

Exchange Rate Flexibility and the Effect of Remittances on Economic Growth

Emmanuel K.K. Lartey



WORLD BANK GROUP

Africa Region

Office of the Chief Economist

December 2016

Abstract

This paper studies the question of whether exchange rate policy affects the impact of remittances on economic growth in recipient countries. The paper utilizes a comprehensive data set that comprises annual observations for 135 developing and transition countries, spanning 1970–2007. The data for exchange rate regimes is based on the Reinhart and Rogoff exchange rate regime classification, whereas the data for remittances and all other variables are from the World Bank's World Development Indicators database. The findings indicate that more flexible exchange rate regimes are associated with a greater increase in economic growth following an increase in remittances, but

also that the impact of remittances on growth is positive under a fixed exchange rate regime. The estimates suggest that a 1 percent increase in remittances increases per capita growth by about 0.79 percent under a fixed exchange rate regime, and that this effect increases by about 0.13 percent for a 1 point increase in the exchange rate flexibility index. The results further suggest that the effect of remittances under a fixed exchange rate regime is positive in less financially developed countries as well, but do not provide conclusive evidence that this effect varies inversely with exchange rate flexibility in such economies as theorized.

This paper is a product of the Office of the Chief Economist, Africa Region. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at elartey@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

Exchange Rate Flexibility and the Effect of Remittances on Economic Growth

Emmanuel K.K. Lartey*

JEL Classification: F24 F43 O10

Keywords: Remittances, Exchange Rate Regimes, Economic Growth, Financial Development, Panel Data.

*The World Bank, 1818 H St. NW, Washington, DC 20433. Email: elartey@worldbank.org. The author is grateful to Andrew Gill and Larry Howard for providing very helpful comments.

1 Introduction

There is an extensive literature on the linkage between exchange rate regimes and economic growth with no consensus on the nature of the relationship. A key argument, among several, that has been advanced in favor of flexible regimes is that they enhance economic growth by facilitating adjustments to real shocks originating from both domestic and foreign sources, in the presence of nominal rigidities. This argument therefore suggests that a fixed regime renders the economy susceptible to greater macroeconomic volatility, and should have an adverse impact on growth. A contrasting theoretical argument is that a flexible regime is a source of macroeconomic uncertainty, as it allows the propagation of negative external shocks and hence dampens growth. Thus, in this case, a fixed regime is favored to provide an environment that enhances growth through a decline in uncertainty and limited variability in the interest rate.

This paper addresses the debate on whether exchange rate regimes matter for the impact of remittances on economic growth in recipient countries. It is well documented that countries, in the past, have resorted to combatting inflationary consequences and the concomitant real exchange rate appreciation effects of capital inflows by pegging their exchange rates under the notion that this would help their external competitiveness and thereby enhance their efforts at utilizing those capital inflow resources to enhance productivity and growth. Remittances, as has been observed, could act as private capital inflows, and given that they could negatively impact economic growth through an appreciation of the real exchange rate and contraction of the tradable sector, it is important to empirically assess the role exchange rate regimes play in driving the economic growth dynamics in recipient economies.

Several indirect channels through which exchange rate regimes could affect growth have been identified. These include the level of financial development, investment and international trade.¹ Aghion et al. (2009) find evidence that more financially developed countries grow faster under a more flexible regime. They also observe a negative relationship between productivity growth and flexible regimes in less financially developed countries. The main idea is that firms in countries with higher levels of financial development are able to survive liquidity shocks that accompany exchange rate fluctuations and contribute to innovation and long-run growth. Such exchange rate volatility tends to have negative effects on long-run growth in less financially developed countries as they discourage investments. Bailliu et al. (2003) note that the indirect route is based on the certainty or uncertainty triggered by the exchange rate regime, and the impact of that on trade and investment.

In a study that analyzes the implication of exchange rate policies for the dynamics of sectoral output and nontradable inflation in an economy that is subject to remittance shocks, Lartey (2015) shows that under a fixed exchange rate regime, an increase in remittances leads to an increase in consumption of nontradable goods and a rise in nontradable inflation. For an inflation targeting regime, though, an increase in remittances leads to an expansion of the tradable sector, and a decline

¹See De Vita and Kyaw (2011) for additional details and references.

in consumption of nontradables, which reduces nontradable inflation. The findings also indicate that a near-zero nontradable inflation rate, and a managed variability in the nominal exchange rate characterizes the optimal monetary policy, suggesting that an inflation targeting regime is preferable to a fixed exchange regime. An empirical assessment of the theoretical model using vector autoregression analysis indicates that these observations are generally consistent with the dynamics of inflation induced by a shock to remittances in El Salvador, which is representative of an economy that operates a fixed exchange regime, and the Philippines, which typifies an economy with an inflation targeting monetary regime.

It may be argued then, that exchange rate regimes could facilitate or undermine economic growth directly, to the extent that they curtail or precipitate Dutch disease effects of remittances respectively, through their impact on resource reallocation which in turn has implications for economic growth. In addition, exchange rate regimes could have an indirect effect on how remittances impact growth, particularly in the case where remittances act as investment capital. Furthermore, given that exchange rate policies have implications for macroeconomic (un)certainly and the transmission of negative external shocks, the choice of exchange rate regimes could serve to provide desirable macroeconomic environments for remittances to positively affect growth or otherwise.

On that account, this study contributes to the literature by examining the question of whether the relationship between remittances and economic growth is affected by exchange rate policies in recipient countries. The paper also analyzes whether exchange rate flexibility diminishes the growth effects of remittances in countries with low levels of financial development. Furthermore, this study differs from the extant literature, in that it utilizes a comprehensive data set on 135 developing and transition countries representing different income groups, and employs estimation techniques that address potential endogeneity issues that exist between GDP per capita growth on one hand, and exchange rate regimes and remittances on the other hand.

