Workers’ Remittances and Real Exchange Rate in Bangladesh: A Cointegration Analysis

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Abstract: Workers’ remittances have an ever important role as one of the major sources of foreign exchange earnings for the Bangladesh economy. It accounts for over 12 per cent of GDP in 2010 and having colossal socio economic implications for the country. Using Cointegration an Error Correction model, this paper attempts to contribute to the literature by investigating the effects of increasing flow of remittances on the real exchange rate of the country.

Our results suggest that the influx of workers’ remittances significantly appreciating the real exchange rate by lowering the relative prices tradables to nontradables of the country compared to its major trading partners. While the fundamental variables including technological progress and improvement in terms of trade are having the similar adverse effect on the tradables sector, openness in goods and capital market depreciate the real exchange rate. Therefore, trade openness and nominal devaluation along with other domestic policies can be powerful policy devices to improve the external competitiveness of the country while diverting the valuable flow of remittances to the priority investment areas away from nontradable sector to avoid the Dutch Disease in the country.

JEL code: F24, F31, O10

Keywords: Remittances, Real exchange rate, Dutch disease, Bangladesh, Cointegration, Error Correction Model.
Introduction

The global flow of migrant workers and the workers’ remittances has been increasing significantly over the past decade which renewed the attention and interest of the researchers, observers and policy makers to study the implication of this ongoing phenomenon in the pinnacle of globalisation. Although people moving across the boundary of their own country in search of job and repatriating income is not a new phenomenon, the movements of migrant workers and inflow of remittances have been a significant feature of the services trade of the developing countries since the mid 1970s. From the mid 1980s, the rapid increase in the inflow of remittances becomes a salient feature of globalisation. The estimated flow of global remittances in 2010 reached at US$ 440.1 billion of which developing countries accounted for US$326 billion (World Bank, 2011). It is believed that a large part of remittances remains unrecorded and it could be as large as 50 to 200 per cent of the officially recorded remittances (Aggarwal et al., 2006). USA is the major source of remittances followed by Saudi Arabia (World Bank, 2011). Workers’ remittance is one of the major sources of foreign exchange earnings and it exceeded private capital flows and foreign aid to the developing countries (World Bank, 2006).

Although the primary motive to remit is allude to as altruism, repayment of loans and self interests including savings and investment are also cited as important reasons in the literature. Remittances make a significant socio-economic contribution through both direct and indirect channels on different sectors of an economy, and eventually on the growth of the economy (Durand et al., 1996, Mundaca, 2005, Aggarwal et al., 2006; Gupta et al., 2009, Rao and Hassan, 2010). The flows of remittance are more stable than other types of private capital inflows and generally are counter cyclical, as the flows increase during economic downturns as emigrant workers want to provide financial support to the family members in the country of their origin (Sayan, 2006). Therefore, remittances act as a significant macroeconomic stabiliser in the developing countries.

South Asia secured about 25 per cent of remittances on average among the developing countries in 2010. In fact, the region experienced an increase in remittances in absolute value of $82.6 billion, which exceeded the net private capital inflow of $80.7 billion to the region in 2010. Although the flow of remittances trickled down during the global economic meltdown in 2008-09, yet it displayed resilience and did not fall as much as it was expected initially. In 2008, Bangladesh accounts for
about 2.5 per cent of the global remittances and about 13.5 per cent of the total remittances coming to South Asia.

Bangladesh is one of the leading remittance recipient countries as the export earnings of labour services growing at a speedy rate from the early 1990s. The flow of remittances has become one of the largest foreign exchange earners for the country. Remittances income increased from low $24 million in 1976 to over $11.1 billion in 2010 and accounts for 12% GDP of the country. These large inflows of remittances are having numerous economic and development effects for Bangladesh. Some concerns have been raised due to the massive nature of the inflows since the early 2000s as the contribution of the workers’ remittances is having profound impact on the external trade balance. Like any other net capital inflow, the flow of remittances may potentially lower the trade competitiveness by allocating resources from the tradables to non tradables sector and appreciate the real exchange rate of the country. This phenomenon is known as the Dutch Disease in the literature. Therefore, the objective of the paper is to analyse the effects of remittances on trade competitiveness to assess whether the economy of Bangladesh has been adversely infected by the disease.

The paper is organised as follows: Section II presents the literature review on the effect of remittances; Section III illustrates the flow of remittances to Bangladesh economy over the past three and a half decades; Section IV discusses the methodology and the data employed to study the long-run effect of remittances on the real exchange rate of the country. Section V presents the result of the empirical study and Section VI draws the conclusion of the study.

