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A Cross-Country Investigation of Foreign Aid and Dutch Disease: Evidence from selected SAARC Countries

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The efficacy of foreign aid inflow with regards to dictating the development of the recipient nations is often questioned in the light of the Dutch disease problem whereby a surge in such inflows tend to appreciate the respective real exchange rates of the recipient nations,bottlenecking their export competitiveness. Against this prelude, the main aim of this paper is to investigate the causal relationship between FAID inflow and RER movements in context of the four SAARC countries that have been traditionally dependent on foreign development assistance. The countries considered in this paper include Bangladesh, India, Pakistan and Sri Lanka. The econometric model is structured using a multivariate framework incorporating annual time series data of all these four nations from 1980 to 2014. Following Edwards (1989) and Montiel (1999), real exchange rates were expressed as country-specific functions of foreign aid and other real fundamentals as control variables. Augmented Dickey-Fuller unit root test, Johansen cointegration test, vector error correction model approach and Granger causality test are considered. Thecorresponding results reveal that both in the cases of Bangladesh and India, the inflow of foreign aid in the form of official development assistance isstatistically insignificant in explaining the movements in the respective real exchange rates, neither in the short run nor in the long run. A possible reason behind this similarity could be the fact that the central banks in both these nations managed to maintain a strong grip over their exchange rates which worked as a cushion against RER misalignments and avoided Dutch disease problems in these countries. In contrast, foreign aid inflows are found to stimulate appreciative pressures on the real exchange rates of Pakistan and Sri Lanka, imposing the threats of potential Dutch disease problems within these nations.

JEL Codes: F30, F31, F35, F41

Keywords: Dutch disease, real exchange rate, foreign aid, appreciation, causality
Field of Research: International Economics

1. Introduction

The causal associations between Foreign Aid (FAID) inflow into a developing nation and its local bi-lateral Real Exchange Rate (RER) has been one of the utmost imperative fields of research for economists and policymakers across the globe. Different researchers have taken different stands portraying the possible nature of the FAID-RER nexus. The motivation behind this paper has been drawn from the fact that it is even more crucial to examine the FAID-RER relationship from the perspective of underdeveloped nations, merely due to their vulnerability to unfavorable RER movements following a surge in the inflow of foreign capital in the form of FAID and other possible sources. Such causal examinations also provide the basis for questioning

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the aid-effectiveness phenomenon. This is because, according to conventional economic development theories, it is ideal for all developing nations to invite inflow of FAID and other sources of foreign finances that would fill in the resource gaps experienced by the developing nations.

The main objective of allowing inflow of FAID into the underdeveloped nations is to supplement their national savings that have historically been inadequate to finance the investments necessary for achieving economic development. Thus, effective utilization of FAID in productive sectors within the recipient nations has been empirically acknowledged to spawn positive externalities on the economies of the underdeveloped nations in particular. Conversely, a sudden rise in inflow of foreign currencies in the form of FAID and other sources of foreign finance has also been witnessed to adversely affect the economies of the aid-receiving countries, commonly referred to as the Dutch Disease problem.

According to Van Wijnbergen (1986), a rise in the inflow of foreign currency can stimulate a rise in the price of non-tradable goods relative to that of tradable goods within the host country[i], leading to an appreciation of its RER leading to the Dutch Disease phenomenon. According to Barder[ii] (2006) Dutch disease can be referred to as an appreciation in the real exchange rate, of the aid-recipient country, following huge inflow of foreign currency whereby causing harm to the long run economic growth prospects of the nation. This relationship is of immense significance since an appreciation of the real exchange rate will lead to an adjustment in the sectoral composition of output, which may contradict the growth strategy pursued by the host country. For instance, a real exchange rate appreciation is synonymous with loss of export competitiveness of the host nation leading to a fall in its volume of exports. Such scenario is even more detrimental for developing countries like Bangladesh those follow export-led economic growth strategies[iii]. Dutch disease is of immense concern for policymakers since it curbs the effectiveness of the impacts FAID might have on the host economy.

Empirical studies addressing the factors influencing RER movements are crucial for policy-making purposes in the context of countries that are predominantly reliant on respective export sectors, to which Bangladesh is no exception. This is because of the fact that fluctuations in RER movements can disrupt international trade strategies and transactions which ultimately would work as a constraining factor upholding economic development in the aid recipient nations. The effectiveness of FAID inflow with respect to RER movements has been featured in several studies over the years but the results reflected ambiguity with respect to different countries of origin. However, the indispensable role of foreign finance in stimulating economic development in the underdeveloped world is unquestionable. As a result, the examining the effects of such inflows on macroeconomic indicators concerning the host nations is an important agenda of the respective governments in those countries.

The main aim of this paper is to investigate the causal relationships between FAID inflow and RER in context of selected SAARC enlisted countries that are traditionally dependent on foreign development assistances. To the best of knowledge, there have not been many previous studies addressing the intra- South Asian FAID-RER nexus. This paper fills this gap by taking four South Asian nations into consideration which includes Bangladesh, India, Pakistan and Sri Lanka covering the time period 1980 to 2014. The following questions are specifically addressed in this paper:

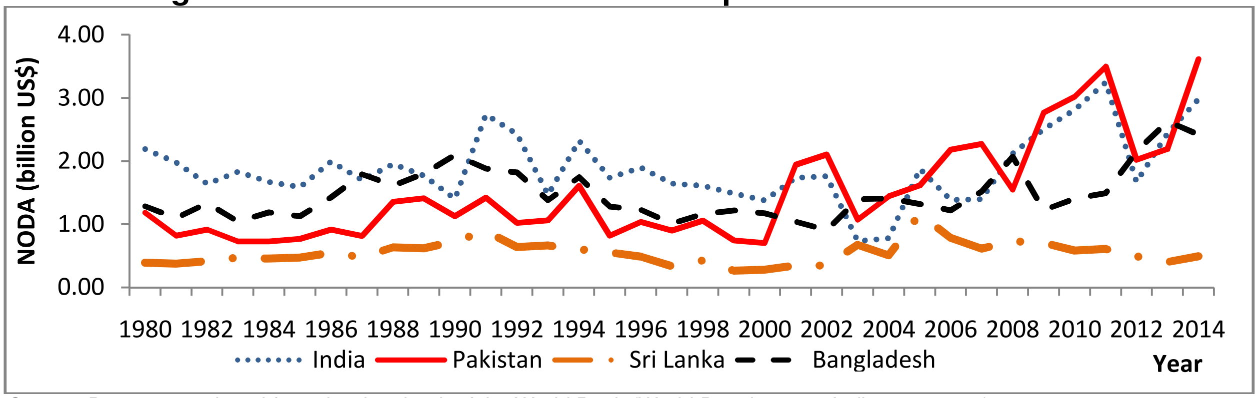
(a) Is there any causal influence between FAID inflow and RER response in the four South Asian countries?
(b) What are the directions of causalities between the variables considered in the study?
(c) Is there any evidence of the Dutch Disease problem within the South Asian region?

