








Trade Balance and Pakistan Economy using ARDL model: A Perspective of Trade Deficit Developing Economies

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ABSTRACT

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The influence of trade balance on the economy provides opportunities and challenges against an ongoing global uncertain environment. Existing studies take a broad picture to analyze such influence, often failing under specific implications, indicating a need for a close perspective. Taking this background, this paper aims to study the main features of the complex association between trade balance and economic growth through a close perspective of Pakistan. Accordingly, the study follows econometric techniques and applies the autoregressive distributed lag (ARDL) model on time series days of Pakistan from 1970–2021. In methodology, various statistical techniques are applied to refine the findings, mainly unit-root analysis and cointegration modeling in both long and short-run evaluations. In addition, dependence on trade balance was measured against independence of currency rate, joblessness, investment, and overall domestic production. Findings revealed that the local currency rate, in the long run, has a negative and significant association with the trade deficit, suggesting a growth in exports by lowering that rate. It also boosts local manufacturing to compete against imports, which feel costly. These results can facilitate customizing the local policy guidelines at the national level or in developing countries with similar financial issues like trade deficits. This study's implications suggest that a close viewpoint between trade balance and the economy could guide in pursuing area-specific goals on a sustainable basis.



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1. Introduction

The trade balance, in association with economic development, creates better opportunities to browse the upcoming uncertainties. Understanding this association becomes a complex challenge with variations in demographic features and domestic technological trends. Because local trade features like import and exports, manufacturing, and consumption are related to international trade and associated uncertainties (Adeleye, Osabuohien, Bowale, Matthew, & Oduntan, 2018). Because a given geographical area has its own culture, living style, and technological trends, the relationship between the trade balance and economic development needs to be understood. A similar concept was explained by the Ricardian model that often countries view international trade concerning the economy to get a better perspective of competitive advantage. Moreover, the factors governing the association between trade and economy are dynamic and continue to change the trade balance positively (trade surplus) or negatively (trade deficit). It suggests a need to comprehend the association between trade balance and economic progress while simultaneously customization at the local level for given factors of production and resource allocation, particularly for countries with scarce resources (Khan, 2019).

The underdeveloped countries have a more complex trade association to economic progress with reciprocal features. Typically, trade can be defined as a transfer of products and services against some currency. In this way, the trade balance is the overall value of products and services against sales and purchases at the national level. This overall value can be negative or positive. A positive net value is called a trade surplus when the value of a country's exports is more than the value of imports; vice versa is called a trade deficit (Du, 2021). A trade deficit negatively influences economic progress. On the one hand, a negative trade balance shows better local people's financial capability as they pay higher prices for imported goods. On the other hand, this behavior negatively impacts the economy over a more extended period in many ways. 1) The country's national economy depends on external finances, most likely loans with higher interest rates. And these higher interest rates put more pressure on the country's budget because of annual repayments (Shahbaz, Naeem, Ahad, & Tahir, 2018). 2) Another impact of the negative trade balance is the depreciation of the local currency; which further decreases the capacity to purchase the products and services (Muzammil, 2020). 3) Another negative trade balance impact is the depreciation of the local currency, which further decreases the capacity to purchase the products and services. (Müller, Storesletten, & Zilibotti, 2019). 4) The decline in new business prospects leads to a shrink in economic progress (Sawaie, 2018). In this way, the regional industry suffers from the loss of competition internationally, which also puts pressure on economic progress (Bathelt & Glückler, 2018). To summarize, such scenarios lead to a decrease in the revenue supported by a rise in the standard of living, leading to the compromising of national sovereignty. Consequently, understanding the dynamics between the trade balance and economic progress at a regional-specific level must be considered.

