDP, or procyclical. If they 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, or countercyclical. Fig. 2 shows the correlations of the cyclical components of remittances and output for about a hundred developing countries.²¹ It is apparent from the figure that remittances are procyclical – to different degrees – for two thirds of the countries. There is, thus, some indication that migrants tend to send

¹⁹ 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 Eq. (5), which uses the most conventional determinants of investment only.

²⁰ The marginal effect of remittances only becomes zero at very high levels of financial depth, beyond the 90–95 percentile of the distribution.

²¹ 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 et al. (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.

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.

It is worth nothing that cross-country studies only reflect average behavior and by definition could conceal important differences in the cyclical behavior of remittances (see Ratha (2003) and Sayan (2006). Time series analysis based on specific case studies could provide additional important information that could complement the average regularities found in our paper.

5. Conclusions

What is the macroeconomic impact of remittances? Is there evidence that remittances foster productive investment? How does financial development influence the growth effect 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 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 by providing an alternative way to finance investment. 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, including threshold estimations. By becoming a substitute for inefficient or inexistent credit markets, remittances help alleviate credit constraints contributing to improve the allocation of capital and to boost 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. We also analyzed the cyclical properties of remittances and concluded that they are predominantly profit-driven and mostly procyclical.

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

Table 6
Investment, remittances, and financial development, SGMM estimates.

	DEP/GDP	LOAN/GDP	CREDIT/GDP	M2/GDP
Lagged InvGDP	0.874*** (0.110)	0.837*** (0.095)	0.865*** (0.104)	0.854*** (0.110)
Real GDP growth	0.534** (0.214)	0.518*** (0.181)	0.555*** (0.189)	0.528** (0.208)
Lending rate	−0.014 (0.019)	−0.015 (0.020)	−0.021 (0.019)	−0.005 (0.014)
RemGDP	0.398* (0.231)	0.710** (0.341)	0.507** (0.242)	0.690** (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 (2.054)	−1.726 (2.476)	−0.974 (2.554)	−2.405 (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

Dependent variable is investment to GDP.

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%.

All regressions include time dummies.

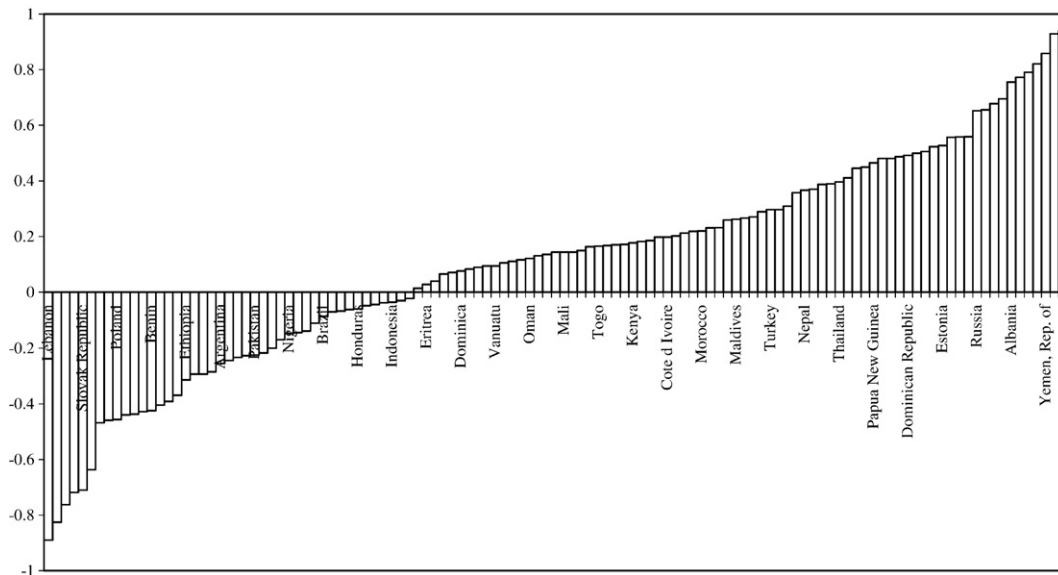


Fig. 2. Country correlations between the cyclical components of remittances and GDP 1975–2002. Source: IMF balance of payment statistics and authors' calculations.

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.

Overall, our empirical analysis provides the first macroeconomic evidence of how remittances and financial development may interact in promoting growth. The evidence that remittances contribute to overcome liquidity constraints and help undertake profitable investment in countries with less developed financial systems is encouraging. But while many policy-makers stress the need to stimulate remittances across the board by reducing transfer costs, the biggest challenge is to understand why remittances do not seem to boost growth in countries with well-functioning credit markets, and how policies could possibly address this.

Appendix A. Definition 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) include 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, Cote d'Ivoire, Dominican Republic, Ecuador, El Salvador, Guyana, Panama, Rwanda, Senegal, Seychelles, Turkey and Venezuela.

Moreover the BOPSY specifies that migrants; transfer 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. Caribbean²²: Desk provided data for 1991–2002
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

²² 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.

Appendix B. 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 Rep.
Indonesia	Thailand
Iran, Islamic Rep. of	Togo
Jamaica	Tonga
Jordan	Trinidad and Tobago
Kenya	Tunisia
Malawi	Turkey
Malaysia	Uruguay
Mali	Venezuela
Malta	Zimbabwe
Mauritania	
Mauritius	

Table A1

Summary statistics, 5 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 1. Outliers have been excluded.

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