II Literature Review

Majority of the existing studies illustrate the welfare gains from the outflow of migration and inflow of remittances for the recipient countries, especially for the developing countries. Literature on the topic indicates that the remittances flow not only have growth enhancing potential but by reducing poverty level, increasing schooling attendance, improving health, augmenting savings and providing the investment funds, encouraging the entrepreneurship and defusing technological knowledge promoting the long run growth of the developing countries. Nonetheless, the magnitude of the inflow of remittances may pose number of challenges for the recipient countries.
The recent trail of debates on welfare implications of workers’ remittances has its roots in the original discussions of adverse macroeconomic effect of external transfers by Keynes (1929) and Ohlin (1929). Neary (1988) indicates the possible appreciation of real exchange rate due to inflow of transfers, which was empirically confirmed by Michaely (1981) showing how the transfer of aid impacts on the structure of an economy by changing the relative prices of tradables to nontradables sectors. Over the last two decades, remittances became one of the major external transfers for the developing countries. Majority of the current studies illustrate the positive, direct and indirect, growth effect of remittances inflow especially for the developing countries using cross country data (Beck et al., 2004; Ratha, 2003, Giuliano et al., 2006; Gupta et al. 2009, Barajas et al., 2009, Chami et al., 2003; Rao and Hassan, 2010).

Earlier studies illustrate mostly the positive effects of remittances on economic growth through increased consumption, savings and investment (Chowdhury, 1990, 1991, Chowdhury and Chowdhury, 1992, Solimano, 1993, Durand et al., 1996, Glytsos, 2003). Durand et al. (1996) illustrates that the ‘migra-dollars’ increase economic activities and create higher level of employment, investment and income within the specific communities as well as for the whole nation of Mexico. Various studies (Cornelius, 1990; Massey and Parrado, 1998; Massey and Parrado, 1994) indicate that an overwhelming portion of remittances are used for consumption rather than on productive investment in Mexico. A number of other studies (Adam, 2005, Taylor et al., 2005) also find significant positive poverty alleviation effects of remittances flow on developing countries. Adam (2005) and Taylor, et al. (2005) conclude that the remittances reduce both the level and severity of poverty in Guatemala and Mexico respectively. World Bank (2006) finds that remittances reduce poverty level by 6 per cent in Bangladesh, 5 per cent in Ghana, 11 per cent in Uganda. Ratha (2009), in a cross country analyses, also indicate that a 10 per cent increase in remittances reduce poverty by 3.5 per cent. In contrast, Barajas et al. (2009) did not find any direct effect of remittances on poverty situation of developing countries. Chami et al. (2003) find a negative effect of remittances on economic growth as it reduces the incentive to work by the migrant family members while using a large sample of countries.

In spite of the extensive investigations of the welfare enhancing role of remittances to developing countries, the literature on macroeconomic effects of remittances on the recipient countries is sparse. The enormity of the flow of remittances may cause significant real exchange rate appreciation and lower the external trade competitiveness of the country by increasing the relative price of nontradables to tradables and is termed as Dutch Disease theory in the literature. The theory suggests that the inflow of transfers due to resources boom, foreign aid, foreign direct investment as well as workers’ remittances may bring along with it a significant resource allocation effect on the economy and reduces the competitiveness of the tradables sector. This in turn lowers the long run growth of the developing countries (Rodrik, 2008) in a less diversified tradable sector with weak institutional supports. Obstfeld and Rogoff (1996) illustrate that the transfers in the form of remittances not only reduces the competitiveness of a country by appreciating the real exchange rate, it also reduces the diversification of the exported items. In a panel study of 13 Latin American and Caribbean countries, Amuedo-Dorantes and Pozo (2004) show that a doubling of workers’ remittances appreciated the real exchange rates by 22%. Various other studies (Acosta et al., 2009; Fuentes and Herrera, 2007; Vargas-Silva, 2009; Lopez et al., 2007) also indicate the resource movement effect from tradables to nontradables sector and subsequent appreciation of real exchange rate due to influx of remittances in El Salvador, Guatemala, Mexico and in a number of Latin American countries respectively. However, in a panel study of a large set of countries, Barajas et al. (2010) concludes that the appreciation of real exchange rate becomes weaker as the openness, domestic factor mobility and countercyclical effect of remittances gets restricted. Bourdet et al. (2006) also mentions that the appreciation of real exchange rate and its effect on the trade competitiveness tends to get weaker in the long run as the long run mechanism works in the opposite direction of the spending effect.

Since remittances income accounts for a significant share of GDP for Bangladesh and the exportable sector is yet to be diversified to take the advantage of its relatively cheaper labour cost, we attempt to investigate whether remittances flow has any adverse effect on the international trade competitiveness of the country.

III Trend in Remittances to Bangladesh

Prior to the World War II, a substantial migration had taken place from Bangladesh to Burma which was then a thriving economy. Mahmood (1991) reported that as far back as in 1942 Bangladeshi nationals had migrated to the port cities of London and Liverpool in United Kingdom and obtained
British citizenship by naturalisation after staying four to five years. Also a limited number of Bangladeshi workers had taken up employment in Saudi Arabia and Qatar mostly by individual initiatives during 1960s. However, after the independence of Bangladesh in 1971, pattern of workers’ migration changed dramatically. Several delegations from the Middle East visited Bangladesh to recruit workers between 1972-75. Bangladesh government created the Bureau of Manpower, Employment and Training (BMET) to devise policies to export manpower in a coordinated manner and keeping the systematic records of flow of migration and remittances (Chowdhury and Chowdhury, 1992). The recorded migration of workers between 1976 and 2009 is 6.68 million, with yearly migration being 6,087 in 1976 and 875,055 in 2008.

