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Debt-migration and workers' remittances

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Abstract

The literature on migrants' motivation to remit ranges from self-interest to altruism, where studies analyze the impact from home country interest rates or interest differentials between home and host countries. We reinterpret the interest rate elasticity of remittances as a form of debt-repayment responsiveness rather than based on opportunistic motivation. Modelling altruistic transfer and debt-repayment, we find for a panel of countries that the long-run responsiveness of remittances to changes in real lending rates is negative. This suggests that an expansionary (contractionary) monetary policy is most likely to lead to an increase (reduction) in remittances in the long-run. In contrast to this, the short-run impact of interest rate changes on remittances is positive.

Keywords

Remittances, debt-migration, migration indebtedness, temporary migration, real interest rates, panel data.

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1. Introduction

Remittances sent out by migrants across the globe account for a sizeable component of global international flows. The magnitude of workers' remittances is more than three times the value of Official Development Assistance (ODA) worldwide, and second only to foreign direct investment (FDI) flows in developing countries. For developing and emerging economies, the importance of remittances is often substantial because these receipts can supply necessary international currency to finance import bills and also account for a substantial portion of the balance of payments current account. Remittances provide a number of specific benefits to recipients, including the reduction of poverty, alleviation of credit constraints, and improvements in the educational and health outcomes of the recipient households (Cox-Edwards & Ureta, 2003). Remittances are instrumental in generating savings and the accumulation of productive assets by removing investment constraints and deepening the financial sector within the recipient economy (Chiodi at al., 2012). The inflow of remittances can thus lead to accelerated investments in physical and human capital, remove households' credit constraints, and contribute towards long-run growth (Rao & Hassan, 2011; Feeny et al., 2014). While remittances are compensatory flows generating countercyclical behaviour enabling recipients to smooth their consumption (Chami at al., 2009) and reduce income volatility (Chami et al., 2009), the inflow of remittances does pose several development challenges in terms of controversial effects on economic growth (Chami et al., 2003; World Bank, 2006), and the capacity of remittances to lead to an appreciation of the real exchange rate, thereby causing a Dutch disease effect (Hassan & Holmes, 2013;).

The macroeconomic role of workers' remittances is further underscored as a responsiveness to important policy variables. Moreover, theoretical and empirical models of migration suggest that the flows of remittances should be affected by key macroeconomic indicators such as interest rates and exchange rates (see, for example, Jackman, 2013; Cooray and Mallick, 2013; Chami et al., 2005). For instance, policies such as de-regulation of the financial sector or adoption of a floating exchange rate regime in order to attain a structural shift of resources towards the tradable goods sector are quite likely to affect the international flow of remittances.

While several previous studies have assessed the impact of interest rates and exchange rate policies on remittances, the purpose of this paper is to offer a new interpretation on the responsiveness of remittances to migrant home country's real lending rates. In doing so, we investigate whether debt-migration, i.e. international migration where the costs of migration are covered by taking on a market loan, can influence the remittance behaviour of the migrant once abroad. Our framework falls under the existing new economics of labour migration (NELM) approach because the repayments on these migrant loans are likely to be seen as remittances when they run through the family. This makes sense since a lender would probably see lending to a

potential migrant as very risky unless there were domestic co-signatories for the loan. We further add to the NELM approach by assuming that some migrants might borrow from non-family market sources. The NELM approach views migrant remittances as only repaying a family loan, or an extended family loan, that has arisen from some form of contractual agreement between the household and the migrant to undertake the cost of migration and/or to finance a migrant's potential education (Poirine, 1997). Under this scenario, the exchange resulting in loan repayments occurs predominantly on account of the liquidity constraints faced by the migrant who undertakes the familial loan tied to non-market implicit interest rates. Indeed, the household finances a potential migrant's education if the family's implicit lending rate is higher than the market interest rate (Poirine, 1997). However, one of the major shortcomings of the loan repayment hypothesis is that it cannot be tested directly since the data on remittances between migrants and households other than their immediate family, i.e. extended family, are generally not available from existing surveys (Ilahi and Jafarey, 1999).

In this paper, we develop a framework to directly test whether debt repayment constitutes a significant component of the total remittance flows wherein the debt incurred to undertake migration is viewed as a form of market activity. The argument is based on the observation that international migration costs are quite substantial and above the financial possibilities of the migrants' families, requiring financing from all different sources available in the economy. Therefore, there is increasing evidence of debt-migration among migrants in Asia, Latin America as well as in other parts of the world where migrants pay their recruitment and travel expenses up front by borrowing at the market interest rate from money-lenders and other formal and non-formal institutions, in addition to borrowing from the family (Rahman, 2000, 2015; Stoll, 2010; Loschmann and Seigel, 2014). Since the lending rate represents the short to long term cost of financing in the economy, the debt-migration hypothesis - wherein the costs of migration are covered by taking on a market loan - can be directly tested by analysing the relationship between remittances inflow and the home country real lending rate.

