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How Do International Remittances Respond to Real Exchange Rate Movements?

by

Michael Bleaney and Mo Tian

Abstract
Shifts in the bilateral real exchange rate between the countries of migrants' origin and destination alter the real value of international remittances in origin currency relative to their real value in destination currency. Theoretical models predict a response in the form of some adjustment in remittances, measured in either currency. We construct real effective exchange rates weighted by migrant stocks for a large sample of countries to investigate the matter empirically. The evidence shows that remittances as a share of destination countries' GDP tend to remain virtually unchanged, so that real exchange rate movements predominantly affect the real value of remittances in terms of origin countries' currency. Possible explanations of this are discussed.

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1 Introduction

Migrants' remittances have attracted increasing attention amongst economists as stocks of international migrants have grown and remittances have become an increasingly important element of the balance of payments of some countries. Docquier and Rapoport (2006), Yang (2011) and Dustmann and Goerlach (2015) have provided surveys of the economics of remittances. Here we focus on a rather neglected topic, namely how international remittances respond to real exchange rate movements. Real exchange rate movements are potentially very important in this context, since they alter the real unit of resource obtained by the recipient for each real unit of resource transmitted by the sender. Apart from one paper by Faini (1994) about aggregate remittances to six countries by migrant workers abroad, and two papers by Yang (2006, 2008) that examine survey evidence for the Philippines over the period of sharp real depreciation following the Asian financial crisis of 1997, the topic has attracted little interest.

In this paper we use aggregate data for a large number of countries to examine how remittance flows respond to real exchange rate movements. In the next section we show that, according to standard theoretical models, remittances are likely to adjust, whether they are measured in the currency of migrants' origin or in the currency of migrants' destination, although exactly how they adjust depends upon the precise theoretical model. In Section Three we describe the data and the empirical model, and after some preliminary data analysis in Section Four, we present the results in Section Five. Section Six concludes.

2 Background

The literature has identified a number of motivations for remittances: altruism towards other family members, investment in good relations with the family in order to secure future benefits such as inheritance, insurance against loss of employment and accumulation of real or financial assets in preparation for return to the home country. There is empirical evidence in favour of all of these hypotheses.

Faini (1994) shows that, with a constant-elasticity-of-substitution (CES) utility function, the standard altruistic model of family utility as a weighted average of that of the migrant and of relatives back home predicts adjustment of remittance flows in response to real exchange rate movements, but in which direction and by how much depends on the elasticity of substitution. With a low elasticity of substitution, income effects dominate, and a real appreciation of the foreign (destination) currency leads to a decrease in flows so that both parties experience a rise in real consumption; with a high elasticity of substitution remittances increase because of their greater real value in home currency.

In an alternative model, the extended family may have pooled resources to invest in sending one of its members abroad, for instance as insurance against negative income shocks at home (Azam and Gubert, 2006). Remittances are then part of an implicit contract, and a perception of default may result in a loss of dignity and goodwill, or even

some eventual material loss to the migrant through disinheritance. In both the implicit contract model and the altruistic model, the geographical distance and the family's unfamiliarity with conditions in the destination country confer significant information advantages on the migrant. It is hard for the family to monitor the migrant's level of consumption and savings in the destination country. This means that there is considerable potential for mistrust as to whether the migrant's remittance level conforms to the implicit contract (or weighted utility function in the case of the altruistic model).

This raises the question whether the potential for mistrust affects remittance patterns. If certain actions, such as adjusting the amount remitted, are consistent with maximising the altruistic utility function but cannot be verified to be so by the recipients, there is potential for generating mistrust by adjusting remittances. In recent years there has been an explosion of experimental evidence on trust. Johnson and Mislin (2011) provide a meta-analysis of 162 replications of the trust game of Berg et al. (1995), in which subject one sends a certain portion of an endowment via the experimenter to subject two; the experimenter triples the amount, and then invites subject two to send back some proportion of that amount to subject one. The amount originally sent by subject one is regarded as a measure of trust, and the amount sent back by subject two is usually interpreted as a measure of trustworthiness. One result of the meta-analysis is that there are comparatively low levels of trust in sub-Saharan Africa.