From the early 2000s, Bangladesh has emerged as one of the major manpower exporting countries in the South Asia and the flow of remittances is increasing at an ever faster rate. Remittances income exceeded 4 times higher than the total aid and 9 times the foreign direct investment (FDI) received by the country (Siddiqui 2009). Globally, Bangladesh is the 6th largest remittances recipient country and ranked 19th positions in terms of its share of remittances to GDP in 2009 (Ratha, et al., 2010).

The flow of remittances increased steadily from US$24 million in 1976 to US$1949.2 million in 2000 and started to play a key role in the economic development of the country. However, from 2001, the trend shows a dramatic increase of 400 per cent to US$9689.3 million in 2009 and US$11.1 billion in 20101 (Bangladesh Bank, 2010). While the flow of remittances slowed down quite rapidly in the region as a result of global financial crisis, the flow of remittances grew robustly by 24 per cent in Bangladesh during 2009. Remittances account for 95 per cent of current transfer, equivalent to 62 per cent exports and could finance 48 per cent of imports value in 2009 (Bangladesh Bank, 2009). As a result the share of remittances to GDP increased to about 11 per cent, equivalent to 96.4 per cent of government revenue in 2009 and has been supporting the current account surplus over the last 4 years from 2006. Remittances raised the credit-worthiness of the country similar to many emerging economies. Bangladesh is rated as BB- for long term and B for short term by the Standard and Poor’s Investor Service and Ba3 by the Moody’s Investor Service for the first time in April 2010 (The Financial Express, 2010). The steady and strong share of remittances to GDP has been taken into account by the rating agencies in their rating decision (Ratha, et al., 2010).

1 Data for 2010 is up to May of financial year 2009-2010.
The contribution of remittances to the economy would have been much higher if the unofficial flow of remittances could have taken into account. A large portion of remittances are still coming into the country through informal channels.

According to the World Bank (2006) while 46 per cent remittances are coming into the country via formal channel and 54 per cent of remittances are coming through different avenues like hand carried by friends and relatives and hundi\(^2\) system.

The sources of remittances to Bangladesh are changing over time. Migrant workers are mainly employed by MENA\(^3\) countries, South East Asian countries, as well as by Australia, UK, US, Italy, Japan, Germany and South Korea. Traditionally about 50 per cent of remittances income originated from Kingdom of Saudi Arabia (KSA). KSA still tops the list, employing 1.5 million Bangladeshi workers and paying about US$3 billion, followed by United Arab Emirates (UAE) with US$1.8 billion, USA with US$1.5 billion, Kuwait with US$935 million and UK comes fifth with US$790 million in 2009 (Bangladesh Bank, 2010).

\(^2\) Hundi or hawala is an old informal way of transferring money or settling account believed to be originated in India.

\(^3\) The term MENA refers to 20 member countries of Middle East and North African Countries.
Between 1976 and 2008, over 6.5 million people are recorded to leave the country for foreign employment. Among them about 50 per cent are unskilled, 16 per cent semi-skilled, 31 percent skilled and only about 3 per cent professional (BMET, 2009). A recent study (Hugo, 2009) reveals that the estimated stock of migrant workers from Bangladesh is about 2.1 million. Between 1978 and 1989, on average yearly 52000 workers left for overseas employment, mainly to the Middle Eastern countries. During 1990s, Bangladeshi workers started going to South East Asian countries, namely, to Malaysia and Singapore for taken up employment. The number of total migrant increased four times to 205000 workers per year between 1990 and 2000 from its previous decade. New labour markets for Bangladeshi workers has open from 2001 including USA, United Kingdom (UK), some East European countries, Italy, Brunei, Mauritius, Japan, South Korea and Russia. Yearly outflow of Bangladeshi workers in 2000s doubled from the previous decade to 410000 workers yearly (Raihan, et al., 2009). In 2008, recorded 875055 people migrated for overseas jobs UAE employed the highest number of Bangladeshi migrant workers equivalent to 48 percent of total, followed by KSA and Malaysia, about 15 per cent each and 6 per cent by Singapore.

In 2008, recorded 875055 people migrated for overseas jobs of which 32 per cent were skilled, 16 per cent semi-skilled and 52 percent unskilled (Siddiqui, 2009). Bangladeshi workers are predominantly male, only about 4.5 per cent of them are female in 2008. It is believed that the presence of a large number of female workers to the Middle East and Asian countries remains undocumented (IMO, 2009).

