Asymmetric real exchange rates and poverty: The role of remittances

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ARTICLE INFO	ABSTRACT
	This paper explores the asymmetric effect of real exchange rate changes on poverty through the remittance channel for a panel of 99 countries, spanning the period 1980–2015. Considering a threshold partial adjustment modelling approach, the results document that real exchange rate depreciations exert a stronger positive effect on poverty through remittances. The results are expected to be of substantial importance in the case of emerging and developing countries in designing exchange rate and inflation policies that affect the poverty levels of their population through the mechanism of remittances. © 2018 Elsevier B.V. All rights reserved.

1. Introduction

Remittance inflows into the developing economies have increased over tenfold from US$ 31,058 million to US$ 581,640 over the 1990 to 2015 period, overtaking overseas development aid (ODA) flows, and accounting for the second largest foreign exchange inflow next to foreign direct investments (World Bank, 2016). Remittances account for a very large share of GDP in certain smaller economies, i.e., 36% of GDP in Tajikistan, 29% of GDP in Lesotho, 25% in Samoa, 23% in Moldova, 21% in Kyrgyzstan, and 20% in Tonga, Nepal and Lebanon. Remittances account for 10% and above of GDP in 26 low and middle income economies contributing to the promotion of development in many of these countries (World Bank, 2016). Accordingly, remittances have been termed the "new development mantra" (Kapur, 2005), while unlike foreign direct investments and foreign aid flows, remittances are received directly by households, and therefore, are a "bottom up" source of development finance (De Haas, 2005). The magnitude and significance of these flows has led to a heightened interest in the role played by them in the development process, as well as in poverty alleviation in the developing economies.

Thus, the dependence on remittances by many households in the low and middle income economies gives rise to the following question: how do changes in remittances affect the livelihoods of those in the low and middle income economies? Remittance receipts however, are affected by changes in the exchange rate. Lin (2010) in the case of Tonga, highlights that a percentage point of real appreciation in the Tongan currency against the remitting country currency is related with a two percentage point fall in remittance receipts. Similarly, Nekoei (2013) finds that migrants earnings fall by 0.92% in response to a 10% real appreciation in the US dollar. In a study on the response of Filipino migrants to exchange rate shocks, Yang (2008) documents that an appreciation of a migrant's currency against the Philippine peso increases migrant remittances. Olubiyi and Kehinde (2015) find that an expected depreciation of the real exchange rate lead to a fall in remittance inflows.

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Accordingly, exchange rate variations can change remittances receipts, thus, affecting poverty levels in an economy. The over-valuation of a currency can adversely affect the macro-economy by discouraging export competitiveness and increasing current account deficits.[1] Given the emphasis on the alleviation of poverty by the United Nations and the Millennium Development Goal (MDG) of eradicating extreme poverty and hunger, the goal of the present study is to empirically investigate the effect of real exchange rate movements on poverty, through the specific channel of remittances. Paya et al. (2003) argue that exchange rate movements may not be symmetric, implying that changes in exchange rates need not have a symmetric effect on poverty through remittances. Asymmetric exchange rate adjustments have significant welfare and policy implications (Meyer and Von Cramon-Taubadel, 2004). If upward movements in the exchange rate lead to declines in remittances and increases in poverty, then in that sense, asymmetric exchange rate movements are expected to lead to a different distribution of welfare as well. Similarly, if an exchange rate depreciation has a greater impact on remittances, leading to a fall in poverty, then this would help to alleviate poverty. Given the high reliance of many emerging economies on remittances, the present study additionally seeks to extend upon the literature by investigating whether changes in real exchange rates affect asymmetrically poverty through remittances.

Overall, the contribution of the present study is threefold: (1) it investigates, to the best of the authors' knowledge, for the first time, whether changes in real exchange rates asymmetrically affect poverty through remittances; (2) it examines the asymmetric effect of the real exchange on poverty through remittances for the panel of countries under investigation by disaggregating them by income group – low income and low middle income and high middle income, as the effects could differ across different income groups; (3) it makes use of the Nonlinear Auto-Regressive Distributed Lag (NARDL) model proposed by Shin et al. (2014), which has important advantages over others methodologies that model jointly cointegration and asymmetries. In particular, this modelling approach provides greater flexibility in allowing for combinations of I(1) and I(0) variables by making use of a bounds testing procedure for the presence of the equilibrium vector, while it is not constrained by the requirement of cointegrating models that all variables are I(1).