Some evidence that migrants might be tempted to exploit an informational advantage is provided by Ambler (2015), who reports the result of an experiment with lottery wins by migrants from El Salvador in the United States. The migrants decide how much of their windfall to send back home. In some cases the recipients of remittances are told the size of the lottery win, and in some cases they are not. When recipients have full information, migrants remit significantly more, which suggests that migrants are indeed tempted to exploit any lack of information of recipients to their own advantage. Similarly, in an ultimatum game in which Player 1 has all the resources and offers to give some to Player 2, who either accepts the offer or rejects it (in which case both players get nothing), Croson (1996) finds that significantly higher offers are made by Player 1 when Player 2 knows the size of the pie.

The results of trust games suggest that practically everyone wishes to be seen to be trustworthy: in trust games of the Berg et al. (1995) type, very few people send back nothing (Johnson and Mislin, 2011). The question is: how do migrants signal their trustworthiness, given that relatives do not have full enough information to be sure whether migrants are reneging on the implicit contract? If relatives appear to be satisfied with the amounts sent in the past, then one way to do this is by repeatedly remitting similar amounts without showing any signs of considering revising it; such behaviour would seem to suggest a commitment to the deal. Conversely, tinkering with the amount sent may raise concerns that the migrant might at some point actively exploit the recipients' lack of information about conditions in the foreign country to find an excuse for a significant reduction in remittances. If this is the way adjustments in the size of remittances are viewed, there is a powerful incentive for the genuinely trustworthy migrant not to adjust remittances, except in exceptional circumstances, as a signal of trustworthiness. This concern for trustworthiness may be a significant force for inertia in remittance flows (for some evidence that knowledge of having previously been deceived affects experimental subjects' behaviour, see Jamison et al., 2008).

Where the motive for remittances is asset accumulation, for example in order to finance a higher level of consumption after return to the home country, the migrant has

the option of acquiring assets in either country. Real exchange rate movements may affect the decision through their effect on expected future real exchange rate movements. If agents believe real exchange rates to be mean-reverting, for example, a real appreciation of the origin currency relative to the destination currency will be expected to be reversed, implying a higher expected return in the origin currency, which will encourage a greater flow of remittances. The opposite will occur if expectations are extrapolative.

An important point is that many of the theoretical reasons for expecting remittances to react to real exchange rate movements presume a high level of financial literacy amongst the migrant population. Studies of financial literacy amongst the general population do not support this assumption (see Lusardi and Mitchell, 2014, for a survey). For example, in a survey of the adult population of the United States, only about one-third could answer correctly all three relatively straightforward questions about compound interest, real interest rates and the relative riskiness of a single company stock relative to a mutual fund. If financial illiteracy is widespread, a lack of response of remittances measured in the currency of migrants' destination seems much more likely.

We now turn to previous studies on real exchange rate effects. Faini (1994) uses two sets of aggregate data: one on annual remittance flows into five countries (Morocco, Portugal, Tunisia, Turkey and Yugoslavia) over the years 1977 to 1989, and the other on annual remittance flows from Germany to six countries (Greece, Italy, Portugal, Span, Turkey and Yugoslavia) over the period 1971 to 1989. He estimates a panel regression for real remittances (presumably the consumer price index is used as the deflator) on one lag of itself, the stock of migrants, the GDP of the home country and the destination countries, the real exchange rate and the interest rate differential between the two countries, adjusted for expected exchange rate changes. All variables except the last are in logs. The real exchange rate and destination countries' GDP are averages weighted by the migrant stock in each destination country. The interest rate differential is intended to capture the difference in expected returns on savings in the two countries. Because the lagged dependent variable is highly significant, the estimated long-run effects of each explanatory variable are much larger than the short-run effects.