The outflow number of migrant workers to South East Asia and the Middle East has dropped significantly in 2009 caused by aftermath of global financial crisis. The total number of workers left for overseas jobs decreased to about 50 per cent from its previous year to 475000 in 2009 as the major employer countries, namely, UAE, KSA, Malaysia and Singapore were restricting inward employment. However, KSA and Malaysia refrain from retrenching the Bangladeshi workers after high level negotiations which has stabilised the decline in the number of out-going migrant workers. It is interesting to note that despite the decline in the number of migrant workers, the flow of remittances was strong in 2009 which indicates the robustness of remittances flow in the face of global financial and economic crisis.
IV Empirical Model and Data

In attempt to examine the effect of remittances flow on the external trade competitiveness we specify the model as follows:

\[ RER_t = \alpha + \beta_1 REM_t + \beta_2 X_t + \epsilon_t \]  

(1)

where, \( t \) is the time period between 1971 to 2008, Remi is the key explanatory variable referring to the ratio of remittances income to GDP. Remittances are the current transfers that are sent by the non-resident workers from overseas countries. This also includes the transfers sent by the migrants who are employed and resident of another country. The vector of control variables, \( X_t \), is assuming to have possible impact on the financial sector’s development of the country and \( \epsilon_t \) is the error term.

International price competitiveness, which is usually measured by the real exchange rate (RER) of a country, has an important role determining export performance in economic analysis. The growth of tradables sector depends on the costs and prices of tradables, which in turn, determines the demand for tradables domestically as well as internationally. The ability to reduce the cost of tradables, hence offering tradables at a lower price than its competing countries supplying exports in the world market, not only attracts the foreign buyers away from its competitors but also increases the export volume and reduces the imports by lowering the price of import substitutes for the domestic consumers. This, in turn, improves the current account balance and adds to economic output and growth. Since price competitiveness is one of the key factors that have a great influence on the export performance of a country, this study attempts to analyse the effect of remittances on the real exchange rate of Bangladesh.

The relationship between remittances flow and RER is ambiguous since increased flow of remittances may impact differently on the RER through consumption, savings and investment choices by the recipient families on the economy. Inflow of remittances may increase the consumption by the recipient families on the non tradables sector, or reduce their work leisure choice, which may increase the relative price of nontradables to tradables and appreciate the real exchange rate of the country. On the other hand, the flow of remittances may increase the saving and investment efforts by recipient families, lowers the resource gap and raises investment in education, health and small business. This in turn will lower the relative price of nontradables to tradables and improves the international competitiveness of the country.
The above model incorporates the real and nominal factors affecting the observed RER both in the short and long run. The “fundamentals” or the real variables affect the equilibrium RER in the long run whereas the nominal variables impact on the RER only in the short run. Following the literature (Edwards, 1989; Montie, 1999; Edwards and Savastano, 1999, Froot and Rogoff, 1995), the vector of control variables, $X_t$, consist of government expenditure to GDP (GEX), terms of trade (TOT), technological progress (TP), openness in goods market (Gopen), openness in the capital market (Kopen), and nominal variables including money supply and nominal devaluation. The movement of the real exchange rate from its sustainable long run position due to changes in real variables has significant consequences for policy evaluation as it can imply either gain or loss of external competitiveness. Increase in government expenditure (GEX) increases the demand for nontradables if the major portion is spent on nontradable goods and services. In the short run this excess demand for nontradables bids up their price and results in RER appreciation. However, there will be depreciation of the RER if the larger share of government expenditure is spent on the tradable sector rather than on consumption of nontradables. Thus, the sign of this variable can be either positive or negative in relation to RER movements.

The overall effects of terms of trade (TOT) on the real exchange rate are ambiguous. The price of tradables is a weighted average of the price of exportables and importables. TOT may have two different effects on the real exchange rate, namely, income and substitution effects. The income effect results when an increase in export prices, or a fall in import prices, raises the income of an economy and increases demand for nontradables. This, in turn, tends to reduce the relative price of tradables to nontradables and appreciates the RER. On the other hand, the substitution effect can be observed due to relative cheapness of nontradables. An improvement in TOT due to an export price increase brings about a RER depreciation for given levels of nominal exchange rate and nontradable prices.

Openness in goods and capital markets (Gopen and Kopen) expects to depreciate the RER. Increased openness in the goods market (Gopen) by reducing the trade restrictions in form of tariff and quota lowers the relative price of tradables to nontradables and improves the competitiveness of a country in the external trade. A reduction in tariff makes the domestic import substitutes more cost effective and cheaper. Lower tariffs on capital imports also reduce the cost price of tradables and make the tradables sector more competitive. Openness in capital market (Kopen) by relaxing capital controls may affect the movement of RER in either way. If liberalisation of capital control increases net
capital inflow, it leads to expansion in the monetary base. This raises current expenditure over income and increases the demand for and prices of nontradables, resulting in an appreciation of the equilibrium RER. A fall in world real interest rates or a rise in international transfers, such as foreign aid, remittances flow, also affects the equilibrium RER in a similar way to net capital inflow. However, if the openness in capital market induce capital outflow in search of higher return on financial investments or reduces the resource gap in the tradable sector, then the relative price of nontradables to tradables falls causing a real appreciation.

The non-policy domestic fundamental variable, namely, technological advancement (TP measured by GDP per capita), generally increases the efficiency and productivity of the tradable sector. Increased productivity induced by technological progress increases factor availability. By reducing the cost and price of tradables, increased productivity makes the tradable sector more competitive and tends to depreciate the RER of the sector. In this situation, supply effects of technological progress offset the demand effects according to the Rybczynski principle (Edwards, 1989:48). But if the advancement in technology increases income, which, in turn, increases demand for nontradables and reduces the relative price of tradables to nontradables, there will be a real appreciation. In this case, the demand effects of technological progress are greater than the supply effects and this is known as the Ricardo-Balassa effect (Edwards, 1989:136).

