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Remittances and the Dutch Disease[1]

Evidence from Cointegration and Error-Correction Modeling

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Abstract

Remittances have grown in size and importance. They are also among the most stable inflows of scarce foreign exchange for the developing world. While such inflows can boost economic growth, they may also cause domestic currency to appreciate and hurt exports – a side effect commonly referred to as the Dutch disease. This paper adds to this literature by applying the bounds-testing approach to cointegration and error-modeling (Pesaran, et al., 2001) on a reduced form model linking remittance inflows to real exchange rate in some of the major remittances destinations in absolute terms (viz. China, India, Mexico, and Philippines) and in relative terms (viz. Lesotho) over the last 3 decades.

JEL classification codes: F24, O40, O53

[1] Draft; please do not quote. Comments and questions may be forwarded to: aratha@stcloudstate.edu.

I. Introduction

Remittances are known to be larger than official aid flows. They are also found to be counter-cyclical and more stable than and for many countries, larger than FDI flows (World Bank, 2003; Frankel, 2011). The migrants' firsthand knowledge of the recipients also mitigates the problems of adverse selection and moral hazards, resulting in better utilization of the scarce foreign exchange in the developing world. Thus, remittances are gaining in importance as an effective tool promoting GDP growth and reducing poverty and inequality (Adams and Page, 2005). However, remittances are essentially inflows of foreign exchange and any large inflow of foreign exchange can potentially cause currency appreciations in the receiving countries and hurt their exports. Known as the Dutch-Disease phenomenon in the literature, this side effect of remittances has received relatively scant empirical attention, partly because remittances' ascendance to the limelight is also relatively recent. This paper investigates the Dutch disease effect for some of the largest destinations of remittances.

The Dutch-disease effect of remittances may be attributed to various channels. Being purely income transfers, remittances can lead to a *spending effect* increasing the consumption of both tradable and non-tradable goods. With prices of tradable goods essentially determined in world markets, the relative prices of the domestic, non-tradable goods, rise and push up the overall price level in the economy. This translates into a higher real exchange rate, both fueling and fueled by a *resource movement effect*: Rising non-tradable prices divert resources away from the tradable- and toward the non-tradable sector and exert upward pressure on wages and other production costs, prices, and real exchange rate of the domestic currency. Thus, an increase in remittance inflow would lead to the incidence of the Dutch Disease. The increased income of households, as a result of the increased remittances would also increase imports. This, coupled with the decline in the export competitiveness of the tradable sector, would hurt exports and contribute to current account deficits.[2] Remittances may also exert an income effect on the consumption-leisure tradeoff, reducing the overall supply of labor in the economy. At a time when demand is growing (because of increased remittance inflows), this reduction in labor supply will only exacerbate price increases, especially in the non-tradable sector, and cause the domestic currency to appreciate even further.

Many of the top remittance destinations being in the developing world (e.g., China, India, Mexico, and Philippines), the applicability of the above channels may be qualified further. For example, if there is surplus labor in the economy (as is the case with most LDCs), at least part of the excess demand for labor in the non-traded sector would be met by the surplus labor and the resource movement effect may not be as pronounced. However, there would still be a spending effect leading to real exchange rate appreciation and hence, a decline in export competitiveness. Also, and more likely perhaps, labor mobility between LDCs' tradable and non-tradable sectors is quite limited (either because of labor market imperfections and/or specific-skills required by these sectors), in which case the relative price of non-tradable goods can still rise and raise the real exchange rate further.

As we mentioned earlier, empirical investigations of remittances' Dutch disease effects are still quite few. Rajan and Subramaniam (2005) conducted a large cross-country study and found that foreign aid inflows lead to the Dutch disease, but not remittances. They attributed this finding to remittances drying up as receiving country's currency appreciates (thus, remittances become endogenous). From a panel study of 13 Latin American countries, Ameudo-Dorantes

[2] However, remittances mostly saved and not spent, or if most of the remittances are spent on imported inputs and traded goods, Dutch Disease effects would be subdued.

and Pozo (2004), however, find that remittances do lead to the Dutch Disease by lowering export competitiveness. Lopez, Molina, and Bussolo (2008) reconfirmed this findings for a larger sample of countries, followed by Lartey, Mandelman, and Acosta (2012) who also segregated the resource movement and the spending effects and found remittances to shrink the tradable sector (relative to the non-tradable sector) – a finding consistent with the foregoing discussion.