Faini's results differ somewhat between the two datasets. For the first dataset, he finds a real exchange rate elasticity of real remittances in terms of origin currency significantly greater than one, indicating a strong substitution effect; but in the second dataset he finds this elasticity to be significantly less than one, which suggests that the income effect dominates.[1]

Yang (2008) uses data from an annual survey of Philippine households that includes questions about household members who have left for overseas in the previous five years. He uses data for households that were sampled in July 1997 and resampled in October 1998, a period that straddles the large devaluation associated with the Asian crisis. For each destination country he constructs the change in the exchange rate as the October 1997 to September 1998 average level compared with the July 1996 to June 1997 average level, and calculates the average exchange rate change for each household by weighting these bilateral exchange rate changes by the number of migrants from that household in each destination country. He finds an elasticity of remittances measured in Philippine currency with respect to the exchange rate of 0.64, but with a standard error of

1 An elasticity of one for remittances measured in origin currency is equivalent to an elasticity of zero for remittances measured in destination currency.

0.30. Since this figure is less than one, it suggests a fall in remittances measured in destination currency, but not a statistically significant fall, because the coefficient is not significantly less than one. A second paper (Yang, 2006) looks at the effect of the same real exchange rate shock on return migration rates.

3 Data and the Empirical Model

We model the proportional change (relative to the previous year) in international remittances, measured as a ratio of GDP, as a function of movements in the real effective exchange rate, the growth of GDP and the trade-weighted growth rate of the rest of the world, both in constant local currency units. The real effective exchange rate measures how a real unit of resources in destination currency translates into a real unit of resource in origin currency, whilst GDP growth captures the effects of income movements.

We use two measures of the real effective exchange rate: one that uses stocks of migrants as weights, and one that uses bilateral trade as weights. The former measure seems preferable, since it reflects the likely bilateral remittance flows rather than trade flows, with the caveat that the migrant stock data provide estimates only at ten-year intervals. We estimate this model separately for gross remittance inflows and gross outflows. For inflows, international remittances are taken as a ratio of the recipient country's GDP, and stocks of emigrants from that country are used as the weights; for outflows, remittances are specified as a ratio of the GDP of the sending country, and stocks of immigrants to that country are used as weights. To give an example, for inflows to Uganda, remittances are measured as a ratio to Uganda's GDP, and the distribution of emigrants from Uganda to other countries are used as the weights in constructing the real effective exchange rate index. For outflows from France, say, remittances are measured as a ratio of French GDP, and the weights are determined by the stocks of immigrants to France from each other country. Thus the model is

$$\Delta \ln\left(\frac{REM_{it}}{GDP_{it}}\right) = a\Delta \ln REER_{it} + b\Delta lnGDP_{it} + c\Delta lnWGDP_{it} + e_i + u_t + v_{it} \qquad (1)$$

where REM_{it} is international remittances to (from) country *i* in year *t*, *REER* is the real effective exchange rate (weighted either by migrant stocks or by trade), *GDP* is gross domestic product, *WGDP* is the trade-weighted GDP of the rest of the world, and *a*, *b* and *c* are parameters to be estimated. The parameter *a* measures the elasticity of the remittance/GDP ratio with respect to the country's real effective exchange rate. We expect the parameter *b* to be negative because GDP is in the denominator of the dependent variable: if the local economy grows faster, remittances will tend to grow less fast as a share of GDP, other things being equal. It is not clear that we should expect any significant effect of world GDP growth, but it seems sensible to include it as a control.

The remittance and GDP series are from the World Bank World Development Indicator (WDI) database. The bilateral trade data are taken from the IMF Direction of Trade Statistics (DOTS) database. We then use the period-average (1970-2015) of trade (exports plus imports) to construct the weighting shares for REER and WGDP.

The bilateral migration stocks data are from the World Bank Bilateral Migration Stock database. This database provides estimates every ten years, and hence our bilateral weights are updated for every decade (from the 1970s to the 2010s) upon data availability. The weights used differ depending on the direction of remittances to be examined. For country *j*'s inflow of remittances from the world, the weights will be the stock of emigrants from country *j* in each destination country as a proportion of total emigrants from country *j*; for country *j*'s outflow of remittances, the weights will be the

stock of immigrants to country *j* from each origin country as a proportion of total immigrants to country *j*.

The real exchange rate is calculated from the CPI-adjusted nominal exchange rate. The latter series is taken from the IMF International Financial Statistics database, measured as annual period average. The annual CPI is from the WDI database.