In order to maintain a sustainable macroeconomic equilibrium in an open economy, fiscal and monetary policies must be consistent with the exchange rate regime. Misalignment of the real exchange rate occurs due to inconsistencies between macroeconomic policies and the official exchange rate policy. Domestic policy decisions can have short run effect on RER of a country via changes in money supply and devaluation of nominal exchange rate.

Expansionary monetary policy raises the real stock of money, increasing demand for both tradable and nontradable goods and financial assets. The excess demand for tradable goods results in a higher trade deficit and loss of international reserves, whereas the increased demand for nontradables raises their price and lowers relative price of tradables to nontradables and appreciate the real exchange rate. The over-valuation of the RER, which is a fall in the actual real exchange rate from its long run equilibrium, will be short-lived and the economy adjusts through reduction of the money stock. Adjustment of the nominal exchange rate (devaluation/revaluation) could be one possible strategy to speed up this readjustment. In the case of an over-valued real exchange rate, a nominal devaluation
reduces the stock of money and thus reduces the real value of financial assets. This induces expenditure reducing effects, by reducing expenditures on both tradable and nontradable goods. A nominal devaluation also induces expenditure switching effects by switching expenditure away from tradables. It tends to increase the production of tradables, since given the price of tradables; the exportable sector is more competitive following a devaluation. This depreciates the RER resulting in an expansion of the export sector. Expenditure switching effects tend to increase the demand for nontradables but expenditure reducing effects may reduce their price. Therefore, following a nominal devaluation, the demand for nontradables increases and the price falls to re-establish equilibrium in the nontradable market, and this induces a real depreciation.

IV Variable Definition and Measurement

The real exchange rate model in equation (23) is estimated over the sample period 1971-2008 using annual data. The annual data for 1971 to 2008 is used for this study are obtained from the various World Bank data sources, including World Development Indicators, International Financial Statistics (from IMF), which have been transformed and used to construct annual data series by the authors. The most data series are measured in natural logarithms and expressed in ratio to GDP except for technological progress, TP, which is measured as real per capita GDP of Bangladesh measured in US dollar following Amuedo-dortes and Pozo (2004).

The definition of real exchange rate focuses on the rate at which tradables are exchanged for nontradables (Salter ratio), or the cost of domestically produced tradables. Since the exact counterpart of prices of tradables and nontradables are not directly observable, the common practice is to construct a real exchange index where the trade-weighted nominal exchange rate (\(e_{TW}\)) is deflated by the ratio of foreign price (\(P_f\)) to the domestic price (\(P_d\))\(^4\) (Chowdhury 2004). In this study, nominal effective exchange rate is defined as the cost of one trade-weighted average of Bangladesh’s major trading partners’ currencies in terms of Bangladesh currencies. Thus a depreciation of Bangladesh’s nominal effective exchange rate reduces foreign currency price of Bangladesh goods, increasing the demand for exports and leading to an expansion of Bangladesh’s export sector.

\[ RER = e_{TW} \frac{PPI_f}{GDP_{deflator}} \]

\( RER \) is the trade-weighted nominal effective exchange rate, \( PPI_f \) is the producer price indices of major trading partners (United States, China, Germany, Singapore & Japan in 2000) of Bangladesh and GDP deflator is used for the domestic price of nontradables.

\(^4\) RER = \( e_{TW} \frac{PPI_f}{GDP_{deflator}} \), where \( e_{TW} \) is the trade-weighted nominal effective exchange rate, \( PPI_f \) is the producer price indices of major trading partners (United States, China, Germany, Singapore & Japan in 2000) of Bangladesh and GDP deflator is used for the domestic price of nontradables.
A number of issues relating to data availability should be mentioned. One of the major obstacles faced was the non-availability of annual data for most of the real exchange rate fundamentals. External TOT is the only real variable for which data are readily available and the variable can either appreciate or depreciate the RER depending on income and substitute effect of it. Therefore, some proxies had to be constructed to estimate the real exchange rate equation. Government expenditure is included in the model as a ratio of GDP (GEX). Thus, the actual sign of GEX can be either positive or negative depending on its share in the nontradable or tradable sector.

It is difficult to find a good proxy for trade policy due to the non-availability of consistent and longer period data on tariff rates or tariff revenues as a proportion of imports. The standard practice in the literature is to proxy exchange and trade controls by the degree of openness of the economy. This is given by the expression \([X+M]/Y\] and used as an indicator of trade openness in the goods market (Gopen). Openness in capital market (Kopen) is proxied by the ratio of net official development assistance and foreign direct investment to GDP ((NODA+ FDI)/GDP). Openness in both goods and capital market can have either positive or negative sign with RER movement. Technological progress (TP) has been used as an explanatory variable to capture the Ricardo-Balassa effect on the equilibrium RER and is proxied by the real GDP per capita\(^5\). According to this hypothesis, productivity improvement in rapidly growing economies tends to be concentrated in the tradable sector and usually accounts for an appreciation of RER through increasing the income and price of nontradables (Balassa, 1964). The short run policy variables, namely, nominal devaluation (ND) is measured as the change in the nominal effective exchange rate and the money supply is measured as ratio of M2/GDP of Bangladesh.