2 Related Literature

Remittances to developing countries have been on a rising trend in the last several years, with a projection to top \$500 billion by 2015 according to a World Bank report on global migration and remittances issued in 2012. The estimates for the recent past are \$327 billion in 2010 and \$372 billion in 2011, reaching slightly over \$406 billion in 2012. Remittances have become an important component in total international capital flows to developing countries, and currently, are more than three times the size of official development assistance and have become the second largest source of external finance behind foreign direct investment (FDI). Table 1 shows the top recipients of migrant remittances in 2012, with India leading the group and followed closely by China, having received \$70 billion and \$65 billion respectively.

The literature has documented both desirable and undesirable consequences of remittances in recipient economies. Studies by Adams and Page (2005) and Acosta et al. (2008) have provided some evidence that remittances are associated with lower poverty indicators and high growth rates.

Others, like Gupta et al. (2009) indicate that remittances have contributed towards smoothing household consumption, and to investment in human capital. There is also evidence that there is a positive relationship between remittances and growth, and that there exists an investment channel through which remittances affect growth (Lartey, 2013). In direct contrast, some studies have shown that remittances may be harmful to the long-run growth of recipient economies through a decline in labor supply and labor market participation rate, as well as through the appreciation of the real exchange rate and the associated detrimental effect on the tradable sector, otherwise known as the Dutch disease phenomenon (Acosta et al., 2009). In essence, the inflow of remittances, in spite of its benefits, could cause a real exchange rate appreciation and loss of international competitiveness, and eventually lead to resource reallocation away from the tradable sector and toward real estate and other nontradables that tend to experience rising prices in the face of capital inflow, which could potentially hurt economic growth (Amuedo-Dorantes and Pozo, 2004; Lartey et al, 2012).

Against the backdrop of extensive research on the impact of the choice of exchange rate regimes on the macroeconomic effects of capital inflows, some work has been done on the macroeconomic dynamics generated under different exchange rate regimes following the inflow of remittances. This has been in response to the magnitude of remittances, and the questions it has generated with respect to the potential undesirable effects and how that could alter the economic growth prospects of recipient economies, as was the case during periods of massive capital inflows to emerging market economies in the 1990s. Mandelman (2012), for instance, examines the stabilization role and welfare implications of monetary and exchange rate policies in a small open economy that is subject to remittances fluctuations. The study shows that a fixed exchange regime provides a better outcome for households facing rising trend in remittances, while a flexible regime does better when unanticipated shocks over the business cycle are considered. Lartey (2015) studies the properties of exchange rate and monetary policies in an economy that is a recipient of remittances, focusing on the implications for the dynamics of sectoral output, nontradable inflation and the real exchange rate. The main results are that an increase in remittances leads to an increase in nontradable inflation under a fixed exchange rate regime, whereas for an inflation targeting regime, an increase in remittances generates dynamics that result in a decrease in nontradable inflation.

Lartey et al. (2012), using disaggregated data, show that an increase in remittances in emerging economies is associated with Dutch disease effects by way of real exchange rate appreciation and resource reallocation that favors the nontradable sector at the expense of tradable goods. Moreover, their findings suggest that these effects operate stronger under fixed exchange rate regimes. Ball et al. (2013) analyze the short-run dynamics triggered by an increase in remittances under different exchange rate regimes, with a focus on the monetary nature of remittances. The theoretical predictions indicate that under a fixed exchange rate regime, a rise in remittances leads to an increase in gross domestic product (GDP), increase in the rate of inflation and an appreciation of the real exchange rate, while they do generate an increase in GDP, an appreciation of the real exchange rate but a decrease in inflation rate under a flexible exchange rate regime. The key result is the inflationary consequences of remittances under fixed exchange regimes, which is supported by an

empirical analysis using data for 21 emerging market economies and a panel vector autoregression approach.

The aforementioned studies have focused on different aspects of the impact of exchange rate regimes on macroeconomic dynamics in recipient economies, none of which directly addresses the economic growth consequences, although their results do carry some implications for that. Thus, the focus of this study is to examine directly, how exchange rate flexibility influences the way remittances affect economic growth. Notably, it departs from studies by Guliano and Ruiz-Arranz (2009) and Lartey (2013) which focus on the impact of remittances on economic growth without consideration for the role of exchange rate regimes.

The next section explores the data and considers an empirical examination of the extent to which exchange rate flexibility affects the relationship between remittances and economic growth. Section 4 discusses the results and the policy implications thereof, and section 5 presents some concluding remarks.

3 Data and Methodology

3.1 Characteristics of the data

The data set used constitutes annual observations that span the period, 1970-2007, for 135 developing and transition countries.² The data for exchange rate regimes is based on the Reinhart and Rogoff de-facto exchange rate regime (COARSE) classification, whereas the data for remittances and all other variables are from the World Bank's World Development Indicators (WDI) database. Table 2 presents a description of the exchange rate regime classification scheme. Table 3 provides some basic descriptive statistics for the data on the main variables used in the analysis. The exchange rate regime varies between categories 1 and 5, with an increase indicating a movement towards a more flexible exchange rate regime. GDP per capita growth rate is highly variable across countries over the sample period, ranging between about -50 percent to about 91.7 percent, with a mean of about 7 percent. Remittances are characterized by a low of US\$9,980 and a high of US\$37.2 billion, with an average of US\$687 million. When expressed as a share of GDP, remittances receipts amounted to the tune of about 5 percent of GDP on average.

