Impact of Bilateral Real Exchange Rate on Bilateral Trade Balance: Evidence from Pakistan and Its Major Trading Partners

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Abstract

This study investigates the impact of the bilateral real exchange rate on the bilateral trade balance of Pakistan with its five major trading partners, namely the US, China, Saudi Arabia, Germany, and the UK. We utilize panel data spanning from 1991 to 2018 for the six countries. We employ the fully modified OLS (FMOLS), and panel error correction model (ECM) to explore the short-run as well as long-run dynamics of the relationships among the variables. Since the cointegration procedure requires the investigation of the order of integration of variables, we employ the panel unit root test to check the order of integration of variables. Before moving on to panel unit root analysis, it is mandatory to check cross-sectional dependence. For this purpose, we employ a cross-sectional dependence test designed by Pesaran (2004) which indicates the existence of cross-sectional dependence. Since the presence of cross-sectional dependence requires a second-generation test for panel unit root analysis, therefore, we employ the Fisher-ADF panel unit root test. The results of the test reveal that the trade balance is stationary at level, while bilateral real exchange rate, domestic real GDP, and foreign real GDP are first-order integrated. Further, the results of the FMOLS test reveal that both domestic real GDP and bilateral real exchange rate harm the bilateral trade balance of Pakistan, while foreign real income has a positive impact on it. Moreover, the results of panel ECM confirm the presence of a tendency of adjustment to the long-run equilibrium.

***Keywords**:* Bilateral Real Exchange Rate, Bilateral Trade Balance, Fully Modified OLS, Panel Data, GDP, Real Income.

JEL Classification: F31, B27, C31, C33

Introduction

In this era of globalization, economies of the world are moving on the path of trade openness to reap comparative advantages instead of relying on self-sufficiency. In the face of fast globalization, the interdependence among countries has increased and is still increasing. Although globalization has broadened the horizon of economic opportunities for countries, at the same time it has also created challenges for them, especially for the developing ones (Xia et al., 2022; Yang et al., 2021). The problem arising from deteriorated conditions of balance of payments and balance of trade has become a global one and has attracted the attention of policymakers across the globe. Pakistan is not an exception regarding this problem as it has been facing this problem since its inception, except for a few years. Nonetheless, the deficit in the balance of trade of Pakistan is widening over time despite a variety of policy tools being pursued.

A glance at Pakistan's exports and imports reveals that both exports and imports, though there are some variations, have an overall soaring trend over time. Pakistan's exports are 10.47% and imports are 21.5% of its GDP, and the trade deficit hovers around 11.38% of GDP in the fiscal year 2022-23. Moreover, variations in the growth rates of imports and exports, and their ratios to GDP are witnessed (Pakistan Economic Survey, 2022-23). So, considering the ratios of exports and imports to GDP, it is reasonable to deem that the fluctuations in the export and import prices, exchange rates, and trade balance (henceforth TB) cast a substantial impact on Pakistan's economy.

With the view to cope with the problem of deficit in the balance of trade and balance of payments, researchers have suggested various measures by evaluating the performance of tools under different conditions. The major contribution in this context is attributed to Marshall and Lerner in the form of famous Marshall-Lerner (henceforth ML) condition in literature. It posits that the devaluation of a country's currency improves its TB provided that the sum of absolute elasticities of demand for its imports and exports is greater than unit. To test the ML condition, traditional studies use aggregate data of exports and imports. Examples of these studies are Kyophilavong et al. (2013) and Ziramba and Chifamba (2014). But another argument exists that views that the traditional studies have limitations for not properly addressing the problem of 'aggregation bias' – if there is a very high elasticity of demand of one trading partner and very low of another then these will offset the effect of each other that may lead to misleading results.

The new strand of studies avoids the problem of 'aggregation bias' by using the data disaggregated at the country level. This group of studies analyzes the bilateral trade performance of countries. They investigate the relationships of bilateral TB and bilateral real exchange rate (hereafter ER) to test whether ML condition, in bilateral trade case, holds or not (Baak, 2008; Chui et al., 2010; Dash, 2013; Irandoust et al., 2006; Wang et al., 2012). They investigate the relationships between bilateral trade position and bilateral ER. In the same manner, this study explores whether bilateral real ER has significant bearings on the bilateral trade position of Pakistan with its five largest trade allies: China, Germany, Saudi Arabia, the UK and the US.