**IV.1 Methodology: Cointegration and Vector Error Correction Model**

In this study we employ the Cointegration and Vector Error Correction model to examine both the long and short run effects of remittances flow (Remi) on the real exchange rate (RER) of Bangladesh. As mentioned in the earlier section, other control variables included in the model are government expenditure (GEX), terms of trade (TOT), technological progress (TP), openness in goods market (Gopen), openness in capital market (Kopen), and two nominal policy variables nominal devaluation (ND) and change in money supply (Money).

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\(^{5}\) This is admittedly a weak proxy because factor accumulation itself can increase GDP with little technical progress.
Johansen Juselius (JJ) (1990) Vector Error Correction Model (VECM) has been adopted for the empirical analysis of the study due to its stronger ability to incorporate the potential long run dynamic relation and better forecasting power. Regression analysis produces efficient estimates if the variables are stationary i.e., I(0). If the explanatory variables are consistently and significantly reflected by the dependent variable RER in the long run, then these variables are cointegrated\(^6\). If the variables are not cointegrated in the long run, then we may conclude that RER is independent of remittances flow and other control variables.

As a prerequisite of the cointegration analysis, the presence of persistence trends in the data are tested for a unit root. We begin with the unit root test for all the variables under study using Augmented Dickey Fuller (ADF), Dickey Fuller GLS (GLS AD) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests\(^7\). The results of the tests with constant and trend are reported in Table 1. We found that all variables used in this study are non-stationary in level, i.e., they are not I(0), however, all time series are integrated in order one, I(1), or stationary in their first differences.

Table 1 here.

Following the stationarity test, the presence and number of cointegration are examine by JJ (1990) Likelihood Ratio statistics (LR) and Trace test procedure, which suggest the existence of long run relationship between the dependent variable (RER) and remittances flow (Remi) and other independent variables. Different versions of the real exchange rate model can be represented by the following equation:

\[
RER_t = \lambda_0 + \beta_1 \text{Remi}_t + \beta_2 \text{GEX}_t + \beta_3 \text{TOT}_t + \beta_4 \text{TP}_t + \beta_5 \text{Kopen}_t + \beta_6 \text{Gopen}_t + \beta_7 \text{ND}_t
\]

\[+ \beta_8 \text{MS}_t + \epsilon_t \quad --- \quad --- \quad (2)\]

where, the variable definitions are as before.

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\(^6\) If the null hypothesis of nonstationary residuals is rejected, the long run equation is considered to be cointegrated.

\(^7\) For KPSS test, if the null hypothesis of stationary residuals is accepted, the long run equation is considered to be cointegrated.
V Econometric Results

The results of alternative versions of equation 2 are presented in Table 2. Our results show the long run elasticities relating to the key explanatory variables and their t-ratios along with JJ (1990) Cointegration test. It appears from the JJ test that we reject the null hypothesis of no cointegrating vector based on the sufficiently large values of the test statistics. The test results indicate the presence of at least one cointegrating vector for all equations at 1 per cent significance level based on maximum likelihood ratio test and trace test. Since, the variables are cointegrated in the long run; there exists an error correction mechanism which brings together the long run relationship with its short run dynamic adjustments. In all the cases, the eigen-value statistics drop sharply for last alternative hypotheses. Thus, we can conclude that our model is a fair representation for most of the cases.

Table 2 here.

The value of RER is normalized to one. Our results suggest the remittances flow is having significant adverse effect on the trade competitiveness (RER) of Bangladesh as expected by the analytical model. Our results are consistent with the notable studies in the literature (Amuedo-Dorantes and Pozo, 2004; Lartey et al., 2010 and Acosta et al., 2009). A one percentage point increase in Remi reduces the RER by 0.62 (equation 2.1) and 0.13 (equation 2.2) and 0.25 equation 2.3) percentage point. The result suggests that the increasing influx of remittances is having a significant Dutch disease effect in Bangladesh by appreciating the real exchange rate of the country.

The other coefficients of the explanatory variables are also indicating the expected signs in most of the equations. In all equations it is found that the openness in both goods and capital market are positively impacting on the RER and improving the competitiveness of the country in the external trade sector. Empirical results also suggest that the size and significance of capital openness is prominent on real exchange rate of Bangladesh in all equations, which is also expected by the theoretical model. Increased technological progress (TP) measured by per capital GDP of the country is indicating Balassa-Samuelson effect of real exchange rate appreciation (equation 2.1), however the effect is not significant at the 5% level. Improved TOT is also indicating a real exchange rate appreciation while having a significant negative relationship with the RER in equation 2.2. Income effect of TOT might have outweighed the substitution effect in Bangladesh as the less diversified export sector is not able to use the opportunity of higher terms of trade. Interestingly, the government expenditure, Gex, (equation 2.3) is indicating a positive effect on the RER of Bangladesh and improving the trade competitiveness of the country in the long run. In all equations, the dummy
variable representing the structural brake in the remittances flow from 1989 is having significant negative impact on the RER and suggesting an appreciation of RER.

