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Economic implications of BRICS economies for Pakistan; Evidence from nonlinear ARDL cointegration approach

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Abstract

This study employs the pooled mean group estimator to examine the effects of gross domestic product (GDP), population size, integrated infrastructure, geographical distance, common language, common border, landlock, ethnicity, and WTO membership, using an updated dataset for Pakistan and BRICS economies from 1990 to 2021. Harris-Tzavalis's and Levin-Lin-Chu's tests confirm the stationarity of the regressand and regressors at I (0) and I (I), allowing for the utilization of the pooled mean group estimator panel ARDL. Results from the Kao and Pedroni cointegration tests indicate cointegration among the variables. Empirical results of the Pooled Mean Group (PMG) reveal that GDP, infrastructure, common borders and languages, and WTO agreements have positive and significant impacts on trade flows, while distance and ethnicity negatively affect trade performance. Further policies are recommended based on the findings.

Keywords: Trade Potential. ARDL method. Economic Growth. Gravity Model. Trade potential.

I. Introduction

Trade diversification and globalization are recognized catalysts for fostering creativity, innovation, competitiveness, and economic growth in economies, providing increased access to global trade markets [1, 2]. The World Trade Organization (WTO) plays a pivotal role in promoting trade potential among nations through the formulation of trade-related rules and regulations for both developed and developing countries [3, 4]. Within this global context, the

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BRICS economies emerge as a significant trading bloc, contributing substantially to the global trade volume [5]. As a developing economy, Pakistan relies on various developed economies to enhance its trade potential and domestic production. In this regard, various favorable policies are essential to increasing the trade potential of Pakistan with its trading partners.

Pakistan is a small, open economy with a very low contribution to the global trade of goods and services, heavily relying on labor-intensive products such as food and textiles.

Over a period, Pakistan's biggest trade partners are the United States (18.63%), the United Kingdom (7.76%), Germany (6.27%), the United Arab Emirates (4.93%), and China (8.40%), which account for 40.2%. In addition, the European Union (EU) is another export destination for Pakistan's exports, which imports about 31% of Pakistan's product exports at the same time[6]. In line with the SDGs' Agenda 2030, for long-term and sustainable growth, it is also important to increase trade opportunities and market diversity by making it easier for willing trading partners to trade with each other within the region [7, 8].Being a significant economic bloc, BRICS (Brazil, Russia, India, China, and South Africa) has expanded its trade products in the world economy and has gained profound growth in the global trade market[9].Therefore, based on trade-related rules and regulations of the World Trade Organization (WTO), the member states of the BRICS have developed various rules and regulations to increase their trade potential in the region [10]. The global economy has experienced many structural changes during the last five decades and is also expecting many more radical changes in the coming years [11] .Depending on the structure of economics, many developed economies and very few developing economies implement and adopt various developmental strategies over a period of time to enhance their growth and development processes. To capture global markets, different regional economies, especially the BRICS countries, adopted and implemented various structural changes and contributed about 50 percent of the world's economic growth soon after the 2007 global financial crisis [12, 13]. If BRICS countries are continuously enforcing and implementing required global economic and structural policies, then it is expected that by the end of 2030, the BRICS nations will be among the top seven world economies [14, 15].

Pakistan, not being a member of the BRICS countries, faces trade losses in terms of diversification. However, the BRICS region actively fosters political, cultural, social, and commercial relationships globally. Despite being a non-member, Pakistan can derive benefits and enhance its trade potential through the formulation of essential trade agreements. BRICS

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economies play a pivotal role in Pakistan's exports, contributing to approximately 35 percent of its total imports and exports[16, 17] Notable exports from Pakistan to the BRICS countries include textiles, leather products, and food items [18, 19]. Furthermore, Pakistan's strategic location and natural resource position make it favorable to capitalize on trade opportunities presented by the BRICS nations[20, 21].

This study aims to analyze the economic implications of Pakistan's trade potential with BRICS countries by employing a dynamic cointegration approach through pooled mean group analysis in line with the study's objectives.

In essence, the research explores how Pakistan can enhance its exports to the BRICS region over time, leveraging its position as a significant recipient of global investment opportunities. Pakistan, as a non-member of the BRICS, faces trade losses in terms of diversification. However, the BRICS region actively promotes global political, cultural, social, and commercial relationships. Despite its status as a non-member, Pakistan can benefit from and expand its trade potential by negotiating essential trade agreements. The BRICS economies play a critical role in Pakistan's exports, accounting for approximately 35% of total imports and exports (World Bank, 2020). The study incorporates various important variables such as GDP, population, distance, integrated infrastructure, common languages, common borders, landlocked status, ethnicity, and WTO membership using panel data from 1990 to 2021. The study aims to focus on the changing dynamics of Pakistan's trade relations with the BRICS countries. The WTO also provides information on BRICS membership.