According to the theoretical literature on the motivation to remit by migrants, there exist plausible exchange motivations based on self-interest as well as altruism for sending remittances (Lucas and Stark, 1985; Stark, 1991). However, despite many empirical studies on the determinants of remittance flows, it is hard to distinguish which theories of remittances determination, i.e. exchange or altruism, are identified because a positive or negative coefficient on a particular explanatory variable may be consistent with multiple theories. Some researchers find evidence that remittances respond to favourable investment opportunities in the home country. These studies have used the interest rate of home country or interest rate differentials between the home and host country in their empirical models (Faini, 1994; Jackman, 2013; Cooray and Mallick, 2013; El-

Sakka and McNabb, 1999; Aydas et al., 2005; Alleyne et al., 2008; Chami et al., 2005,) as a test for the exchange or self-interest theory of remittances. In particular, a positive coefficient on the interest rate or interest rate differential is regarded as an evidence of opportunistic remittances whereas an insignificant or negative coefficient would tend to invalidate support for remittances responding to favourable investment climate in the home country.

Our paper re-interprets and offers a fresh insight into the interest rate elasticity of remittances as a form of debt- repayment responsiveness rather being based on opportunistic or self-interest/investment motives. The implication of this re-interpretation is that the home country lending rate alone may determine parts of remittance flows as opposed to interest differentials as underscored in many studies. As a result, home country policies towards macroeconomic management or financial liberalisation, as well as structural adjustments, may have greater impact in remittances determination than what is traditionally understood. Furthermore, remittance flows are often observed to be less volatile compared to most other forms of resources inflows (see Ratha, 2003) which have been attributed to the altruistic component of remittances because of its less vigorous reaction to home economic conditions (Ratha, 2003 and World Bank, 2001). Related to this, we would like to emphasize that a statistically significant co-movement of remittances with domestic lending rates would also imply the stability of remittances, because remittance flows which are attached to debt repayment will also tend to be steady irrespective of home conditions.

The purpose of this paper, therefore, is to assess the impact of home country real lending rates and exchange rates on remittances. We are particularly concerned with the possibility of how remittances respond to changes in the home county real lending rate. We develop and estimate a simple model of altruistic transfer and debt-repayment and show that for plausible parameter values the long-run effect of home country real lending rate on remittances may be negative.

2. Remittances and debt-repayment: the model

While the importance of interest rates has been documented in previous remittances models, a conspicuous omission in the literature relates to the explicit modelling of the real lending rates on migrant family's consumption to gauge the effect of its changes on remittances. Simple intuition would suggest that the real lending rate and exchange rate should affect the behaviour of remittances, whether seen from the context of altruistic or exchange-related models. Suppose that a migrant's income is given in terms of the home country good and that recipient (or migrant's family) consumption falls exclusively in terms of the home country good. In an altruistic model and for a given level of debt, a decrease in the real home country lending rate (a proxy measure for the cost of migration loan) will affect remittances through two pivotal channels. First, it will increase the family's income net of debt repayment analogous to increased remittance receipts thereby enabling greater consumption of the home good by the migrant's family. This is equivalent to a positive

income effect on the consumption of the home good which presumes that the family is a net borrower, and there is evidence to suggest that 50 percent or more of migrant families tend to incur debt (see Loschmann and Seigel, 2014; Rahman 2013). Second, a falling interest rate may also create a larger demand for the home country good through a substitution effect away from the host country good. This is plausible because a prevailing low real interest rate at home may cause depreciation of the real exchange rate generating higher remittance flows[i] that are spent on home goods. If remittances are instead expressed in terms of the host country good, the substitution effect will still be associated with larger remittances, but the income effect may work in the opposite direction: this is because the lower interest rate at home may cause remittances to decline thereby enabling the migrant greater consumption of the host country good because less remittances are now required to service the same amount of debt. Thus, it may be argued that the impact of a fall in the home country's lending rate on the behaviour of real remittances leaves open two possibilities. The realised impact could be either positive or negative, depending on whether the income effect dominates the substitution effect or whether remittances are viewed in terms of the home or host country good. Therefore, the issue remains to be solved empirically.

To better assess the relevance of these considerations, we rely on the following simple extension of the Faini (1994) framework by introducing debt-repayment due to a migration loan. Suppose that the migrant's utility is a function of their own consumption as well as family consumption. Also assume that instantaneous utility can be described by a CES function, i.e.

$$U(C_m, C_f) = [(1-\beta)C_m^{-\delta} + \beta C_f^{-\delta}]^{-1/\delta} \quad (1)$$

The representative migrant maximises (1) subject to the following two constraints:

$$C_f = Y_f + \lambda R - rD = Y_f + R_f - rD \quad (2)$$

$$C_m = Y_m - R \quad (3)$$

Where *C*, *R* and *Y* indicate consumption, remittances (in terms of the host country good) and income respectively, the subscripts *m* and *f* refer to the migrant and his family respectively, λ denotes the real exchange rate (defined so that an increase in the index correspond to a real depreciation), *D* is the value of migration loan, *r* is the real market lending rate existing in the migrant's home country and $0 \leq \beta \leq 1$. Also, $R_f = \lambda R$ represents remittances in terms of the home country good.

