Article

ELRR

The Economic and
Labour Relations Review
2019, Vol. 30(1) 59–76

DOI: 10.1177/1035304619828560
journals.sagepub.com/home/elra
SAGE

Do emigrants' remittances cause Dutch disease? A developing countries case study

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Abstract

Although the positive socio-economic effects of remittances for recipient countries in the short term are unmistakable, inflows of remittances may at the same time exert adverse effects on the trade competitiveness of an economy, by appreciating the real exchange rate. This phenomenon is characterised as an instance of the 'Dutch disease' – the negative impact of windfall revenue inflows on the competitiveness of other tradable sectors and hence on overall economic growth. While the real effect of workers' remittances on real exchange rates in a recipient economy is still a controversial issue, several studies have analysed evidence for the existence of the 'Dutch disease' phenomenon in various sets of countries. The main objective of this study is to examine whether remittance flows have had any adverse effect on the international trade competitiveness of a selected group of developing countries during the period from 1995 to 2014. Using a one-step system Generalised Method of Moments specification within a simultaneous equation approach, it shows that remittance flows depreciate the real exchange rate at their levels and that the lagged value of remittances create the Dutch disease for this country group. In addition, we confirm that while trade openness and world real interest rates contribute to a depreciation in real exchange rates, gross domestic product per capita and net Official Development Aid inflows tend to appreciate real exchange rates. A policy implication is that trade liberalisation policies that lower tariff rates on capital imports and new export-oriented incentive programmes should be accompanied by measures designed to prevent appreciation

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in the real exchange rate: steps in this direction such as recent macroeconomic and prudential capital flow management initiatives are briefly referenced.

JEL Codes: F20, F21, F22, F23

Keywords
Exchange rate, international migration, remittances

Introduction

International trade and capital movements across countries have shown a dramatic increase since the 1990s, as developing countries have opened up their borders to the rest of the world. Many of those countries have come to perceive Foreign Direct Investment (FDI), Foreign Aid (FA) and Portfolio Investments (PI) as the most important options to finance new investments in various recipient economies. FDI, FA and PI are believed to influence a wide range of macroeconomic parameters, such as output measured as gross domestic product (GDP), level of employment, level of investment and the external trade competitiveness of the receiving country, through their effect on the exchange rate. On the contrary, large inflows of foreign currency sourced from FDI, FA or PI may lead to an appreciation of real exchange rates (RERs) and may therefore have an adverse effect on the competitiveness of the recipient country in the international market. This adverse effect of large inflows of foreign currency on the appreciation of RERs is known as the 'Dutch Disease', a term originally coined in *The Economist* (1977) in reference to the adverse impact on the competitiveness of the Netherlands' traditional tradable sector, of windfall revenue from post-1960s natural gas exports.

Since the 1990s, currency inflows have intensified as a result of economic globalisation, based on remittances from the increasing movement of migrant workers across national borders. As Żuk and Żuk (2017) note, 'residents and employees of periphery and semi-periphery areas move to other countries in search of better living and working conditions' (p. 98). International migration to seek employment has increased gradually over the years and shown a sharp rise since 2000. The United Nations Department of Economic and Social Affairs (UNDESA) sees remittances as an underrecognised source of sustainable development, noting that in 2017, over 200 million of 258 million people living abroad sent money home, and that in the Asia-Pacific region, remittances were worth 10 times the value of official development aid (UNDESA, 2018).

Three-quarters of total workers' remittances are sourced from the earnings of workers who have migrated from developing countries to developed countries. In fact, in recent years, workers' remittances have become the most important source of foreign exchange earnings for many developing countries. As remittances have come to exceed inflows of private capital (FDI and PI) in developing countries, and also exceed foreign aid, many scholars have begun to analyse their effects on the receiving countries' macroeconomic parameters, particularly on RERs. In contrast to private capital (FDI or PI), workers' remittances do not create external debt or obligations of future repayment. Also, unlike FA, they do not put pressure on national economies to meet political or economic

demands or to implement policies imposed by developed country donors. Thus, they are mostly assumed to be more stable and sustainable financial flows compared to any other capital flows. At the same time, large inflows of workers' remittances may lead to a re-allocation of resources from tradable production to non-tradable production and cause an appreciation of RERs. In return, they may reduce the competitiveness, particularly of the tradable goods sector, of the recipient economy in the international arena.

Hassan and Holmes (2013) have noted that 'the interacting effect of remittances inflow and the real exchange rate may differ in the long-run and short-run', because the undesirable effects of remittance inflows may be offset if such flows enhance capital accumulation by a rise in savings or investments in the long run. Furthermore, one may expect that repatriated earnings can be used to finance education and health expenses and therefore lead to higher amounts of investments such as in new hospitals or universities in the long run. On the other side, remittances may serve a de facto social safety net in difficult times so that recipient families in developing countries may use repatriated earnings to survive even in the long run. Therefore, we expect that developing countries typically feature mostly as poor or emerging markets in which households react to the higher disposable income by *consuming more and saving less, even in the long term*. In this context, one should not distinguish the long-run effects of remittances from short-run effects when studying the relationships between exchange rate equilibrium and remittances.