The results in this paper suggest that the export rate regime is an important factor in preventing RER appreciations and controlling any possible Dutch Disease impacts arising from a surge in FAID inflow. The remainder of the paper is as follows. The next section provides a brief overview of the histories of FAID inflows in all the four countries considered in this paper. Section 3 sheds light on the review of existing literature in relevance to this paper. Section 4 discusses the empirical model used in this paper and provides information on the sources and units of the data used. The types of econometric methodologies considered in this paper are discussed in section 5. Section 6 provides the empirical results found from the several tests performed. Finally, concluding remarks are made in section 7.

2. An Overview of Net Official Development Assistance Inflows and Real Exchange Rate Movements in the Group of the South Asian Countries

Inflow of FAID in the form of Net Official Development Assistance (NODA) in the selected SAARC member nations has mostly exhibited a positive over the period of 1980 to 2014 as shown in Figure 1. In the 1980s, the total volumes of NODA inflows in Bangladesh, India, Pakistan and Sri Lanka were USD 1.287 billion, USD 2.186 billion, USD 1.181 billion and USD 0.387 billion respectively (World Bank 2016). In the context of Bangladesh, the volume of NODA inflow projected an overall upward trend between 1980 and 1992 depicting a growth of 2.41%.However, figure 1 also portrays the fact that in 1993 the country experienced a fall in its NODA inflows which more or less continued till 2002. From the post-2002 period onwards, Bangladesh regained its upward trend with regards to the inflow of NODA from multilateral international donor countries that have extended financial assistance in developing the country. Bangladesh has always been a recipient of foreign assistance from its proven friends across the world. Recently, in the latter part of 2016, the Chinese president's visit to Bangladesh has promised development assistance worth USD 21 billion in the form of aid and loan. On the other hand, compared to the other three nations, India in the past has managed to pull a relatively greater volume of NODA into its economy.

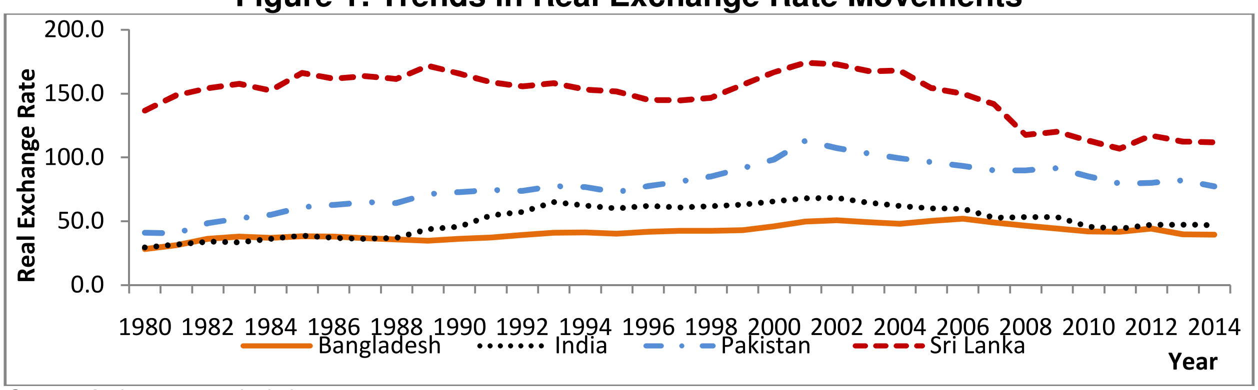
Figure 1: Trends in Net Official Development Assistance Inflows



Source: Data was retrieved from the data bank of the World Bank (World Development Indicators, 2016).

Figure 2 illustrates the historical trends in RER movements across the four nations. From the figure, it can be seen that in recent times the RERs of Bangladesh and India depict convergence while Pakistan and Sri Lanka have always had higher RERs compared to the other two nations. Also visible from the figure is that Bangladesh had managed to avoid volatility in its RER compared to the relatively volatile RER trends in Sri Lanka and Pakistan. In India, a RER appreciation took place during mid-1988 which sustained till 1993 before experiencing a downward trend since then.

Figure 1: Trends in Real Exchange Rate Movements



Source: Authors' own calculation

3. Review of Literature

Section 3 is split into between two subsections: Theoretical Framework and Empirical Findings. Over the years, the causal relationship between capital inflow and the real exchange rate of the recipient country had been the topic of numerous empirical studies in the context of both developing and developed countries. In addition, the Dutch disease problem arising from such capital inflow induced real exchange rate misalignment had also been focused in most of those studies. Empirical findings of various related studies provided mixed results with respect to the existence of Dutch Disease in the aid-recipient countries.