While at the outset it may seem that we are using very restrictive assumptions in our model, it is not actually the case. From a sociological point of view, in the migration process, the individual migrant is deeply enmeshed in a complex web of household relations and dependencies and the migrant moves internationally for work as an envoy of the extended family that places the well-being

of the extended family before the individual migrant's interests (Rahman, 2013). Therefore, having both arguments based on the migrant's and family's consumption in Eq. (1) make sense because we are modelling how the migrant is trying to allocate income towards his own and his family's consumption, which give him utility. Moreover, we have basically followed the Faini (1994) framework except for the addition of the debt repayment component. We do not think this is an unreasonable assumption either. Because migration opens up various opportunities for potential migrants, it has been a highly competitive process in some labour surplus countries. To achieve economic and social mobility, many potential migrants towards the Gulf countries in the Middle East pay the added economic costs of migration by borrowing from money lenders with higher rates of interest, in the process risking the economic base of the family (Rahman, 2009, 2013; Ullah, 2010). Rahman (2013) and Loschmann and Seigel (2014) found in their sample that more than 50 percent of the migrant families have incurred migrant loans. In fact, debt-migration has become a defining feature of contemporary South Asian migration to the GCC[ii] countries (Rahman, 2015).

We make explicit in Eq. (2) our extension of the Faini (1994) framework by allowing for consumption by the family to be equal to home income plus remittances net of the debt-payment (i.e. real lending rate times the amount of debt) which is paid at the outset. The term rD in Eq. (2) represents debt repayment where it is assumed that the representative migrant's debt-repayment is fixed for a given lending rate[iii].

Eq. (3) represents the consumption of the migrant which is equal to the difference between foreign income and remittances sent out. After substituting the constraints in Eq. (2) and Eq. (3) into Eq. (1), taking derivatives with respect to *R* then solving the first-order condition for the optimal value of remittances, we then find that:

$$R = \frac{Y_m - \alpha(Y_f - rD)}{1 + \alpha\lambda} \tag{4}$$

where

$$\alpha = \left\{\frac{\lambda\beta}{1-\beta}\right\}^{-1/1+\delta} = \left\{\frac{\lambda\beta}{1-\beta}\right\}^{-\sigma} \tag{5}$$

with σ denoting the elasticity of substitution between C_f and C_m.

Some features of this model are worth noting. The expression for remittances in Eq. (4) is very similar to that found in Faini (1994). However, the numerator includes an additional term αrD which signifies how remittances also depend on the real lending rate since *D* is assumed fixed. While it is clear that remittances respond to the real lending rate, there is ambiguity in terms of which

direction *R* moves in response to changes in *r*. This ambiguity depends on the elasticity of substitution and the way in which λ depends on *r*. First, if we consider the case of a zero elasticity of substitution, i.e. where $\sigma = 0$, then

$$R = \frac{Y_m - Y_f + rD}{1 + \lambda} \tag{6}$$

and therefore, assuming remittances are expressed in terms of host country good, a decrease in *r* will only be dominated by the income effects as the substitution effects are weak. This implies that a fall in the lending rate will lead to a decline in remittances. This is because less remittances are now required to service the same amount of debt. On the other hand, for larger values of σ, a decrease in *r* may cause a strong substitution towards home country goods as remittances increase in response to a real exchange rate depreciation. Therefore, it seems reasonable that interest changes will affect the real exchange, i.e., $\lambda = f(r)$. In our paper, depreciation of the exchange rate is indicated by an increase in λ, and so substituting a simple relationship defined as $\lambda = r^{-1}$ into Eq. (4) and combining with Eq. (5) for $\sigma = 1$ (higher elasticity of substitution), we obtain:

$$R = (1 - \beta)[r(rD - Y_f)] - \beta Y_m \tag{7}$$

Eq. (7) is an alternative remittances equation where the exchange rate effect has been explicitly accounted for. Intuitively, the equation implies that a relatively higher lending rate and/or migration-debt relative to family income will result in higher remittances being sent out provided that the migrant's degree of altruism (β) is high. Although in general there is ambiguity, in this equation it is rather likely that remittances will be inversely respond to changes in *r*. Consider the partial derivative $\partial R / \partial r = (1 - \beta)(2rD - Y_f)$ - responsiveness of remittances to the lending rate - which is more likely to be negative because $\beta < 1$ and by assuming that households would naturally prefer a sustainable debt wherein $2rD < Y_f$, i.e., where debt-repayment is small in relation to family's income. This makes sense because otherwise a lender will identify the migrant's family as a risky borrower and their access to finance will be limited. Intuitively this means that as the interest rate falls the family's margin of income over debt-repayment increases, which raises the possibility of consumption towards home goods, similar to the exchange rate effect whereby remittance flows rise to finance consumption of home goods. Examples of such investments could be buying land, fixed properties at home or financing another migrant's move from the same household. Therefore, theoretically one can justify the possibility that remittances and interest rates are inversely related for as long as $r < Y_f / 2D$.