In developing economies, the trade balance concerning economic progress has been studied on various topics like GDP, foreign direct investment, production factors, and consumption. First, the Gross Domestic Production (GDP) remained the main topic to be studied. Typically, GDP reveals an optimistic and meaningful association with the trade balance in the presence of other indicators like oil prices, rate of currency, and Gross national production (GNP) (Taşseven, Saracel, & Yılmaz, 2019). Similarly, findings were revealed between GDP and various indicators of trade balance in Ethiopia as a developing country (Aghsilni, Sentosa, & Syofyan, 2019). This study also examines inflation's positive influence on the trade balance. Second, foreign investment is also discussed concerning the trade balance. For example, the behavior of trade balance was analyzed with various main economic indicators including, rate of inflation, human skills development, foreign direct investment (FDI), currency rate, government expenditures, and consumption (Trevor, Yongchang, & Wenshan, 2018). On a similar track, the influence of FDI was studied on the trade balance over

the long term and short term, along with various indicators like GNP, national consumption, and currency rate (Iqbal, Kalim, & Arshed, 2019). In the same manner, foreign direct investment were also observed to have a positive relation with trade balance and currency rate (Khalaf et al., 2018). Third, factors of production work together to have a substantial impact on economic progress to make local investment more competitive. This determinant of production, if well organized, has been shown to have prime importance for international trade to impact the trade balance positively (Olczyk & Kordalska, 2018). In last, expenses and consumption rates were also studied concerning the trade balance because of public and government spending (Akoto & Sakyi, 2019). They studied that the currency rate is closely associated with the negative trade balance as it is often devalued to reduce the impact of the negative trade balance.

Above mentioned studies confirm a close association between trade balance to economic progress, with many determinants affecting this relationship positively and negatively taking Pakistan as a typical case of a developing economy. Studies find that continuous historical patterns of trade deficit impact economic development. For example, the trade balance is found to be a close association over the long term with total domestic production, currency rate, and level of funding from 1970 to 2005 (Siddique, Anwar, & Quddus, 2020).

Similarly, another study observes a negative association between trade balance to the local currency rate and oil prices (Olayungbo, 2019). They observe that currency devaluation has positive signs for the trade balance, but soon these signs disappear. It also means that a higher currency transfer rate has a negative association with trade balance over a long period. Besides the currency rate, they also observe the oil prices to affect negatively with significant impact over the long run from 1975 to 2010. Similarly, another study measures the effects of the currency rate on the trade balance in the years 1988-2006 (Kyophilavong, Shahbaz, Rehman, Souksavath, & Chanthasene, 2018). They also suggest better options than currency devaluation for trade balance. Likewise, another work evaluated the behavior of trade balance under the strong influence in association with three variables, namely, rate of inflation, currency rate, and financial progress (Shahbaz et al., 2018).

First, the country constantly uses loans to balance the trade deficit over the years. As each loan is provided with some interest over the years, it compounds over time (Shahbaz et al., 2018). Secondly, the economy has to devalue the currency to support the trade deficit, further slowing economic progress (Muzammil, 2020). Third, recently, the Sri Lankan economy has defaulted, and now the investment stakeholders in the country are losing their confidence, often delaying new project investment due to future challenges (Müller et al., 2019). Fourth, consequently, the country's economic progress has slowed down, compromising its competitive advantage (SAWAIE, 2018). These points suggest a typical characteristic of a country for the continued trade deficit. For example, the historical data of the country show that the trade deficit was around one billion \$ which grew to 1.5 billion at the start of the year 2020 (Khan et al., 2020). In these years, the economy has suffered from low-income and demographic trends with compromised lifestyles. The country showed a positive trade balance only two times in 1951-1952 and 1972-1973 when the economy was supported by increasing the luxury goods tax and devaluing the currency. After this trend, now the country is on the edge of compromising its national sovereignty when the trade deficit is sizable in 2023. Given the above discussion, the currency rate is a significant tool to manage the trade deficit somewhat, but it is not managed (Yusuf, Afolabi, Shittu, Gold, & Muhammad, 2021). Similarly, another tool to manage the negative trade balance is attracting foreign investment (Tahir, Khan, & Shah, 2015). The country's economic governance has applied many policies and plans over the years and these plans remain to achieve unsatisfactory performance. In summary, the case of Pakistan offers a sufficient research gap to analyze the various factors between the trade balance and its impact on economic progress, considering distinctive features of culture, demographical trends, and technological progress.