Evidence has shown that remittances have enabled low income households to reduce poverty and income inequality (Bertoli and Marchetta 2014; Naatus, 2014; Hatemi-J and Uddin, 2013; Gaaliche and Zayati, 2014; Adams and Page, 2003; Taylor et al., 2005; Acosta et al., 2008), smoothen consumption by reducing vulnerability to adverse shocks (Yang and Choi, 2007), increase their propensity to save (Adams, 2002), provide capital for micro enterprises (Woodruff and Zenteno, 2007), and invest in farm technology (Stark and Lucas, 1988). Ratha (2007) finds that remittances, by directly supplementing the income of low and middle income households, influence poverty both directly and indirectly through multiplier effects. A 10% increase in remittances is found to lead to a 3.5% fall in the share of poor people at the macroeconomic level, and a fall in the poverty head-count ratio at the microeconomic level in a number of countries; for example by 11% age points in Uganda, by 6 percentage points in Bangladesh and by 5 percentage points in Ghana (Ratha, 2007).

Notwithstanding the rapidly growing literature on remittances, the emphasis of the literature hereto (discussed in the next section), has been on the effect of remittance inflows on poverty (Bertoli and Marchetta, 2014; Naatus, 2014; Hatemi-J and Uddin, 2013; Gaaliche and Zayati, 2014; Adams, 2001; Adams and Page, 2003; Taylor et al., 2005; Acosta et al., 2008; Brown and Jimenez, 2008; Coombes and Ebeke, 2011), as well as on the effects of remittance receipts on the exchange rate (Caceres and Saca, 2006; Lopez et al., 2007; Acosta et al., 2007; Barajas et al., 2010). A few studies have examined the impact of exchange rate changes on remittance receipts (Olubiyi and Kehinde, 2015; Yang, 2008; Lin, 2010; Nekoei, 2013), while another strand of the literature investigate the link between remittances and the exchange rate, i.e. the Dutch disease effect (Rahman et al., 2013; Acosta et al., 2007). Surprisingly, there are no empirical studies which investigate the impact of real exchange rate changes on poverty asymmetrically through the specific channel of remittances.

The rest of this paper is structured as follows. Section 2 discusses the literature. Section 3 presents the data and methodology. Section 4 discusses the empirical results and Section 5 concludes.

2. Background

Remittances have, in general, been found to lead to the enhancement of welfare for remittance receiving households, thus, mitigating both poverty and inequality. Adams (2001) finds that in rural Egypt, remittance receiving households spend 42.5% of such revenues on building a new home. In a study of households receiving remittances in Turkey, Koc and Onan (2004) conclude that of all households receiving remittances, about 80% spend them on improving their standard of living. Acosta et al. (2008) show that for every percentage point increase in the remittances to GDP ratio, the poverty headcount is reduced by 0.4% for a group of ten Latin American and Caribbean countries. Similarly, Taylor et al. (2005) find evidence in favour of a significant effect of remittances on equalizing income inequality in Mexico. Their results suggest that in West-Central Mexico which has the largest number of international migrants, a 10% increase in international remittances reduces the total income Gini index by 0.3%. Evidence also supports the hypothesis that remittances act as an insurance cover for those experiencing rainfall shocks (Yang and Choi, 2007).

Brown and Jimenez (2008) explore the impact of migration and remittances on poverty and income distribution in two Pacific Islands, namely, Fiji and Tonga, and find that the findings depend on the choice of the economic methodology used, as well as on the history of migration in the countries in question. The impact of remittances on poverty alleviations is found to be more

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[1] Studies also show that large inflows of remittances are associated with real exchange rate appreciation and loss of export competitiveness (Lopez et al., 2007), and the Dutch disease effect (Acosta et al., 2007).

significant when more rigorous income estimates are used. Esquivel and Huerta-Pineda (2006) use three different measures of poverty for Mexico, i.e., food-based, capabilities-based and assets-based,[2] and note that remittances receiving households are able to reduce the probability of being in food-based and capabilities-based poverty by 8 and 6 percentage points, respectively; however, they are unable to significantly reduce asset-based poverty levels.