3. Data and methodology

In assessing the relationship between R and all the key drivers- including Y_m, Y_f, λ nd r, we employ a balanced panel of annual data for 57 remittance-receiving countries covering the study period 1995-2014[iv]. The sample of countries is listed in the appendix. In order to choose our sample of countries which are the main migrant source countries, we consulted the World Bank's *Migration and Remittances Factbook 2011* by the World Bank which lists all the remittances-sending countries and recipient countries where remittances data are expressed in constant prices measured in US dollars. There were 80 countries for which continuous data throughout 1995-2014 were available that had positive net remittances (i.e. remittances received net of remittances paid). So, it was difficult how to judge a sending (host) or a receiving (home) country. To overcome the problem, we applied the definition of a remittance-dependent economy provided by IMF which defines as such those countries with the remittances to GDP ratio exceeding 1 percent. Therefore, we collected our sample of recipient (home) countries only by including the 57 countries with a remittance to GDP ratio of more than 1 percent.

Data on remittances are derived from balance of payments statistics provided by each country to the IMF. According to the *Balance of Payments Manual 5* (BPM5), remittances data until 2005 comprised three categories: i) workers' remittances, which are current transfers by migrant workers, where migrants are defined as individuals with resident status who come to work for at least a year; ii) compensation of employees that includes income earned by non-resident workers; and iii) migrants' transfers, which are a capital account transfer reflecting the movement of assets by a migrant from one country to another when he or she migrates. The World Bank's *World Development Indicators* data combine workers' remittances and compensation of employees together to form the remittance measure reported therein, and this has been the definition of remittances used in a number of studies in the literature (for example, Rao and Hassan 2011). However, in practice it had proven difficult for central bank authorities to separate transfers made by migrant workers from their employment income from a number of other transfers. Therefore, the *Balance of Payments Manual 6* (BPM6) of the IMF replaced the category of workers' remittances with *personal transfers* which consist of "all current transfers in cash or in kind made or received by resident households to or from non-resident households" (IMF 2009, p. 20). Net remittances data which are used in our paper are extracted from the *World Development Indicators* (2016). Hence, the current measurement of remittances data addresses many of the previous issues and concerns highlighted by Singer (2010) and others.

The dependent variable in our study is *personal remittances* (i.e., personal remittances received net of personal remittances paid), being the sum of personal transfers and compensation of employees. Because aggregate level data is used, during estimation the dependent variable represents

bilateral remittances to each home country from the rest of the countries in the world that report remittances statistics, but in most cases these are usually the host countries. However, due to the rise in South-South migration, it is not unusual that a sizable chunk of remittances may be sent out from Bangladesh to India or vice versa where both are, in aggregate terms, recipient countries.

In terms of the explanatory variables, the real lending rate is computed as this year's nominal rate adjusted for the current year's actual inflation[v]. Family income is measured by the real GDP of the home country. Migrant income is measured by the aggregation of real GDP values across fourteen remittance sending countries. All real GDP data are expressed in constant US dollars. Finally, the real exchange rate is measured as the real effective exchange rate as the relative price of tradable goods to non-tradable goods produced in the domestic economy following the methodology of Hassan and Holmes (2013).

4. Empirical analysis

Ideally, our model should be applied to microeconomic data. Despite the obvious problem of data availability through a survey, one would have to contend with one major difficulty, namely the absence of sufficient real exchange rate and lending rate variations for a cross-section of individuals at a given point of time. Longitudinal data require even further resources and are seldom available over an adequately long period of time. As a result, we take the approach of relying on the aggregate panel-data information on the variables that are captured in Eq. (4). Obviously, the cost of doing so is not being able to control for crucial individual characteristics, for example age, sex, demographic indicators, which are known to affect remittances (see Lucas and Stark, 1985).

For our econometrics analysis, we rely on the assumption that the household remittances equation can be aggregated to obtain the country-wise remittances equation, and we depend on the log-linearization of Eq. (4) which gives us the testable equation from our model that is taken to the aggregate data:

$$\ln(R) = \alpha_0 + \alpha_1 \ln(Y_m) + \alpha_2 \ln(Y_f) + \alpha_3 \ln(r) + \alpha_4 \ln(\lambda) \qquad (8)$$

Where the variables are as defined earlier. According to standard remittances theory, we expect α_1 < 0 or > 0 and α_2 > 0. The expected sign of α_3 can be either way. But based on our model's prediction we expect that $\alpha_3 < 0$. Finally, we expect that $\alpha_4 < 0$, because a real depreciation leads to increased remittances.

Under normal circumstances one would take Eq. (8) to the data and estimate with the various available panel-data estimators, such as the fixed or random effects model or the more

robust generalized methods of moments (GMM) estimators of the Arellano and Bond type. However, these estimators are only suitable for estimating the instantaneous effect, e.g. change in the current year's remittances due to change in current year's interest rate. In terms of information conveyed about the actual relationship, this might be too restrictive at the least or distortionary at most. This is because most variables exhibit a long-run as well as a short-run instantaneous relationship. For instance, how remittances adapt to changes in real interest rate depends on how all other factors underlying the dynamics of these two variables behave. When these factors are stable, the relation between lending rate and remittances is steady or stable in their true long-run relationship and naturally estimating this relationship is our primary concern. On the other hand, when global factors change, such as the Global Financial Crisis (GFC) or individual country characteristics exhibit a shock, such as through regulatory changes or a natural disaster, the relationship between lending rate and remittances may diverge from their steady state one and that changed relationship will need to be estimated within a short-run framework through an error correction mechanism (ECM). Therefore, our methodology involves estimating a long-run relationship and the associate short-run fluctuations of the variables in Eq. (8) which include log of remittances, log of migrant or host country income, log of family or home country income, log of lending rate and log of real exchange rate.