This study examines the main components concerning the association between trade balance and economic progress. Methodologically, the study used an autoregressive distributed lag model (ARDL) besides multiple econometric and statistical models for cointegration and unit root tests in the short and long run. Accordingly, a typical case of Pakistan as a developing country is taken using the time series data from 1970-2020 because of multiple unique cultural, technological progress, and demographical features. This study offers a continuous trend of negative trade balance supported by inferior living style, growing of loans, and shake in investment confidence. Therefore, the analysis drives a better understanding of trade deficit and economic progress to capture the competitive gain. The study would facilitate building strategic planning for the growth of international trade because of managing various factors like current rate, efficient use of labor resources, attracting foreign investment under customized text policy, and finding new ways of production. Such strategic planning takes the applied perspective to realize better the association of trade balance to economic progress after globalization.

The rest of the paper is organized into the following sections. Section 2 explains the methodology, while Section 3 discusses the results. The final section concludes the paper with some policy recommendations.

2. Data and Methods

This part explains the method to analyze the theoretical model, its formulation, and data foundation.

2.1. Data Source

This study analyzes the link between trade imbalance (TD), Gross domestic product (GDP), currency exchange rate (EXR), direct investment (FDI), and rate of unemployment (UEM). This study used secondary data for the variables explained above from the years 1970-2020. This data is arranged using information from the Pakistan Bureau of Statistics, Pakistan Economic Survey, and World Development Indicator (WDI, 2020). The selected variables and how they are used are explained in Table 1.

Table 1
The Description of Selected Variables Used in the Study

Variable	Label	Explanation	Source
Deficit in trade	TD	It represents the total trade balance after deducting the imports	WDI
Private Investment also called Foreign Direct Investment	FDI	It is the total investment by a foreign company normally aimed at direct investment, it checks the net inflows (Bank of Punjab, normally measured in US \$)	WDI
Gross Domestic Product	GDP	It is total production at the national level (constant LCU)	WDI
Rate of Unemployment	UEM	It refers to the number of unemployed people, in terms of the labor force, at the national level calculated on an annual basis.	WDI
Local Currency Rate or exchange rate	EXR	It is the official rate of a given currency against US \$ at a given time. It continuously changes over time and is more dynamic than other indicators. (LCU per US\$, period average)	WDI

2.2. Specification and Framework

The model used the specifications considering the analysis of the trade deficit in association with various key indicators of Pakistan's economy, such as currency rate (EXR), rate of unemployment (UEM), Foreign direct investment (FDI), and overall domestic production. Given the discussion in the introduction, the association among these factors shows a significant gap in the current works concerning secondary data in a developing country

like Pakistan. Accordingly, the model is applied through linear analysis using the equation below.

$$TB = f(FDI, GDP, UEM, EXR) \quad (1)$$

The linear expression (TB) explains a function to analyze the association between four indicators: FDI shows the foreign direct investment, GDP denotes the overall domestic production, UEP is the unemployment rate, and EXR is the currency rate. The same equation can also be written with different expressions to show the error factors in those four economic indicators.

$$TB_t = \beta_0 + \beta_1 FDI_t + \beta_2 GDP_t + \beta_3 UEM_t + \beta_4 EXR_t + \varepsilon_t \quad (2)$$

After the inclusion of the errors, further reliability and consistency are added by taking the natural logarithm as given below

$$\ln TB_t = \beta_0 + \beta_1 \ln FDI_t + \beta_2 \ln GDP_t + \beta_3 \ln UEM_t + \beta_4 \ln EXR_t + \varepsilon_t \quad (3)$$

Inclusion of the error terms makes each variable elastic over the long run, and represented by these parameters β_1 , β_2 , β_3 , and β_4 , respectively for the foreign direct investment, overall domestic production, rate of unemployment, and currency rate of exchange. In this study, the first two parameters are used as negative expected sign β_1 , and β_2 , while the other two parameters β_3 , and β_4 , are proposed with a positive expected sign.