4 Preliminary Data Analysis

Some basic statistics are shown in Table 1. Remittances are larger as a proportion of origin countries' GDP than as a proportion of destination countries' GDP, as one might expect because destination countries tend to be richer. They are also significantly positively skewed. The change in the log of remittances has a positive mean, because remittances have been growing over time, with the growth of migrant stocks. The correlation between outflows and inflows for the same country is +0.151, indicating that countries with large outflows also have some tendency to have large inflows, suggesting that for many countries migration is a two-way process. The three real exchange rate series are quite highly correlated, but more so for trade weights and emigrant stock weights than for either of these and immigrant stock weights. This is because the main trading partners of most countries are the richer countries, which are also the main recipients of emigrants from other countries.

Table 1. Basic Statistics

Conditioning on three abs(dlnREER)<0.5 jointly

	count	mean	sd	min	max
EMTpGDP	4365	0.013	0.025	-0.003	0.329
IMTpGDP	4569	0.035	0.056	0.000	0.538
dlnEMTpGDP*	4220	0.019	0.300	-0.604	0.741
dlnIMTpGDP*	4442	0.023	0.246	-0.453	0.642
dlnREER_IS	5942	0.004	0.093	-0.484	0.500
dlnREER_ES	5942	0.006	0.086	-0.490	0.495
dlnREER_TR	5942	0.004	0.081	-0.493	0.500

Correlation matrix

	EMTpGDP	IMTpGDP	dlnEMTpGDP	dlnIMTpGDP	dlnREER_IS	dlnREER_ES	dlnREER_TR
EMTpGDP	1.000						
IMTpGDP	0.151	1.000					
dlnEMTpGDP	0.055	0.005	1.000				
dlnIMTpGDP	0.006	0.033	0.220	1.000			
dlnREER_IS	0.000	0.002	-0.018	-0.057	1.000		
dlnREER_ES	0.001	0.016	-0.017	-0.077	0.801	1.000	
dlnREER_TR	0.007	0.024	-0.017	-0.071	0.791	0.901	1.000

Notes: EMTpGDP denotes remittances by emigrants as a proportion of destination countries' GDP; IMTpGDP denotes remittances by emigrants as a proportion of origin countries' GDP. dln: change in natural logarithm. REER_IS: real effective exchange rate weighted by bilateral immigrant stocks. REER_ES: real effective exchange rate weighted by bilateral emigrant stocks. REER_TR: real effective exchange rate weighted by bilateral trade . * changes in EMT and IMT are winsorised .

5 Results

To minimise the effect of outliers, the changes in remittance flows are winsorised at the 5% level, and observations with a change in the real effective exchange rate larger in absolute terms than 0.5 are omitted. Table 2 shows the results of estimating equation (1) using migrant stocks as weights in constructing real effective exchange rates. In the top half of Table 1 the dependent variable is the change in the log of remittance *outflows* as a ratio of the GDP of the country *from* which the remittances are sent (migrants' destination country); in the bottom half the dependent variable is the change in the log of remittance *inflows* as a ratio of the GDP of the country *to* which the remittances are sent (migrants' origin country). The explanatory variable in which we are principally interested is the change in the log of the real effective exchange rate. Thus, for example, for the observations for which the country is Mexico, the dependent variable in the top half of the table is remittances sent home by immigrants to Mexico divided by Mexican GDP, and the real effective exchange rate is constructed using the stocks of immigrants to Mexico as weights. In the bottom half the dependent variable is remittances sent back to Mexico by emigrants divided by Mexican GDP, and the real effective exchange rate is constructed using the stocks of emigrants from Mexico as weights. Thus the United States will have a large weight in the real effective exchange rate measure for remittance inflows to Mexico, but a much smaller weight for remittance outflows from Mexico, because of the large share of emigrants from Mexico in the United States compared with the US share of immigrants to Mexico.

Looking first at the top half of Table 2, we can see that real exchange rate movements have no significant effects on the ratio of remittance outflows to GDP. This is true for the sample as a whole and for the three country groups individually: advanced economies, emerging markets and developing economies. Even though a real exchange rate appreciation raises the real value in origin currency of a given ratio of remittance flows to destination country GDP, there is no significant adjustment of this ratio. As expected the GDP growth coefficient is mostly negative (but not for the advanced countries), and is just significant at the 5% level for the whole sample. The trade-weighted growth of the rest of the world has a coefficient that is not significant for any group of countries.