Given the low power of country by country tests, we are motivated to conduct panel unit root tests on our data. In the presence of cross-section dependence, "first generation" panel unit root tests tend to reject the null hypothesis of a unit root excessively. Therefore, we apply panel-unit root tests which take into account the residual dependence in panel. Table 1 reports these tests, including IPS, Hadri and CADF panel unit root tests, on our variables which are outlined in Eq. (8). In usual circumstances, to estimate a long-run relationship the variables in our model should be integrated of the same order and then a test for the existence panel cointegration carried out. However, the panel unit root tests in Table 1 show that the variables in our model are integrated of mixed order according to the IPS and CADF tests. While we are able to reject the null hypothesis that all series are non-stationary in the cases of remittances and income, there is mixed evidence that the null can be rejected in the cases of the real exchange rate and real interest rate. In the case of the Hadri test, the null hypothesis that all panel members are stationary is strongly rejected at the 1 percent level.

Given the mixed results obtained from the unit roots tests, an appropriate estimator for the long-run relationship is the autoregressive distributed lag ARDL(p,q) technique. Pesaran and Shin (1999) argue that a panel ARDL such as this can be employed even with the variables being of a different order of integration, i.e. irrespective of whether the variables under study are I(0) or I(1). Both the

short- and long-run effects can be estimated simultaneously from a data set with large cross-section and time dimensions.

Table 1. Panel unit root testing

	R	Y_f	Y_m	λ	r
IPS	-1.239	0.205	-0.473	-1.500*	-2.182***
Hadri	20.009***	23.217***	22.889***	14.194***	8.074***
CADF	-0.029	32.498	4.883	-1.979**	-1.483*

*Notes: IPS is the Im, Pesaran and Shin panel unit root test, CADF is the cross-sectionally augmented ADF panel unit root test. Both the IPS and CADF tests are of the null that all panel members are non-stationary. Hadri is the panel stationarity test of the null that all panel members are stationary. In all cases, ***, ** and * indicates rejection of null at the 1, 5 and 10 percent significance levels.*

The ARDL(*p,q*) technique is developed by Pesaran et al. (1999, 2001) and others, and we initially employ an estimation approach whereby a dynamic heterogeneous panel regression is incorporated into an error correction model using an autoregressive distributed lag ARDL(*p,q*) technique. For changes in *R*, we may write

$$\Delta(R_{it}) = \sum_{j=1}^{p-1} \vartheta_j^i(\Delta R_{i,t-j}) + \sum_{j=1}^{q-1} \vartheta\mu_j^i(\Delta X_{i,t-j}) + \varphi^i\left[R_{i,t-1} - \{\tau_0^i + \tau_1^i X_{i,t-1}\}\right] + \epsilon_{it} \quad (9)$$

where *X* is the set independent variables namely Y_m, Y_f, λ and *r*. The τ coefficients represent the long-run coefficients based on the long-run equilibrium equation

$$R_{i,t} = \tau_0^i + \tau_1^i Y_{m,i,t} + \tau_2^i Y_{f,i,t} + \tau_3^i \lambda_{i,t} + \tau_4^i r_{i,t} + e_{i,t} \quad (10)$$

where e is a long-run disturbance term and φ^i is the coefficient of speed of adjustment towards long-run equilibrium. The term in the square brackets in Eq. (9) contains the long-run remittances regression with all variables expressed in levels form. We estimate Eq. (9) by maximum likelihood using dynamic fixed effects (DFE). The DFE estimator imposes restrictions on the slope coefficient and error variances to be equal across all countries in the long run. The DFE model further restricts the speed of adjustment coefficient and the short-run coefficient to be equal too.

5. Results

In the long-run, remittances, home and host income, lending rates and exchange rate constitute a long-run relationship. This means, for instance, debt-migration, the migrant's and their

family's income, real exchange rate and remittances all grow in a manner that is sustainable to hold an equilibrium among them. If there is a disturbance to this equilibrium in the short-run, such as too much debt or a sudden increase in the lending rate, a shock in the home income or a global common shock, there will be an adjustment procedure which will bring the relationship towards equilibrium. We now report our empirical results for the estimation of the long-run equation in Table 2. Before we do so we briefly discuss what are the theoretically expected signs on the coefficient. According to NELM (see Lucas and Stark, 1985), the motivations to remit are broadly categorised as "pure altruism", "pure self-interest" and "tempered altruism or enlightened self-interest". Any kind of contractual arrangements between the migrant and household left behind can be in the latter category, for example loan repayment. The effects of changes in the family's income (home country) or migrant's income (host country) on remittances depend on whether the migrant's motive to remit is based on altruism or self-interest. If it is altruism, then the coefficient on Y_f should be negative and if it is self-interest, then the coefficient on Y_m should be positive. But under a situation of loan-repayment, the coefficient on Y_f can be positive or negative while the coefficient on Y_m is still expected to be positive.