The main objective of this study is therefore to examine the effects of inflows of workers' remittances on the movements of RERs from 1995 to 2014. Doing so, we include 41 developing countries classified as low-income, upper middle-income and lower middle-income countries by the World Bank, 2018.[1] The study employs the Generalised Method of Moments (GMM) dynamic panel data model to examine the impact of workers' remittances on RER levels. The main contribution of the study to the literature is twofold: first, contrary to previous studies, it employs one-step system GMM dynamic panel data specifications to capture the endogeneity between exchange rate and workers' remittances and endogeneity, if any, between the exchange rate and other explanatory variables. Second, by applying appropriate econometric model specifications, this study is able to determine whether 'Dutch disease' is evident in any of the developing countries examined and to provide guidance for future policy formation.

The rest of the article is organised as follows: the next section 'Effects of remittances on the equilibrium exchange rate: Theory' provides a theoretical background to analysing the effects of remittances on the exchange rate equilibrium. Following this conceptual exposition, the third section 'Literature review: Conceptual origins' analyses previous works in the literature. The data and methodology used are presented in the fourth section. The fifth section 'Empirical results' interprets the study's empirical findings, while the last section 'Implications and concluding remarks' concludes the study by offering important policy implications.

Effects of remittances on the equilibrium exchange rate: Theory

Empirical investigations have traditionally used an equilibrium RER approach proposed by Edwards (1989). The equilibrium RER is defined as the relative price of tradable

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

goods to prices of non-tradable goods that simultaneously balances both external and internal equilibrium. The equilibrium RER can be shown mathematically as RER = PT / PNT where PT is the price of tradable goods and PNT is the price of non-tradable goods.[2] With respect to this definition, a fall in the RER implies a RER appreciation and a rise in the opportunity cost of producing non-tradable products. Conversely, a rise in the RER means a depreciation of RERs and a reduction in the opportunity cost of producing non-tradable products. Workers' remittances affect movements in the RER in two ways, known as the *spending effect* and the *movement effect*. Before examining the possible effects of remittances on exchange rate equilibrium through the *spending effect* and the *movement effect*, we need to make some assumptions. We consider first that the economy in the analysis is a small open economy with a fixed nominal exchange rate and flexible domestic wages and prices. Furthermore, we assume that the economy has two production sectors identified as tradable and non-tradable goods production sectors. And we assume that the fixed labour force can freely move from one sector to another sector.

The spending effect occurs when large remittance inflows increase the non-labour income of households in the recipient country. As the disposable income of resident households increases, they are likely to increase their demand for both tradable and non-tradable products. However, excess demand for both types of goods only affects the prices of non-tradable products, because these are subject to resource constraints in the domestic economy. As the price of tradable products is determined by the forces of supply and demand in international markets, higher domestic demand for tradable products therefore has no role in the determination of their final prices. In other words, higher household spending is likely to increase the price of non-tradable products without affecting the price of tradable products. Thus, the spending effect of remittance flows is expected to lead to an appreciation in the RER of the recipient country. Yet the magnitude of spending effects on exchange rate appreciation depends on the preferences of household' expenditures between traded and non-traded products. In other words, the share of traded goods in domestic absorption may weaken the effects of remittances on exchange rate appreciation. This means that, the more the increase in consumption induced by remittances is devoted to traded goods rather than non-tradable goods, the less the impact of remittance flows on exchange rate appreciation. However, it is possible that large flows of remittances could affect households' preferences over their consumption. When households' income increases, they are more likely to devote some part of their earnings to the traded goods sector rather than consuming all repatriated earnings in the non-tradable goods sector. It is the mere fact that the amount of imports is dependent on aggregate income and based on the marginal propensity to import that leads us to expect that the amount of imports increases as aggregate household disposable income increases. Thus, the *spending effect* may affect the degree of the country's involvement in the international market and increase its trade openness to the rest of the world. The *spending effect* therefore may also lead to depreciation in the exchange rate by affecting trade openness as the household's preferences change. Till now, we assume that remittances are exogenous. Yet, in real life, remittances may be endogenous and would be responsive to domestic household income. In other words, family members working abroad may remit less of their earnings when their relatives remaining behind experience

high household income, or they may repatriate more of their earnings when their relatives experience low household income. Under the assumption that remittances may be endogenous rather than exogenous, an RER appreciation due to large inflows of remittances (in the case of the existence of the Dutch disease) may increase the real income of households and thus reduce the amount of remittances in coming years. Thus, the 'Dutch disease phenomena' may weaken the effect of remittances on the exchange rate equilibrium in the coming years as well.