This result implies that real exchange rate movements have little effect on the remittance flows measured in the currency of migrants' destination, which could be the result of one of three possible situations: (1) migrants are conscious of real exchange rate effects and willing to adjust to them, but the parameters of the altruistic utility function are such that the adjustments are negligible; (2) the parameters of the altruistic utility function suggest significant adjustments, but the migrants prefer not to make adjustments in the interests of maintaining the trust of relatives (and perhaps also because they believe that most real exchange rate movements are temporary); or (3) migrants may initially have set their remittances in line with some altruistic utility function, but thereafter they fail to take account of the effect of real exchange rate movements on the real value of the remittances to the recipients, and simply keep sending similar amounts through inertia that is perhaps in part associated with financial illiteracy. We shall return later to the issue of distinguishing between these explanations.

The bottom half of Table 2 looks at remittance inflows as a ratio of receiving countries' GDP. What we observe here is a consistent real exchange rate effect, which is significant at the 1% level for all three country groups, although it is particularly large for emerging markets. When the real exchange rate of the country of migrants' origin

appreciates, remittance inflows fall relative to GDP. This is consistent with the finding in the top half of Table 2 that the real value of remittances in terms of the now depreciated destination currency does not increase to compensate for the real exchange rate movement.

Table 2. Remittances and real effective exchange rates (migrant-stock weights) 1970-2016

Dependent variable:	Change in the log of remittance outflows/GDP			
	(1) All countries	(2) Advanced countries	(3) Emerging markets	(4) Developing countries
DlnREER_IS	-0.077 (-1.29)	0.036 (0.39)	-0.087 (-0.56)	-0.098 (-1.30)
DlnGDP	-0.201** (-2.04)	0.125 (0.29)	-0.178 (-0.37)	-0.208* (-1.88)
DlnWGDP	0.015 (0.76)	0.052 (0.47)	-0.809 (-1.05)	-0.010 (-0.37)
Countries	164	32	21	111
Observations	3871	1044	487	2340
RMSE	0.219	0.174	0.217	0.235
Dependent variable:	Change in the log of remittance inflows/GDP			
	(1)	(2)	(3)	(4)
DlnREER_ES	-0.349*** (-6.34)	-0.386*** (-3.40)	-0.549*** (-4.57)	-0.284*** (-4.21)
DlnGDP	-0.461*** (-4.45)	-0.608* (-1.92)	-0.806*** (-3.21)	-0.371*** (-3.16)
DlnWGDP	0.055 (1.55)	0.004 (0.05)	0.155 (1.56)	0.031 (0.94)
Countries	163	32	21	110
Observations	4140	1037	626	2477
RMSE	0.174	0.143	0.186	0.182

Notes: Country and year fixed effects also included. The dependent variable is winsorised at 5% (i.e. for the top 5% of observations the value of each variable is replaced by the value at the 95th percentile, and similarly the value at the 5th percentile replaces the actual value for the bottom 5%). Figures in parentheses are t-statistics. Standard errors are clustered by country. ***,**,*: significant at 1, 5 and 10% respectively. Dln: change in natural logarithm. REER_IS: real effective exchange rate weighted by bilateral immigrant stocks. REER_ES: real effective exchange rate weighted by bilateral emigrant stocks. WGDP: GDP of other countries weighted by bilateral trade with the relevant country.

In Table 3 we repeat the same exercise, except that now real effective exchange rates are constructed using the more conventional trade weights rather than migrant-stock weights. This weighting seems less appropriate, but we include it as a robustness test. The correlation between real exchange rate movements using the two different sets of weights is 0.901 for remittance inflows, but only 0.791 for outflows. This is because the destination countries for migration tend to be the rich countries that dominate world trade, whereas the origin countries are generally much poorer, so the migrant-stock weights are much more similar to trade weights for inflows than for outflows. The results are very similar to Table 2: outflows as a ratio of GDP do not respond significantly to real exchange rate movements, but inflows do.