Moreover, Pakistan's exports are highly concentrated in a few markets as around half of its exports go to five countries: Afghanistan, China, Germany, the UAE, the UK and the US. Among them about one-fourth of total exports are destined to only two countries, the U.S. (19% of total exports) and China (8% of total exports). On the other hand, imports of Pakistan are also highly concentrated in a few markets as around 50% of Pakistan's imports originate from four markets: China, the UAE, Saudi Arabia, and Kuwait. Among these markets, China is the largest import supplier to Pakistan with a share of 21% of Pakistan's total imports and UAE is the second largest with a share of 10% of Pakistan's total imports (Pakistan Economic Survey, 2022-23).

Given the aforementioned discussion, it is highly desirable to analyze Pakistan's bilateral trade position with its five significant trade allies. This study aims to investigate the role of the bilateral real ER in determining Pakistan's trade position viz-a-viz its significant trading partners. Furthermore, we also address the most probable issue of 'aggregation bias,' as highlighted by various studies, by utilizing data on bilateral trade and bilateral ER instead of relying on aggregated data. Additionally, we examine the short-term and long-term dynamics of the bilateral trade position to ascertain whether the bilateral real ER, as well as the domestic and trading partners' real economic activity, play distinct roles in the short-term and long-term analyses.

The study is arranged as follows. Its second section reviews the existing works in the field and presents major streams of the existing literature, section 3 includes the theoretical framework, section 4 discusses econometric techniques employed in the study and the description and sources of data, section 5 contains results of the study and their discussion and finally in section 6 conclusion and policy recommendations are given.

Literature Review

This section briefly reviews the existing literature in the field and classifies the literature on the basis of focus and methodology employed by the studies. A huge body of theoretical as well as empirical literature explores the connections between ERs and TB. The studies have investigated this relationship in the case of single as well as multiple countries. Different studies have employed different methods and techniques to investigate the nature of the effect of ER on balance of trade, but their findings have produced mixed results. That is why, the ER to be used as an instrument to correct the balance of trade or to improve the trade position of a country is still a matter of wide debate, especially for the developing countries. The existing literature can be classified on the basis of data, method of estimation, and findings.

Regarding the nature of data, a class of studies has used aggregate data of imports and exports of a country along with real effective ER to examine the relationship (Alessandria & Choi, 2021; Bhat & Bhat, 2021; Kyophilavong et al., 2013; Shah & Majeed, 2014; Ziramba & Chifamba, 2014). However, there is an argument that these studies suffer the shortcoming of not addressing the problem of 'aggregation bias'. It is due to the fact that these

explorations use real effective ERs which do not reflect the true effect of currency's fluctuation – an adjustment in the value of the currency of a country in relation to the currency of its one trading partner may offset the change in the value of its currency against the currency of another trading partner, thereby smoothing the overall change in real effective ER. Moreover, the proxy used for the world income may itself be misleading. On the other hand, some other types of studies like Onafowora (2003), Irandoust et al. (2006), Baak (2008), Chui et al. (2010), Wang et al. (2012), Dash (2013), Hussain and Bashir (2013), Šimáková (2014), Suleman et al. (2014), Guan and Ip Ping Sheong (2020) etc. have used disaggregated data to a country level and have investigated the bearings of bilateral ER on bilateral trade position. These explorations are also likely to encounter the same issue of 'aggregation bias'. It might be due to this reason that a recent version of studies has used the data disaggregated to a industry level (Chiloane et al., 2014; Dogru et al., 2019; Šimáková & Stavárek, 2014).

A variety of estimation methods and techniques have been employed in the studies conducted by different researchers. A strand of literature has employed ARDL and error correction models (Hussain & Bashir, 2013; Kyophilavong et al., 2013; Nguyen et al., 2021; Shah & Majeed, 2014; Suleman et al., 2014; Ziramba & Chifamba, 2014). Another type of explorations has used VAR and VECM techniques to achieve their objectives (Baak, 2008; Chiloane et al., 2014; Dash, 2013; Kodongo & Ojah, 2013; Onafowora, 2003; Šimáková, 2014). To explore short-run relationships among the variables, some studies have employed impulse response functions (Chiloane et al., 2014; Dash, 2013; Onafowora, 2003). To investigate the bilateral trade position of countries, panel cointegration has been used in most of the studies (Chui et al., 2010; Wang et al., 2012). Irandoust et al. (2006) employ likelihood-based panel cointegration technique to investigate the impact of ERs on bilateral trade position. Bahmani-Oskooee and Gelan (2018) employ bounds-testing approach to discern between the short- and long-term drivers of trade. In addition, Bhat and Bhat (2021) and Dogru et al. (2019) utilize nonlinear cointegration techniques.