On the contrary, large amounts of remittance inflows lead to the re-allocation of restricted resources from the tradable to the non-tradable goods sector and create a *movement effect* in the recipient country. In other words, higher demand for non-tradable products make this sector more profitable compared to the tradable goods sector. Thus, domestic producers are likely to shift their resources from the tradable goods sector to the non-tradable goods sector. As a result, while production expands in the non-tradable goods sector, real wages of labour and other factor costs in the tradable goods sector rise and make total production costs in this sector higher in an international context. Therefore, the movement effect of remittance inflows may appreciate RERs and reduce the competitiveness of the tradable goods sector of the recipient country as the non-tradable sector expands. Yet, the shape of the Production Possibilities Frontier (PPF) curve determines the magnitude of movement effects on the RER equilibrium. A flatter PPF curve reduces the magnitude of the effect of remittances on exchange rate appreciation, while a steeper PPF strengths the effects of remittances on exchange rate appreciation. In other words, more open economies with flexible labour markets reduce the trade-off costs of factor movements between the traded and non-traded good sectors and thus diminish the effect of remittances on exchange rate appreciation. However, if a country experiences permanent changes in remittance receipt, the capitalised value of those receipts represents a change in its national wealth and is thereby likely to affect the risk premium of the country in the international capital market. In other words, countries experiencing permanent large flows of remittances face a declining risk premium in international capital markets, which in turn would reduce the interest rates in those countries. Thus, a decline in interest rates leads to capital outflows from the recipient country and may cause a *movement effect* from the non-tradable product sector to the tradable product sector which in turn would cause depreciation in the exchange rate.

Literature review: Conceptual origins

The first formal approach to the mechanism of the Dutch disease was provided by the seminal work of Corden and Neary (1982) that developed a theoretical model illustrating the Dutch disease hypothesis for a small open economy with a booming export sector. Earlier works by Keynes (1929a, 1929b) and Ohlin (1929) had discussed Germany's ability to pay reparations after the First World War and the Terms of Trade effect. This well-known discussion, known as the transfer paradox, identified a situation whereby a country *transferring* wealth to another ends up being better off than the recipient once prices reached their new equilibrium. It became a benchmark for discussing the welfare implications of workers' remittances. Analysis of more recent literature illustrating the effects of workers' remittances (external transfers) on RER movements in recipient countries provides mixed

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

evidence. Nevertheless, most of those studies are in favour of the existence of the Dutch disease phenomenon resulting from large flows of remittances.

Obstfeld and Rogoff (1996) claimed that transfers of remittances into a national economy not only causes appreciation of RERs but also reduces the diversification of exported goods. Wahba (1998), investigating the effect of natural resource prices and remittances on exchange rate appreciation in the Gulf States, concluded that the Dutch disease may result not only from a major resource discovery but also from large capital flows such as remittances. In a panel study of 13 Latin American and Caribbean countries, Amuedo-Dorantes and Pozo (2004) showed that a doubling of workers' remittances led to an appreciation in the REER (real effective exchange rate) by 22%.[3] Similarly, Bourdet and Falck (2006), in a study of the linkage between remittances and RER appreciation in Cape Verde at aggregate level rather than micro level, also identified the existence of the Dutch disease. Furthermore, studies by Fuentes and Herrera (2007), Lopez et al. (2007) and Acosta et al. (2009) attributed REER appreciation to the resource movement effect of workers' remittances in El Salvador, Guatemala, Mexico and a number of other Latin American countries. Barajas et al. (2010) applied a panel cointegration technique to data for a large set of countries and found that remittances appreciate the REER. Lartey et al. (2012) also demonstrated the existence of the Dutch disease for 109 countries between 1992 and 2003. Hassan and Holmes (2013) illustrated a long-run relationship between remittances and RERs for less-developed countries, providing empirical confirmation of a Dutch disease–type effect, and demonstrating a one-dimensional causal effect of remittances on exchange rates in the short run. Chowdhury and Rabbi (2014) investigated the effects of remittances on the external trade competitiveness in Bangladesh by employing a model incorporating Johansen Cointegration and Vector Error Correction for the period 1971 to 2008. They concluded that remittance flows significantly appreciate RER and deteriorate external competitiveness. Furthermore, Roy and Dixon (2016) examined the Dutch disease argument by employing a fixed effects panel data model for the four countries (Bangladesh, India, Pakistan and Sri Lanka) that received the largest portion of remittances from 2003 till 2012, again confirming the existence of the Dutch disease phenomenon in these countries. At the same time, they argued that while trade openness leads to a depreciation in the RER, the REER appreciation due to the large flows of remittances may be weakened by trade liberalisation. A recent study by Ito (2017) analysed the existence of the Dutch disease for Moldova by employing a vector autoregressive model from quarterly data for 2006 to 2014. He concluded that inflows of remittances led to appreciation in the RER, while he rejected the endogeneity of remittances with exchange rate movements, claiming that RER appreciation does not affect remittance flows.