A potential problem with the dependent variable is that if in any year remittances are very small, their natural logarithm is a large negative number, which means that, even after taking first differences, there may be some large outliers associated with negligible remittance flows that may exert a large influence over the results. Even after winsorisation of the dependent variable, we find that the residuals in Table 2 tend to be significantly larger when the previous year's remittance flows are a smaller proportion of GDP. Consequently, as a robustness check, in Table 4 we add 0.01 to remittance flows divided by GDP before taking logs. As remittance flows tend to zero, this tends to ln(0.01) rather than to minus infinity, which reduces the outlier problem t the lower end, while at the upper end it is similar to the dependent variable used in Tables 2 and 3.[2] The alteration to the dependent variable will make coefficients smaller, but hopefully no less statistically significant.

In Table 4 the real exchange rate coefficient for outflows for the whole sample has a slightly larger *t*-statistic than in Table 4 (-1.59 compared with -1.29), although it still does not quite reach even the 10% level of significance. This is because the coefficient does just reach the 5% level of significance for developing countries in Table 4, with a *t*-statistic of -2.02. As in Table 2, the bottom half of Table 4 shows that remittance inflows as a share of origin countries' GDP respond negatively to real exchange rate appreciations, with only slightly smaller *t*-statistics than in Table 2 for the full sample (-5.00 in Table 4 and -6.34 in Table 2). As in Table 2, the coefficient is largest for emerging markets.

Earlier we offered three possible explanations of these results: (1) the altruistic utility function is being maximized, but the parameters have a particular value; (2) the altruistic utility function is not being maximized, but remittances are nevertheless not adjusted because of trust issues; and (3) inertia, because the utility of the migrant is not affected if the amount remitted in destination currency remains unchanged. It is difficult to find a test that discriminates between hypotheses (1) and (3). In the case of hypothesis (2), we could conceive of trust issues as imposing a kind of fixed cost to adjusting remittances rather than leaving them unchanged. Then remittances will only be adjusted if the real exchange rate movement is large enough that the gain in altruistic utility outweighs this fixed cost. This can be tested by allowing the coefficient of the real exchange rate change to differ between large and small absolute changes. If hypothesis (2) is correct, the coefficient should be more significant for large changes in remittance

2 For example, if variable x is 0.5% of GDP and its logarithm decreases by 0.3 (roughly one standard deviation of the regressions in Table 2), x falls to 0.37% of GDP, whereas if x is 10% of GDP, it has to fall to 7.4% of GDP to reduce its logarithm by 0.3. This is the same proportionate fall, but a large disparity in terms of percentage of GDP. Using ln(0.01+x), a fall of 0.1 reduces x of 0.5% to 0.35%, but it reduces x of 10% to only 9%.

outflows. This is tested for remittance outflows in Table 5, using two alternative thresholds: the 50th and the 75th percentile of absolute changes.

Table 3. Remittances and real effective exchange rates (trade weights) 1970-2016

Dependent variable:	Change in the log of remittance outflows/GDP			
	(1) All countries	(2) Advanced countries	(3) Emerging markets	(4) Developing countries
DlnREER_TR	-0.116**	0.126	-0.062	-0.138**
	(-2.05)	(0.86)	(-0.46)	(-2.19)
DlnGDP	-0.216**	0.153	-0.494	-0.213*
	(-2.12)	(0.36)	(-0.96)	(-1.84)
DlnWGDP	0.718*	-0.332	0.681	0.831*
	(1.84)	(-0.43)	(0.50)	(1.92)
Countries	169	32	21	116
Observations	3877	1029	464	2384
RMSE	0.220	0.175	0.223	0.235
Dependent variable:	Change in the log of remittance inflows/GDP			
	(1)	(2)	(3)	(4)
DlnREER_TR	-0.418***	-0.349***	-0.594***	-0.362***
	(-7.24)	(-2.81)	(-5.04)	(-4.94)
DlnGDP	-0.448***	-0.703**	-0.760***	-0.357***
	(-4.14)	(-2.19)	(-2.87)	(-2.92)
DlnWGDP	0.595*	0.992*	1.714**	0.332
	(1.71)	(1.87)	(2.57)	(0.88)
Countries	168	32	21	115
Observations	4084	1015	601	2468
RMSE	0.173	0.143	0.182	0.181

Notes: Country and year fixed effects also included. The dependent variable is winsorised at 5% (i.e. for the top 5% of observations the value of each variable is replaced by the value at the 95th percentile, and similarly the value at the 5th percentile replaces the actual value for the bottom 5%). Figures in parentheses are t-statistics. Standard errors are clustered by country. ***,**,*: significant at 1, 5 and 10% respectively. Dln: change in natural logarithm. REER_TR: real effective exchange rate weighted by bilateral trade. WGDP: GDP of other countries weighted by bilateral trade with the relevant country.