Table 4 presents correlation coefficients between remittances and GDP per capita growth across the five exchange rate regime classes. With the exception of regime 2, all other regimes classes show a positive correlation between remittances and growth, of which only regimes 1 and 3 are statistically significant. The estimates further show that when regime classes are combined into two groups only, then for regimes 1 through 3, there is a positive and statistically significant correlation between

²The following are noteworthy: a. The choice of countries was guided by availability of data for remittance recipients, and particularly for exchange rate regimes. b. Although the data spans 38 years, the time dimension is in the range, 13 -15 years, across the various estimations due to missing observations. c. Annual observations are used primarily in the estimations, because the literature documents that remittances may affect growth by enhancing macroeconomic stability via consumption smoothing over the business cycle, in addition to the potential impact through an investment channel. Refer to Lartey (2013) for further details.

remittances and growth, with an estimate of 0.14.

Figure 1 shows a graph of remittances and GDP per capita growth for the Philippines and El Salvador, two countries that operate under two different exchange rate regimes, and have been the focus of studies on different aspects of the macroeconomic effects of remittances. The plot reveals no clear difference in the observed association between the two variables in the two countries. The data, however, reveals that the Philippines had an average growth rate of 1.7% between 1998 and 2007, a period during which they operated under some type of a flexible exchange rate regime (category 4). El Salvador, on the other hand, for the same period, achieved an average growth rate of 2.4%, while operating under some type of a fixed exchange rate regime (category 1). The data further shows that between 2001 and 2007, when the Philippines saw the steepest rise in remittances, the average growth rate was about 3%; compared to an average growth rate of 2.4% for El Salvador over the period 1999-2007, during which they experienced a marked increase in remittances.³

3.2 Model specification and estimation

In order to explore further, how exchange rate flexibility affects the relationship between remittances and economic growth, I specify and estimate a dynamic model using the generalized method of moments (GMM) estimator proposed by Arellano and Bond (1991) and Blundell and Bond (1998), which is designed to deal with potential endogeneity in all explanatory variables, but which accounts, particularly, for endogeneity due to the introduction of lags of the dependent variable as covariates.

The dynamic equation is represented by an autoregressive-distributed lag model of the form

$$y_{i,t} = \varphi y_{i,t-1} + \beta'(L)x_{it} + \eta_i + \varepsilon_{it}. \quad (1)$$

This is a dynamic model for y_{it} , where $y_{i,t-1}$ is the one period lag of y_{it} , x_{it} is a vector of other explanatory variables, $\beta(L)$ is a vector of associated polynomials in the lag operator, η_i is a country specific effect which is unobserved, and ε_{it} is an error term. The dependent variable is GDP per capita growth rate, and the main explanatory variables include remittances, exchange rate regime, investment as a percentage of GDP, money supply (M2) as a percentage of GDP, government spending and an interaction term for remittances and exchange rate regimes. The interaction term is introduced to analyze the extent to which exchange rate flexibility influences the effect of remittances on economic growth.⁴

Estimating equation (1) with the fixed-effects (within) estimator yields a biased and inconsistent estimate of the coefficient on the lagged dependent variable because it makes use of a transformation by which the country specific effect is eliminated, and which culminates in a correlation between the lagged dependent variable and the error term. Thus, I utilize the *system* GMM estimator which

³The estimated mean growth rates for the referenced periods are the author's calculation based on the data.

⁴For all estimations, I use a logarithmic transformation of all variables, with the exception of the exchange rate regime index.

combines an estimator in first-differences with an estimator in levels. The inclusion of a levels equation allows the use of information on cross-country differences. This estimation technique generates internal instruments by using the lagged levels and lagged differences of the explanatory variables as instruments under two conditions: i) that there is no serial correlation in the errors and ii) the differences of the explanatory variable and the errors are uncorrelated. Two specification tests, Sargan test for over-identifying restrictions and Arellano-Bond test for second-order serial correlation are applied to assess the validity of the instruments and consistency of the estimates.⁵

4 Results

4.1 The role of exchange rate flexibility

The results obtained from the preliminary regressions are presented in Table 5. The estimates show that when expressed as percentage of GDP, remittances and the interaction of remittances and exchange rate regimes are both positive and statistically significant in one case only, but when expressed in units of currency, they are significant in both regressions.⁶ The main initial observation is that remittances have a positive effect on growth, and the impact increases with exchange rate flexibility.

Table 6 presents estimates from alternative specifications that indicate that the initial findings are robust. These results, which are based on both the two-step and one-step GMM system estimation methods, show that the point estimate for remittances is statistically significant in columns (1), (3) and (4) whereas the estimate for the interaction term is positive in four regressions, including the three identified. The estimated contemporaneous effect of remittances on growth, when interacted with exchange rate regime, thus, turns out to be statistically significant across those four specifications. Based on column (4) for instance, which shows results using the preferred estimator, the point estimate suggests that a 1% increase in remittances increases per capita growth by about 0.79% under a fixed exchange rate regime (regime class=1), and that this effect increases by about 0.13% for a 1-point increase in the exchange rate classification index, as evidenced by the estimate of 0.92 at the mean of the exchange rate indicator ($1.97 \approx 2$).⁷ Since the remittances-growth relationship could operate at a lag given the smooth growth in remittances, a specification using one-period lag of remittances, and an interaction term involving that variable and exchange rate regime is estimated, the results of which are in column (5). The one-period lag of remittances is positive but not statistically significant, likewise the interaction term. The estimated effect of remittances at one period lag, when interacted with exchange rate regime, is therefore not statistically significant.⁸ It is noteworthy that when robust standard errors are employed in the estimations,

⁵These estimators have been widely applied and discussed in a number of studies. See Blundell and Bond (1998) for details on the system GMM estimators.

⁶Given that the ratio of remittances to GDP would be expected to have a strong correlation with GDP growth rate, the statistical insignificance of its coefficient is attributable to weak internal instruments.