Meanwhile, other earlier works have found little or no effect of workers' remittances on REER movements. Izquierdo and Montiel (2006) found mixed results when they performed a time series analysis of six Central American countries. Furthermore, a study by Özcan (2011) examined the relationships between workers' remittances and the REER in 10 developing countries, employing panel cointegration test. However, the study did not find any evidence supporting the Dutch disease effect in this country group. A study by Martins (2013) investigated the impacts of both Official Development Aid (ODA) and remittance flows on RER in Ethiopia by employing an Unobserved Components (UC) model. He additionally employed several cointegration approaches to test the robustness

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

of estimates and concluded that there is weak evidence that remittances are associated with RER appreciations. A recent work conducted by Prakash and Mala (2016) studied the relationship between remittances and the RER in Fiji by employing the Vector Error Correction Model (VECM) technique. They failed to find any effect of remittances on the RER in the long run and thus rejected the 'Dutch disease' effect of remittances. Nevertheless, they confirmed local currency appreciation due to large flows of remittances in the short run. At the end of the study, they concluded that large flows of remittances have been directed to investment to boost domestic capacity, putting little or no pressure on the domestic exchange rate in the long run. Additional studies by Athukorala and Rajapatirana (2003), Elbadawi et al. (2008), Issa and Ouattara (2004), Munemo et al. (2007), Nwachkwu (2008), Nyoni (1998), Sackey (2001) and Quattara and Strobl (2003) also found no evidence of a Dutch disease effect resulting from remittances or found that remittances may lead to depreciation in RER.

We propose a new approach, in an effort to resolve these conflicting results.

Data and methodology

Data

We have determined RER as the dependent variable to be analysed in this study. However, price data are not available for tradable and non-tradable goods; so we estimate RER by adjusting the nominal exchange rate of remittance-receiving countries for differences in the price levels of domestic and foreign goods, that is, $E(P_f / P_d)$, where E refers to the nominal exchange rate defined as the domestic price of foreign currency, and P_f and P_d are the foreign and domestic prices of goods and services. To calculate the RER, we follow the procedure suggested by Rodrik (2008) who claims that the nominal exchange rate, E, can be converted to RER by multiplying E by Purchasing Power Parity (PPP) conversion factors. PPP conversion factors measure the amount of foreign currency needed to buy the same goods in the domestic market. The RER can thus be defined mathematically as $(RER_{i,t} = E_{i,t} / PPP_{i,t})$. Instead of multiplying E by the PPP conversion factor, we have used the price level ratio of the PPP conversion factor to market exchange rate data, which is already available in the World Bank Data retrieval tool. Our RER definition used in this study then can be shown mathematically as $RER_{i,t} = PPP_{i,t} / E_{i,t}$. With respect to this definition, a fall in the exchange rate is referred to as RER depreciation, whereas a rise in the exchange rate is an RER appreciation. We have also incorporated the main explanatory variable of interest (worker's remittances) alongside other additional (control) variables expected to have interactions with remittance flows in affecting the RER movements through a *spending effect* or *movement effect* mechanism. Our explanatory variables are as follows: workers' remittances as percentage of GDP, lagged value of remittance flows as percentage of GDP to find out previous years' remittance inflows, long-term US real interest rates, openness index, GDP per capita, net ODA as a percentage of Gross National Product (GNP), Terms of Trade (TOT), Interaction term for Remittances and openness index and time dummies for the years 2008 and 2009 to capture the effect of the Global Financial Crisis (GFC) that emerged at the end of 2007 in the United States. All variables are measured in US dollars and taken from the World Bank data (www.worldbank.org),

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

except for the external interest rate which is obtained from Organisation for Economic Co-operation and Development (OECD) statistics (www.oecd.org). Short definitions of all the variables alongside their expected signs, and justifications for adding additional (control) variables are provided in the following sections.

Remittances as percentage of GDP (+/−). Remittances are large official transfers by migrant workers. They are expected to appreciate the recipient country's currency if they accelerate consumption of both non-tradable and tradable goods rather than contributing to saving and investment. We have also incorporated lagged values of remittance flows in order to figure out how previous remittance inflows affect the current years' exchange rate. The net impact of remittance flows on exchange rate movement is still a controversial and undetermined issue.

Long-term US real interest rate (+/−). The long-term real interest rate is used as a proxy to measure the world real interest rate. The world real interest rate is the major external fundamental in influencing the exchange rate equilibrium (Chowdhury, 2014; Edwards, 1989). A high world real interest rate may influence the external lending of a country and improve its creditor position with respect to the rest of the world and thus may appreciate RER. However, a high world interest rate may reduce domestic spending in the short term and cause relative prices of non-tradable products to decline. Thus, the world interest rate may depreciate the RER in the short run as well. Therefore, one may assume that the real effect of the world RER on exchange rate equilibrium is undetermined (see the studies of Bourdet and Falck, 2006; Hassan and Holmes, 2013).