Table 2 reports the pooled mean group estimates of the long-run equation for the full sample of 57 recipient (home) countries. We find that Y_f exerts a significant positive effect on remittances for the overall sample but no significant effect from Y_m can be observed. According to the discussion in the preceding paragraph, the positive and significant coefficient of Y_f found in the full sample is consistent with the loan-repayment/self-interest motive, and it means that a 1 percent rise in home income will correspond to a 1.9 percent rise in remittances. The effects of λ and the real lending rate have negative and significant coefficients. These correspond to the predictions of the model. The interpretation of the estimated coefficient on λ is that if the home country real exchange appreciates by 1 percent then remittances are expected to fall by 1.2 percent. In terms of the linkage between real lending rates and remittances, the first row of the table based on the full sample of 57 countries reports that a 1 percent fall in the real interest rate leads to a 8.7 percent increase in remittances in the long-run. This finding is consistent with the discussion around the model as set out in Eq. (7) whereby $\sigma > 0$ means that decreases in *r* lead to an increased *R* on account of a strong substitution effect. Although the effect may seem quite large, it should be noted that the remittances data include both those sent by permanent and temporary migrants (i.e. migration on temporary job contracts). The latter group predominantly tend to finance their migration move under debt-migration (Rahman, 2015); it is therefore not unreasonable to find that remittances flow will respond heavily to lending rates.

As a form of robustness check, we carry out sensitivity analysis to see whether the response of migrants to changes in real interest rates differs by splitting the sample according to the amount

of remittances receipts, income level, time effects such as the GFC, or according to the level of interest rates. The sensitivity analyses based on the long-run equation are also reported in Table 2 from rows two to row eight.

Table 2. Long-run relationships

	Y_f	Y_m	λ	r
All countries (N=57)	1.850***	-0.289	-1.246***	-8.678***
	(0.714)	(0.884)	(0.469)	(1.893)
Low remittance countries	0.281	2.847***	-2.847***	-3.352***
	(0.725)	(0.951)	(0.371)	(1.283)
High remittance countries	1.057***	1.120***	0.291*	-1.970**
	(0.226)	(0.287)	(0.158)	(0.982)
Pre-GFC	1.935*	-0.261	-1.806***	-9.172***
	(1.049)	(1.710)	(0.541)	(1.850)
Post-GFC	0.405	1.035*	0.555*	-1.150
	(0.379)	(0.606)	(0.283)	(1.331)
Low-income countries	0.054	3.088**	-1.519**	-3.993
	(1.222)	(1.300)	(0.721)	(3.470)
Middle-income countries	2.500***	-1.672	-1.180**	-9.406***
	(0.909)	(1.181)	(0.569)	(2.330)
Low- interest countries)	2.953***	-0.720	-1.419***	-11.113***
	(0.850)	0.936)	(0.496)	(2.305)
High interest countries	0.832	1.106	-1.170*	-7.912**
	(1.043)	(1.382)	(0.708)	(3.626)

*Notes: Estimation is by pooled mean group dynamic fixed effects. Figures in parentheses are standard errors, *, ** and *** denote significance at the 1, 5 and 10 percent levels respectively. High (low) remittances countries are those countries for which remittances are on average greater (less) than 2 percent of GDP over the study period. High (low) interest rate countries are those countries for which the average real interest rate is greater (less) than the full sample average of 10.382 percent over the study period.*

The first part of our first sensitivity analysis includes splitting the sample into low and high remittance-recipient countries. Low remittance countries are defined as those with a remittance to GDP ratio of less than 2 percent and high remittance countries are those with more than 2 percent. The long-run estimates are presented in rows two and three of Table 2. Home income is not a significant determinant of remittances in the case of low remittance countries, but host income is. A 1 percent increase in host income increases remittances by 2.8 percent. The negative exchange rate effect is still significant. In terms of the lending rate, the elasticity is still found negative but magnitude is less than the overall sample – a 1 percent fall in lending rate will cause remittances to rise by 3.4 percent. For the high remittance countries, both home and host income are significantly positive and so consistent with loan repayment theory. Interestingly the lending rate elasticity is still negative but with a relatively lower magnitude. These could be because high remittance countries[vi] tend to be over reliant on remittances to finance their expenditure on consumption and investment; hence remittances tend to respond more to household characteristics than to policy variables.