At the macroeconomic level, Adams and Page (2003) observe that in the case of the Middle East and North Africa (MENA) countries, both remittances and government employment have contributed to low poverty rates and reduced income inequality, with a 10 percentage point increase in the share of remittances to GDP reducing the poverty headcount ratio by 5.7%. In a similar study covering a sample of 71 countries, Adams and Page (2005) suggest that remittances contribute to reducing the depth, the level and the intensity of poverty, with a 10% increase in migration leading to a 2.1% fall in the share of people living below the poverty line of $1.00 a day. Bertoli and Marchetta (2014) examine the effect of migration on the incidence of poverty in Ecuador. They find that migration leads to a fall in the incidence of poverty among migrant households. Also in a study between migration remittances received by 262 municipalities and the level of extreme poverty in El Salvador, Naatus (2014) similarly finds that remittances lead to a fall in the level of extreme poverty in municipalities. Hatemi-J and Uddin (2013) in a study of the relationship between remittances and poverty in Bangladesh over the 1976–2010 period, find a bi-directional relationship between the two variables. They find that the effect of poverty reduction on remittances is stronger than the reverse impact. Similar findings are documented by Gaaliche and Zayati (2014). In a study of the bi-directional causality between remittances and poverty reduction for 14 emerging and developing countries over 1980–2012, they observe a bi-directional relationship between poverty and remittances. They also find that the causal effect of poverty reduction on remittance is stronger than the reverse effect. Employing a panel dataset covering 1970–2000, Portes (2009) observe that an increase in remittances is associated with a fall in income inequality. While a 1 percent increase in remittances is associated with an increase in the first decile's income by approximately 0.43%, a 1% increase in remittances is associated with a 0.10% decrease in the income of the top 10% of the population in low income countries.

Coombes and Ebeke (2011) illustrate that remittances reduce consumption instability and act as an insurance policy in the event of negative shocks, such as natural disasters, exchange rate and financial instability, in a panel of developing economies. They also argue that remittances play a stronger role in acting as a stabilizer in the event of negative shocks in countries with weaker financial systems.

Evidence also shows that the decision to remit is influenced by changes in the exchange rate. Employing a panel of nine Western Hemisphere countries, Higgins et al. (2004) test the hypothesis that remittances of immigrants respond to risk variables, in particular, to exchange rate uncertainty. Their results support the idea that migratory flows are driven by investment motives. The studies by Lianos (1997) and El-Sakka and McNabb (1999) corroborate the findings of Higgins et al. (2004) in that exchange rates affect a migrant's decision to remit. Lianos (1997) examines the flow of migrant remittances from Germany, Belgium, and Sweden to Greece. He attributes the ongoing devaluation of the Greek drachma as a factor which causes migrants to postpone sending remittances back home. Similarly, in a study of Egypt, El-Sakka and McNabb (1999) highlight that both exchange rates and interest rates differentials play an important role in remittances flowing in through certain formal channels. Consequently, if the decision of a migrant to remit is based on changes in the exchange rate, then migrant remittances act as a channel through which the exchange rate affects poverty.

Another strand in the literature documents that changes in the exchange rate affect remittance receipts. Lin (2010) finds that a percentage point real appreciation in the Tongan currency against the remitting country currency is related with a 2 percentage point fall in remittance receipts into Tonga. Nekoei (2013) in a study of Mexican workers in the US, suggests that a 10% appreciation of the US dollar leads to a fall in migrants annual earnings by 0.92%, while Yang (2008) in a study of the response of Filipino migrants to exchange rate shocks, notes that stronger positive shocks, i.e. an appreciation of a migrant's currency against the Philippine peso, leads to larger increases in households' remittances receipts. A 10% increase in Philippine Pesos per unit of foreign currency was found to increase Peso remittances by 6%. Rahman et al. (2013) examine the long-run and short-run effects between emigrants' nominal remittances in U.S. dollars into Mexico and the Peso-Dollar nominal exchange rates using high frequency data. They find that changes in the exchange rate lead to larger effects on changes in remittances in the long run as compared to the opposite. Olubiyi and Kehinde (2015) using a choice-theoretical model find that the real exchange rate negatively effects remittances. Hence, an expected depreciation of the real exchange rate lead to a fall in remittance inflows.

In spite of the fact that a number of studies investigate the impact of remittances on the exchange rate, i.e. real exchange rate appreciation and loss of export competitiveness (Lopez et al., 2007), and the Dutch disease effect (Caceres and Saca, 2006; Acosta et al., 2007; Barajas et al., 2010), much less attention has been paid to the impact of the exchange rate on remittances. Additionally, although the literature investigates separately the influence of remittances on poverty, and the influence of exchange rates on remittances, there are no studies which investigate the effect of exchange rate changes on poverty through the remittance channel. Given the high reliance of many economies on remittances, the livelihood of many is severely affected by exchange rate changes. Therefore, the present study extends upon the literature by investigating the following hypothesis: *Changes in exchange rates affect poverty non-linearly through the remittance channel.*

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[2] A household was considered as poor if the household's income was less than 672.25 Pesos in 2002 which is the lowest income required to buy a basket of food. A household was considered to be in capabilities-based poverty if that household could not cover his basic expenses on food, health, and education, according to an officially defined basket; finally, a household was considered to be in assets-based poverty if he could not cover his expenses on food, health, education, dressing, home and public transportation (Esquivel and Huerta-Pineda 2006).