Table 3 here.

The final parsimonious dynamic Error Correction Model of real exchange rate is reported in Table 3 together with the most common diagnostic tests. The coefficients of the first differenced regressors indicate the influences of the explanatory variables on RER in the short run. The results are satisfactory and indicate that all equations perform well. The lagged error correction terms for all equations are statistically significant at 1 per cent level and having the expected negative sign indicating that there is a cointegrating relationship between the dependent and independent variables. The value of the error correction term in all equations suggests that in the absence of other intervention, actual real exchange rate converges at the rate of about 30% to its long run equilibrium. In the short run, flow of remittances indicates the real appreciation of the exchange rate, although they are not significant in all equations. Both goods and capital market openness are having positive short run effect on RER. We included two nominal determinants of RER in the short run equation to examine the policy effect on the RER of the country. Our results indicate that nominal devaluation facilitate the real devaluation of exchange rate (equation 3.3) in the short run as expected by the analytical model, whereas, excess money supply is not having any significant effect on RER of the country.

**VI Summary and Conclusion**

This study has shown the effect of increasing flow of workers’ remittances on the real exchange rate behaviour in Bangladesh. Although the migrant workers away from home work hard to save and send the major portion of their income to their country of origin to support the families and improve the standard of living, ironically, the inundation of foreign exchange may create Dutch Disease in the country. Our results suggest that the escalating flow of remittances is happen to be detrimental to the tradable sector including the exportable sector of the country as it appreciates the real exchange rate by reducing the relative price of tradables to nontradables. Although the technological progress of the country indicates Balassa Samuelson effect of loss of competitiveness due to technological progress, but the result is not statistically significant. Furthermore, an improvement in the external TOT seems to appreciate real exchange rates. However, government expenditure, openness in goods and capital
markets are facilitating the improvement of international competitiveness as they depreciate the real exchange rate of the country in the long run.

It is prevalent from our study that the flow of remittances is having adverse effect on the competitiveness of the country despite its positive socio economic effects which may augment the domestic savings and reduce the resource gap. It is found that the policy variables significantly affect the real exchange rate of the economy over the study period. Government of Bangladesh has to design and implement policies to divert this valuable flow of remittances to the priority areas of investment away from the nontradables sector. In particular, a nominal devaluation indicates a re-establishment of the real exchange rate in the short run can be a powerful device to improve the trade competitiveness of the country.
### Table 1: Unit Root Test

<table>
<thead>
<tr>
<th>Test</th>
<th>LNRER</th>
<th>LNREMI</th>
<th>LNNER</th>
<th>LNGOPEN</th>
<th>LNKOPEN</th>
<th>LNGEX</th>
<th>LNTOT</th>
<th>LNMS</th>
<th>LNTP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Order of Integration</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(0)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
</tr>
<tr>
<td></td>
<td>Order of Integration</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
</tr>
<tr>
<td>KPSS</td>
<td>Level</td>
<td>0.1364</td>
<td>0.1759</td>
<td>0.2082</td>
<td>0.20</td>
<td>0.17</td>
<td>0.1315</td>
<td>0.1382</td>
<td>0.1592</td>
</tr>
<tr>
<td></td>
<td>1st Difference</td>
<td>0.1081**</td>
<td>0.2077***</td>
<td>0.005</td>
<td>0.007**</td>
<td>0.08**</td>
<td>0.0875**</td>
<td>0.1510***</td>
<td>0.1023**</td>
</tr>
<tr>
<td></td>
<td>Order of Integration</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
<td>I(1)</td>
</tr>
</tbody>
</table>

Note: *, ** and *** indicate *No Unit Root* at 10%, 5% and 1% respectively.
**Table 2: Johansen’s Cointegration Test: Long Run Estimation**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Alternative</th>
<th>( \lambda )-Trace</th>
<th>( \lambda )-max</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{lnRER} )</td>
<td>( r = 0 )</td>
<td>( r = 1 )</td>
<td>0.61</td>
<td>100.99*</td>
</tr>
<tr>
<td>( \text{lnREMI} )</td>
<td>( r \leq 1 )</td>
<td>( r = 2 )</td>
<td>0.50</td>
<td>68.22</td>
</tr>
</tbody>
</table>

\( \text{lnRER} = -0.62 \text{ lnREMI} - 1.86 \text{ lnTP} + 1.73 \text{lnGopen} + 2.71 \text{lnKopen} - 2.15 \text{ Dummy} \) --- (2.1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Alternative</th>
<th>( \lambda )-Trace</th>
<th>( \lambda )-max</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{lnRER} )</td>
<td>( r = 0 )</td>
<td>( r = 1 )</td>
<td>0.78</td>
<td>131.55*</td>
</tr>
<tr>
<td>( \text{lnREMI} )</td>
<td>( r \leq 1 )</td>
<td>( r = 2 )</td>
<td>0.65</td>
<td>77.46</td>
</tr>
</tbody>
</table>