We find interesting results in our long-run estimates when splitting the sample into the pre- and post-GFC periods. The pre-GFC sample, in the period 1995-2006, shows that the elasticity of lending rate is negative and highly significant with the estimated coefficient, implying that a 1 percent fall in lending rate will increase remittance flows by 9.1 percent, which is close to the estimate of the overall sample. In the post-GFC sample, however, the interest rate elasticity is found to be insignificant. This interesting finding lends support to our hypothesis. We have already mentioned that temporary migration tends to be financed comparatively more on the debt-migration basis. The best available proxy of temporary migration is migration flows data, which is the change in migration stock per year. This statistic was 4.6 million persons worldwide during 2000-2010 period compared with 3.6 million persons during 2010-2013 (see, UN ESA, 2013). These estimates show that temporary migration fell from the pre-GFC to post-GFC period, providing justification for the lack of responsiveness of remittances to lending rates in the post-GFC period.

Next, we split our sample into low- and middle-income countries following the definition of the World Bank[vii]. The long-run estimates show that the home income coefficient is not a significant determinant of remittances in case of the low income countries, but is a highly significant positive determinant for the middle-income countries thereby lending support to self-interest/loan repayment theories. On the other hand, host income is a significant positive determinant of remittances for the low-income economies, but not for the middle-income economies. An interesting finding is that the magnitude of the lending rate elasticity is higher for the middle-income countries. A 1 percent decrease in lending rate cause a 9.4 percent increase in remittances in middle-income countries while the comparable estimated elasticity in low-income countries is 3.9 percent. The differential in the estimated lending rate elasticities in the low- and middle-income

economies strengthens our debt-migration hypothesis. The financial markets in the low-income countries are relatively less developed than middle-income countries. Access to market loans to undertake the cost of migration is obviously more limited due to credit constraints in the low-income countries relative to middle-income countries. Therefore, since migration is a costly venture, it is more likely that debt-migration is a more dominant feature of the middle-income countries which explains their higher lending rate elasticity.

Table 3. Error correction models

ΔR_t	φ_{t-1}^{i}	ΔY_f	ΔY_m	$\Delta\lambda$	Δr
All countries (N=57)	-0.184*** (0.019)		2.295** (0.916)		1.968*** (0.255)
Low remittance countries	-0.429*** (0.017)	1.314** (0.670)	3.057* (1.859)		1.508*** (0.345)
High remittance countries	-0.440*** (0.017)		1.869*** (0.652)		1.575*** (0.269)
Pre-GFC	-0.296*** (0.029)				2.010*** (0.344)
Post-GFC	-0.378*** (0.034)	1.106*** (0.281)			
Low-income countries	-0.327*** (0.049)				
Middle-income countries	-0.165*** (0.015)		1.996** (0.989)	0.310* (0.173)	2.213*** (0.258)
Low interest countries)	-0.236*** (0.024)		2.453** (1.103)		1.968*** (0.255)
High interest countries	-0.201*** (0.027)	1.246** (0.616)			

Notes: see Table 1. All estimated error correction models include a constant. Only significant slope estimates are reported in this table.

Finally, we estimate the long-run equation by splitting the sample into high and low interest economies. We label high (low) interest rate countries as those countries for which the average real interest rate is greater (less) than the full sample (57 countries) average of 10.382 percent over the full study period. If we only consider the high interest countries, then we still find negative roles for λ and *r* in the long-run. In the case of the low interest countries, the coefficients on Y_f, λ and *r* are significant in the long-run. The interesting finding is that remittance flows in the low interest rate countries are more sensitive to movements in the real interest rate. The elasticity with respect to the lending rate for the low interest countries imply remittances increase by 11.1 percent for a reduction of 1 percent in lending rate and the comparable figure is 7.9 percent in high interest countries. This finding supports our hypothesis. In low interest countries debt-migration should become more frequent because cost of undertaking migration becomes comparatively cheaper, as a result the responsiveness of remittances to lending rate is higher than high interest countries.

Our long-run estimates are mostly in congruence with previous studies in the literature, though there are key differences found in the role played by interest rates. In terms of home income effects, Chami et al. (2005) find a negative relationship between remittances and home income, confirming an altruistic motive to remit. But with regard to household income and wealth, a positive relationship is also reported in other studies, thereby supporting the self-interest motive (see Lucas and Stark, 1985; Itzigsohn, 1995, and Osili, 2007). On the other hand, host country income is found to be positively associated with remittances in earlier studies (Lueth and Ruiz-Arranz, 2007). Faini (1994) and Lueth and Ruiz-Arranz (2007) observe a negative effect from real exchange appreciation on remittances. Moving onto interest rate effects, El-Sakka and McNabb (1999), Jackman (2013) and Mallick (2017) find that the home country's interest rate differential significantly influences remittance inflows along with inflation and incomes of both the home and host countries. As a determinant of remittances, the effects of real interest rate differentials of the home and the host countries were found to be mixed in these studies, particularly in Mallick (2017), whereas our findings show a consistent negative effect of real lending rates on workers' remittances in the long-run estimates.