There exists a chunk of literature that investigates the dynamics of trade at industry and commodity levels. For instance, Bussière et al. (2020) examine the role of price and quantity elasticities for 51 advanced and emerging economies. They inspect disaggregated trade flows among more than 160 trading partners and 5000 products. The results of the study substantiate that the depreciation of currency improves trade position. Dogru et al. (2019) analyze bilateral trade position of the US with Mexico, Canada and the UK in tourism industry, using linear and nonlinear ARDL techniques. They find that the depreciation of domestic currency cast favourable impact on TB with all the trading countries. Nevertheless, the strengthening of domestic currency deteriorates TB with Canada and the UK, but has no bearings on the bilateral TB with Mexico.

The theoretical literature suggests that the devaluing of the currency of a country makes its exports relatively cheaper than its imports. Therefore, the devaluation of a nation's currency may potentially benefit its trade position. For example, the concept of the J-curve states that the short-term effects of the decrease in the value of country's currency (devaluation) deteriorates its TB, while in the long run, it leads to an improvement in its TB. The findings of the empirical explorations are in support of this concept in some cases, but they contradict this proposition in some other cases. For an illustration, Onafowora (2003) substantiates that there exists one long-run (cointegrating) relationship among real ER, real TB, real domestic income, and real foreign income in the case of each country. However, considerable variations are observed in the results – the impulse response functions affirm the satisfaction of the ML condition in the long term and the prevalence of J-curve phenomenon in the short term.

In the same vein, Alessandria and Choi (2021) examine the J-curve type phenomenon for the US, and Kyophilavong et al. (2013) substantiate that there happens to be a J-curve type associations for Laos trade. A decline in the real value of the national currency harms the TB in the short term, but its impact remains insignificant in the long run. However, the long-term trade capability of the country is mainly driven by its domestic income. Bhat and Bhat (2021) maintain that a decline in the value of Indian currency in terms of foreign currency deteriorates TB of India in the short run while it ameliorates it in the long term, validating the existence of J-curve phenomenon for Indian trade. Nguyen et al. (2021) also confirm the presence of J-curve type trade patterns in the trade of Vietnam with the US.

In contrast, there is an argument supported by mixed findings. For instance, Dogru et al. (2019), Šimáková (2014), Dash (2013), Wang et al. (2012), Chui et al. (2010) and Irandoust et al. (2006) authenticate that the J-curve phenomenon exists in the case of some trading partners, but it does not exist in case of other trading partners of the same country. Moreover, there these studies also provide evidence of the presence of an inverted J-curve for some trading partners. Besides all this, another standpoint exists that suggests that devaluation of currency worsens TB rather than correcting TB and/or has no effect on TB (Suleman et al., 2014; Shah & Majeed, 2014; Ziramba & Chifamba, 2014).

Thus, it can be concluded that researchers have investigated the connections between ER and balance of trade by using aggregated, disaggregated to country level, and disaggregated to industry-level data and employing ARDL, VAR, ECM, VECM, and panel cointegration techniques. However, in the case of Pakistan, the studies have used aggregated data and employed ARDL, variance decomposition analysis, and impulse response functions (Ahmed et al., 2022; Shah & Majeed, 2014) and disaggregated data to country level: bilateral trade with only one trading partner (Suleman et al., 2014) and bilateral trade in case of two trading partners (Hussain & Bashir, 2013). Because of all this, this study aims to inspect the connections among variables in the case of five major trading partners by employing panel co-integration.

Theoretical Framework

One of the most pioneer attempts that provide foundations for open economy models is the Mundell-Fleming framework, owed to the seminal works of Mundell (1960) and Fleming (1962). The Mundell-Fleming framework visualizes that fluctuations in domestic currency (that might be due to any policy action or any other reason) can profoundly impact TB of a country. For instance, as a result of the depreciation of a nation's, its domestically produced goods become relatively cheaper than the foreign goods due to which foreign spending shifts to the domestic goods. Consequently, domestic economic activity flourishes while foreign output declines. Thus, the impact of a surge in the money supply of an economy in this framework is considered as "beggar-thy-neighbour" type.