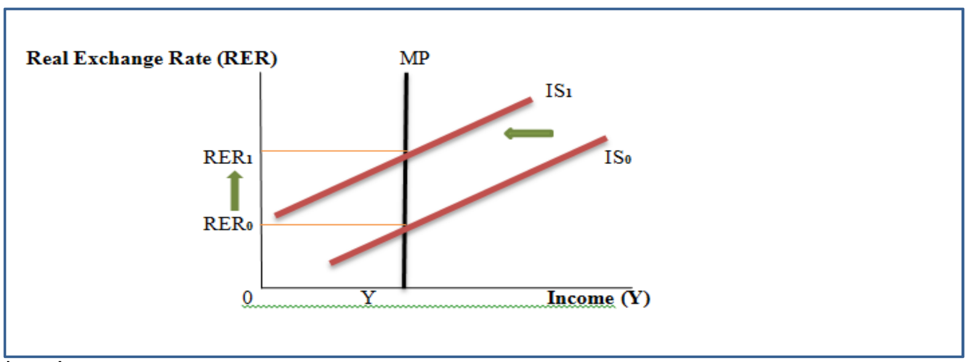
3.1. Theoretical Framework

According to Krugman (1987), an inflow of foreign capital in the form of international transfer payments stimulates real exchange rate appreciation is the host country. As a result, its traded goods sector loses competitiveness whereby it no longer enjoys a comparative advantage in producing certain goods. He also asserts that if the transfer payments are short lived then the nation eventually would regain its comparative advantage. However, long lasting transfer payments are more ominous as the nation may not regain its comparative advantage even after the transfers end. Thus, this economic theory argues that exogenous capital inflow is positively correlated to stimulation of the Dutch disease epidemic both in the short run and in the long run as well.

3.1.1. The Investment-Savings – Monetary Policy (IS-MP) Framework

The IS-MP framework also provides insights on real exchange rate movements following huge inflow of foreign capital leading to Dutch disease problems in the home economy. According to this theory, a rise in foreign flows of currencies would trigger imports in the home country minimizing its net exports value. In addition, due to the negative relationship between imports and expenditure function the IS curve in Figure 3 will shift to the left (from IS_0 to IS_1) which will then be reflected through depreciation (increase) in the RER (from RER_0 to RER_1). This theory backs up the findings of studies like Barrett (2014) where the inflow of remittances led to RER depreciation.

Figure 3: The IS-MP Framework of RER Movements

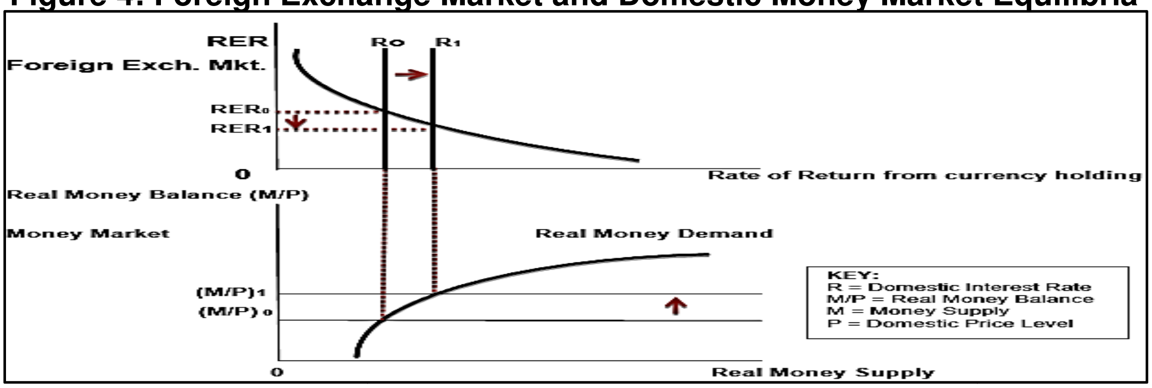


Source: Authors' own

3.1.2. The Spending Effect-Dutch Disease Framework

The effectiveness of international inflows in determining the recipient nation's growth can be evaluated in the light of the Dutch disease problem. According to Barder (2006), Dutch disease can be referred to as an appreciation in the real exchange rate, of the aid-recipient country, following huge inflow of foreign currency whereby causing harm to the economic growth prospects of the nation. A real exchange rate appreciation is synonymous to loss of export competitiveness which tends to mitigate economic growth in the underdeveloped nations. Following inflow of foreign exchange, there may be a 'spending effect' (Corden and Neary 1982) within the recipient economies whereby the local demand for both tradables and non-tradables increases which in turn exerts pressure on prices. Since the price of non-tradables is determined locally, such pressures result in inflation in the home country. On the other hand, the price of tradables remains constant due to it being exogenously determined in the international markets. As a result, the recipient country's RER would have a tendency to appreciate. This can be shown graphically in Figure 4 which shows both the foreign exchange market and the domestic money market in the context of the recipient country. From the figure, it can be seen that due to a large inflow of foreign currencies there are inflationary pressures in the market of the recipient country. As a result, domestic price level increases shifting the real money balance line from $(M/P)_0$ to $(M/P)_1$which, in turn, raise domestic interest rate from R_0 to R_1. Thus, the RER appreciates (declines) from RER_0 to RER_1.

Figure 4: Foreign Exchange Market and Domestic Money Market Equilibria



Source: Krugman (2008).

3.2. Empirical Findings

The long-run causality between foreign aid and Dutch disease with regards to Sierra Leone was examined closely by Kallon (2012). He resorted to using of annual time series data for the period 1975 to 2005. A multivariate model was taken into consideration with the RER being the only dependent variable while foreign aid and other real fundamentals of real exchange rate were held to be the independent variables. Johansen's cointegration VAR model was used to test the data set. In addition, a multivariate stationarity test was also employed. Breuch-Godfrey LM test for serial correlation, normality test, and Autoregressive Conditional Heteroskedasticity (ARCH) test for heteroskedasticity was also carried out in the research. The findings from his paper showed that there was no evidence of Dutch disease problem following foreign aid inflow in Sierra Leone. Rather, it was evident that external flow of foreign aid has had depreciation effects on the country's RER.

Uneze (2011) examined the relationship between foreign aid and real exchange rate in the context of the Western African Economic and Monetary Union (WAEMU). He used the Salter (1959) - Swan (1960) framework for analyzing this relationship using both traditional annual time series and dynamic panel data were considered in this paper between the time periods from 1975 to 2000. Moreover, he relied on the use of unit root and cointegration tests to evaluate the stationarity and cointegrity of the data set.

Pooled Mean Group (PMG) estimator was the natural choice for data analysis. The regression findings showed that foreign aid did exert some appreciating pressure on real exchange rate during the time period of consideration. In addition, he also concluded that other factors including labour productivity, terms of trade, and government consumption of non-tradable goods also contributed towards real exchange rate appreciation.