Table 3 reports the short-run error correction models based on Eq, (9) that accompany the long-run estimates. In all cases, the lagged error correction is negative and significant which is in accordance with a long-run relationship. It is expected that there will be heterogeneity with regard to the estimated half-lives based on the error correction coefficients because different policy variables will have a range of impacts on how the economies converge to the long-run relation from a short-run shock. The key result to note here is that the short-run coefficient on the real lending rate is positive and significant. This new finding, that the qualitative effect of an interest rate change is dependent upon the time horizon, suggests that in the short-run the income effect resulting from a

change in the real interest rate dominates the substitution effect because of the absence of the exchange rate effect. Indeed, our results suggest that the dominant substitution effects resulting from an interest rate change are very much part of the long run experience.

6. Conclusion

We provide evidence that the long-run effect of the real lending rate on workers' remittances is negative. Indeed, this is consistently found to be the case when we split the sample by the remittances-GDP ratio, time effects, income level as well as level of interest rates. The short-run results show that the growth in remittances is positively related with growth in lending rates (change in log lending rates). This is perhaps because the substitution effect between the migrant's and family's consumption is weak as the exchange rate effect is not as pronounced in the short-run.

Our evidence is consistent with a long-run altruistic transfer and debt-repayment motive for the sending of workers' remittances based on the repayment of market based loans used to cover the cost of migration. However, we also acknowledge that while the response of remittances to the interest rate is consistent with the debt-migration hypothesis, it is also consistent with other hypotheses, e.g. assisting family members who may otherwise have to borrow at a higher rate, sending money back to make money through investing or lending.

Further to this, we find evidence that the relationship between lending rates and remittances is dependent upon the level of remittances receipts, time, income level and the level of real interest rates. While a climate of low real interest rates might stimulate an increase in remittances in the long-run, this will most likely be accompanied by less sensitivity of remittances to real interest rates. If lending rates are increasing through tightening monetary conditions say, then remittances will fall. However, remittances will also become more sensitive to lending rates. There is an important policy implication here insofar as a climate of increasingly tighter monetary conditions may have an increasingly negative effect on remittances in the long-run. By way of contrast, the short-run is different insofar as tighter monetary policy may actually have an expansionary effect on remittances on account of income effects dominating substitution effects according to our model. While changes in monetary policy may impact on remittance flows, there may of course be other beneficial or detrimental effects on the macroeconomy. But given the positive viewpoint that is held regarding the role of remittances, policymakers should perhaps take added care in influencing interest rates.

Appendix 1: List of countries included in sample: remittances to GDP ratio (average 1995-2014)

Albania	13.60442	*Gambia, The*	10.34024	*Nepal*	12.71427
Algeria	1.190975	*Grenada*	7.785786	*Nicaragua*	7.291272
Armenia	11.99323	*Guatemala*	7.463689	*Nigeria*	5.348227
Bangladesh	6.323491	*Guyana*	9.969882	*Paraguay*	2.674057
Belarus	1.216309	*Honduras*	12.15368	*Peru*	1.514822
Belgium	1.885443	*Hungary*	1.342649	*Philippines*	9.961227
Belize	4.058823	*India*	2.908986	*Poland*	1.274269
Bolivia	3.008831	*Jamaica*	13.43331	*Romania*	1.632466
Cabo Verde	13.09895	*Jordan*	18.31297	*Rwanda*	1.201331
Colombia	1.651455	*Kenya*	2.689358	*Sierra Leone*	1.569789
Comoros	15.41069	*Kyrgyz Republic*	12.30587	*Slovak Republic*	1.023198
Costa Rica	1.381932	*Lesotho*	40.36765	*Sri Lanka*	7.416992
Croatia	2.849139	*Lithuania*	2.083681	*St. Kitts & Nevis*	6.200333
Dominica	5.319202	*Madagascar*	1.983793	*St. Lucia*	3.204674
Dominican Republic	7.484523	*Malta*	1.185184	*St. Vin. & Gren.*	4.875181
Ecuador	4.126862	*Mauritius*	2.050723	*Swaziland*	3.227573
Egypt, Arab Rep.	4.963431	*Mexico*	1.829841	*Syrian Arab Republic*	2.321135
Estonia	1.097352	*Moldova*	20.59776	*Thailand*	1.022832
Fiji	4.120861	*Mozambique*	1.155982	*Vanuatu*	5.256299

[i] Here we are assuming that a real depreciation of exchange rate can lead to an increase in remittances because consumption of home country good is now relatively cheaper (see Faini, 1994).

[ii] Gulf Cooperation Council

[iii] We do not have evidence that loans were not ever at a fixed interest rate. We have rather assumed that the lending rate is floating. Although it may not be an ideal assumption, we do not have sufficient evidence against it either.

[iv] All data are downloaded from World Development Indicators (http://databank.worldbank.org/data/home.aspx).

[v] Adjusting for next year's actual inflation also seems plausible if we assume households have perfect foresight. Since this may be a restrictive assumption, thanks to a suggestion made by an anonymous

referee, we compute the real lending rate as this year's nominal rate adjusted for current year's actual inflation.

[vi] For example, countries with a high remittance to GDP ratio include Lesotho (40 per cent), Jordan (18 per cent) and Jamaica (13 per cent).

[vii] As of 1 July 2016, the low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of $1,025 or less in 2015. We split the sample according to whether home income per capita is less than or greater than $1,025.

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