It also needs to be noted that signs for the overall domestic production and total private investment (GDP & FDI) are negative when the value has an increase in the trade deficit. On the contrary, the EXR and UEM, i.e., the exchange rate and unemployment rate, have a positive effect on the trade deficit when their value is increased. The time is expressed by the parameter t . Moreover, other parameter β_0 represent the value of possible condition when the impact is fixed, while the ε_t denotes the noise in the normal distribution.

2.3. Estimation Approach

Given the recent studies, many techniques have been applied on the data having the properties to reveal the time-based trending in both scenarios, i.e., short and long run. The current study applied the ARDL model to reveal the complex interface among the variables; this model was presented by Pearson and his colleague (Pesaran, Shin, & Smith, 2001). These techniques offer various advantages when compared to relevant cointegration methods (Engle & Granger, 1987; Johansen & Juselius, 1990). This model provides various advantages for cointegration over the classical techniques in the relevant field. First, the ARDL offers a straightforward application, which makes the interpretation straightforward and more clear than the previous methods (Bayer & Hanck, 2013). It means that a single structured equation is used to work with the application of this method, and it is exactly the contrast as the previous method used various transformations or piles of equations to achieve the signal objective (Bayer & Hanck, 2013). Second, the model is reliable over a small sample size, when a comparison is drawn over previous methods of Johansen and Juselius Haug (2002) as most of the time extensive dataset on a given case study is not available. It makes the underutilization of existing resources. Third, the model also features the long-run and short-run perspective simultaneously, making the hypothesis testing much easier in long-run estimates (Alam, Li, Baig, Ghanem, & Hanif, 2021). Such features make this model a challenging competitor when comparison is drawn with the previous techniques of Engle-Granger.

Considering the advantages mentioned above, the model is applied in various steps. At first, the stationarity among the various variables is evaluated to know about the power of stability between those variables. In the second step, the time series features of the variables

were used to evaluate the long-term association with dynamic or non-stationary characters. In the third step, both the long-run and short-run causality relationship was evaluated for those variables. Taking all together, all these steps were completed with different approaches although, some methods might take the procedure short without applying the first two steps. These all steps were performed using the statistical package for the econometric analysis.

3. Results and Discussion

3.1. Test for Analyzing the Variable' Stationarity

Typically, analyzing the stationarity of the variables is a common step; it checks whether the variables have unit root to find the incorrect regression. No doubt, there are also some other methods normally used to check the unit root in a given variable although the test procedure introduced by the Augmented Dickey-Fuller (ADF) test is generally preferred (Dickey & Fuller, 1979). Findings of this unit root test results are provided in Table 3. It can be seen that only the LnTD is stationary, while the other variables, like LnUEM, LnFDI, LnGDP, and LnEXR are stationary on the first difference with the given level of 1% Significance. Moreover, it needs to be noted that LnTD shows stationary at a 10% value of significance. It also means that when the integration of these variables was completed at mix-order, the given time series variables showed a meaningful value. However, when the values of a single time series variable were calculated at the second difference, the observed values showed no significant difference (Pesaran et al., 2001). Therefore, it can be suggested that applying the ARDL method is better suited after reading the above points.

Table 2
Results of Unit Root Test

Variables	Test Statistics for ADF	
	At Level t-statistics	At 1st Difference t-statistics
LnTD	-2.6471*	----
LnFDI	-2.2425	-4.9854***
LnGDP	-2.3232	-5.4659***
LnUEM	-2.2462	-6.5789***
LnEXR	-0.898	-6.1449***

*** 1% level Significant level, ** 5% level Significant level, * 10% level Significant level.

3.2. Applying the Test of Cointegration

The cointegration analysis is applied to examine the long-term association among the given data variables with time series features (Pesaran et al., 2001). The implication of such analysis concerns the long-term trends that are the foundation of variable dynamics which are mainly caused by short-term changes. Then the F-statistics value is calculated using the ARDL limit testing, which is observed between the minimum and maximum range of the critical values. Such a range of F-statistics values is affected through the interval of the gap; this way selecting the best lag becomes challenging. Accordingly, the criteria of AIC are applied. At this phase, the significance level of 5% was set to calculate the F-statistics value as 4.84. This analysis also confirms that those variables show a long-term association, which rejects the null hypothesis of no cointegration. Accordingly, the relevant details are provided in Table 3 given as follows.