Thus, it appears that remittance inflows do lead to a real exchange rate appreciation. However, because of data constraints, many of these studies, of necessity, happen to be panel studies. While panel studies have their own merits, they tend to be quite aggregative in nature. In any case, time-series investigations of this phenomenon are rather rare and will enrich this quite sparse but growing literature. Some recent examples include Vergas-Silva (2009) for Mexico, Bayangos and Jansen (2010) for Philippines, and Bourdet and Falck (2007) for Cape Verde, and so on (to be discussed). This paper adds to this literature by estimating a reduced form model linking real exchange rate to remittance inflows (and FDI), and select control variables using the bounds-testing approach to cointegration and error-correction modeling (Pesaran, et al., 2001) – a technique also deemed appropriate for small samples such as the case in hand. As a pilot project we look at a handful of countries: China, India, Mexico, and Philippines, the top four recipients of remittances in absolute terms. We also look at a top-recipient in relative terms, viz. Lesotho.

The rest of the paper is organized as follows. A reduced form model is proposed in section II, followed by a discussion of the methodology and empirical results in Section III. Section IV concludes. Data, definitions, and sources are listed in the appendix.

II. The Model

We estimate a variant of the equation employed by Bourdet and Falck (2006):

$$REER_t = a + b\, REM_t + c\, NFDI_t + d\, OPEN_t + e\, TOT_t + f\, GPOL_t + \varepsilon_t \ldots \quad (1)$$[3]

where *REER* is the real effective exchange rate, *REM* is the remittance inflows (% of GDP), *OPEN* is trade-share (average of exports and imports as % of GDP), NFDI is the net FDI inflow (% of GDP), TOT is the terms of trade, GPOL is a proxy for Government policy, monetary as well as fiscal. See Appendix I for a description of the variables.

While the macroeconomic variables included here are, by and large, commonly used in the literature, the signs and significance the corresponding coefficients are theoretically ambiguous and call for an empirical investigation. For example, an increase in REER implies an appreciation of the domestic currency so a positive and significant coefficient of REM (and NFDI), *b* (and *c*) would be evidence in favor of the Dutch-disease. If the terms-of-trade improves, there will be an income effect (such that prices of non-tradable rise) as well as a substitution effect (imports are cheaper) so net effect seems theoretically ambiguous. If the income effect dominates, then REER will appreciate. Freer trade, associated with greater trade openness, likewise, would lower import prices (due to lower tariffs, for example), as well as prices in the non-tradable sector, resulting in a real depreciation of the domestic currency. GPOL, a proxy for fiscal and monetary expansions exceeding the growth rate of GDP, will likely carry a negative coefficient.

[3] Choice of a parsimonious model may be justified by the small sample size of this study. In fact, in order to free up some degrees of freedom as well as check the robustness of the findings, we also estimate and report the results without NFDI.

III. Methodology and Empirical Results

Specification (1) outlines the long-run relation (cointegration) among the variables of interest and is estimated using the bounds-testing approach to cointegration, proposed by Pesaran, et al. (2001). The underlying short-run dynamics are picked up by an error-correction model as follows:

$$\begin{aligned}\Delta REER_t = a_i &+ \sum_{i=1}^{n} b_i \Delta REM_{t-i} + \sum_{i=1}^{n} c_i \Delta NFDI_{t-i} + \sum_{i=1}^{n} d_i OPEN_{t-i} \\ &+ \sum_{i=1}^{n} f_i \Delta TOT_{t-i} + \sum_{i=1}^{n} f_i \Delta GPOL_{t-i} + \delta_1 REER_{t-1} + \delta_2 REM_{t-1} \quad \ldots(2) \\ &+ \delta_3 NFDI + \delta_4 OPEN_{t-1} + \delta_5 GPOL_{t-1} + \varepsilon_t\end{aligned}$$

The procedure then comprises of (1) *selection of optimal lag structure* for (2), based on criteria the Schwartz Bayesian Criterion (SBC) as well as the Akaike Information Criterion (AIC), followed by an (2) an F-test (variable addition test) where the null hypothesis of "*non-existence of cointegration*" (i.e., H_0: $\delta_1=\delta_2=\delta_3=\delta_4=\delta_5=0$) is tested against its alternative. Since the F-test results depend on the number of lags imposed on each first differenced variable, we only report the value of the F-statistic for lag-structure chosen in step 1. See Table 1a and 1b.