Contrary to the Mundell-Fleming framework, recent models emerged in the literature on international trade and openness such as Kollmann (2001) and Obstfeld and Rogoff (1995) take into account nominal rigidities and imperfect asset substitution across countries. They argue that a depreciation of domestic currency due to an expansionary monetary shock may increase output both at home and abroad. So, in their view, the effect of a policy action causing a depreciation of domestic currency can be of "prosper-thy-neighbor" type. As postulated in the Mundell-Fleming framework, a policy action that depreciates domestic currency results in the shift in demand from foreign goods to domestic goods. Nevertheless, the effect across different time periods (intra-temporal effect) so caused may be upturned by the period-specific effect (inter-temporal effect) as initially the prices resistant to change are likely to soar in the subsequent periods. Hence, future goods become relatively more expensive than the current period goods. Owing to this reason, demand for both foreign as well as domestic goods shifts towards the present (inter-temporal switching effect) simultaneously. Given that this across-the-periods effect, which has been ignored in the Mundell-Fleming framework, comes into action, an expansion of domestic money supply boosts foreign output.

Further, for the purpose of sketching somewhat exact functional forms of demand for exports and imports of a country, the recent empirical literature suggests that exports of a country mainly depend upon foreign income (income of importing country) and real ER (Bhat & Bhat, 2021; Keho, 2021). Further, both foreign income and real ER favourably impact exports. Thus, the demand function of exports becomes:

$$X = f(RE, Y^f)$$

In the same vein, imports of a country are chiefly determined by the country's real income and real ER. Moreover, imports are positively associated with domestic income but are negatively connected with real ERs. So, the demand function of imports becomes:

$$M = f(RE, Y^d)$$

Here, $X =$ Value of Exports

M = Value of Imports
Y^f = Foreign Income
Y^d = Domestic Income
RE = Real Exchange Rate
While the RE is calculated as:

$$RE = \frac{eP^f}{P^d}$$

Where e is the nominal ER, and taken as the worth of a unit of foreign currency in terms of domestic currency. In other words, it is the number of domestic currency units exchanged for one unit of foreign currency, P^f is the foreign price level (CPI of a trading partner) and P^d is the domestic price level (CPI of Pakistan).

Research Hypotheses

H_1: Bilateral real RE has significant impact on bilateral TB of Pakistan.
H_2: The nature of the impact of bilateral real RE on bilateral TB of Pakistan remains same in the short run as well as long run.
H_3: Domestic economic activity has a significant effect on bilateral TB of Pakistan.
H_4: Foreign GDP (GDP of trading partner) has significant bearings on bilateral TB of Pakistan.

Methodology and Data

This section contains the description of variables, sources of data, and econometric techniques and methods employed in this study. We use panel data for six countries: Pakistan and its five trading partners for the period 1991 to 2018. The selection of sampled countries and time period for the analysis is based on several reasons. Firstly, the countries are selected keeping in view their bilateral trade volume with Pakistan. The countries having significant (more than 10% of Pakistan's total trade volume) share in Pakistan's total trade have been selected. Secondly, the time period is selected because it constitutes a reasonably good sample to ascertain the dynamics of relationships among variables as it spans over four to five trade cycles (considering average period of a trade cycle of a five to six years). Additionally, the latest years are not included in the sample period due to nonavailability of data especially on bilateral ER of sampled some countries, and also to avoid anomalies caused by disruptions in global trade during Covid-19 pandemic.

Variables and Sources of Data

Acquiring insight from the existing literature, this study uses real bilateral ERs, bilateral TB, and domestic and foreign real incomes. The ER is taken as the value of one unit of foreign currency in terms of domestic currency and the real ER is adjusted to domestic and foreign price level which is explained in the theoretical framework, given above. Real domestic and foreign incomes are the domestic GDP and foreign GDP at the constant price of 2010 respectively. The TB is measured as the worth of exports per unit of imports. Simply it is the ratio of exports to imports as used by many studies (Chiloane et al., 2014; Kodongo & Ojah, 2013; Šimáková, 2014;). The data on exports and imports is extracted from Directions of Trade and Statistics (DOTS), the data on CPI is obtained from International Financial Statistics (IFS) and the data on real GDP is taken from WDI, and on the ER is taken from the Federal Bureau of Statistics of Pakistan.

Descriptive Statistics

Table 1 showcases descriptive statistics of the variables utilized in this exploration. It is apparent from the table that mean and median values of almost all the variables are approximately equal which indicates that the variables follow normal distribution approximately.