⁷Following Bond et al. (2001), I use the one step GMM estimator with standard errors that are both robust and reliable for finite sample inference, and consider this to be the preferred estimator.

⁸The two-period lag of remittances, and an interaction between that and the exchange rate regime is also estimated

the impact of remittances when taking into account exchange rate flexibility has been observed to be statistically significant only when expressed in units of currency.⁹

I implement additional checks for robustness by comparing the impact of remittances on growth under a fixed exchange regime to that under all other regime types that accommodate some variability in the exchange rate. An indicator variable, which is equal to 1 for regime classes greater than 1, is interacted with remittances and introduced into various specifications. The results of those estimations are presented in Table 7. The coefficient estimates for remittances and the interaction term are statistically significant in all the regressions and support the finding that an exchange rate policy that allows for some degree of variability increases the impact of remittances on economic growth. For instance, the estimates given in column (2) suggest that on average, under a regime that is not fixed, the impact will be about 0.13% higher, which matches the initial estimated impact for a unit increase in the exchange rate regime index. The baseline effect, however, is found to be slightly lower at about 0.65% in the case of a fixed exchange rate regime.

4.2 Exchange rate regimes and financial development interaction

Aghion et al. (2009) find that countries that have a more developed financial system grow faster under a more flexible exchange rate regime, and that growth may be hampered under flexible regimes in those with a less developed financial system. The objective for this part of the analysis is to test the hypothesis that the impact of exchange rate flexibility on the effect of remittances will be negative for countries with low level of financial development, in line with the findings in Aghion et al. (2009). An indicator variable, set equal to 1 for low level of financial development is further interacted with the original interaction between remittances and exchange rate regime. The indicator variable is based on two measures of financial development; domestic credit provided by banking sector (% of GDP) and domestic credit to private sector (% of GDP). In each case, the indicator variable is set to 1 where the value of the financial development variable is less than the median observation for the sample.

The results for the set of regressions that incorporate the three-way interaction term are given in Table 8. The estimates that are based on domestic credit provided by the banking sector are in columns (1) through (3), and they show the interaction term is statistically significant in one case only. Where the indicator variable is based on domestic credit to the private sector, the estimates are in columns (4) and (5), and the interaction term is negative and not statistically significant. Still and all, the estimates show that, in general, the standalone effect of remittances is positive and statistically significant, likewise the total effect of remittances when interacted with the indicator variable for financial development and exchange rate regime, with estimates

using the same set of control variables. The results, which are available upon request, show that the standalone effect of remittances(t-2) is positive but not statistically significant, whereas the interaction term is positive and statistically significant. The non-linear combination of the two (total effect) at the mean value of exchange rate regime is not statistically significant, however.

⁹Remittances expressed in currency units is used for the remainder of the analysis, given that in the preceding regressions, when expressed as a percentage of GDP, the estimates are not statistically significant, which could be due to the problem of weak instruments.

between 0.555 and 0.867. These estimates therefore suggest that exchange rate flexibility increases the impact of remittances when countries have a low level of financial development, where the measure is domestic credit provided by the banking sector; but decreases this impact where the financial development indicator is given by domestic credit to the private sector. A unit increase in exchange rate flexibility would, thus, increase the growth effect of remittances by about 0.18% in less financially developed countries, as measured by total domestic credit, but decrease it by about 0.05% where the indicator is domestic credit to the private sector, based on the difference between the standalone effect of remittances, and the nonlinear combination of the estimates for remittances and the interaction term in columns (1) and (4) respectively.

A final set of specifications are estimated using 4-year period averages of the data as additional checks for robustness of the results, and the estimates are given in Table 9.¹⁰ The results show that when expressed as percentage of GDP, the standalone effect of remittances is positive, but when taking into account the exchange rate regime, the impact of remittances is not statistically significant. On the other hand when expressed in currency units, remittances have a positive effect on growth under a fixed regime, and the effect rises with exchange rate flexibility, consistent with the preceding results. Of particular interest are the estimates reported in column 3, which show remittances with a positive coefficient, and lagged remittances with a coefficient of -0.429, whereas the interaction term coefficient estimated at the mean value of exchange rate regimes is -0.378. This is an intriguing result, as it suggests remittances have positive effect on growth in the short-run but could impact growth negatively in the medium to long-run, possibly through the Dutch disease mechanism, and that exchange rate flexibility may minimize such negative consequences; an inference that is consistent with findings in Lartey (2015). In general, the results presented in columns (4) – (6) support those in Table 8, which suggest that exchange rate flexibility may increase or decrease the growth effects of remittances in countries with low levels of financial development.¹¹

Thus, although the impact of remittances on growth is observed to be positive under fixed regimes, it is unclear whether exchange rate flexibility increases or decreases this impact in less financially developed economies. It is interesting to note, however, that the negative impact of exchange rate flexibility is based on the financial development index associated with the private sector, which seems to be consistent with the argument advanced by Aghion et al. (2009), that for firms in countries with lower levels of financial development, liquidity shocks that accompany exchange rate fluctuations discourage investments and hence tend to have negative effects on economic growth. In other words, the broader measure for the level of financial development, i.e. domestic credit provided by the banking sector, is associated with a positive impact of exchange rate flexibility on the relationship between remittances and growth plausibly because it conceals

¹⁰This is done to reduce any business cycle effects and potential measurement errors.

¹¹I performed additional robustness checks by foremost, estimating the specifications in Table 9 while dropping from the sample, China and India, the two largest recipients of remittances with receipts in excess of US\$40 billion more than countries like Mexico and the Philippines, which are ranked directly behind them. Secondly, I estimated the same specifications after dropping from the sample, offshore financial centers namely Belize, Malaysia, Panama, Samoa and Vanuatu. The results, which are available upon request, are identical to the reported estimates, and do not alter the main findings.

the sensitivity of borrowing activity of private sector firms to exchange rate fluctuations and how that affects growth negatively.