This study contributes to the literature on regional trade in Pakistan and the BRICS nations by utilizing a dynamic cointegration approach through pooled mean group (PMG) analysis. This method is preferred over previous approaches as it can identify short- and long-term relationships for the sample countries. After analysis, it is evident that the GDP, infrastructure, common borders and languages, and WTO membership all have a positive and significant effect on trade flows for Pakistan and BRICS countries. However, distance, ethnicity, and common language, to some extents, have negative effects on cross-border trade among nations. Because of economic coalitions with the BRICS, Pakistan may experience a redirection of trade flows away from its market. WTO participation benefits Pakistan and the BRICS economies by improving regional economic integration and prosperity. This study is organized as follows: After the introduction in Section I, Section II describes a review of the literature. The relevant methodology is discussed in Section III. The findings of the study are

discussed in Section IV. Section V concludes the study with relevant policy recommendations.

II. Review of Literature

In general, regional integration has been considered a powerful means to promote economic growth and development in various developed and developing countries. But over the last many years, trade has been an engine of economic growth and development in various countries. This trade mechanism has also been strengthened and liberalized since the inception of the WTO's General Agreement on Tariffs and Trade (GATT) among the willing trading partners in the world economy.

This existing literature on the subject matter reveals that regional trade can be promoted through various trade-related measures. [22] examines both the short-run and long-run relationship between Pakistan's GDP and its exports over a period of 1975–2010 and concludes that the growth in GDP over a period of time expands the exports in Pakistan. This analysis also suggests that there is a need to increase production and output to enhance trade volume for the long-term growth process.

Depending on the structure of the economies, some of the studies have used the gravity model approach to examine the growing effects of trade among willing trading partners. By using a gravity model approach, [23] estimate and examine trade flows for India and BRICS countries by using a dynamic gravity model over a period of 1990 to 2010. In their analysis, they find that over a period, the trading partners have increased their economic performance. It is also revealed that transportation costs remained a hindrance to the promotion of trade among BRICS countries.

[24] extend their analysis by including various factors such as common language, borders, and colonial history and conclude that the trade had a positive effect on their partner countries' GDP during 2004–2013, both in the short run and long run. In their analysis, it is also revealed that distance is negatively affecting their trade flows over a period of time.

Trade liberalization is considered a powerful tool to increase growth and development processes in many developed and developing countries.

[25] examine the patterns of exports and imports between the Russian Federation and East Asian economies, namely, the People's Republic of China, Hong Kong, China, Macau, China, Japan, the Republic of Korea, and Mongolia, over a period of 2001 to 2017 by using the gravity model. In their analysis, it is evident that GDP and income are more relevant for export patterns from the Russian Federation to the East Asian economies as compared to

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other variables. It is also evident that the Russian Federation's export pattern with the East Asian region follows the hypothesis of Linder (1961), while the Russian Federation's import pattern aligns with the Heckscher-Ohlin (H-O) hypothesis.

By using the cointegration and error correction model [26], we can analyze how Bangladesh's economy gained growth and development when they liberalized their exports in the world economy during the time period of 1974–1995. This analysis reveals that there is a long-term relationship between goods exports, export prices, the exchange rate, trade liberalization, and economic growth.

Panel data analysis provides more information than time series and cross-sectional data analysis. Moreover, during panel data analysis, estimators remain consistent and reliable, and henceforth, statistical findings remain generally valid.

By using the same token, a panel of 13 countries [27] examined trade flows by including various factors such as land, capital, labor, population, GDP, distance, and remoteness during 2002–2019. In their analysis, it is evident that bilateral trade has a significant effect on trading countries over a given period. Further, it is also found that pool mean group (PMG) model results reveal that the GDP, distance, land, endowments, capital, trade volume, and population size negatively affect their sharing of trade volumes during the given period.

The available literature on trade and growth is no doubt quite important, but it covers relevant aspects regarding the trade potential of Pakistan with the rest of the world. Moreover, the existing studies examine the trade potential of Pakistan with other countries to determine whether trade is beneficial or not for the economy of Pakistan. But to protect its domestic industry, Pakistan must spend hours developing its production and level of output as per international standards to capture various other regions throughout the globe.

To further fill the theoretical and empirical gap, this paper significantly contributes to several keyways. Firstly, it distinguishes itself by deliberately adding value to existing knowledge instead of redundantly readdressing established concepts. Secondly, it addresses the gaps in the literature by navigating through mixed conclusions regarding the impacts of GDP, population, distance, and integrated infrastructure on total trade. Thirdly, the inclusion of panel data spanning from 1990 to 2021 sets this study apart, marking it as the first of its kind to focus on specified economies while incorporating various crucial factors. Moreover, the meticulous application of advanced econometric techniques, such as the panel ARDL approach and cointegration tests, enhances the robustness and reliability of the study's analytical framework. Overall, the paper's findings emphasize the urgent need for Pakistan to

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explore new potential markets within specific regions, making it both timely and impactful for the nation's economic trajectory. These contributions collectively illuminate the trade nexus and its pivotal role in realizing sustainable development goals in a developing country like Pakistan, thereby providing valuable insights for policymakers and researchers.