Fielding and Gibson (2012) aimed to put light on foreign aid inflow and Dutch disease problem incorporating data from 26 Sub Saharan African countries, out of which 13 had the hard peg. They used annual country-specific time series data between 1970 and 2009. In addition, cross-country panel data was also used to derive conclusions regarding evidence of Dutch disease in those countries. The foreign aid data for all countries considered were deflated using their corresponding GDP deflators. Unit root and cointegration tests were run on a multivariate regression model that was modeled using VAR technique. They concluded that 25 out of the 26 countries did experience appreciation of their real exchange rates following inflow of foreign aid and the magnitudes of such appreciations varied substantially from nation to nation. Moreover, they also pointed out the fact that countries those had hard-peg are more vulnerable to real exchange rate appreciations compared to those preferring flexible exchange rate regime.

Ouattara and Strobl (2008) analyzed the empirics of the relationship between inflow of foreign currency and the recipient country's real exchange rate in the context of 12 countries belonging to the Cooperation Financiere en Afrique centrale (CFA) Franc zone.They aimed to discover whether or not the Dutch disease epidemic is experienced by these countries. The authors used a multivariate log-log regression model with the real exchange rate being the dependent variable while foreign aid and other non-aid variables were considered to be independent. Annual panel data for the period 1980 to 2000 was chosen to be included in the data set. For estimation, dynamic panel data-estimation econometric methods were applied. Moreover, Augmented Dickey-Fuller (ADF) tests were used to test the data for stationarity. In addition, Sargan test was also run to test the hypothesis of the research. Findings reveal that foreign aid inflow does not generate Dutch disease problem in those countries since there were no evidence of real exchange rate appreciation following such inflow. Moreover, the authors also pressed on the fact that inflow of external finance in the mode of foreign aid does not reduce the export competitiveness of the recipient nations and therefore there is no chance of experiencing the Dutch disease phenomenon. However, the other non-aid factors were found to have mixed effects in generating real exchange rate appreciations.

The effects of international inflow of aid and remittance on export competitiveness if Fiji, a part of the Pacific Island Countries (PICs), were closely monitored by Jayaraman*et al.* (2016). The underlying hypothesis of this paper was that international inflow of capital led to the Dutch disease problem in Fiji, mainly by affecting its export sector. They used time series data ranging from 1980 to 2012 in order to test the validity of the hypothesis. A multivariate model was taken into consideration where the real effective exchange rate was defined as a function of foreign aid, remittance, economic openness, and domestic credit. They used conventional unit root tests to determine stationarity of their data. Moreover, Granger causality test was also run to understand the directions of causalities running from one variable to another. In addition, ARDL bound tests were also employed to see the long run relationships. The results from these tests revealed evidence of Dutch disease in Fiji as all independent variables were found to have strong direct effects on the appreciation of real effective exchange rate. Thus, the hypothesis was proved to be correct which implied that inflow of international capital does lead to reduction in the export competitiveness of the host (recipient) nation.

Johnson-Kanu (2012) also made an attempt to comment on the relationship between foreign aid inflow and export performance of the aid-recipient countries. She used panel data from 28 African countries within the reference period 2000–2009 in order to draw conclusions on this relationship. The study was based on theoretical frameworks put forward by Van Wijnbergen (1986). She resorted to using two linear models, one with the real exchange rate and the other with exports as the dependent variables. Based on the statistical findings, it was found that on average, across all the countries considered, a 1% rise in the volume of aid receipts led to 7% fall in export volume all else being equal. Thus, the results were in line with the essence of the Dutch disease theory. Moreover, she also stated that external aid had both direct and indirect negative effects on exports but the magnitude of the direct effects, in absolute terms, outweighed that of the indirect effects.

Foreign aid in relation with the export competitiveness of developing countries was probed by Munemo et al. (2006). They incorporated panel data of 84 developing countries within the reference period 1980 and 2003 in their study. They used a simple linear regression model expressing export performance as a function of numerous determinants with utmost emphasis on foreign aid. Country fixed effects and time fixed effects were allowed in their model. Moreover, dummy variables were added to the model in order to capture their impacts on the dependent variable. Pooled OLS estimation techniques were adopted to evaluate the data set. Sub-samples were also drawn from the original sample of 84 countries and were tested separately. Chi-square test and scatter plots were also used to sketch conclusion. The findings from the study depicted no trace of adverse effects on export competitiveness following inflow of foreign aid. Rather, it was found that foreign aid actually had positive, but not significant, impacts on the export performance of the countries those were taken into consideration. Thus, the results were in contradiction to the Dutch disease theory.

Fielding (2007) tried to examine aid and Dutch disease scenario in the context of 10 South Pacific Island states. Annual time series data from 1970 to 2003 was accessed in this paper. He fitted a simple conditional VAR to his data set to derive his models. Two separate models were designed in this study, one for countries those had flexible nominal exchange rate and the other for countries those are deprived of domestic currency of their own. The lag orders in the models were determined empirically using Akaike Information Criterion (AIC). As part of estimation tools, unit root tests were undertaken to test the data for stationarity. Moreover, the fitted Vector Autoregressive (VAR) coefficients provided the basis for making inferences from the test results. In compliance with the findings, it was seen that the effects of foreign aid on real exchange rate movement in 9 out of the 10 countries considered were in line with the Dutch disease hypothesis. However, those effects were not significant. In the other country, it was actually found that inflow of foreign aid actually led to real exchange rate depreciation. Moreover, Fielding also concluded that the effects were more persistent in countries those did not have their own local currency.

A particular limitation in all the aforementioned studies is in the sense that these studies have analyzed the impacts of FAID and other foreign currency inflows on the RER movements but have not specifically linked those movements to the Dutch Disease problem in the context of loss of export competitiveness. Thus, the findings of this paper is expected to shed light on the possibility of the Dutch disease taking place across the South Asian nations considered in this paper.