Table 1
Descriptive Statistics

Variable	Obs	Mean	Median	Std. dev.	Min	Max
LGDPD	140	26.024	26.039	0.328	25.477	26.594
LGDPF	140	28.687	28.663	1.185	26.513	30.601
LRER	140	3.925	4.361	0.959	2.140	5.261
TB	140	1.016	0.890	0.857	0.074	3.924

Note: Here LGDPD is the logarithmic transformation of domestic real GDP, LGDPF is the logarithmic transformation of real GDP of foreign country (trading partner), LRER is the logarithmic transformation of bilateral real ER and TB is the bilateral balance of trade.

The coefficients of linear associations among the variables are portrayed in Table 2. It is apparent from the table that the strongest association is between bilateral balance of trade and real ER with the magnitude of correlation coefficient is 0.713, whilst the weakest association is between real domestic GDP and real ER. It is also worth noting that bilateral real ER and bilateral TB are comparatively more strongly correlated with foreign real GDP than domestic real GDP, which is probably due to the reason that our trade indicators are driven more by international factors than domestic factors. It further favours the argument that a small economy plays negligible role in international trade.

Table 2
Correlation Matrix

	LGDPD	LGDPF	LRER	TB
LGDPD	1.000			
LGDPF	0.249	1.000		
LRER	0.045	0.294	1.000	
TB	0.080	0.534	0.713	1.000

Note: As for Table1.

Econometric Model

The authenticity and credibility of the findings of a research investigation chiefly depend on the suitability of the econometric model it employs. Further, the selection of econometric model is determined by the objectives of the study. Therefore, the empirical endeavours aiming to analyse the impact of ER on balance of trade have employed a variety of econometric techniques what they deem fit to the objectives of their explorations. For instance, one strand of literature has employed ARDL and error correction models (Hussain & Bashir, 2013; Kyophilavong et al., 2013; Shah & Majeed, 2014; Suleman et al., 2014; Ziramba & Chifamba, 2014). Another type of explorations has used VAR and VECM techniques to achieve their objectives (Baak, 2008; Chiloane et al., 2014; Dash, 2013; Kodongo & Ojah, 2013; Onafowora, 2003; Šimáková, 2014). However, to investigate the bilateral trade position of countries, many studies has utilized panel cointegration models (Chui et al., 2010; Wang et al., 2012).

Since this study utilizes panel data, therefore, it exploits panel-data econometric techniques for its analyses. There is a wide array of panel-data econometric techniques but their suitability varies under different settings of the analyses. The most widely used panel-data econometric models include fixed effects (hereafter FE), random effects (hereafter RE), panel indirect least squares, generalized method of moments (henceforth GMM), etc. The FE and RE models do not differentiate between the short-term and long-term analyses. Panel indirect least squares model is used when there is a system of equation and to address the problem of endogeneity. Dynamic panel models, such as system GMM, panel ARDL and panel vector autoregression are used when the focus of the study is to investigate the dynamic relationships among variables as these models use lag(s) of dependent variable as a predictor(s).

This paper aims to inspect dynamics of connections among the variables under investigation both in the short as well as long run. For the purpose, it utilizes fully modified OLS (henceforth FMOLS) model to examine the long-term dynamics of the connections. The FMOLS model devised by Phillips and Hansen (1990) is a better tool to estimate the cointegrating slopes of the cointegrated variables even in the presence of serial correlation and

endogeneity among the regressors (Phillips, 1995). It gives optimal and consistent estimates of the cointegrating regression. Considering these advantages of the model, we exploit FMOLS model to investigate the long-term associations among the variables. For the short-run analysis, we employ panel error correction technique.

Keeping in view the advantages of FMOLS model and gaining insight from the existing literature, we employ panel data models to analyse the impact of bilateral ER on the bilateral TB of Pakistan with its five major trading partners. The econometric form of the relationships among the variables can be sketched as:

$$\ln TB_{it} = \alpha_i + \beta_i \ln Y_{it}^{\ f} + \gamma_i \ln Y_{it}^{\ d} + \delta_i \ln RE_{it} + \varepsilon_{it} \quad \ldots (1)$$

Here, BT_{it} is the bilateral balance of trade of Pakistan with the country i in time t. It is taken as as a ratio of Pakistan's exports to country i to Pakistan's imports from country i. It becomes a unit-free measure of TB, as it is in the form of a ratio, and has also been used by several studies. $Y_{it}^{\ f}$ is the real economic activity of the country i (trading partner of Pakistan) in time t, $Y_{it}^{\ d}$ is the real income of Pakistan in time t, and RE_{it} is the real bilateral ER in time t, measured as the real value of trading partner's currency in terms Pakistani rupee.