Openness index (+/−). The openness index is simply calculated as export plus import ratio to GDP. Openness may depreciate the exchange rate if trade liberalisation is permanent. Tariff reductions may make domestic imports more cost effective relative to foreign imports. As foreign imports are substituted by domestic products, lower tariff rates are likely to depreciate the exchange rate as the amount of domestic consumption rises. Similarly, lower tariffs in capital markets reduce the cost of production in the tradable goods sector and increase the competitiveness of the country in the international market. For example, the studies of Martins (2013) and Roy and Dixon (2016) have found that an increase in the openness index causes a depreciation in the RER. Furthermore, greater openness in the capital market may affect the exchange rate in two ways: First, if controls on capital flows are relaxed, this will induce financial capital inflows into the country, which in turn will increase demand for and prices of non-tradable goods. The outcome of this liberalisation appreciates the exchange rate. Second, if openness in capital markets is adjusted to induce financial capital outflows in order to gain higher returns on financial investments, this will result in depreciation of the exchange rate. The openness index is incorporated into the model to capture the impact of trade liberalisation policy on the RER. And the real effect of the openness index on exchange rate equilibrium depends on trade policies, so it may be considered as undetermined and conditional.

GDP per capita (+/−). GDP per capita is used as a proxy for differential technological progress. Technological progress is expected to be greater in the traded goods sector of

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

the economy relative to the non-traded goods sector. Technological progress increases productivity and efficiency in the tradable goods sector and leads to a re-allocation of resources from the non-traded goods sector to the traded goods sector. Higher productivity and availability of resources lowers costs and price in the tradable goods sector and thus may cause exchange rate depreciation. (Chowdhury and Rabbi, 2014; Hassan and Holmes, 2013; Roy and Dixon, 2016). In this situation, the supply effect of technological progress offsets the demand effects according to the Rybczynski principle (Edwards, 1989: 48). However, technological progress (proxied by higher GDP per capita) may appreciate the exchange rate, if advances in technological progress raise income and demand for non-tradable goods and lower the prices in the tradable goods sector relative to those in the non-tradable goods sector. In this case, the demand effect of technological progress outweighs the supply effect, a phenomenon known as the Ricardo–Balassa effect (Edwards, 1989: 136). Thus, we expect that the effect of GDP per capita on the exchange rate equilibrium is ambiguous and undetermined.

Net official development aid (net ODA) as Percentage of GNP (+/−). According to the World Bank (2018) definition,

> Net official development assistance (ODA) consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients.

Net ODA constitutes another foreign capital inflow, and ODA is expected to affect the exchange rate in a similar way as remittances. Thus, net ODA as a percentage of GNP is incorporated into the model to capture the effects of foreign capital inflows apart from remittances on exchange rate movements (see Bourdet and Falck, 2006; Prakash and Mala, 2016; Roy and Dixon, 2016).

TOT (+/−). TOT is defined as the price of exports relative to imports. As the relative price of exports increases, this may cause re-allocation of resources from the tradable goods to the non-tradable goods sector. Thus, higher TOT may lead to higher demand for and prices of non-tradable goods, which in turn appreciates the exchange rate. However, an increase in TOT will raise purchasing power, so that consumers shift from consuming exportable or non-tradable goods to consuming importable goods. This will in turn reduce prices in the non-tradable goods sector and may cause RER depreciation (Chowdhury, 2004; Chowdhury and Rabbi, 2014; Edwards, 1989; Hassan and Holmes, 2013; Martins, 2013).

Interaction Term for Remittances and Openness index (+). Remittance inflows are non-labour income of households, which increase the purchasing power of migrants' families remaining behind. As the disposable income of domestic households increases, they may devote a larger portion of their income to importable goods rather than consuming non-tradable goods. That may in turn reduce prices in the non-tradable goods sector and

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

Table 1. Summary and descriptive statistics.

Variables	Observations	Mean	Standard deviation
Real exchange rate	820	0.3799	0.1334
Remittances as percentage of GDP (%)	820	4.9893	5.9992
Long-term US real interest rate (%)	820	3.8585	2.1329
Openness index (%)	820	73.5726	35.8621
GDP per capita	820	30.5390	27.6679.
Net ODA as percentage of GNI (ODA) (%)	820	2.4665	3.6830
TOT	820	0.9737	0.3518

GDP: gross domestic product; GNI: gross national income; ODA: Official Development Aid; TOT: Terms of Trade.

depreciate RER. Thus, one may assume that trade liberalisation may weaken the appreciation effect of the RER caused by remittance inflows. Hence, we have incorporated an interaction term for remittances and the openness index, in order to capture the contribution of trade liberalisation in alleviating the exchange rate appreciation effects of remittances inflows (see Roy and Dixon, 2016).

As Table 1 indicates, there are no missing observations in our dataset. Furthermore, the openness index and GDP per capita are the most volatile variables, with standard deviations around 35.8621 and 27.6679, respectively. The high standard deviation value of the openness index displays that there is variation across countries in terms of trade liberalisation policies. Moreover, the high standard deviation value of the GDP per capita variable reflects the dissimilar levels of development in countries variously classified by the World Bank as low-income, upper middle-income and lower middle-income countries.