Table 3
Applying the ARDL Method with Bound Cointegration

Model	F-statistics
LnTD= LnEXR, LnUEM, LnGDP, LnFDI	4.84*

*Cointration exists at 5% level

3.3. Results to test Long Run and Short Run Estimation

When the test is applied, it calculates the cointegration to estimate the long-term relationship between the given time series variables. The result of this test is presented in Table 5 which lists the long-run and short-run association between the given variables alongside the correction of error terms, the level of significance, relationship symbols, and coefficients of estimation.

Table 5
Findings of Short-run and Long-run Evaluation

Variables	Coefficient	St. Error	t-statistics	Prob.
Long-run estimates				
lnFDI	0.037	0.196	0.1889	0.851
lnGDP	-1.5909	2.1505	-0.7397	0.4636
lnUEM	0.1988	0.173	1.1492	0.2571
lnEXR	-2.0859**	1.0123	-2.0605	0.0457
C	27.3059	21.83	1.2508	0.2181
Short-run estimates				
lnFDI (-1)	0.0136	0.0719	0.1896	0.8505
lnGDP (-1)	-0.5861	0.788	-0.7438	0.4612
lnUEM (-1)	0.0732	0.0597	1.2259	0.2272
lnEXR (-1)	-0.7685**	0.3376	-2.2761	0.0281
ECT(-1)	-0.3684	0.0858	-4.2901	0.0001
Diagnostic test				
Serial Correlation	0.5131			
Heteroscedasticity	0.4705			
Normality	0.7751			

**Significant at 5% level.

The above findings suggest a long-term association such that a long-run exists between the exchange rate and negative trade balance. Moreover, the study also finds that this association is significant statistically in the long term. From the results, it can be observed that when the exchange rate increases with the value of 1%, superficially the trade balance improves with this change in the exchange rate; however, a drop of 2.09% in the value of trade balance is noted over time. This long-term association implies that weaker improvements in the currency although, boost exports, but at the same time, also increases the import prices, which were lower than before. The combined impact of such impacts is the decrease in the currency exchange rate and it pushes the purchasing price of foreign items that further increase the inflation to impact the consumer needs. Moreover, the study also finds an association between the trade deficit and private investment, joblessness, and the economy; this relation shows a negative sign with no significance in the numerical sense. The association between the currency rate and the trade deficit shows a negative sign and its significance is recorded at the given statistical value. This result shows a rise in the exchange rate with the value of 1% and it reduced trade deficit with the value of 0.76% in the short term. This impact has derived the exchange rate and its influence on international business trade in a very close association with the trade balance. Further the GDP, joblessness, and foreign investment are the other variables that show negative positive, and positive, signs respectively. These indicators have not shown the substantial difference in the short time. The figure for the error adjustment term shows a value of -0.3684 for the change rate.

3.4. Diagnostic Test and its Application

The econometric features like autocorrelation, heteroscedasticity, and normalcy test are assessed using various diagnostic tests with time series properties such as the LM test of serial correlation, the test of heteroscedasticity, and Ramsay (Kuiper, 2008; Martins, Barreto, Souza, & Souza, 2021). The result of these analyses is presented in Table 5. Moreover, this analysis

also follows the econometric features through the selected model. The finding also revealed that the exchange rate, unemployment, gross domestic production foreign investment, and variance of TD have no autocorrelation and heteroscedasticity. Moreover, CUSUM and CUSUM square tests were also applied to check whether the applied model was steady. These findings are provided in Figure 1 and Figure 2 respectively with the blue graph lines while these lines are centered between the red lines in the graph; these explain the stability of the system. The three tests, including the LM test, Ramsay test, and heteroscedasticity, are diagnostic tests that are used for analyzing the serial correlation. These three tests are capable of analyzing the data with time series properties and econometric features like heteroscedasticity, autocorrelation, and normality tests (Kuiper, 2008; Martins et al., 2021). Accordingly, these test findings are provided in Table 5, which also provides to feature of data with econometric properties. These findings suggest that the four indicators, including exchange rate, unemployment, gross domestic production, and foreign direct investment, show some changes in the value of trade deficit; it is in the absence of autocorrelation, and heteroscedasticity.