Table 4. Using 0.01 plus the log of remittances GDP (migrant-stock weights)

Dependent variable:	Change in 0.01 plus the log of remittance outflows/GDP			
	(1) All countries	(2) Advanced countries	(3) Emerging markets	(4) Developing countries
DlnREER_IS	-0.021 (-1.59)	0.012 (0.42)	-0.007 (-0.36)	-0.037** (-2.02)
DlnGDP	-0.081** (-2.11)	-0.034 (-0.41)	-0.042 (-0.42)	-0.081* (-1.77)
DlnWGDP	0.005* (1.77)	0.045* (1.69)	0.021** (2.02)	0.006* (1.65)
Countries	164	32	21	111
Observations	3901	1066	535	2300
RMSE	0.065	0.045	0.052	0.074
Dependent variable:	Change in 0.01 plus the log of remittance inflows/GDP			
	(1)	(2)	(3)	(4)
DlnREER_ES	- 0.126*** (-5.00)	-0.081** (-2.44)	-0.163*** (-3.03)	-0.114*** (-3.66)
DlnGDP	- 0.218*** (-4.98)	-0.069 (-0.074)	-0.518*** (-3.83)	-0.212*** (-3.98)
DlnWGDP	0.036** (2.33)	-0.021 (-0.44)	0.050 (1.35)	0.023 (1.04)
Countries	163	32	21	110
Observations	4129	1051	619	2459
RMSE	0.077	0.052	0.073	0.086

Notes: See notes to Table 2.

The results shown in Table 5 for remittance outflows do not support hypothesis (2). For both the whole and for the three sub-samples, the coefficient of real exchange rate changes for remittance outflows, using migrant-stock weights, is insignificant both for large and small real exchange rate movements, whether we use the 50^{th} percentile (top panel) or the 75^{th} percentile (bottom panel). Indeed there is no evidence that the coefficient is any further from zero for large real exchange rate movements, contrary to the predictions of the fixed adjustment cost model.

Table 5. Distinguishing large and small real exchange rate changes (migrant-stock weights)

Dependent variable:	Change in the log of remittance outflows/GDP			
	(1) All countries	(2) Advanced countries	(3) Emerging markets	(4) Developing countries
DlnREER_IS (Absolute change ≤ 50th percentile)	-0.153 (-0.61)	-0.273 (-0.63)	-0.659 (-1.56)	0.085 (0.24)
DlnREER_IS (Abs. change >50th percentile)	-0.074 (-1.27)	0.049 (0.55)	-0.074 (-0.47)	-0.102 (-1.39)
DlnGDP	-0.200** (-2.03)	0.121 (0.28)	-0.179 (-0.38)	-0.210* (-1.90)
DlnWGDP	0.015 (0.75)	0.049 (0.44)	-0.798 (-1.02)	0.024 (1.39)
Countries	164	32	21	111
Observations	3871	1044	487	2340
RMSE	0.219	0.174	0.217	0.235
Dependent variable:	Change in the log of remittance outflows/GDP			
	(1)	(2)	(3)	(4)
DlnREER_IS (Absolute change ≤ 75th percentile)	-0.070 (-0.58)	-0.112 (-0.70)	-0.162 (-0.54)	-0.065 (-0.38)
DlnREER_IS (Abs. change >75th percentile)	-0.078 (-1.23)	0.040 (0.43)	-0.076 (-0.42)	-0.103 (-1.31)
DlnGDP	-0.201** (-2.03)	0.125 (0.29)	-0.175 (-0.37)	-0.208* (-1.88)
DlnWGDP	0.015 (0.76)	0.053 (0.48)	-0.804 (-1.02)	0.024 (1.38)
Countries	164	32	21	111
Observations	3871	1044	487	2340
RMSE	0.219	0.174	0.217	0.235

Notes: See notes to Table 2.