Panel Unit Root

It is imperative to determine the stationarity of data series because nonstationary series yield spurious and misleading results unless they are cointegrated (Newbold & Granger, 1974). Econometricians have developed a number of statistical tests and techniques to test the stationarity of series. However, the suitability and performances of tests differ in different situations. Owing to this reason, particularly in panel data setting, we have to check whether there exists cross-sectional dependence (henceforth CSD) or not before executing panel unit root test. In the case where there is no CSD, a first-generation test for the investigation of unit root can be used, but if it exists then second-generation tests for panel unit root are to be used. For the determination the presence the unit root of a panel-data series with CSD, the most widely used tools include a battery of panel unit root tests grounded in the works of Levine et al. (2002), Im et al. (2003) and Pesaran (2007). These tests include LLC, IPS and CIPS. To investigate panel unit root, for each cross section the ADF regression can be structured as:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \gamma_i t + \sum_{j=1}^{k_i} \theta_{ij} \Delta y_{i,t-j} + \varepsilon_{it} \quad \ldots (2)$$

Here, the first difference of the series is denoted by Δ, t denotes time dimension of the series, (where $t = 1,2,3,.....,T$), i corresponds to the number of cross sections in the panel (and $i = 1,2,3,\ldots\ldots,N$). Suppose X_{it} is the static of unit root test of the i th group. The p-value of the statistic for i th cross-section be ρ_i asymptotically, then $\rho_i = f(X_{it})$, so $f(X_{it})$ will be the distribution function of the variable X_{it}. Here, we have the null hypothesis that the series for each cross section is nonstationary that is it is the unit-root process. Whereas, the alternative hypothesis maintains that each cross section is not a unit-root process. So, we test the null hypothesis, that is $\rho_i = 0$. Further, in case the series are nonstationary, we must determine whether there exists a cointegrating relationship among the series with an objective to minimize the possibility of spurious regression.

Panel Cointegration

Since this study mainly aims to investigate the short-term and long-term dynamics of the impact of bilateral real ER on bilateral TB. It is, therefore, necessitated that there should be well-established cointegrated relationships among the variables for the long-run analyses. Econometricians have developed a number of tests to test the existence of panel cointegration, but the most widely used tests are designed by Pedroni (1999, 2004). There are major two categories of these tests. The first category includes panel *t*-statistic, panel ρ -statistic, panel *v*-statistic and panel ADF-statistic. The statistics utilized by these tests are within dimension-based, and are generally known as panel cointegration statistics. Further, the second category comprises group-statistic ρ -statistic, group t-statistic and group ADF-statistic. These statistics are between-dimension panel statistics, and are considered to

be group mean panel cointegration statistics. These statistics determine whether there exists any cointegrating relationship among the variables under investigation or not. The regression employed for panel cointegration can be represented as:

$$y_{it} = \alpha_i + \sum_{m=1}^{M} \beta_{mi} x_{mit} + \varepsilon_{it} \quad \ldots (3)$$

Here, i is the number of cross sections (members) of the panel, and t corresponds to the number of observations. The parameter α_i may allow the unit-specific fixed effects. The vector of the slope coefficient may also vary by country allowing the possibility of heterogeneous vectors across the countries for the existence of cointegrating relationships in the panel-data setting. Here in this setting, the null hypothesis to be tested is that there is no cointegration among the variables against the alternative that there exists cointegration among the variables.

Panel Error Correction Model

The study employs panel ECM to explore the short-term dynamics of the bearings of real bilateral ERs on bilateral TB. Moreover, this model also indicates the presence of an adjustment mechanism to the equilibrium path in the long run. The econometric form of panel ECM can be sketched as:

$$\Delta \ln TB_{it} = \alpha_i + \sum_{j=1}^{p} \beta_i \Delta TB_{it-j} + \sum_{j=0}^{p} \delta_i \ln \Delta RER_{it-j} + \sum_{j=0}^{p} \gamma_i \ln \Delta GDPD_{it-j} + \sum_{j=0}^{p} \varphi_i \Delta \ln GDPF_{it-j} + \lambda \varepsilon_{t-1} + \mu_{it} \quad \ldots (4)$$

Here, Δ denotes the first difference, i represents cross-section, p represents of lag length, and ε_{t-i} lag ECM term. For the stable long-run relationship, any deviation from the equilibrium path must disappear over the time. This sort of tendency in the adjustment mechanism requires that the coefficient of the ECM term (λ) must be significant with a negative sign, and its absolute value should be less than one. It will imply that short-term drifts from the equilibrium path will be corrected back towards the equilibrium path by the dependent variable $\Delta \ln TB_{it}$ with the speed of adjustment λ per period of time in the long run.