Methodology

We have employed the dynamic panel data model of GMM estimator suggested by Arellano and Bond (1991) and Blundell and Bond (1998), which is designed to address potential endogeneity issues. As we noted in the theoretical section, remittance flows are strongly expected to be an endogenous variable rather than exogenous. Thus, while remittance flows may have the power to affect exchange rate movements, changes in the exchange rate may affect the remittance flows as well. Furthermore, endogeneity problems may also arise between the exchange rate dependent variable and other explanatory variables. Thus, use of the GMM dynamic panel data model is an appropriate technique to reduce omitted variable biases in static panel models, the omitted variable being the one period of lag of the dependent variable, accounting for endogeneity due to the introduction of the lagged dependent variable as a regressor. The main principle of this method is based on the utilisation of the orthogonality conditions that exist between lagged values of $Y_{i,t}$ and the error term $\varepsilon_{i,t}$. Lagged values of $Y_{i,t}$ can serve as valid instruments provided that they are orthogonal to the disturbances $\alpha_{i,t}$ as suggested by Arellano and Bond (1991). This is a valid approach as long as the error term is serially

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

uncorrelated and the lags of the explanatory variables are weakly exogenous. This standard approach is called GMM in differences (GMM-dif) since the instruments used for equations in differences are in level form (the variable without applying the difference operator). Alternatively, lagged first differences of $Y_{i,,t}$ can serve as additional instruments as proposed by Arellano and Bover (1995) and Blundell and Bond (1998), particularly when the Arellano and Bond estimator might perform poorly due to the existence of large autoregressive parameters or persistent explanatory variables. Under such circumstances, they have shown that the lagged levels of the variables become weak instruments.

The usage of these additional instruments leads to what is described as GMM system estimation (GMM-sys). With the inclusion of extra instruments, although we inevitably create additional moment conditions associated with both first differenced and level forms, we are thus able to reduce biases and imprecisions by incorporating additional information. In other words, the GMM system estimator combines an estimator in first-difference with an estimator in levels. The inclusion of a levels equation allows the use of information on cross-country differences, which is otherwise impossible to exploit using the difference estimator. While many disappointing features of the standard GMM-dif approach can be overcome by GMM-sys, this may also come at a cost as the time dimension grows, since with the resulting increase in the number of instruments, the power of the tests may weaken. However, the costs of this trade-off between efficiency and power of tests may be alleviated by adopting Roodman's (2009) instrument reduction technique by way of imposing lag limits and collapsing the instrument matrix. Consequently, we have adopted the GMM-sys approach. Hence, all equations prefixed as GMM denote the GMM system estimation results. Our main GMM system specification takes the form of

$$\begin{aligned} RER_{i,t} &= \alpha_{0t} + \alpha RER_{i,t-1} + \beta_1 Remittances + \beta_2 Interest + \beta_3 Openness \\ &+ \beta_4\, GDP + \beta_5 ODA + \beta_6 TOT + \beta_7 Interaction + \eta_i + \varepsilon_{i,t} \end{aligned}$$

where the subscripts i and t denote countries (cross sections) and time series, respectively, and RER represents a dependent variable, while RER_{t-1} represents the lagged value of the dependent variable. Furthermore, Remittances, Interest rates, Openness, GDP and ODA, TOT and Interaction terms represent the explanatory variables incorporated into the specification. Finally, η_i is a country-specific effect which is unobservable, and ε is an error term which is time variant.[4]

Empirical results

By employing dynamic panel data from 1995 to 2014, we have estimated two GMM system specifications to investigate the relationship between recipient country RER movements and workers' remittance inflows. One-step GMM system estimation results are prefixed as Sys-GMM1 and Sys-GMM2. Table 2 presents the one-step GMM system estimation results including its post-estimations (Arellano Bond Test for AR(2) and Hansen Test statistics) at the bottom of the table. As clearly seen from the post-estimation

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Table 2. Estimation results.

Variables	Sys-GMM1	Sys-GMM2
RER_{t-1}	0.8532 (0.000)**	0.8817 (0.000)**
Remittances	−0.0069 (0.024)*	−0.0096 (0.002)**
$Remittances_{t-1}$	0.0088 (0.004)**	0.0093 (0.003)**
Long-term US real interest rate	−0.0010 (0.289)	−0.0018 (0.017)**
Openness index	−0.0001 (0.034)*	−0.0001 (0.025)*
GDP per capita	0.0008 (0.001)**	0.0006 (0.025)*
Net ODA	0.0006 (0.313)	0.0008 (0.046)*
Terms of trade	−0.0062 (0.625)	−0.0078 (0.546)
Interaction term	____	0.00001 (0.387)
Dummy for 2008	0.0230 (0.000)**	0.0222 (0.000)**
Dummy for 2009	−0.0414 (0.000)**	−0.0419 (0.000)**
Fixed effect	0.6833	0.6886
OLS	0.9202	0.9300
Wald χ^2 = Prob > χ^2 =	4842.2 (0.000)**	7004.21 (0.000)**
Arellano–Bond test for AR(2)	0.062	0.074
Hansen test	0.690	0.718
Number of instruments	42	43
Number of observations	779	779