4.3 Policy implication

Remittances, it has been found, can generate certain short-run dynamics that could potentially hurt the growth prospects of recipient countries. The main mechanism through which this can occur is the well-known Dutch disease phenomenon. Studies on such short-run dynamics, in general, have found that flexible exchange rate regimes tend to minimize the inflationary consequences of the inflow of remittances (Ball et al., 2013). A supporting argument is that in the case where monetary policy is not devoted to pegging the nominal exchange rate, an inflation targeting regime, for instance, generates dynamics that lead to lower nontradable inflation and favorable outcome for the tradable sector which is considered key to economic growth (Lartey, 2015).

The main finding in this paper indicates that, by and large, the impact of remittances on growth is positive under both fixed and flexible exchange rate regimes, such that this effect increases with exchange rate flexibility. The positive effect that is observed under fixed exchange rate regimes is likely a consequence of the neutralizing effect of any potential appreciation of the nominal exchange rate and the favorable impact on economic growth that this generates. However, given that this positive impact is higher under more flexible regimes, it is arguable that policies that are characterized by exchange rate flexibility do mitigate some of the undesirable consequences of remittances that occur under fixed regimes. Nonetheless, such negative consequences corresponding to fixed exchange rate policies are not strong enough to overturn the positive contribution that remittances invariably make towards economic growth.

In essence, a fixed regime may not decrease the growth effects of remittances. Still and all, it may generate dynamics in the short-run that could potentially limit the size of the positive impact of remittances on growth. Thus, where a fixed exchange rate is considered as necessary to satisfying the short-term objectives of policy makers, which may include controlling appreciation of the nominal exchange rate following the inflow of remittances, it would be appropriate for such a policy to be adopted. On the other hand, the adoption of a policy that favors exchange rate flexibility should lead to realization of a larger impact of remittances on growth.

5 Conclusions

This paper informs the debate on whether the exchange rate regime that a recipient country adopts has consequence for the impact of remittances on economic growth. Particularly, the study analyzes how exchange rate flexibility impacts the effect of remittances on growth. The literature has documented a positive association between remittances and growth, and argued in favor of different channels through which this may occur, including investment in both human and physical capital, and through consumption smoothing. However, it has also been shown that remittances may be associated with a decline in labor supply, appreciation of the real exchange rate and reallocation

of resources away from the tradable sector, all of which have adverse consequences for economic growth. Furthermore, it has been argued that exchange rate regimes may have implications for the growth effect of remittances either directly through the impact they exert on resource reallocation and the real exchange rate or indirectly with respect to how they influence macroeconomic stability.

The findings indicate that the impact of remittances on growth is positive under fixed exchange rate regimes. The results further suggest that more flexible exchange rate regimes are associated with a greater increase in economic growth following an increase in remittances. In the case of countries with less developed financial systems, however, the results demonstrate that exchange rate fluctuations may serve to diminish the effect of remittances on growth. Thus, in general, in spite of the exchange rate policy a country adopts, it can be expected that the inflow of remittances will have a positive effect on growth, with the size of this effect increasing in the flexibility of the exchange rate regime.

References

- [1] Acosta, P.; Calderón, C.; Fajnzylber, P.; and López, H. (2008). “What is the Impact of International Migrant Remittances on Poverty and Inequality in Latin America?” *World Development* 36(1), 89-114..
- [2] Acosta, P., Lartey, Emmanuel .K.K., and Mandelman, F. (2009). “Remittances and Dutch Disease.” *Journal of International Economics* 79, 102-116.
- [3] Adams, R. and J. Page (2005). “Do International Migration and Remittances Reduce Poverty in Developing Countries?” *World Development* 33 (10), 1645–1669.
- [4] Aghion P., P. Bacchetta, R. Ranciere and K. Rogoff, (2009), “Exchange rate volatility and productivity growth: The role of financial development,” *Journal of Monetary Economics* 56:494-513.
- [5] Amuedo-Dorantes, C. and Pozo S. (2004). “Workers’ Remittances and the Real Exchange Rate: A Paradox of Gifts.” *World Development* 32 (8), 1407-1417.
- [6] Arellano, Manuel and Stephen Bond (1991), “Some tests of specification for Panel Data: Monte Carlo Evidence with an Application for Employment Equations,” *Review of Economic Studies* 58:277-97.
- [7] Bailliu, J., R. Lafrance and J-F. Perrault (2003), “Does Exchange Rate Policy Matter for Growth,” *International Finance* 6(3), 381-414.
- [8] Ball, Christopher P., Claude Lopez and Javier Reyes, (2013). “Remittances, Inflation and Exchange Rate Regimes in Small Open Economies,” *The World Economy*, forthcoming.
- [9] Blundell, Richard and Stephen Bond (1998), “Initial conditions and Moment Restrictions in dynamic panel data models,” *Journal of Econometrics* 87:115-43.
- [10] Bond, Stephen R., Hoeffler, Anke and Temple, Jonathan R.W., (2001) “GMM Estimation of Empirical Growth Models,” CEPR Discussion Paper No. 3048.
- [11] De Vita, G. and Khine S. Kyaw (2011), “Does the choice of exchange rate regime affect the economic growth of developing countries,” *Journal of Developing Areas* 45 (1),135-153.
- [12] Giuliano P., and Ruiz-Arranz, M. (2009), “Remittances, Financial Development and Growth,” *Journal of Development Economics*, 90, 144-152.
- [13] Gupta, Sanjeev, Catherine A. Pattillo and Smita Wagh (2009), “Effect of remittances on poverty and financial development in Sub-Saharan Africa” *World Development* 37 (1), 104–115.