Furthermore, the stability of the model was assessed using the CUSUM and then taking its square root. The finding is also provided in the Figure 1 and Figure 2. The model shows stability depicted by the blue line between the two red lines over the 5% significance value. These two red lines are the extreme cases.

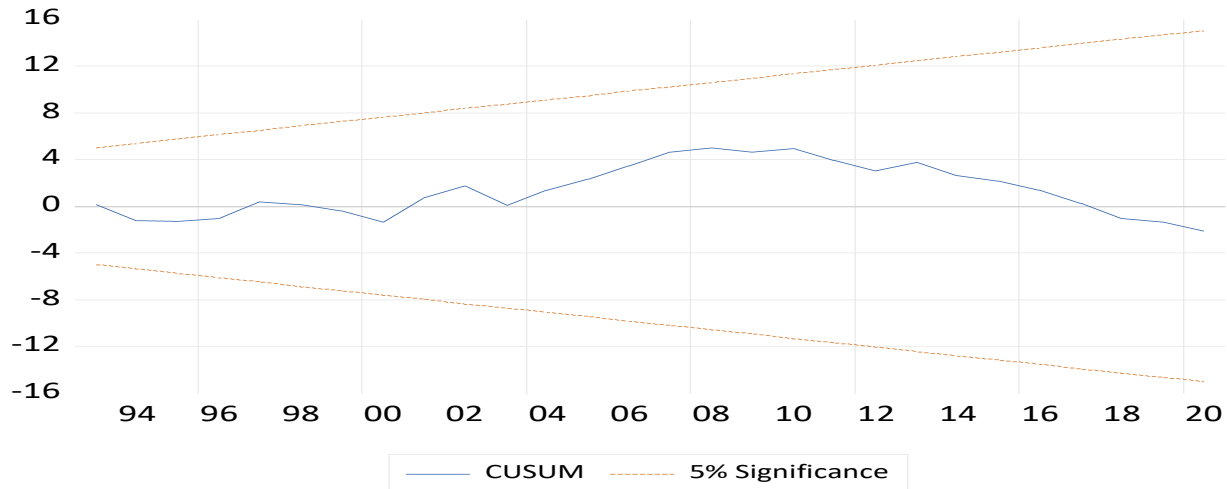


Figure 1. The CUSUM Chart Showing the Model' Stability

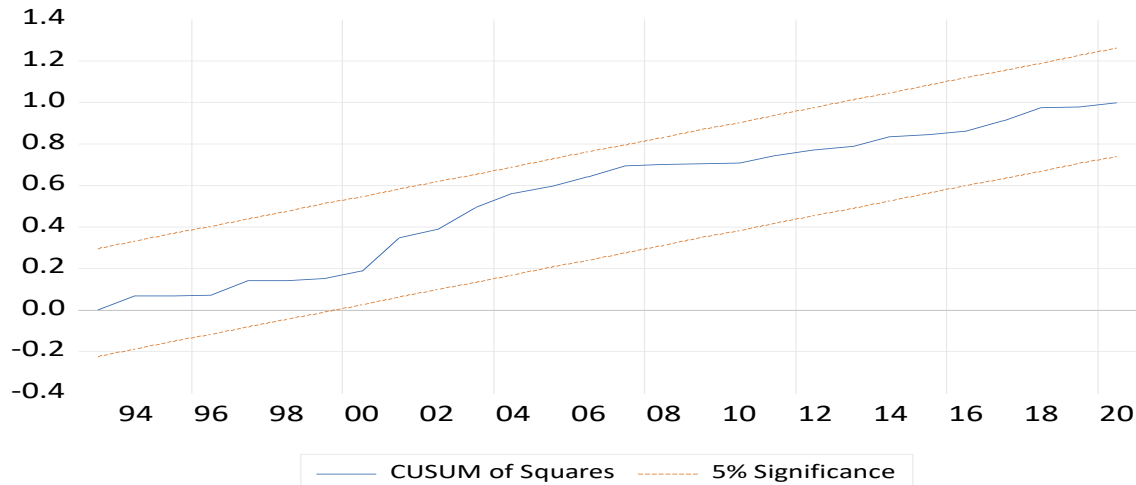


Figure 2. CUSUM of Squares Chart Showing the Model's Stability

4. Conclusion and Policy Remarks

Current work used the ARDL model to analyze the association of the trade balance with other potential economic factors to seek sustainable growth. The model applies various statistical approaches, including the ARDL limit, optimum lag duration, and unit root test, and these tests analyze the cointegration along with the error correction in both fashions, i.e., short-run and long-run association. Later the other two tests were applied to analyze the balance in the model, i.e., the Cusum test and Cusum square test. This analysis uses a close perspective by using the time series data from Pakistan between 1970 to 2020, considering the uniqueness of the culture, demography, and specific technological trends. This close perspective would provide a typical scenario of a developing country because of consistent growth in the trade deficit and its impact on the economy and living standards.

The current study offers an analysis of trade deficit concerning the economic indicators, simultaneously implying the short- and long-term scenario in theoretical relevance. Accordingly, the study used four key economic indicators, including gross domestic production, the currency rate, foreign investment, and unemployment, to assess the behavior of trade imbalance in long and short scenarios.

Findings suggest that out of four indicators, such as gross domestic production, foreign direct investment, and joblessness show a favorable and numerically significant association with the trade deficit. The findings also suggest a negative but statistically significant association between the currency rate and the long and short-term trade deficit. These findings would facilitate relevant authorities to frame and guide the related policy and its applications.

4.1. Exchange Rate Treatment

Current work might guide policymakers to estimate currency exchange rates and their economic role. The currency rate of exchange is the primary determinant associated with the trade balance. When the exchange rate of currency decreases, it pushes the trading to foreign countries with a reverse impact on the imports. In reality, this boost in exports is due to the low actual value of the local currency. It costs less money in foreign currency to buy the local product, resulting in boosting the export by placing more orders. On the other hand, lowering the actual value of the currency would exert a downward trend for imports, as the foreign products become too expensive for local customers.