OLS: ordinary least squares; GDP: gross domestic product; ODA: Official Development Aid; RER: real exchange rate; GMM: Generalised Method of Moments.
The probability values of the standard errors are in parenthesis.
**1% significance level; *5% significance level.

results, no second-order autocorrelation can be detected in the error terms, nor do over-identification problems emerge in terms of the number of instruments. To ensure the robustness of our estimates, the estimate for the coefficient of a lagged dependent variable should lie between the fixed effect (FE) and ordinary least squares (OLS) estimates. These are provided in the bottom part of each table, and the values of the coefficients of the lagged dependent variables for each one-step GMM system model do, indeed, fall between the FE and OLS estimates.

As seen from Table 2, the main difference between Sys-GMM1 and Sys-GMM2 specifications is that the former does not include interaction term for remittances and openness index, while the latter includes all the variables. At first glance, it is clearly seen that Sys-GMM1 and Sys-GMM2 estimators produce similar results in terms of the sign of the coefficients and their significance level in affecting exchange rates, except for the long-run US real interest rate and net ODA variables.

Since both estimators (Sys-GMM1 and Sys-GMM2) have passed the robustness check, we can rely on the estimation results of both GMM specifications in interpreting the empirical findings.

Turning back to the empirical findings, we have found that the RER is negatively correlated with remittance flows at their levels, while it is positively correlated with the lagged value of remittance flows. In other words, a rise in current years' remittance flows tends to depreciate the RER, while the lagged value of remittance flows is likely to

https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press

appreciate RER. This interesting result shows that recipient families tend to use the current year's remitted earnings first for savings or investments such as education or health expenses, which in turn depreciates the RER. Under the assumption that those remittance flows are endogenous variables rather than exogenous, a fall in the value of real income of domestic households due to the depreciated RER in the current year raises the expectations of households for higher remitted earnings in the coming years. Thus, recipient families are likely to use the rest of the previous year's remitted earnings for consumption on traded and non-traded goods sector in the current year, which in turn appreciates the RER. Thus, our main finding points to the existence of the 'Dutch disease' due to the lagged value of remitted earnings.

With respect to the linkage between the RER and additional explanatory variables, we have empirically shown that the RER is negatively correlated with the long-term US real interest rate and openness index, while it is positively correlated with GDP per capita and net ODA. In other words, a rise in the world interest rate or openness index leads to a depreciation in the RER, while a rise in GDP per capita or net ODA causes appreciation in the RER. Interpretation of the results in terms of the relationship between external and internal factors and the RER can be elaborated as follows: A rise in the world interest rates as an external non-policy variable may reduce the consumption and therefore demand for non-tradable goods sector in the short run and then lead to the capital outflows to gain return on capital outside of the country. As the capital outflows increase, this will reduce the relative price of non-tradable goods to tradable goods and in turn depreciates the RER. Within a short time, capital outflows are thus predicted to create a reverse effect on the RER compared to the effects of capital inflows on the RER.

Moreover, we have shown that an increase in the openness index leads to a depreciation in the RER. Internal liberalisation policies only depreciate the RER if lower tariff rates lead to an increase in the consumption of domestic products rather than foreign imports, or higher liberalisation in the capital market induces investors to shift their capital flows outside of the country to earn high rate of return on their investment. As an outcome of liberalisation policies, higher domestic imports and capital outflows are likely to reduce the demand for and relative prices in the non-tradable goods sector flowing on in turn to the tradable goods sector, which may lead to depreciation in the RER.

On the other side, as an internal non-policy factor, we have found that GDP per capita tends to cause an appreciation in the RER. As noted in the data section, this outcome may be results of the Ricardo–Balassa effect, which occurs when the demand effect of technological progress outweighs the supply effect. Thus, technological advances in the traded goods sector may raise income and thus increase demand for non-tradable goods and lowers the relative price of tradable goods sector to non-tradable goods sector. Furthermore, we have found that the net ODA, which is again an external policy factor, may appreciate the RER. Net ODA affects the RER in the same way as remittance inflows do. If large flows of net ODA are used for consumption purposes rather than savings or investments that boost the economy, they tend to raise the demand for and price of non-traded goods relative to prices and demand in the traded goods sector, with the likely result of an appreciation in the RER.

In addition, in terms of time dummies, we have found that while the year of 2008 appreciates RER, the year of 2009 leads to depreciation in the RER. The GFC, emerging at the

end of 2007 in the United States, affected developed and developing countries in 2008 and 2009. As the US economy experienced a huge recession in its economy, it reduced the level of imports from its trading partners. As a result, most of the developing countries experienced a fall in their exports. This in turn induced investors to shift their resources from the traded goods sector to the non-traded goods sector. Re-allocation of restricted resources from the traded goods sector to non-traded goods sector creates a *movement effect*, which in turn increases factor prices in the traded goods sector and thus reduces the competitiveness of the country in international markets. We can therefore easily argue that the GFC has led to RER appreciation in this country group through the *movement effect* mechanism.