- [14] Lartey, Emmanuel K.K., Federico S. Mandelman and Pablo A. Acosta (2012), "Remittances, exchange rate regimes, and the Dutch disease: A panel data analysis," *Review of International Economics* 20:2, 377–395
- [15] Lartey, Emmanuel K.K., (2013) "Remittances, Investment and Growth in Sub-Saharan Africa" (2013), *Journal of International Trade and Economic Development* 22:7, 1038-1058
- [16] Lartey, Emmanuel K.K., (2015) "Remittances, Monetary Regimes and Nontradable Inflation Dynamics," forthcoming, *Macroeconomic Dynamics*
- [17] Magud, Nicolas E., Carmen M. Reinhart and Esteban R. Vesperoni (2012), "Capital Inflows, Exchange Rate Flexibility and Credit Booms," IMF Working Paper WP/12/41.
- [18] Mandelman, Federico S. (2012) Monetary and Exchange Rate Policy Under Remittance Fluctuations. *Journal of Development Economics* 102(c) 128-147.

A Appendix

A.1 Variables and Data Sources

Personal remittances, received (% of GDP), (World Development Indicators)

Personal remittances, received (current US\$), (World Development Indicators)

Inflation, consumer prices (annual %), (World Development Indicators)

Lending interest rate (%), (World Development Indicators)

Investment *i.e.* Gross fixed capital formation (% of GDP), (World Development Indicators)

Money and quasi money (M2) as % of GDP, (World Development Indicators)

General government final consumption expenditure (constant 2005 US\$), (World Development Indicators)

GDP per capita growth (annual %), (World Development Indicators)

Population growth (annual %), (World Development Indicators)

Domestic credit provided by banking sector (% of GDP), (World Development Indicators)

Domestic credit to private sector (% of GDP), (World Development Indicators)

A.2 List of Countries

Afghanistan	Comoros	India	Moldova	Somalia
Albania	Congo, Dem	Indonesia	Mongolia	South Africa
Algeria	Congo, Rep	Iran	Montenegro	Sri Lanka
Am. Samoa	Costa Rica	Iraq	Morocco	St Lucia
Angola	Cote D'Ivoire	Jamaica	Mozambique	St Vincent Gr
Argentina	Cuba	Jordan	Myanmar	Sudan
Armenia	Djibouti	Kazakhstan	Namibia	Suriname
Azerbaijan	Dominica	Kenya	Nepal	Swaziland
Bangladesh	Dominican Rep	Kiribati	Nicaragua	Syria
Belarus	Ecuador	Korea	Niger	Tajikistan
Belize	Egypt	Kyrgyz Rep	Nigeria	Tanzania
Benin	El Salvador	Lao	Pakistan	Thailand
Bhutan	Eritrea	Lebanon	Palau	Togo
Bolivia	Ethiopia	Lesotho	Panama	Tonga
Bosnia Herzeg	Fiji	Liberia	Papua New G.	Tunisia
Botswana	Gabon	Libya	Paraguay	Turkey
Brazil	Gambia	Macedonia	Peru	Turkmenistan
Bulgaria	Georgia	Madagascar	Philippines	Uganda
Burkina Faso	Ghana	Malawi	Romania	Ukraine
Burundi	Grenada	Malaysia	Rwanda	Uzbekistan
CAR	Guatemala	Maldives	Samoa	Vanuatu
Cambodia	Guinea	Mali	Sao Tome Pr	Venezuela
Cameroon	Guinea-Bissau	Marshall Is	Senegal	Vietnam
Cape Verde	Guyana	Mauritania	Serbia	West Bank G
Chad	Haiti	Mauritius	Seychelles	Yemen
China	Honduras	Mexico	Sierra Leone	Zambia
Colombia	Hungary	Micronesia	Solomon Is	Zimbabwe

Table 1 Remittances - Top recipients in 2012

Ranking	Country	Billion (US\$)
1	India	70
2	China	65
3	Philippines	24
4	Mexico	24
5	Nigeria	21
6	Egypt	18
7	Pakistan	14
8	Bangladesh	14
9	Vietnam	9
10	Lebanon	7

Source: World Bank Report

Table 2 Exchange Rate Regimes - Coarse Classification

Regime Class	Description
1	No separate legal tender
1	Pre announced peg or currency board arrangement
1	Pre announced horizontal band that is narrower than or equal to $\pm 2\%$
1	De facto peg
2	Pre announced crawling peg
2	Pre announced crawling band that is narrower than or equal to $\pm 2\%$
2	De facto crawling peg
2	De facto crawling band that is narrower than or equal to $\pm 2\%$
3	Pre announced crawling band that is wider than or equal to $\pm 2\%$
3	De facto crawling band that is narrower than or equal to $\pm 5\%$
3	Moving band that is narrower than or equal to $\pm 2\%$ (i.e., allows for both appreciation and depreciation overtime)
3	Managed floating
4	Freely floating
5	Freely falling
6	Dual market in which parallel market data is missing

Source: www.reinhartandrogoff.com

Table 3 Descriptive Statistics

	OBS	MEAN	SD	MIN	MAX
Remittances (% of GDP)	2732	4.79	9.4	0.0004	106.5
Remittances (US\$ million)	2825	687	2120	0.00998	37200
GDP per capita growth (%)	4044	1.66	6.67	-50.2	91.7
Exchange rate regime	3406	1.97	1.22	1	5
Population growth	5089	2	1.3	-7.6	11
Government spending (US\$ million)	2600	9120	26400	14.7	399000
M2 (% of GDP)	3717	44.5	228.3	0.83	7414
Inflation (CPI)	3395	55.1	667.7	-17.62	24411
Investment (% of GDP)	3608	21.4	8.9	-2.4	92.4
Domestic credit (% of GDP)	3681	38.9	34.9	-72.9	333.9
Private sector credit (% of GDP)	3681	24.9	21.6	0.55	167.5