4. Empirical Model and Data Description

Following the model used by Edwards (1989) and Montiel (1999),the empirical model, considered in this paper, expresses the bilateral RER as separate country-specific functions of FAID and other real determinants of RER including government expenditure, terms of trade, economic openness, foreign direct investment, and remittance, which were used as controlled variables. The model in general also depicts the spending effect hypothesis put forward by Corden and Neary (1982) which states that a rise in relative spending in the non-traded goods sector will have appreciative pressures on a country's real exchange rate. Four separate regression models, one for each of the four countries, are considered in this paper in order to capture the country-specific FAID-RER nexus. The general regression model is as follows:

$$RER_t = \beta_0 + \beta_1 (FAID)_t + \beta_2 (GOV)_t + \beta_3 (TOT)_t + \beta_4 (OPEN)_t + \beta_5 (FDI)_t + \beta_6 (REMIT)_t + \varepsilon_t \text{ ----- (i)}$$

where RER is the bilateral real exchange rate; FAID is proxied by the NODA received by the nations; GOV is the government consumption and it is included as a control variable in the model since GOV is referred to influence RER movements (Ravn *et al.* 2007); TOT is the terms of trade which has the capability of influencing RER by altering the ratio of the price of tradables to that of non-tradables; OPEN is the degree of economic openness which can be a yardstick in quantifying the volume of FAID inflows which possibly would, in turn, be reflected in movements in RER; FDI is the foreign direct investment inflow and REMIT is the inflow of personal remittances and these two are other sources of foreign currencies which can also be attributing to RER movements. For all the aforementioned variables in the model, the authors incorporated annual time series data in the context of Bangladesh, India, Pakistan and Sri Lanka from 1980 to 2014 using various data sources. Table 1 provides a brief description of the independent variables included in the model along with their corresponding sources of data.

The RER data was calculated manually using corresponding Nominal Exchange Rate (NER) and Consumer Price Indices (CPI) of the four countries and of the USA. The RER of a particular nation was calculated by multiplying its NER with the ratio of its own CPI to that of the USA.[iv] The NER data, considering the base year to be 1995, was retrieved from the International Financial Statistics (IFS), published by the International Monetary Fund (IMF).

Table 1: Description and Sources of the Explanatory Variables

Variable	Definition	Units	Source
FAID	Sum of equity capital, reinvestment of earnings, and other capital.	Current US$	World Development Indicators (2016)
GOV	Includes all government current expenditures for purchases of goods and services.	% of GDP	
TOT	Price of exports relative to the price of imports.	Index	
OPEN	Ratio of the sum of exports and imports to the GDP	Index	
FDI	Refers to direct investment equity inflows	Current US$	
REMIT	Comprise of personal transfers and compensation of employees. Personal transfers consist of all current transfers in cash or in kind made or received by resident households to or from nonresident households.	Current US$	

5. Methodology

5.1. Augmented Dickey-Fuller Test

At first, data of all the variables were tested for unit root in order to check the stationarity of the variables that were considered in this study. The authors used the Augmented Dickey-Fuller (ADF) unit root test to detect the existence of unit roots, if any, in the data set. Once the variables were found to be stationary, cointegration test was run to find possible linear combinations of the variables which could be considered stationary. Moreover, following confirmation of cointegration between the concerned variables were found to be cointegrated, finally the Granger Causality tools are tapped for determining the direction of causalities between the variables.

It is important to test data, especially time series data, for stationarity since non-stationarity of time series data leads to spurious regression unless there is the existence of at least one cointegrating relationship. Furthermore, the Johansen procedure was applied to test for cointegration, which is known to provide a unified framework for estimation and testing of cointegration relations in the context of VAR error correction models. The authors estimated an Unrestricted Vector of Autocorrelation of the following form for this purpose:

$$\Delta x_t = \alpha + \theta_1 \Delta x_{t-1} + \theta_2 \Delta x_{t-2} + \theta_3 \Delta x_{t-3} + \cdots\cdots + \theta_{k-1} \Delta x_{t-k+1} + \theta_k \Delta x_{t-k} + u_t \quad \text{-------------- (ii)}$$

where Δ is the difference operator; $x_t$is a (n x 1) vector of non-stationary variables (in levels); and $U_t$is the (n x 1) vector of random errors. The matrix θ_k contains the information on the long run relationship between variables, for instance, if the rank of θ_k = 0, the variables are not cointegrated. On the other hand if rank (usually denoted by r) is equal to 1, there exists one cointegrating vector and finally if $1 < r < n$, there are multiple cointegrating vectors. Johansen (1988) derive two tests for cointegration, namely the trace test and the maximum Eigenvalue test. The trace statistic test evaluates the null hypothesis that there are at most *r* cointegrating vectors whereas the maximal Eigenvalue test, evaluates the null hypothesis that there are exactly *r* cointegrating vectors in x_t.

5.2. Johansen Test of Cointegration

According to cointegration analysis, when two variables are cointegrated then there exists at least one direction of causality. Granger-causality, introduced by Granger (1969), is one of the important matters that has been much studied in empirical macroeconomics and empirical finance. The presence of non-stationarity can lead to ambiguous or misleading conclusions in the Granger causality tests (Engle and Granger 1987). Only when the variables are cointegrated, it is possible to deduce that a long run relationship exists between the non-stationary time series.

5.3. Granger Causality Test

When we take y and x as the variables of interest, then the Granger causality test (Granger, 1969) determines whether past values of y add to the explanation of current values of x as provided by information in past values of x itself. If previous changes in y do not help explain current changes in x, then y does not Granger cause x. In a similar way, we can examine if x Ganger causes y just be interchanging them and carrying out this process again. There could be four probable outcomes: (i) x Granger causes y (ii) y Granger causes (iii) Both x and y granger causes the other and (iv) neither of the variables Granger causes the other. In this paper, the causality tests among all the concerned variables are conducted. For this the following set of the equations are estimated:

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \cdots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \cdots + \beta_l y_{t-l} + u_t \text{ --------------- (iii)}$$

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \cdots + \beta_l x_{t-l} + v_t \text{ ---------------(iv)}$$

We consider the above set of equations for all possible pairs of *(x, y)* series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_2 = \beta_3 = \cdots = \beta_l = 0 \text{ ---------------- (v)}$$