Finally, the study could not find any effect of the TOT and interaction terms for remittance inflows and the openness index on the RER movement in this country group.

Implications and concluding remarks

While various theoretical and empirical studies have analysed whether the 'Dutch disease' exists or not, an apparent consensus in the extant literature reveals that previous studies are still controversial and inconclusive. Thus, the main objective of this study has been to investigate the impact of remittance inflows on the RER in 41 developing countries for the period 1995 to 2014. The novelty of the study is twofold. First, by employing a one-step GMM system dynamic panel data method, we were able to treat remittance inflows as an endogenous variable rather than an exogenous variable. This means that remittance inflows and the exchange rate may interact with each other simultaneously. It is important because previous remittance inflows may determine the volume of the following remittance inflows in the coming years. Second, by employing an appropriate technique, we are able to predict whether the 'Dutch disease' exists or not in a particular country group and to provide guidance for future policy formation.

Our main findings reveal that the RER is negatively correlated with remittance inflows but positively correlated with the lagged value of remittance inflows repatriated to the recipient families. Remittance inflows first depreciate RER. For example, if recipient families devote most of the repatriated earnings to tradable goods rather than non-tradable goods, this may lead to a movement effect from the non-tradable goods sector to the tradable goods sector which in turn may cause a depreciation in the RER. But the depreciation in the RER reduces the real value of domestic households' income, which in turn induces migrants to remit more of their earnings to their relatives in coming years. Thus, expectations of larger remittance flows in coming years are likely to lead recipient families to use the rest of the previous years' remittances inflow for consumption, in both the non-traded and traded goods sectors in the current year. In turn, this response creates a 'Dutch disease' impact in the market. A 'Dutch disease' phenomenon deteriorates the welfare of a society by reducing the competitiveness of this country group in the international market and reduces the overall gains coming from international market. With respect to the effects of external and internal factors on the RER, we have found that the long-run US real interest rate, representing the world real interest rate, and the openness index depreciate the RER, while GDP per capita and net ODA appreciate the RER.

Based on our empirical findings, we indicate possible policy responses. Trade liberalisation policies should be adjusted to lower tariff rates on capital imports which in turn

reduce the cost of exportable goods in international market and make the sector more competitive. Furthermore, liberalisation in capital markets should be adjusted to reduce net capital inflows and to induce capital outflows in search of higher returns on financial investment. For example, capital controls should be re-designed by policy makers to manage international transfers into the country – see, for example, the capital flow management policy framework canvassed by the International Monetary Fund (IMF) (2012), which includes a range of macroeconomic and prudential measures. In addition, governments of capital-recipient countries could provide new export-oriented incentive programmes to investors that reduce the production cost of the traded goods sector. A national and international policy framework is a necessary recognition that remittances and labour migration are two sides of the same coin.

Acknowledgements

We are indebted to the two anonymous reviewers of an earlier version of the manuscript for providing insightful comments and directions for additional work which has resulted in this article.

Funding

Dr. Rodríguez received financial support for the research and publication of this article from the SGS project no. SP2018/151 entitled '*The role of migration and the knowledge economy in developing and emerging economies, Faculty of Economics, VSB TU Ostrava*'.

Notes

1. The developing countries are listed as follows: Albania, Argentina, Armenia, Azerbaijan, Bangladesh, Bolivia, Botswana, Brazil, Cameroon, China, Colombia, Congo Rep., Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, Honduras, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Kyrgyz Republic, Macedonia, Malaysia, Mexico, Morocco, Nepal, Nigeria, Pakistan, Panama, Peru, Philippines, Senegal, Sri Lanka, Thailand, Tunisia, Turkey and Yemen Republic.
2. If real exchange rate (RER) indexes between countries are stable over time, relative Purchasing Power Parity (PPP) is thought to hold. Note that Ghosh (2018) argues that the use of exchange rates based on PPPs to compare country incomes tends to overstate both the relative income levels of poorer countries, and their improvement in income levels over time
3. A country's real effective exchange rate (REER) is the average of nominal bilateral RERs between a country and its trading partners, weighted using the trade allocation of each partner and adjusted for inflation.
4. The consistency of this estimator is contingent upon specification tests. The main test, also called the J test, was developed by Hansen (1982) and is a test of over-identifying restrictions. If the instruments are jointly valid under the null hypothesis, the empirical moments have zero expectations, such that the J statistic is distributed as a χ^2 with the degrees of freedom being equal to the degree of over-identification. The other test checks the null hypothesis of no serial correlation of the differenced error term. In this test, a large p value is indicative of an appropriate specification of the model.

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https://doi.org/10.1177/1035304619828560 Published online by Cambridge University Press