(Table 1a and 1b go about here.)

The lower and upper bounds critical values for the F-test are obtained from Narayan (2005). If the calculated F-Statistic exceeds the upper bound then the null hypothesis if cointegration is rejected, validating the presence of a long-run relation among the variables of the trade balance model. If it falls below the lower bound, then the null cannot be rejected, and if it falls between the lower and upper bounds, the results are inconclusive. Given the 95% critical value (upper bound) of 4.499, there is evidence of cointegration in most of the cases (i.e., the variables are all cointegrated).[4] While the null could not be rejected in a few cases, we also look

[4] The critical value is 4.608 for the equation without the NFDI, allowing rejection of the null most cases.

at the coefficient of the lagged error correction term, an alternative evidence of cointegration.[5] As may be noted from the error-correction model (Tables 3a and 3b), the coefficient is negative and significant in almost all cases, confirming a long run relationship (cointegration) among the variables of the model, viz., REER, REM, NFDI, OPEN, TOT, and GPOL.

Since our focus is mainly on the Dutch-disease phenomenon, it is important to see how changes in REM and NFDI contribute to changes in REER over time and we report the corresponding coefficients in Tables 3a and 3b. These dynamics indicate that remittances do cause currency appreciation in Philippines in the *short run* but not in China, India, Lesotho, and Mexico. We also find evidence of Dutch-disease (in the short run) for China and India but the culprit there is NFDI, not remittances. Interestingly, for all but China in our study, remittances seem to lower the REER in the very first year (also in Philippines) although the effects do not necessarily last into the long run.[6]

We report the *long run* results in Tables 2a and 2b. It appears that remittances may be associated with long run currency appreciation in China but currency depreciation in India, Lesotho, and Philippines. While NFDI lead to short run currency appreciation in China and India, the effects reverse in the long run. This may be because investment inflows pay off over time and more than compensate for any short run currency appreciation they might have caused.

The experience of Lesotho and Mexico are worth noting. In Lesotho, a top recipient of remittances in relative terms (% of GDP), remittances and NFDI lead to short run currency

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[5] See for example, Kremers, et al. (1992).

[6] It appears that remittances to China may lead to the Dutch disease effect in the very first year but the effects reverse subsequently. The results for Philippines are consistent with those of Bayangos and Jansen (2010) who found evidence of the Dutch disease effect but our methodology and results suggest that that it is a short run effect.

depreciations but, evident of the Dutch disease syndrome, remittances cause significant currency appreciation in the long run. For Mexico, a large recipient of remittances in absolute terms, none of our macro-variables proved to be significant, either in the long run or in the short run. While lagged the error-correction term in Tables 3a and 3b carried the expected negative sign for cointegration of the macro-variables (including NFDI), it is possible that the equation estimated here does not quite explain the Mexican experience – the variables, or in the least, the results can indeed vary by country, and accordingly more detailed and country-specific might shed better insights into the underlying dynamics.

IV. Concluding Remarks

When it comes to external funding of development, remittances have grown in terms volume and importance. Apart from their sheer growth, they are also counter-cyclical and found to be most stable inflow of foreign exchange for many developing countries. Such large inflows of foreign exchange can potentially cause the domestic currency to appreciate and hurt exports – an undesirable side effect that may slowdown LDCs economic growth. Commonly referred to as the Dutch disease phenomenon, there have been very few country-specific, time-series studies of this effect, understandably because of data constraints. This paper adds to this sparse literature by applying the bounds-testing approach to cointegration and error-modeling (Pesaran, et al., 2001) to estimate a reduced form model linking remittances to real exchange rate. We look at the experience of some of the major remittance destinations in absolute terms (viz. China, India, Mexico, and Philippines) and in relative terms (viz. Lesotho) over the last 3 decades.

Expectedly the results vary by country as well as the timeframe (e.g., short run, long run, or both) under consideration. In particular, we find support for this phenomenon for Philippines in the short run, and China and Lesotho in the long run, and none for India and Mexico. For India and China, the top two remittance destinations, it was NFDI (rather than remittances) that exhibited the syndrome in the short run but the effects did not last into the long run. While such country- and context- specific results do inhibit generalizations of the results, they also highlight the importance of more in depth and country-specific studies.

Appendix

Data, Definitions, and Sources

Annual data are used to carry out the empirical work. The sample comprises of China (1982-2011), India (1975-2011), Lesotho (1975-2011), Mexico (1979-2011), and Philippines (1977-2011). All data come from the World Development Indicators, The World Bank, April 2013.