5.4. Vector Error-Correction Model (VECM)

Engle and Granger (1987) showed that a vector error correction model (VECM) is an appropriate method to model the long-run as well as short-run dynamics among the cointegrated variables. Causality inferences in the multi-variate framework are made by estimating the parameters of the following VECM equations

$$\Delta Y = \alpha + \sum_{i=1}^{m} \beta i \Delta Y_{t-i} + \sum_{j=1}^{n} \gamma_j \Delta X_{t-j} + \sum_{k=1}^{0} \delta \Delta M^s + \sum_{l=1}^{p} \zeta \Delta N + \theta Z_{t-1} + \varepsilon_t \text{ ------------(v)}$$

$$\Delta X = a + \sum_{i=1}^{m} b_i \Delta Y + \sum_{j=1}^{n} c_j \Delta X_{t-j} + \sum_{k=1}^{0} d \Delta M^s + \sum_{l=1}^{p} e \Delta N + f Z_{t-1} + \xi_t \text{ ---------------- (vi)}$$

z_{t-1} is the error-correction term which is the lagged residual series of the cointegrating vector. The error-correction term measures the deviations of the series from the long run equilibrium relation. For example, from equation (v), the null hypothesis that X does not Granger-cause Y is rejected if the set of estimated coefficients on the lagged values of X is jointly significant. Furthermore, in those instances where X appears in the cointegrating relationship, the hypothesis is also supported if the coefficient of the lagged error-correction term is significant. Changes in an independent variable may be interpreted as representing the short run causal impact while the error-correction term provides the adjustment of Y and X toward their respective long-run equilibrium. Thus, the VECM representation allows to differentiate between the short- and long-run dynamic relationships. The Chi-Square test statistic is used to determine the short run causalities between pairs of variables in the model.The authors resorted to using EViews 7.1 software for carrying out all econometric tests in this paper.

6. Empirical Findings

To begin with, all variables considered in this paper were country specifically tested for the presence of unit roots using the ADF Test. Results from the ADF tests are given in Table 2.

Table 2: ADF Unit Root Test Results at First Differences (Lag=8)

Var.	ADF Stat.[a]	Critical Value	ADF Stat.[b]	Critical Value	Decision on Stationarity
			Bangladesh		
RER	-4.105	-2.954	-4.394	-3.553	Stationary considering both cases
FAID	-6.969	-2.954	-6.945	-3.553	Stationary considering both cases
GOV	-4.202	-2.954	-4.150	-3.553	Stationary considering both cases
TOT	-5.638	-2.954	-6.380	-3.553	Stationary considering both cases
OPEN	-3.592	-2.954	-4.494	-3.602	Stationary considering both cases
FDI	-6.371	-2.967	-7.903	-3.574	Stationary considering both cases
REMIT	-3.496	-2.954	-5.126	-3.552	Stationary considering both cases
			India		
RER	4.503	-2.954	-5.118	-3.553	Stationary considering both cases
FAID	7.355	-2.954	-7.363	-3.553	Stationary considering both cases
GOV	-3.106	-2.954	-3.994	-3.553	Stationary considering both cases
TOT	-5.767	-2.954	-6.155	-3.553	Stationary considering both cases
OPEN	-5.505	-2.954	-5.457	-3.602	Stationary considering both cases
FDI	-6.367	-2.967	-6.442	-3.574	Stationary considering both cases
REMIT	-3.704	-2.954	-4.688	-3.552	Stationary considering both cases
			Pakistan		
RER	-4.019	-2.954	-4.904	-3.553	Stationary considering both cases
FAID	-6.064	-2.954	-5.240	-3.553	Stationary considering both cases
GOV	-4.301	-2.954	-5.112	-3.553	Stationary considering both cases
TOT	-5.034	-2.954	-5.408	-3.553	Stationary considering both cases
OPEN	-8.121	-2.954	-7.983	-3.602	Stationary considering both cases
FDI	-3.696	-2.967	-4.990	-3.574	Stationary considering both cases
REMIT	-3.123	-2.954	-4.351	-3.552	Stationary considering both cases
			Sri Lanka		
RER	-5.259	-2.954	-5.501	-3.553	Stationary considering both cases
FAID	-8.768	-2.954	-8.724	-3.553	Stationary considering both cases
GOV	-6.028	-2.954	-6.147	-3.553	Stationary considering both cases
TOT	-6.406	-2.954	-6.361	-3.553	Stationary considering both cases
OPEN	-5.170	-2.954	-5.141	-3.602	Stationary considering both cases
FDI	-6.444	-2.967	-5.688	-3.574	Stationary considering both cases
REMIT	-3.119	-2.954	-3.582	-3.552	Stationary considering both cases

Notes: (a) Considering only constant; (b) Considering both constant and trend; Critical Values are given at 95% level.

According to thestatistical estimates provided in table 2, it can be said that all the variables considered in this dataset are found to be stationary at their first differences, I(1), which lets the authors to proceed to the other aforementioned econometric tests.

Once the stationarity of the variables had been determined, the authors went on to perform the Johansen cointegration test to deduce any possible long-run association between the concerned variables. Results from the Johansen cointegration test, for each of the four countries, are provided in tables A1, A2, A3 and A4 (see Appendix). The results confirm that for each of the countries, there are multiple cointegration equations suggesting the long run relationship between the variables. Thus, confirmation of cointegration between the variables allowsthe proceeding to perform the Granger causality test.

The Granger causality test results, as given in Table 3, show that in context of Bangladesh and India, the inflow of FAIDs is ineffective in influencing the respective countries' RER since the estimated F-statistics were found to be statistically insignificant at 10% level of significance. Conversely, the results also reveal that inflow of FAIDs is effective in influencing the RERs of Pakistan and Sri Lanka. Thus, the ineffectiveness of FAID inflow in influencing RER movements in Bangladesh and India implies that these countries are unlikely to be affected by the Dutch Disease problem which unfortunately is not the similar cases for Pakistan and Sri Lanka in the long run, corroborating to the findings by Amin and Murshed (2018) for the case of Bangladesh and Taguchi (2017) in the context of selected Asian economies.