Table 4 Correlation - Remittances (US\$) and Growth

Regime Class	Observations	Coefficient	P-value
1	1154	0.170*	0.000
2	40	-0.065	0.688
3	667	0.117*	0.003
≤ 3	1861	0.140*	0.000
> 3	387	0.045	0.198
4	384	0.044	0.385
5	3	0.982	0.120

Table 5 Preliminary Regressions - Remittances, Exchange Regimes and Growth

Regressors	(1)	(2)	(3)	(4)
GDP per capita growth (-1)	.175*** (.000)	.177*** (.002)	.168*** (.000)	.166*** (.003)
Remittances (% of GDP)	.279*** (.000)	.276 (.383)		
Remittances (US\$)			.706*** (.000)	.707** (.024)
Exchange rate regime	-.771*** (.000)	-.765*** (.011)	-.672*** (.000)	-.691** (.016)
Remittances*Regime	.073*** (.000)	.073** (.038)	.153*** (.000)	.159* (.062)
Investment (% of GDP)	3.791*** (.000)	3.831*** (.004)	4.154*** (.000)	4.154*** (.001)
Government Spending	1.889*** (.000)	1.872*** (.008)	.581*** (.000)	.591 (.348)
M2 (% of GDP)	-2.270*** (.000)	-2.227* (.056)	-2.664*** (.000)	-2.669** (.026)
Observations	1677	1677	1679	1679
Countries	107	107	107	107
Instruments	114	114	114	114
Sargan	(.912)		(.946)	
Serial correlation test	(.985)	(.972)	(.933)	(.915)

Notes: Dependent variable:GDP per capita growth; p-values are in parenthesis; ***Significant at 1% level, **5% level, *10% level; The interaction term (Remittances*Regime) uses remittances as defined in each specification; (1) and (3) are two-step estimates with maximum of 2 periods lag of instruments; (2) and (4) are one-step estimates (robust standard errors) with maximum of 2 periods lag of instruments; Sargan test statistic is unavailable for one-step (robust) estimator in stata.

Table 6 Robustness Check Regressions - Remittances, Exchange Regimes and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita growth (t-1)	.169*** (.000)	.171** (.030)	.163*** (.000)	.164** (.031)	.125* (.095)	.190*** (.009)
Remittances (% of GDP)	.330*** (.000)	.307 (.255)				
Remittances (US\$)			.669*** (.000)	.661** (.015)		.247 (.261)
Remittances (US\$) (t-1)					.267 (.235)	
Exchange rate regime	-.473*** (.000)	-.467 (.179)	-.577*** (.000)	-.573* (.104)	-.558 (.149)	-.682* (.101)
Remittances*Regime	.039*** (.000)	.042 (.260)	.128*** (.000)	.132** (.051)		.105** (.032)
Remittances(t-1)*Regime					.080 (.179)	
Investment (% of GDP)	1.751*** (.000)	1.837 (.319)	2.009*** (.000)	2.074 (.217)	3.222** (.015)	2.462* (.095)
Government Spending	.067** (.052)	.052 (.939)	-.960*** (.000)	-.973* (.087)	-.853 (.154)	-.585 (.124)
Inflation (CPI)	-.653*** (.000)	-.667** (.024)	-.639*** (.000)	-.654** (.025)	-.479* (.097)	-.442 (.213)
Population growth	-1.271*** (.000)	-1.301 (.144)	-1.037*** (.000)	-.991 (.239)	-1.064 (.131)	-2.169* (.076)
[Remit + Remit*Regime] ^a	.406*** (.000)	.391 (.133)	.922*** (.000)	.921*** (.001)		.454* (.074)
[Remit _{t-1} + Remit _{t-1} *Regime] ^a					.424 (.116)	
Observations	1437	1437	1439	1439	1406	1073
Countries	96	96	96	96	95	87
Instruments	115	115	115	115	115	116
Sargan	(.992)		(.993)			
Serial correlation test	(.454)	(.368)	(.465)	(.378)	(.531)	(.929)

Notes: Dependent variable:GDP per capita growth; p-values are in parenthesis; ***Significant at 1% level, **5% level, *10% level; ^a Estimated at the mean value of regime (=1.97); The interaction term (Remittances*Regime) uses remittances as defined in each specification;

(1) and (3) are two-step estimates with maximum of 2 periods lag of instruments; (2), (4), (5) and (6) are one-step estimates (robust standard errors) with maximum of 2 periods lag of instruments; Lending rate is entered in specification (5) as a covariate but is not statistically significant and is not reported; Sargan test statistic is unavailable for one-step (robust) estimator in stata.

Table 7 Robustness Check Regressions - Remittances, Exchange Regimes and Growth

Regressors	(1)	(2)	(3)	(4)
GDP per capita growth (-1)	.162*** (.000)	.163** (.032)	.164** (.031)	.151*** (.013)
Remittances (US\$)	.651*** (.000)	.651** (.017)	.679*** (.014)	.786** (.023)
Exchange rate regime	-1.055*** (.000)	-1.027* (.087)		
Dummy	1.355*** (.000)	1.285 (.338)	-.953 (.244)	-1.159* (.104)
Remittances(US\$)*Dummy	.127*** (.000)	.130** (.051)	.122* (.059)	.160** (.053)
Investment (% of GDP)	2.049*** (.000)	2.041 (.224)	2.231 (.184)	4.545*** (.000)
Government Spending	-.948*** (.000)	-.960* (.096)	-1.040* (.070)	.047 (.937)
Inflation (CPI)	-.647*** (.000)	-.657** (.024)	-.664** (.022)	
Population growth	-.999*** (.000)	-.971 (.243)	-.988 (.239)	-.773 (.320)
M2 (% of GDP)				-3.142*** (.014)
[Remit + Remit*Dummy] ^a	.778*** (.000)	.780*** (.004)	.801*** (.004)	.945*** (.005)
Observations	1439	1439	1439	1562
Countries	96	96	96	98
Instruments	116	116	115	115
Sargan	(.991)			
Serial correlation test	(.465)	(.376)	(.390)	(.900)

Notes: Dependent variable:GDP per capita growth; p-values are in parenthesis; ***Significant at 1% level, **5% level, *10% level; ^a Dummy=1 if regime is greater than 1 i.e. non-fixed regimes.