REER = Real effective exchange rate, defined such that an increase implies a real appreciation of the domestic currency.

REM = Remittance inflows, expressed as % of GDP

OPEN = Trade-share, average of exports and imports as % of GDP

NFDI= Net FDI inflow, expressed as % of GDP

TOT = Terms of trade, defined as exports price index over imports price index. An increase implies an improvement of the terms of trade. This variable allows incorporation of external shocks to the economy.

GPOL= Proxy for Government policy, monetary as well as fiscal. This variable is computed as growth rate of domestic credit *minus* growth rate of real GDP.

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Table 1a: The F-test Results (without FDI)

	Computed Value of the F-Statistic	
	Based on SBC	*Based on AIC*
China	18.30***	20.22***
India	6.95***	6.95***
Lesotho	4.67**	5.18**
Mexico	2.32	5.01**
Philippines	3.11	3.11

Asterisks ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The 95% critical value corresponding to a model with 4 regressors and an intercept is 4.608.

Table 1b: The F-test Results (with FDI)

	Computed Value of the F-Statistic	
	Based on SBC	*Based on AIC*
China	9.08***	9.08***
India	29.21***	29.21***
Lesotho	3.29	3.53
Mexico	3.68	3.68
Philippines	3.67	4.67*

Asterisks ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The 95% critical value corresponding to a model with 4 regressors and an intercept is 4.499.

Table 2a: Estimated Long Run Coefficients Based on Schwartz Bayesian Criterion:

Regressor	Country									
	China		*India*		*Lesotho*		*Mexico*		*Philippines*	
Intercept	284.30* (17.70)	113.63* (3.28)	248.91* (10.83)	174.54* (3.81)	233.81* (11.06)	238.63* (10.80)	-371.71 (0.13)	81.21 (3.67)	212.72* (19.85)	233.27* (12.94)
REM	80.72* (5.25)	72.06* (8.03)	-25.67* (3.69)	-22.89* (5.02)	0.21* (3.91)	0.15 (1.84)	255.55 (0.15)	-11.23 (1.11)	-3.25* (6.18)	-4.37* (5.83)
NFDI		-5.33* (3.90)		-16.77 (0.58)		-0.13 (0.77)		4.11 (1.04)		2.87 (0.85)
OPEN	-3.63* (7.39)	-0.94 (1.45)	6.06* (4.18)	7.13 (1.85)	-2.79* (16.80)	-2.91* (12.74)	-9.53 (0.14)	0.10 (0.13)	0.61* (3.09)	1.14* (3.76)
TOT	-1.11* (8.87)	0.30 (1.10)	-1.53* (6.78)	-7.71* (2.09)	1.03* (5.86)	1.12* (5.31)	2.54 (0.16)	0.13 (1.13)	-1.25* (9.41)	-1.68* (6.20)
GPOL	1.88* (3.00)	2.42* (2.00)	-4.90 (1.48)	-2.91 (1.02)	-0.005 (0.74)	-0.002 (0.25)	44.90 (0.15)	-4.22 (1.41)	-0.26 (0.45)	0.03 (0.05)

Note: Figures in parentheses represent absolute values of t-statistic. An asterisk (*) denotes significance at 5% level

Table 2b: Estimated Long Run Coefficients Based on Akaike Information Criterion:

Regressor	Country									
	China		*India*		*Lesotho*		*Mexico*		*Philippines*	
Intercept	256.61* (8.11)	113.63* (3.28)	248.91* (10.83)	174.54* (3.81)	219.13* (9.98)	224.66* (9.68)	86.77* (2.92)	81.21* (3.67)	221.04* (17.71)	245.24* (13.06)
REM	79.91 (1.05)	72.06* (8.03)	-25.67* (3.69)	-22.89* (5.02)	0.24* (4.36)	0.19* (2.25)	-17.80 (1.30)	-11.23 (1.11)	-3.27* (6.32)	-4.76* (6.32)
NFDI		-5.33* (3.90)		-16.77 (0.58)		-0.13 (0.81)		4.11 (1.04)		4.19 (1.12)
OPEN	-3.12* (4.16)	-0.94 (1.45)	6.06* (4.18)	7.13 (1.85)	-2.65* (14.39)	-2.78* (11.39)	0.70 (0.91)	0.10 (0.13)	0.60* (3.08)	1.09* (3.71)
TOT	-0.96* (4.73)	0.30 (1.10)	-1.53* (6.78)	-7.71* (2.09)	1.03* (6.17)	1.13* (5.55)	0.11 (0.76)	0.13 (1.13)	-1.34* (8.85)	-1.82* (6.59)
GPOL	1.62 (1.83)	2.42* (2.00)	-4.90 (1.48)	-2.91 (1.02)	-0.005 (0.74)	-0.001 (0.18)	-6.09 (1.50)	-4.22 (1.41)	-0.42 (0.73)	0.89 (0.99)