3. Methodology and data

3.1. The methodology of threshold partial adjustment models

This part of the methodology describes a dynamic panel threshold model to allow for asymmetries in the process of pass-through from changes in the real exchange rate to poverty through the mechanism of remittances. This particular novel methodology has been recommended by Dang et al. (2012). This methodological approach is able to consistently estimate heterogeneous speeds of adjustment in different regimes, as well as to properly test for the threshold effect. It derives the GMM estimators and describes how the threshold parameter is estimated. More specifically, it combines time series methodological approaches in relevance to threshold modelling (Chan, 1993; Hansen, 2000; Caner and Hansen, 2004) with the existing GMM literature (Alvarez and Arellano, 2003). Their methodological approach has a number of advantages: i) it allows the threshold parameter to be estimated endogenously within the model, ii) it allows countries to switch regime over-time conditional on the splitting of real exchange rates into their positive and negative part, iii) it does not suffer from the generated regressors problem and the resulting estimation and inference complexities, especially in dynamic panels, and iv) it allows for complex adjustment mechanisms, whereby countries may not only adjust at heterogeneous rates (short-run asymmetry), but also adjust toward heterogeneous poverty targets (long-run asymmetries).

The estimation is carried out in two steps. In particular, in the first step of the empirical analysis, the methodology decomposes the real exchange rate into its positive and negative partial sums of increases and decreases:

$$RER^+{}_t = \sum_{j=1}^{t} \Delta RER^+{}_j = \sum_{j=1}^{t} \max\left(\Delta RER_j, 0\right)$$

and

$$RER^-{}_t = \sum_{j=1}^{t} \Delta RER^-{}_j = \sum_{j=1}^{t} \min\left(\Delta RER_j, 0\right)$$

Accordingly, the threshold partial adjustment specification can be modelled as follows:

$$\Delta REM_{it} = \left[a_i + \sum_{j=0}^{p_1} b_j{}^+ \Delta RER^+{}_{i(t-j)} + \sum_{k=1}^{p_2} d_k \Delta REM_{i(t-k)}\right] I(q_{it} \leq c) + \left[a_i + \sum_{j=0}^{p_1} b_k{}^- \Delta RER^-{}_{i(t-k)} + \sum_{k=1}^{p_2} d_k \Delta REM_{i(t-k)}\right] I(q_{it} > c)$$
$$+ v_{it} \tag{1}$$

where $I\{\cdot\}$ is an indicator function taking the value of 1 if the event is true (i.e., positive real exchange rates), and 0 otherwise (i.e., negative real exchange rates), α_i captures country-specific fixed effects characteristics, while v_{it} is the well-behaved error term with a zero mean and constant variance. Q_{it} is the (regime-switching) transition variable, such as GDP growth. When guided by altruistic motives, remittances aim to support recipients in their daily expenditure and/or compensate them for catastrophic events. By contrast, when guided by investment motives, remittances aim to take advantage of any opportunities for profits in the home country. In both cases, however, GDP growth is the driver that determines the future course of remittances (Chami et al., 2008; Browne and Mineshima, 2007). Therefore, in this respect, the first regime is defined when the growth of GDP is below the threshold, while the second regime is defined when the growth of GDP is above the threshold. C represents the threshold parameter, while for simplicity, the transition variable, q_{it}, is assumed to be stationary and exogenous. REM denotes the remittances/GDP ratio and RER is the real exchange rate, with v being the error term. The superscripts $(+)$ and $(-)$ stand for the positive and negative partial sums decomposition as defined above, while the symbols p_1 and p_2 denote the respective lag orders for the dependent variable and the remaining variables in the distributed lag part, respectively. The symmetry is tested by using a Wald test of the null hypothesis: $\Sigma b^+ = \Sigma b^-$.

In the second step, the empirical analysis decomposes the estimated remittances from Eq. (1) into their positive and negative partial sums of increases and decreases:

$$\hat{R E M}{}_t^+ = \sum_{j=1}^{t} \Delta \hat{R E M}{}_j^+ = \sum_{j=1}^{t} \max\left(\Delta \hat{R E M}_j, 0\right)$$

and

$$\hat{R E M}{}_t^- = \sum_{j=1}^{t} \Delta \hat{R E M}{}_j^- = \sum_{j=1}^{t} \min\left(\Delta \hat{R E M}_j, 0\right)$$

and the new threshold panel dynamic specification can be modelled as follows:

$$\Delta POV_{it} = \left[\beta_i + \sum_{j=0}^{q_1} c_j^+ \Delta REM_{i(t-j)}^+ + \sum_{k=1}^{q_2} f_k \Delta POV_{i(t-k)} \right] I(q_{it} \leq c) \left[\beta_i + \sum_{j=0}^{q_1} c_k^- \Delta REM_{i(t-k)}^- + \sum_{k=1}^{q_2} f_k \Delta POV_{i(t-k)} \right] I(q_{it} > c) + w_{it} \quad (2)$$

where w is the new error term and β_i captures country fixed effects. In this new case, the transitional variable q is in relevance to GDP growth again, as this variable has been detected by the relevant literature to primarily drive the course of poverty levels (Kraay, 2006; Ravallion, 2012; among others). Once again, the superscripts ($+$) and ($-$) stand for the positive and negative partial sums decomposition of remittances as defined above, while the symbols q_1 and q_2 q_3 denote the respective lag orders for the dependent variable and the remaining variables in the distributed lag part, respectively. The symmetry is tested again by using a Wald test of the null hypothesis: $\Sigma c^+ = \Sigma c^-$.

3.2. Data

Annual data on the RER are the effective exchange rate; data on poverty (POV) are the percentage of population below $2.00 a day. Here, a real exchange rate depreciations will lead to higher remittances reducing poverty, while lower remittances caused by real exchange rate appreciation will tend to increase poverty. Remittances (REM) are defined as the addition of personal transfers and compensation of employees (World Bank, 2014). These include current transfers by migrant workers and wages and salaries earned by non-resident workers. To the ends of the empirical analysis we use the remittances to GDP ratio. The study spans the period 1980–2015 period for 99 emerging countries (see the Appendix A for the countries under investigation). Their selection was based on data availability for the entire time span. The data cover a panel of low and middle income economies from Sub-Saharan Africa, East Asia and the Pacific, Eastern Europe, Central Asia, Latin America and the Caribbean, the Middle East and North Africa, and South Asia. The data for the RER come from Datastream, while those for POV and REM from World Bank's World Development Indicators.

4. Empirical analysis

The first step of the empirical analysis examines the presence of cross-section dependence. In the cases where cross-section dependence is not sufficiently high, a loss of power might result if second-generation panel unit root tests that allow for cross-section dependence are employed. Therefore, before selecting the appropriate panel unit root test, it is crucial to provide some evidence on the degree of residual cross-section dependence. The cross-sectional dependence (CD) statistic by Pesaran (2004) is based on a simple average of all pair-wise correlation coefficients of the OLS residuals obtained from standard augmented Dickey-Fuller regressions for each variable in the panel. Under the null hypothesis of cross-sectional independence, the CD test statistic follows asymptotically a two-tailed standard normal distribution. The results reported in Table 1 uniformly reject the null hypothesis of cross-section independence, providing evidence of cross-sectional dependence in the data given the statistical significance of the CD statistics regardless of the number of lags (from 1 to 4) included in the ADF regressions.

Next, two second-generation panel unit root tests are employed to determine the degree of integration in the respective variables. The Pesaran (2007) panel unit root test does not require the estimation of factor loading to eliminate cross-sectional dependence. Specifically, the usual ADF regression is augmented to include the lagged cross-sectional mean and its first difference to capture the cross-sectional dependence that arises through a single-factor model. The null hypothesis is a unit root for the Pesaran (2007) test. The bootstrap panel unit root tests by Smith et al. (2004) utilize a sieve sampling scheme to account for both the time series and cross-sectional dependence in the data through bootstrap blocks. All four tests by Smith et al. (2004) are constructed with a unit root under the null hypothesis and heterogeneous autoregressive roots under the alternative hypothesis. The results of these panel unit root tests are reported in Table 2 and support of the presence of a unit root in both variables under consideration.

In the next step, the empirical analysis involves the GMM estimation of the asymmetric pass-through of the RER to REM perform the Wald test for detecting both the short- and long-run symmetry, while the optimal number of lags is selected on the basis of the SIC information criterion. Table 3 reports the results. Countries are classified into the first (real appreciations) regime, when the value of the transition variable is less than or equal to the estimated threshold value, and into the second regime (real depreciations), when the value of the transition variable is greater than the estimated threshold value. Panel A reports the short-run

Table 1
Cross-section dependence (CD) tests.

Lags Variables	1	2	3	4
LREM	[0.00][a]	[0.00][a]	[0.00][a]	[0.00][a]
RER	[0.00][a]	[0.00][a]	[0.01][a]	[0.00][a]
POV	[0.00][a]	[0.00][a]	[0.00][a]	[0.01][a]

Notes: Under the null hypothesis of cross-sectional independence the CD statistic is distributed as a two-tailed standard normal. Results are based on the test of Pesaran (2004). Figures in parentheses denote p-values. Significance levels: a (1%).