Results and Discussion

Results of Panel Unit Root Test

As the selection of panel unit root test requires the prior determination of CSD among the variables, we test CSD by utilizing the test designed by Pesaran (2004). The outcomes of the test confirm the presence of CSD in the series. Therefore, we use the Fisher-ADF test for the unit root analysis because the data-series under investigation have CSD, and also, we have a balanced panel. The outcomes of the unit root test show that only the TB series is stationary at its level as only in this case the null hypothesis can be rejected at a 5% level of significance.

Table 3

Results of Panel Unit Root Test

	Level		First Difference	
Variable	Statistics	P-value	Statistics	P-value
LTB	-1.7699	0.0308	-	-
LRER	2.2985	0.9892	-4.3799	0.0000
LGDPD	2.4950	0.9937	-4.4688	0.0000
LGDPF	1.5534	0.9398	-3.8889	0.0001

Note: As for Table 1.

At 5% level of significance, we cannot reject the null hypothesis for the cases of domestic real GDP, foreign real GDP, and bilateral ER. However, all these variables are first-order integrated as the null hypothesis that the series are unit-root process can be rejected at their first difference at 1% level of significance for each case.

Panel Cointegration

We use the FMOLS estimator proposed by Pedroni (2000) for cointegration analysis. Individual intercept and linear trends are incorporated into the estimation process. The findings of this analysis show that domestic real GDP harms the bilateral trade position of Pakistan in the long run which is in concord with the existing literature (Bahmani-Oskooee & Gelan, 2018; Bhat & Bhat, 2021; Dogru et al., 2019;). Moreover, a one percent increase in Pakistan's real GDP results in around seven percent deterioration of Pakistan's TB. This might be due to the nature of imports as a significant component of Pakistan's imports is comprised of input commodities.

Table 4

Results of FMOLS Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LRER	-0.3116	0.0838	-3.7162	0.0004
LGDPF	2.4224	0.5691	4.2559	0.0001
LGDPD	-7.1774	0.9244	-7.7644	0.00
R-squared	0.9558	Mean dependent var		-0.4069
Adjusted R-squared	0.9499	S.D. dependent var		0.9992
S.E. of regression	0.2234	Sum squared resid		4.4946
Durbin-Watson stat	1.9058	Long-run variance		0.0559

Analogously, a rise in domestic real GDP causes a surge in the demand for imports. The bilateral real ER cast unfavourable bearings on the bilateral trade position which implies that the devaluation policy on the part of Pakistan is ineffective (Malik, Awais, Sulehri, Mohsin, & Ali, 2021). It deteriorates the balance of trade instead of improving it. It might be mainly due to insensitive demand for imports to ERs or their prices. On the other hand, foreign real GDP has a positive impact on Pakistan's TB which is in agreement with the existing literature as increased foreign real income leads to increased demand for imports (Pakistan's exports) (Bussière et al., 2020; Dogru et al., 2019; Nguyen et al., 2021). The demand for Pakistani net exports rises by 2.5% as a result of 1% increase in foreign real income.

Panel ECM

To examine the short-term behavior of variables and the adjustment process to the long-run equilibrium, we employ the panel ECM. The selection of lag length of variables plays a key role in the establishment of relationships among the variables. The most suitable lag length as suggested by Akaike Information Criterion (AIC) and other criteria is 2. Therefore, we estimate the model incorporating two lags of variables in the model. Table 5 showcases the short-term connections among the variables. It is apparent from the table that the second lag of bilateral TB and foreign real income have favorable impacts on the bilateral TB of Pakistan. The significant and positive impact of bilateral TB indicates that the variable has to some extent as it moves in the same direction. Analogously, the significant and positive impact of the second lag of foreign real GDP substantiates that the economic activity in the trading partner has lasting impact on Pakistan bilateral TB – the impact may last for some periods. The first lag of the bilateral real ER cast a negative and significant impact on the bilateral trade position of Pakistan in the short run. All this substantiates that the depreciation of bilateral real ER exacerbates bilateral trade position of Pakistan, even it does not improve the position in the long run as well. These findings are in concord with the existing literature (Suleman et al., 2014; Shah & Majeed, 2014; Ziramba & Chifamba, 2014).