6 Conclusions

Theoretically one would expect some adjustment in remittance flows measured in the currency of migrants' destination in response to bilateral real exchange rate movements of the destination currency relative to the currency of migrants' origin. In a model of consumption sharing between a migrant and a family back home, an appreciation of the destination currency may induce the migrant to remit either a larger or a smaller proportion of her earnings, depending on the elasticity of substitution. A migrant whose remittances are instead saved pending her return home should remit more if she regards the appreciation as permanent, because the appreciation represents an increase in lifetime wealth that induces a rise in planned consumption in every period. Only if such a

migrant regards the real appreciation to be temporary, so that the short-run return on savings in origin currency is perceived to be unusually high relative to the return on savings in destination currency, might the migrant decide to reduce consumption in the short run and remit more.

Our empirical results indicate that remittances expressed in the currency of migrants' destination do not change significantly in response to real exchange rate movements, so that the real exchange rate effect comes out entirely in the real value of remittances expressed in the currency of migrants' origin. When the origin currency appreciates, which reduces the value of a given quantity of remittances measured in destination currency, remittances in terms of destination currency do not increase significantly. This is consistent with the findings of Faini (1994), but contrasts with the response of remittances to large weather shocks, where several studies have shown that remittances increase to compensate for a sizeable fall in relatives' income (Yang, 2011). It is possible that this is because a significant minority of migrants are remitting savings and view real exchange rate movements as temporary and adjust remittances in the opposite direction to the majority. This view of migrants as active foreign exchange speculators is, however, at odds with other evidence of apparently irrational behaviour, such as the tendency to make frequent remittances of small amounts, thus incurring unnecessarily large transactions fees (Yang, 2011, pp. 143-4). It also contrasts with recent evidence of widespread financial illiteracy amongst the general population, which one would expect to induce substantial financial inertia.

An alternative interpretation is that our results reflect inertial behaviour because remittances are determined by the sender, and the sender is not immediately affected by a real exchange rate shock. Relatives may recognise that it is the exchange rate rather than migrants' decisions that is affecting the real value of their remittance receipts, and they may be reluctant to enter into a potentially awkward discussion with migrants. Even though theory assumes mutually agreed weights on the utility of the migrant and other family members, in reality this is an implicit agreement, and the people involved will recognise that there is a conflict of interest over the level of remittances. This creates the potential for distrust, such that to raise the issue of the impact of real exchange rate movements might raise suspicions of a surreptitious attempt to revise the weights. These considerations suggest that there is likely to be a psychological "menu cost" to adjusting (or suggesting an adjustment of) the level of remittances, so that most real exchange rate movements (unlike weather disasters) are not large enough to trigger a change. This theory implies a significant adjustment of remittances to real exchange rate changes only in the case of large movements. There is, however, no evidence for such an effect in our empirical tests, which suggests that inertia is the explanation for our results.

Compliance with Ethical Standards

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Appendix

Country List

Industrial

Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

Emerging Markets

Argentina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Russia, South Africa, South Korea, Thailand, Turkey, Ukraine, Uruguay

Other Developing

Afghanistan, Albania, Armenia, Bangladesh, Belarus, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Costa Rica, Cote d'Ivoire, Croatia, Djibouti, Dominica, Dominican Republic, El Salvador, Eritrea, Estonia, Ethiopia, Faeroe Islands, Fiji, Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Jamaica, Jordan, Kenya, Kiribati, Kyrgyz Republic, Laos, Latvia, Lesotho, Liberia, Lithuania, Macedonia, Madagascar, Malawi, Maldives, Mali, Mauritania, Moldova, Mongolia, Mozambique, Namibia, Nepal, Nicaragua, Niger, Papua New Guinea, Paraguay, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Slovak Republic, Slovenia, Solomon Islands, Somalia, Sri Lanka, Suriname, Swaziland, Tajikistan, Tanzania, Togo, Tonga, Tunisia, Uganda, Zambia, Zimbabwe