Table 2
Panel unit root tests.

Variable	Pesaran CIPS	Pesaran CIPS*	Smith et al. *t*-test	Smith et al. LM-test	Smith et al. max-test	Smith et al. min-test
REM	−1.17	−1.26	−1.24	3.03	−1.21	1.33
ΔREM	−5.83[a]	−6.02[a]	−5.61[a]	22.08[a]	−6.99[a]	7.30[a]
RER	−1.25	−1.25	−1.34	3.11	−1.32	1.32
ΔRER	−5.89[a]	−6.04[a]	−7.03[a]	21.82[a]	−7.93[a]	8.10[a]
POV	−1.24	−1.30	−1.26	2.83	−1.24	1.25
ΔPOV	−5.53[a]	−5.90[a]	−6.26[a]	21.19[a]	−6.80[a]	6.97[a]

Notes: Δ denotes first differences. A constant is included in the Pesaran (2007) tests. Rejection of the null hypothesis indicates stationarity in at least one country. CIPS* = truncated CIPS test. Critical values for the Pesaran (2007) test are −2.40 at 1%, −2.22 at 5%, and −2.14 at 10%, respectively. "a" denotes rejection of the null hypothesis. Both a constant and a time trend are included in the Smith et al. (2004) tests. Rejection of the null hypothesis indicates stationarity in at least one country. For both tests the results are reported at lag = 4. The null hypothesis is that of a unit root.

dynamics, as well as the Wald test statistic for the null hypothesis of short-run symmetry. It also reports the implied speed of adjustment and the threshold value. Furthermore, the results illustrate the conventional AR(2) and Sargan test statistics, which allow us to check out for the validity of the instruments used in the GMM regressions. It is worth noting that both tests are not rejected at the 1% significance level, suggesting that all GMM regressions use valid instruments. Panel B reports the long-run coefficients, along with the Wald test statistics under the null of long-run symmetry. Note that these tests enable us to shed light on the interesting question of whether countries in different (growth) regimes adjust toward heterogeneous target remittances. Finally, the findings also display the GDP growth characteristics of countries classified into the first and second regime. In terms of symmetry tests, the results clearly illustrate that the null hypothesis of both long- and short-run symmetry is clearly rejected at the 1% level.

The next step in the empirical analysis estimates the symmetric and asymmetric pass-through of the estimated remittances (i.e., REM) from Eq. (1) to poverty (i.e., POV) through the employment of the model Eq. (2); Table 4 reports the new GMM findings. Once again the optimal number of lags is selected on the basis of the SIC information criterion. Countries are classified into the first (remittances coming from real appreciations) regime and into the second regime (remittances coming from real depreciations). Panel A reports the short-run dynamics, as well as the Wald test statistic for the null hypothesis of short-run symmetry. Both AR(2) and Sargan tests indicate that the null hypothsis is not rejected at the 1% significance level, suggesting that all GMM regressions use valid instruments. Panel B reports the long-run coefficients, along with the Wald test statistics under the null of long-run symmetry. Note that these tests enable us to shed light on the interesting question of whether countries in different (growth) regimes adjust toward heterogeneous target poverty levels. In terms of symmetry tests, the results clearly illustrate that the null hypothesis of both long- and short-run symmetry is clearly rejected at the 1% level. Furthermore, the estimates indicate that both in the short- and in the long-run the impact of remittances on poverty is stronger in the case where the estimated remittances come from a real depreciation regime.

This final part of the empirical analysis explores the validity of the above findings in three separate country panels based on the World Bank income classification: low income, lower middle income, and upper middle income countries (given that the majority of remittances are in relevance to these country groups) to infer the (asymmetric) impact of remittances on poverty through the real exchange rate factor. First, Table 5 reports the estimation of the asymmetric pass-through of the RER to REM.

Table 3
Short- and long-run GMM estimates and symmetry tests (The effect of the real exchange rate on remittances).

Variables	Coefficient (1st regime)	p-Value	Coefficient (2nd regime)	p-Value
Panel A. Short-run				
REM (−1)	0.697	[0.00]	0.728	[0.00]
RER$^+$ (−1)	0.144	[0.00]		
RER$^-$ (−1)			−0.164	[0.00]
Speed of adjustment	0.451		0.542	
Threshold	0.075			
(Wald) symmetry test	43.61	[0.00]		
Sargan	30.44	[0.65]		
AR (2)	−1.295	[0.33]		
Panel B. Long-run				
RER$^+$	0.493	[0.00]		
RER$^-$			−0.766	[0.00]
(Wald) symmetry test	50.32	[0.00]		
Transition variable				
GDP growth	−0.04		0.05	

Notes: AR (2) test is a test for the second-order serial correlation, and is asymptotically distributed as N(0,1) under the null of no serial correlation. Sargan test is a test for the validity of instruments and is asymptotically distributed as χ^2 under the null of valid instruments. As instruments lagged values up to 4 lags of the independent variables have been used. The symmetry tests the null hypothesis that $\Sigma b^+ = \Sigma b^-$ (either in the short- or in the long-run).