Table 3: Granger Causality Test Results (Lag=2)

Country	**Bangladesh**	**India**	**Pakistan**	**Sri Lanka**
Null Hypothesis	**F-Statistic**	**F-Statistic**	**F-Statistic**	**F-Statistic**
FAID does not Granger Cause RER	0.906 (0.415)	0.028 (0.972)	5.168 (0.012)	0.054 (0.947)
RER does not Granger Cause FAID	0.286 (0.753)	0.407 (0.669)	1.444 (0.252)	2.845 (0.075)
GOV does not Granger Cause RER	1.283 (0.293)	1.439 (0.254)	0.679 (0.515)	4.924 (0.014)
RER does not Granger Cause GOV	0.878 (0.426)	0.292 (0.748)	3.971 (0.030)	0.560 (0.574)
TOT does not Granger Cause RER	0.951 (0.398)	1.359 (0.273)	4.982 (0.014)	0.354 (0.704)
RER does not Granger Cause TOT	1.856 (0.174)	0.055 (0.945)	1.956 (0.160)	3.003 (0.065)
OPEN does not Granger Cause RER	0.664 (0.522)	2.856 (0.074)	0.506 (0.608)	1.011 (0.376)
RER does not Granger Cause OPEN	0.658 (0.525)	9.297 (0.001)	0.546 (0.585)	0.084 (0.919)
FDI does not Granger Cause RER	0.607 (0.551)	1.644 (0.211)	0.229 (0.796)	2.617 (0.091)
RER does not Granger Cause FDI	0.148 (0.862)	3.108 (0.060)	1.997 (0.155)	4.827 (0.015)
REMIT does not Granger Cause RER	2.360 (0.112)	1.146 (0.332)	1.587 (0.222)	0.735 (0.488)
RER does not Granger Cause REMIT	4.249 (0.024)	3.393 (0.048)	3.643 (0.039)	0.697 (0.507)

Notes: The probabilities are provided in the parentheses. The estimated F-Statistics are tested to be statistically significant at 10% level of significance. The optimal lag length is selected based on the Schwarz Information Criterion (SIC).

Finally, the VECM test results, given in Table 4 provide the possible short-run causal associations between the variables in the context of all the four countries. The results show that in cases of both Bangladesh and India, the inflow of FAIDs in these countries was ineffective in influencing their respective RERs in the short run, unlike the cases in Pakistan and Sri Lanka. Unidirectional causalities were found to be running from FAID to RER in context of Pakistan and from RER to FAID in context of Sri Lanka. Unidirectional causal associations between FAID and RER were found to be running from RER to FAID for Pakistan and vice versa from Sri Lanka. Hence, the Dutch Disease phenomenon is unlikely to be encountered by the economies of Bangladesh and India in the short run while Pakistan and Sri Lanka run the risk of experiencing the Dutch Disease problem following inflow of FAIDs into their economies.

Table 4: VECM Test Results

Country		**Bangladesh**	**India**	**Pakistan**	**Sri Lanka**
Dep. Var.	**Null Hypothesis**	**Chi-Square Statistic**	**Chi-Square Statistic**	**Chi-Square Statistic**	**Chi-Square Statistic**
RER	**FAID does not cause RER**	3.744	0.276	2.049	6.736
		(0.154)	(0.871)	(0.359)	(0.035)
FAID	**RER does not cause FAID**	1.714	0.109	5.277	1.312
		(0.424)	(0.947)	(0.072)	(0.519)
RER	**GOV does not cause RER**	4.653	2.141	1.057	0.047
		(0.098)	(0.343)	(0.590)	(0.977)
GOV	**RER does not cause GOV**	3.329	17.251	6.276	14.186
		(0.189)	(0.001)	(0.043)	(0.001)
RER	**TOT does not cause RER**	7.934	3.513	1.537	0.439
		(0.019)	(0.173)	(0.464)	(0.803)
TOT	**RER does not cause TOT**	3.482	8.389	0.339	0.152
		(0.175)	(0.015)	(0.844)	(0.927)
RER	**OPEN does not cause RER**	3.499	1.960	8.305	2.882
		(0.174)	(0.375)	(0.016)	(0.237)
OPEN	**RER does not cause OPEN**	5.291	1.512	2.244	4.092
		(0.071)	(0.470)	(0.326)	(0.129)
RER	**FDI does not cause RER**	8.806	0.446	1.747	1.124
		(0.012)	(0.800)	(0.418)	(0.570)
FDI	**RER does not cause FDI**	0.711	11.981	1.136	0.483
		(0.701)	(0.003)	(0.567)	(0.785)
RER	**REMIT does not cause RER**	13.789	0.717	0.707	0.833
		(0.001)	(0.700)	(0.702)	(0.660)
REMIT	**RER does not cause REMIT**	5.491	0.327	18.396	0.617
		(0.064)	(0.849)	(0.001)	(0.735)

Note: The probability values are provided inside the parentheses. The estimated Chi-Square Statistics are tested to be statistically significant at 10% level of significance.

Thus, in light of the estimations put forward following the causality examinations, the aforementioned research questions are answered revealing causal associations between the indicators of foreign currency inflow and RER movement across the selected nations in South Asia. However, the *a priori* hypothesis drawn in favor of a foreign currency inflow-induced Dutch disease problem is partially held in the context of Pakistan and Sri Lanka. In contrast, the results in the context of Bangladesh and India are found to be statistically insignificant in relating such inflows to Dutch disease problem in these two nations.

7. Conclusions

The inflow of foreign assistance in the form of FAID and other sources of foreign currencies are important in shaping the economies of all both developing and middle-income nations across the world. The four South Asian countries considered in this paper are no exception judging by their histories involving inflow of foreign currencies from the developed world. However, the effectiveness of such currency inflows in dictating the development of the recipient countries should ideally be questioned in the light of the Dutch Disease problem. The results reveal that both Bangladesh and India are relatively in better positions compared to Pakistan and Sri Lanka in terms of encountering the menacing Dutch Disease problem resulting from appreciation of their respective RERs following FAID inflows. A possible reason behind this could be the fact that both Bangladesh and India follow a floating exchange rate keeping a tight grip over their respective RER movements through active strategies by the central banks in these countries. This is not the case in reference to the exchange rate regimes followed by Pakistan and Sri Lanka. More importantly, Pakistan’s volatile exchange rate regimes over the past could be a reason behind its RER misalignments creating the Dutch disease problem in that country while frequent inappropriate exchange rate adjustments in Sri Lanka may have accounted for a similar problem as well.