The current value of domestic real GDP worsens while its second lag significantly improves bilateral trade position of Pakistan in the short run. It implies that growth in the real GDP of Pakistan instantaneously exacerbates its bilateral trade position, while with time it improves it. It might be due to the reason that the exports of goods

pass through some procedural requirements that take time. Further, it is maintained that economic activity in Pakistan takes some time to boost its exports as compared to its imports, taking the time of around one year. The ECM term shows that the process reverts to its long-run equilibrium path if there are short-run deviations. The ECM term is significant at a 5% level of significance with a negative sign and an absolute value of less than one. The coefficient of ECM term is -0.1505 which indicates that the process reverts to the long-run equilibrium path at the speed of almost 15% per period (one year).

Table 5

Results of Panel ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTB(-1))	-0.0669	0.1151	-0.5811	0.5628
D(LTB(-2))	0.2616	0.1143	2.2891	0.0134
D(LRER)	-0.0787	0.1397	-0.5633	0.5748
D(LRER(-1))	-0.3249	0.1264	-2.5708	0.0098
D(LRER(-2))	0.1365	0.1372	0.9951	0.3228
D(LGDPD)	-3.1862	1.4587	-2.1842	0.032
D(LGDPD(-1))	0.2592	1.4625	0.1772	0.8598
D(LGDPD(-2))	2.5933	1.2535	2.0689	0.0455
D(LGDPF)	2.8098	1.0898	2.5783	0.0247
D(LGDPF(-1))	-0.2689	1.2145	-0.2214	0.8253
D(LGDPF(-2))	-0.5639	1.0536	-0.5352	0.5941
RESID1(-1)	-0.1505	0.0741	-2.0334	0.0455
R-squared	0.2074	Mean dependent var		-0.0020
Adjusted R-squared	0.0927	S.D. dependent var		0.2389
S.E. of regression	0.2276	Akaike info criterion		0.0039
Sum squared resid	3.9381	Schwarz criterion		0.3417
Log-likelihood	11.8254	Hannan-Quinn critter.		0.1401
Durbin-Watson stat	2.1127			

Conclusion

This study investigates the effect of the bilateral real ER on the bilateral trade position of Pakistan with its five significant trading partners, namely the US, China, Saudi Arabia, Germany, and the UK. To this end, we use panel data from six countries from 1991 to 2018. For the long run analysis, we employ FMOLS model designed by Pesaran (2000), and for the short-run analysis of the interactions of variables, we exploit a panel ECM model.

Since the cointegration procedure requires the investigation of the order of integration of variables, we use the panel unit root test to determine the order of integration of variables. Before moving on to panel unit root analysis, it is mandatory to check CSD. For this purpose, we utilize the test devised by Pesaran (2004) to determine CSD of the variables which indicates the existence of CSD. Since the second-generation panel unit root tests are employed when there is CSD, we employ the Fisher-ADF test. The outcomes of the unit root test reveal that the TB series is I(0) while RER, GDPD, and GDPF are I(1). However, the results of the fully modified OLS test reveal that both domestic real economic activity and bilateral real ER deteriorate the bilateral trade position of Pakistan while foreign real income has a positive impact on it. Further, the results of panel ECM confirm the existence of adjustment tendency in the process to the long-run equilibrium path.

Policy Recommendations

The findings of the study support the notion of a 'small open economy' discussed in standard international economic literature. This perspective maintains that policy decisions in small open economy do not significantly influence global economic environment. The insights derived from the study not only affirm this stance but also extend it, indicating that foreign factors are more important than domestic ones in determining trade position of a small open economy. The implications drawn from these findings suggest that business conditions in the trading partner can significantly impact the trade position of a small open economy. Therefore, economic agents of small open economy should keep a vigilant eye on the global economic developments and make their decisions accordingly in order improve their trade position.

Based on the insights acquired from the study, it is recommended that Pakistan should reconsider its devaluation policy, particularly when it aims to address its TB disequilibrium, as depreciation of domestic currency exacerbates TB instead of ameliorating it. The more effective approach might involve alternative measures, such as bolstering export capabilities through diversification of exports and enhancement of productive capacity. The policymakers in Pakistan should keep a vigilant eye on global trends, as real GDP of trading partners has positive and significant impact on Pakistan's bilateral trade position. They should adjust policy measures in accordance with global business trends (cycles) in order to reap advantages.

Future Research Direction

We recommend exploration and investigation of the elements of bilateral trade for future research endeavours. The researchers may also explore nonlinear dynamics of the drivers of bilateral TB.

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