Table 4
Short- and long-run symmetry tests (the effect of remittances on poverty).

Variables	Coefficient (1st regime)	p-Value	Coefficient (2nd regime)	p-Value
Panel A. Short-run				
POV (−1)	0.410	[0.00]	0.509	[0.00]
$R\hat{E}M^+$ (−1)	0.296	[0.00]		
$R\hat{E}M^+$ (−2)	0.112	[0.00]		
$R\hat{E}M^-$ (−1)			−0.389	[0.00]
$R\hat{E}M^-$ (−2)			−0.192	[0.00]
Speed of adjustment	0.378		0.524	
Threshold	0.070			
(Wald) symmetry test	40.85	[0.00]		
Sargan	26.72	[0.74]		
AR (2)	−1.075	[0.41]		
Panel B. Long-run				
$R\hat{E}M^+$	0.428	[0.00]		
$R\hat{E}M^-$			−0.796	[0.00]
(Wald) symmetry test	64.18	[0.00]		
Transition variable				
GDP growth	−0.033		0.042	

Notes: As instruments, lagged values up to 3 lags of the independent variables have been used. The symmetry tests the null hypothesis that $\Sigma c^+ = \Sigma c^-$ (either in the short- or in the long-run). The remaining are similar to those in Table 3.

The income classification findings clearly provide evidence in favour that the null hypothesis of both short- and long-run symmetry is clearly rejected at the 1% level across all three income country panels. The strongest results are associated with the low income countries panel, denoting that real exchange rate changes have a strongest impact on remittances heading to countries within this sample, which could be potentially attributed to the fact that low income levels in countries within this sample are vital for the sustainability of life in countries where remittances are used to enhance the people's welfare significantly. According to Coombes and Ebeke (2011), remittances reduce consumption instability and act as an insurance policy in the event of negative shocks, such as natural disasters, exchange rate and financial instability, in a panel of developing economies. In low income countries, evidence points to remittance flows being associated more with the altruistic motive, I an investment motive which potentially could explain this.

Finally, Table 6 illustrates the asymmetric effect of estimated remittances on poverty across the three income groups. Once again, the results provide supportive evidence to those reached earlier. More specifically, the presence of asymmetry is confirmed, with the results remaining robust across the three income groups, while the impact of remittances on poverty is stronger in the case of low income countries, followed by the lower middle and upper middle countries, when these estimated remittances are in relevance to countries coming from real depreciated currencies. Additionally, a policy predicament faced by countries is dealing with a large influx of remittance inflows to curb inflationary pressure. A number of studies show that certain countries devalue

Table 5
Short- and long-run symmetry tests (the effect of the real exchange rate on remittances)-income country panels.

Variables	Low income countries		Lower middle income countries		Upper middle income countries	
	Coefficient (1st regime)	Coefficient (2nd regime)	Coefficient (1st regime)	Coefficient (2nd regime)	Coefficient (1st regime)	Coefficient (2nd regime)
Panel A. Short-run						
REM (−1)	0.718[0.00]	0.775[0.00]	0.630[0.00]	0.675[0.00]	0.498[0.00]	0.531[0.00]
RER^+ (−1)	0.282[0.00]		0.237[0.00]		0.172[0.00]	
RER^- (−1)		−0.3295[0.00]		−0.285[0.00]		−0.204[0.00]
Speed of adjustment	0.580	0.644	0.469	0.497	0.401	0.445
Threshold	0.089		0.064		0.051	
(Wald) symmetry test	75.52[0.00]		59.68[0.00]		46.37[0.00]	
Sargan	32.25[0.59]		28.75[0.70]		30.81[0.63]	
AR(2)	−1.214[0.42]		−1.163[0.50]		−1.151[0.52]	
Panel B. Long-run						
RER^+	0.575[0.00]		0.499[0.00]		0.432[0.00]	
RER^-		−0.791[0.00]		−0.663[0.00]		−0.579[0.00]
(Wald) symmetry test	66.19[0.00]		56.25[0.00]		37.81[0.00]	
Transition variable						
GDP growth	−0.05	0.04	−0.03	0.026	−0.01	0.022

Notes: Similar to those in Table 3.