4.2. GDP Impact and Treatment

This work might guide the policy-making authorities considering the long-term economic development perspective. It can imply various sectors of the economy, including tax reforms for new manufacturing zones, subsidies in selective import items, tax-free trade zones, planning and establishing economic towns, financing the infrastructure, etc.

Undoubtedly, growth in any of these areas or their combination can improve economic growth in the long term. And right planning can bring the trade balance back to the normal routine, i.e., export growth and reducing import load. In this way, the negative trade balance can get to the balance or might improve on the positive side.

4.3. Foreign Direct Investment

Direct funding to an economy, also termed foreign direct investment, directly impacts the trade balance positively. Therefore, such direct sources of investment must be attracted by bringing stability to the political environment, a safe working environment from terror attacks, sovereignty at the national level, etc. A stable and peaceful environment is the first condition

for the industrial manager that any multinational company wants before investing in that country. It influences in two ways: 1) the investors who are planning for the investment on its first time like to have a look at the existing investment plans; 2) the investment already work-in-process also gets growth.

4.4. The Right Balance

This study suggests a balance when designing comprehensive policy guidelines for relevant authorities to work in a coordinated fashion. The study offers a guide to consider the macro and micro economic factors in short- and long-term scenarios. In the same manner, the impact of inflation is the after-effect of the lower price of local currency (devaluation). This inflation also has a positive influence on exports. Keeping this point of view, a careful review of foreign direct investment should be considered keeping the long-term perspective and multifactor association to effectively utilize the limited resources of developing countries.

Authors' Contribution

Sana Hanif: Conceptualization, Reviewing, and Editing.

Syeda Neha Fatima: Conceptualization, Reviewing, and Editing.

Muhammad shahid Iqbal: Data Collection and Estimation.

Salman Hanif: Writing and Draft Preparation.

Sania Batool: Writing and Draft Preparation.

Conflict of Interests/Disclosures

The authors declared no potential conflict of interest w.r.t the research, authorship and/or publication of this article.

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