Note: Figures in parentheses represent absolute values of t-statistic. An asterisk (*) denotes significance at 5% level

Table 3a: Select Variables from the Error-Correction Model Based on Schwartz Bayesian Criterion

Regressor	Country									
	China		*India*		*Lesotho*		*Mexico*		*Philippines*	
ΔREM	3.88 (0.56)	17.85* (2.23)	-7.06* (2.16)	-24.45* (5.69)	-0.48* (2.44)	-0.51* (2.52)	-19.12* (3.47)	-12.96* (2.27)	-0.68 (0.55)	-3.05* (4.20)
$\Delta REM1$	-57.84* (5.00)	-67.34* (6.17)	2.65 (0.69)	-11.79* (3.24)					0.36 (0.28)	
$\Delta REM2$	-41.88* (4.63)	-64.90* (6.73)	-6.87* (2.00)	-18.79* (5.24)					3.00* (2.41)	
$\Delta NFDI$		2.01 (0.98)		5.06 (1.14)		-0.16* (0.77)		1.54 (0.89)		-2.82 (1.83)
$\Delta NFDI1$		9.27* (4.32)		15.98* (2.36)						
$\Delta NFDI2$				24.01* (3.01)						
EC_{t-1}	-1.00* (large)	-1.36* (12.09)	-0.46* (3.83)	-0.50* (3.35)	-1.24* (5.21)	-1.26* (5.19)	0.20 (0.15)	-0.37* (2.04)	-1.00* (large)	-0.70* (6.38)

Notes: $\Delta REM = REM_t - REM_{t-1}$, $\Delta REM1 = REM_{t-1} - REM_{t-2}$, and $\Delta REM2 = REM_{t-2} - REM_{t-3}$, and so on; EC_{t-1} denotes lagged error-correction term, and so on. Figures in parentheses represent absolute values of t-statistic. An asterisk (*) denotes significance at 5% level

Table 3b: Select Variables from the Error-Correction Model Based on Akaike Information Criterion

Regressor	Country									
	China		*India*		*Lesotho*		*Mexico*		*Philippines*	
ΔREM	0.93 (0.13)	17.85* (2.23)	-7.06* (2.16)	-24.45* (5.69)	-0.44* (2.25)	-0.47* (2.34)	-12.54* (2.22)	-12.96* (2.27)	-0.47 (0.38)	-1.72 (1.43)
$\Delta REM1$	-44.53* (3.15)	-67.34* (6.17)	2.65 (0.69)	-11.79* (3.24)	-0.26 (1.18)	-0.24 (1.06)			0.64 (0.50)	
$\Delta REM2$	-30.68* (2.70)	-64.90* (6.73)	-6.87* (2.00)	-18.79* (5.24)	-0.21 (1.17)	-0.23 (1.26)			3.07* (2.50)	
$\Delta NFDI$		2.01 (0.98)		5.06 (1.14)		-0.18 (0.82)		1.54 (0.89)		-2.26 (1.37)
$\Delta NFDI1$		9.27* (4.32)		15.98* (2.36)						-1.65 (1.19)
$\Delta NFDI2$				24.01* (3.01)						
EC_{t-1}	-0.77* (5.24)	-1.36* (12.09)	-0.46* (3.83)	-0.50* (3.35)	-1.30* (5.15)	-1.31* (5.12)	-0.29 (1.86)	-0.37* (2.04)	-1.00* (large)	-0.70* (6.56)

Notes: $\Delta REM=REM_t-REM_{t-1}$, $\Delta REM1=REM_{t-1}-REM_{t-2}$, and $\Delta REM2=REM_{t-2}-REM_{t-3}$, and so on; EC_{t-1} denotes lagged error-correction term, and so on. Figures in parentheses represent absolute values of t-statistic. An asterisk (*) denotes significance at 5% level