Table 6
Short- and long-run symmetry tests (the effect of estimated remittances on poverty)-income country panels.

Variables	Low income countries		Lower middle income countries		Upper middle income countries	
	Coefficient (1st regime)	Coefficient (2nd regime)	Coefficient (1st regime)	Coefficient (2nd regime)	Coefficient (1st regime)	Coefficient (2nd regime)
Panel A. Short-run						
POV (−1)	0.633 [0.00]	0.679 [0.00]	0.580 [0.00]	0.597 [0.00]	0.486 [0.00]	0.498 [0.00]
RÊM$^+$ (−1)	0.360 [0.00]		0.278 [0.00]		0.196 [0.00]	
RÊM$^-$ (−1)		−0.395 [0.00]		−0.304 [0.00]		−0.211 [0.00]
Speed of adjustment	0.520	0.574	0.450	0.503	0.368	0.391
Threshold	0.070		0.054		0.044	
(Wald) symmetry test	69.42 [0.00]		53.30 [0.00]		40.21 [0.00]	
Sargan	27.59 [0.67]		25.02 [0.76]		32.38 [0.54]	
AR(2)	−1.105 [0.35]		−1.140 [0.52]		−1.149 [0.51]	
Panel B. Long-run						
RÊM$^+$	0.532 [0.00]		0.458 [0.00]		0.421 [0.00]	
RÊM$^-$		−0.644 [0.00]		−0.496 [0.00]		−0.457 [0.00]
(Wald) symmetry test	60.25 [0.00]		49.42 [0.00]		35.64 [0.00]	
Transition variable						
GDP growth	−0.049	0.035	−0.03	0.029	−0.01	0.020

Notes: Similar to those in Table 5.

their currency in response to these inflows. For example, the nominal devaluations in Costa Rica, Guatemala, Honduras and Nicaragua were 11.9%, 5.3%, 10.1% and 11.1%, respectively, over the period 1995–2000 (Inter-American Development Bank, 2007). Evidence also documents that in some countries, Central Bank's intervention policies in the exchange rate market, have been asymmetrical, limiting the nominal appreciation; for example, Tajikistan (IMF, 2006), the world's largest remittance receiving country in terms of the remittances to GDP ratio. This potentially explains why exchange rate depreciations tend to induce a larger effect on poverty through remittances compared to exchange rate appreciations.

5. Conclusion

This study assessed the asymmetric effects of real exchange rate changes on poverty for a sample of 99 countries through the channel of remittances. The findings highlighted that real depreciations exerted a stronger (negative) effect on remittances than real appreciations. The magnitude and significance of these flows has led to heightened interest in the role played by remittances in development and poverty alleviation the in developing economies. Remittances to the developing countries have helped to increase foreign exchange earnings, foreign reserves, and service debt. They have also contributed to reduce current account deficits in many countries – see for example, Kireyev (2006) in the context of Tajikistan. To the extent that changes in the exchange rate is asymmetrical, with depreciations fostering a stronger impact on remittances compared to appreciations, such exchange rate depreciations would help to increase foreign exchange reserves and improve a country's current account balance. Similarly, exchange rate depreciations would promote higher levels of investments and economic growth. In particular, if depreciations have a stronger impact on remittances, as many migrants invest their remittance income in small scale businesses, real estate and other assets, exchange rate depreciations are expected to reduce credit constraints and alleviate poverty. Thus, policymakers in emerging economies should think carefully of the consequences of exchange rate changes as they can affect remittances receipts and the standard of living for households.

Acknowledgment

Appendix A. Country samples

Full sample: 99 countries
Low income countries: 24 countries
Afghanistan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Ethiopia, Gambia, Guinea, Haiti, Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Niger, Rwanda, Sierra Leone, Somalia, Tanzania, Togo, Uganda, Zimbabwe.
Lower middle income countries: 31 countries

Armenia, Bangladesh, Bolivia, Cameroon, Cote d'Ivoire, Djibouti, Egypt, El Salvador, Georgia, Ghana, Guatemala, Honduras, India, Indonesia, Kenya, Laos, Mauritania, Moldova, Morocco, Nicaragua, Nigeria, Pakistan, Philippines, Senegal, Sri Lanka, Sudan, Tajikistan, Ukraine, Uzbekistan, Vietnam, Zambia.

Upper middle income countries: 44 countries

Albania, Algeria, Angola, Azerbaijan, Belarus, Bosnia-Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Fiji, Gabon, Grenada, Iran, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Mongolia, Namibia, Panama, Paraguay, Peru, Romania, South Africa, St. Lucia, St. Vincent & Grenadines, Suriname, Thailand, Tonga, Tunisia, Turkey, Turkmenistan.

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