\( \text{lnRER} = -0.13 \text{ lnREMI} - 0.75 \text{ lnTOT} + 0.30 \text{ lnGopen} + 0.75 \text{ lnKopen} - 0.44 \text{ Dummy} \) --- (2.2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Alternative</th>
<th>( \lambda )-Trace</th>
<th>( \lambda )-max</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{lnRER} )</td>
<td>( r = 0 )</td>
<td>( r = 1 )</td>
<td>0.80</td>
<td>137.21*</td>
</tr>
<tr>
<td>( \text{lnREMI} )</td>
<td>( r \leq 1 )</td>
<td>( r = 2 )</td>
<td>0.61</td>
<td>79.90</td>
</tr>
</tbody>
</table>

\( \text{lnRER} = -0.25 \text{ lnREMI} + 0.91 \text{ lnGex} + 0.51 \text{ lnGopen} + 1.11 \text{ lnKopen} - 0.82 \text{ Dummy} \) --- (2.3)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Alternative</th>
<th>( \lambda )-Trace</th>
<th>( \lambda )-max</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{lnRER} )</td>
<td>( r = 0 )</td>
<td>( r = 1 )</td>
<td>0.80</td>
<td>137.21*</td>
</tr>
<tr>
<td>( \text{lnREMI} )</td>
<td>( r \leq 1 )</td>
<td>( r = 2 )</td>
<td>0.61</td>
<td>79.90</td>
</tr>
</tbody>
</table>

Notes: Trace test indicates 1 cointegrating equation at the 0.05 level

Max-eigenvalue test indicates 1 cointegrating equation at the 0.05 level.

i) *demotes rejection of the hypothesis at the 0.05 level

ii) Mackinnon-Haug-Michelis (1999) p values are used

iii) Figures in parenthesis represent the t-statistics.
Table 3: Error Correction Model for Remittances Flow and Financial Development in Bangladesh 1970 - 2008

<table>
<thead>
<tr>
<th>Variables</th>
<th>Equation 3.1 (\Delta \ln RER_{t-1})</th>
<th>Equation 3.2 (\Delta \ln RER_{t-1})</th>
<th>Equation 3.3 (\Delta \ln RER_{t-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM(_{t-1})</td>
<td>-0.31*** ((-2.46))</td>
<td>-0.38** ((-1.85))</td>
<td>-0.28*** ((-3.61))</td>
</tr>
<tr>
<td>(\Delta \ln \text{Remi}_{t-1})</td>
<td>0.14 ((-1.94))</td>
<td>0.03 ((-0.49))</td>
<td>-0.05 ((-0.83))</td>
</tr>
<tr>
<td>(\Delta \ln \text{TP}_{t-1})</td>
<td>-0.56 ((-0.77))</td>
<td>---</td>
<td>-0.78 ((-0.98))</td>
</tr>
<tr>
<td>(\Delta \ln \text{Gex}_{t-1})</td>
<td>---</td>
<td>---</td>
<td>-0.28 ((-1.39))</td>
</tr>
<tr>
<td>(\Delta \ln \text{TOT}_{t-1})</td>
<td>---</td>
<td>0.15 ((1.33))</td>
<td>---</td>
</tr>
<tr>
<td>(\Delta \ln \text{Kopen}_{t-1})</td>
<td>-0.06 ((-0.48))</td>
<td>0.16* ((1.71))</td>
<td>0.13 ((1.41))</td>
</tr>
<tr>
<td>(\Delta \ln \text{Gopen}_{t-1})</td>
<td>0.43 ((2.28))</td>
<td>0.45** ((2.05))</td>
<td>---</td>
</tr>
<tr>
<td>(\Delta \ln \text{Dev}_{t-1})</td>
<td>0.33 ((1.03))</td>
<td>-0.34 ((-1.03))</td>
<td>0.73** ((2.14))</td>
</tr>
<tr>
<td>(\Delta \ln \text{MS}_{t-1})</td>
<td>0.09 ((1.15))</td>
<td>0.001 ((0.007))</td>
<td>-0.01 ((-0.09))</td>
</tr>
<tr>
<td>Constant</td>
<td>0.02 ((0.49))</td>
<td>-0.02 ((-0.95))</td>
<td>1.96 ((1.27))</td>
</tr>
<tr>
<td>Adj. R(^2)</td>
<td>0.21</td>
<td>0.34</td>
<td>0.27</td>
</tr>
<tr>
<td>F-stat</td>
<td>2.58**</td>
<td>2.16**</td>
<td>2.82**</td>
</tr>
<tr>
<td>Akaike AIC</td>
<td>2.78</td>
<td>2.61</td>
<td>2.86</td>
</tr>
</tbody>
</table>

Notes: i) *, ** and *** indicate significant at 10%, 5% and 1% levels respectively

   ii) Figures in parenthesis represent the t-statistics.
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