The results are concerning Bangladesh and India are in line with those found by Kallon (2012) for Sierra Leone and Ouattara and Strobl (2008) in context of 12 countries belonging to the Cooperation Financiere en Afriquecentrale (CFA) Franc zone. On the other hand, the results concerning Pakistan and Sri Lanka are pretty much in line with those by Fielding and Gibson (2012) for 26 Sub Saharan African countries and by Uneze (2011) in context of the Western African Economic and Monetary Union (WAEMU). Thus, the results imply that a floating exchange rate regime is more efficient in controlling RER appreciations as in the case of Bangladesh and India. Moreover, in light of the findings, it is ideal for these two countries to continue attracting foreign currencies from the developed world, particularly in the form of FAID, without the fear of experiencing appreciative pressures on their respective RERs. On the flip side of the coin, Pakistan and Sri Lanka could ideally follow their neighbors and move away from their traditional existing exchange rate policies towards a more managed floating exchange rate system which would ideally get a hold on their RER volatility following inflow of FAID in these countries.

Data constraint was the main limitation faced in this paper which restrained the authors from incorporating disaggregated data in to the regression model. As part of the future scope of research, this paper can be extended in the context of panel data estimation techniques for robustness check.

End Notes

[i] All throughout the paper, the host country is referred to the country that is receiving FAID.

[ii] For more information on the definition of Dutch Disease see Barder (2006) "A Policymakers' Guide to Dutch Disease."

[iii] Export-Oriented Industrialization (EOI) sometimes called Export Substitution Industrialization (ESI), Export-Led Industrialization (ELI) or Export-Led Growth (ELG) is a trade and economic policy aiming to speed up the industrialization process of a country by exporting goods for which the nation has a comparative advantage. Export-led growth implies opening domestic markets to foreign competition in exchange for market access in other countries.

[iv] For instance, the RER for Bangladesh was calculated using the formula: $RER = NER_{BDT/USD} * (CPI_{US} / CPI_{BD})$. Similarly, the RER for India, Pakistan and Sri Lanka were calculated.

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APPENDIX

Table A1: Johansen Cointegration Test Results in context of Bangladesh (Lag=2)

Null	Alternative	Trace Statistic	95% Critical Value	Conclusion
Johansen Test of Cointegration (Trace Test)				
r = 0	**r = 1**	156.303	125.615	
r<=1	**r = 2**	95.386	95.754	1 cointegrating equation
r<=2	**r = 3**	62.485	69.819	
Johansen Test of Cointegration (Maximum Eigen Value Test)				
Null	**Alternative**	**Max-Eigen Statistic**	**95% Critical Value**	**Conclusion**
r = 0	**r = 1**	60.917	46.231	
r<=1	**r = 2**	32.901	40.078	1 cointegrating equation
r<=2	**r = 3**	20.261	33.877	

Notes: Selection of the lag is based on Schwartz Information Criterion (SIC). EViews 7.1 software automatically selects the most significant lag length based on this criterion.

Table A2: Johansen Cointegration Test Results in context of India (Lag=2)

Null	Alternative	Trace Statistic	95% Critical Value	Conclusion
Johansen Test of Cointegration (Trace Test)				
r = 0	**r = 1**	224.054	125.615	
r<=1	**r = 2**	142.314	95.754	4 cointegrating equation
r<=2	**r = 3**	86.841	69.819	
r<=3	**r = 4**	55.389	47.856	
Johansen Test of Cointegration (Maximum Eigen Value Test)				
Null	**Alternative**	**Max-Eigen Statistic**	**95% Critical Value**	**Conclusion**
r = 0	**r = 1**	81.743	46.231	
r<=1	**r = 2**	55.469	40.078	2 cointegrating equation
r<=2	**r = 3**	31.452	33.877	

Notes: Selection of the lag is based on Schwartz Information Criterion (SIC). EViews 7.1 software automatically selects the most significant lag length based on this criterion.

Table A3: Johansen Cointegration Test Results in context of Pakistan (Lag=2)

Null	Alternative	Trace Statistic	95% Critical Value	Conclusion
Johansen Test of Cointegration (Trace Test)				
r = 0	**r = 1**	230.342	125.615	
r<=1	**r = 2**	152.842	95.754	
r<=2	**r = 3**	104.986	69.819	
r<=3	**r = 4**	65.211	47.856	6 cointegrating equation
r<=4	**r = 5**	35.434	29.797	
r<=5	**r = 6**	16.929	15.494	
r<=6	**r = 7**	0.091	3.841	
Johansen Test of Cointegration (Maximum Eigen Value Test)				
Null	**Alternative**	**Max-Eigen Statistic**	**95% Critical Value**	**Conclusion**
r = 0	**r = 1**	77.500	46.231	
r<=1	**r = 2**	47.857	40.078	4 cointegrating equation
r<=2	**r = 3**	39.774	33.877	
r<=3	**r = 4**	29.776	27.584	
r<=4	**r = 5**	18.505	21.132	

Notes: Selection of the lag is based on Schwartz Information Criterion (SIC). EViews 7.1 software automatically selects the most significant lag length based on this criterion.

Table A4: Johansen Cointegration Test Results in context of Sri Lanka (Lag=2)

Johansen Test of Cointegration (Trace Test)				
Null	**Alternative**	**Trace Statistic**	**95% Critical Value**	**Conclusion**
r = 0	**r = 1**	215.777	125.6154	
r<=1	**r = 2**	151.605	95.754	
r<=2	**r = 3**	107.8470	69.819	
r<=3	**r = 4**	70.280	47.856	7 cointegrating equation
r<=4	**r = 5**	41.863	29.797	
r<=5	**r = 6**	17.189	15.495	
r<=6	**r = 7**	4.836	3.8415	
Johansen Test of Cointegration (Maximum Eigen Value Test)				
Null	**Alternative**	**Max-Eigen Statistic**	**95% Critical Value**	**Conclusion**
r = 0	**r = 1**	64.172	46.231	
r<=1	**r = 2**	43.758	40.078	5 cointegrating equation
r<=2	**r = 3**	37.567	33.877	
r<=3	**r = 4**	28.417	27.584	
r<=4	**r = 5**	24.674	21.132	
r<=5	**r = 6**	12.353	14.265	

Notes: Selection of the lag is based on Schwartz Information Criterion (SIC). EViews 7.1 software automatically selects the most significant lag length based on this criterion.