(1) presents two-step estimates with maximum of 2 periods lag of instruments; (2) - (4) are one-step estimates (robust standard errors) with maximum of 2 periods lag of instruments; Sargan test statistic is unavailable for one-step (robust) estimator in stata.

Table 8 Remittances, Exchange Regimes and Growth - Role of Financial Development

Regressors	(1)	(2)	(3)	(4)	(5)
GDP per capita growth (-1)	.153*** (.000)	.151*** (.014)	.164*** (.003)	.140** (.015)	.155*** (.004)
Remittances (US\$)	.372*** (.000)	.368 (.195)	.832*** (.007)	.920*** (.006)	.876*** (.003)
Exchange rate regime	-.534*** (.000)	-.541* (.092)	-.574** (.044)	-.473* (.099)	-.622** (.023)
Low FD	.167*** (.007)	.154 (.858)	-.286 (.719)	2.606** (.024)	2.352** (.026)
Remittances*Regime*Low FD	.093* (.067)	.158 (.440)	.070 (.435)	-.027 (.417)	-.014 (.699)
Investment (% of GDP)	4.107*** (.000)	4.244*** (.000)	4.198*** (.001)	4.550*** (.000)	4.300*** (.000)
Government Spending	.173*** (.000)	.200 (.675)	.676 (.273)	.061 (.919)	.592 (.318)
M2 (% of GDP)	-2.506*** (.000)	-2.621* (.074)	-2.533** (.052)	-2.019* (.092)	-1.545 (.176)
Population growth	-3.717*** (.000)	-3.619*** (.003)		-.791 (.376)	
Lending rate	-.001*** (.000)	-.001** (.026)			
[Remit+Remit*Regime*Low FD] ^a	.555*** (.000)	.680 (.216)	.970*** (.006)	.867*** (.011)	.848*** (.006)
Observations	1179	1179	1679	1562	1179
Countries	90	90	107	98	107
Instruments	117	117	115	116	115
Sargan test	(.998)				
Serial correlation test	(.370)	(.301)	(.881)	(.878)	(.870)

Notes: Dependent variable:GDP per capita growth; p-values are in parenthesis; ***Significant at 1% level, **5% level, *10% level; ^a Estimated at the mean value of regime (=1.97); Low FD is dummy =1 for low level of financial development

(1) presents two-step estimates with maximum of 2 periods lag of instruments; (2)-(5) are one-step estimates (robust standard errors) with maximum of 2 periods lag of instruments; Sargan test statistic is unavailable for one-step (robust) estimator in stata.

Table 9 Robustness Check Regressions Using 4-year period average data

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita growth (t-1)	.031 (.687)	.022 (.773)	.064 (.387)	.029 (.667)	.098 (.146)	.086 (.212)
Remittances (% of GDP)	.346* (.086)					
Remittances (US\$)		.335 (.121)	.577*** (.006)	.917*** (.001)	.974*** (.000)	.946*** (.000)
Remittances (US\$) (t-1)			-.429** (.016)	-.232 (.159)	-.098 (.636)	-.143 (.477)
Exchange rate regime	-.235 (.425)	-.095 (.739)	-.003 (.992)	-.490 (.106)	-.485* (.094)	-.557** (.040)
Remittances*Regime	-.017 (.639)	.013 (.635)				
Remittances(t-1)*Regime			.026 (.227)			
Remittances*Regime*Low FD				-.089** (.041)	-.096** (.041)	.120 (.658)
Investment (% of GDP)	4.153*** (.001)	4.034*** (.001)	3.038*** (.002)	3.869*** (.000)	3.754*** (.000)	3.506*** (.000)
Government Spending	-.423 (.252)	-.789** (.028)	-.219 (.598)	-.362 (.516)	-.178 (.763)	-.109 (.847)
Population growth	-1.963*** (.005)	-1.837*** (.010)	-1.123*** (.003)	-.681 (.212)		
[Remit + Remit*Regime] ^a	.312 (.111)	.360** (.064)				
[Remit _{t-1} + Remit _{t-1} *Regime] ^a			-.378** (.040)			
[Remit+Remit*Regime*Low FD] ^a				.739*** (.008)	.781*** (.003)	1.188** (.035)
Observations	407	408	375	389	413	413
Countries	100	100	93	95	103	103
Instruments	28	28	29	30	29	29
Serial correlation test	(.816)	(.885)	(.464)	(.685)	(.945)	(.645)

Notes: Dependent variable:GDP per capita growth; p-values are in parenthesis; ***Significant at 1% level, **5% level, *10% level; ^a Estimated at the mean value of regime (=2.01); Low FD is dummy =1 for low level of financial development, and enters regressions (4)-(6) as covariate, CPI inflation and M2(% of GDP) also enter as covariates in (1)-(3) and (4)-(6) respectively but estimates for these are not reported. (1)-(5) are one-step estimates (robust standard errors) with maximum of 2 periods lag of instruments; Sargan test statistic is unavailable for one-step (robust) estimator in stata.

Figure 1: Remittances and GDP per capita growth