III. Methodological Framework and Data Description

Methodological Framework

It is evident that regional trade is an integral part of the growth and development process among willing trading partners. The trading partners directly or indirectly integrate with each other to enhance their trade potential and access international markets through the provision of their domestic production by using optimal and efficient trade channels. The existing literature on trade expansion reveals that, depending upon the structure of the economies, the potential of trade flows for regional economies may be examined by utilizing Newton's gravity model. The fundamental gravity model is:

$$F_{ij} = G\frac{M_i M_j}{D_{ij}^2} \qquad (1)$$

In the above model, F_{ij} is the force of attraction between two bodies, i and j with masses M_i and M_j respectively. D_{ij} shows the distance between the trading partners. G stands for gravitational force. The gravity model is used to examine and evaluate how changes in policies may affect the flows of trade among trading nations. It works on the principle that the trade volumes between two countries are determined by their respective sizes (*measured in terms of their GDP*) and the existing distance between them. In this regard, *Bergen* (1962) and *Poyhonen* (1963) modified the gravity model to examine the trade flows between trading partners. In their modifications, the volume of total trade acts like a gravitational force between the two trading partners. This total trade volume is directly related to the masses of the concerned economies, which can be measured in terms of their respective GDP, and inversely related to the distance between them, which can be shown as:

$$T_{ij} = \beta\frac{Y_i Y_j}{D_{ij}} \qquad (2)$$

In the above equation, β is treated as a constant of proportionality. T_{ij} is the total trade volume between i (*source*) and j (*destination*) countries. Y_i and Y_j are the masses of the respective countries, measured in terms of their GDP. D_{ij} shows the distance between the trading

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partners. In other words, in the language of international trade, the gravity equation reveals that the total trade between two economies is *proportional* to their respective sizes (*being measured in terms of their respective GDP*) and *inversely* proportional to their geographical distances.

The framework of the gravitational model is used to examine the trade flow behavior of various cross-sectional units over a period. In this regard, the customized Newton's gravitational law of force can be represented as follows:

$$TT_{ijt} = \gamma\left(\frac{GDP_{it}^{\beta_1} * GDP_{jt}^{\beta_2}}{D_{ij}^{\beta_3}}\right) \qquad (3)$$

In this equation, for a given period and respective countries, *if* and *j*, where γ is gravitational force, TT is total trade, GDP measures the sizes of the trading economies, and D shows the existing distance between them, Moreover, β'_s are various parameters that need to be estimated to examine the extent of effectiveness. The above relationship (3) shows that, *ceterus peribus*, the total trade is proportional to their GDP and inversely related to the distance of the concerned economies. By taking the logarithm of both sides:

$$\log TT_{ijt} = \log\gamma + \beta_1 \log GDP_{it} + \beta_2 \log GDP_{jt} + \beta_3 \log D_{ij} \qquad (4)$$

Where $\beta_3 < 0$. If it is assumed that $log\ \gamma = \beta_o$, then above relationship can be written as:

$$\log TT_{ijt} = \beta_o + \beta_1 \log GDP_{it} + \beta_2 \log GDP_{jt} + \beta_3 \log D_{ij} \qquad (5)$$

It is evident that, besides the level of GDP and distance of trading nations, the total trade is also affected by various other unknown factors both across time and space, which are not directly examined during regression analysis. Then the relationship (5) can be written as:

$$\log TT_{ijt} = \beta_o + \beta_1 \log GDP_{it} + \beta_2 \log GDP_{jt} + \beta_3 \log D_{ij} + \mu_{ijt} \quad (6)$$

Where μ_{ijt} shows both time series and cross-sectional unit's factors, affecting panel data regression analysis.

In general, it is evident that due to geographical differences, regional trade is affected by various social, economic, and locational factors, such as the common border, ethnic behavior, common language, geographical distances, available infrastructure, trade agreements, and population. To examine the effectiveness of various factors on total trade, the augmented gravity model can be written as:

$$\log TT_{ijt} = \beta_o + \beta_1 \log GDP_{it} + \beta_2 \log GDP_{jt} + \beta_3 \log POP_{it} + \beta_4 \log POP_{jt} + \beta_5 \log WDIST_{ij} + \beta_6 \log INFR_{ij} + \beta_7 CBOR_{ij} + \beta_8 CLNG_{ij} + \beta_9 LDLCK_{ij} + \beta_{10} ETHN_{ij} + \beta_{11} WTO_{ij} + \mu_{ijt} \qquad (7)$$

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As stated above, in this equation, for cross sections *i* and *j* during *t* time, GDP shows gross domestic product, POP shows population growth, *WDIST* shows weighed distances, *INFR* stands for available infrastructure, *CBOR* shows common border, *CLNG* shows common language, *LDLCK* shows land lock, *ETHN* shows ethnicity, and *WTO* shows membership with WTO. β' s is the estimated parameters.

Research Estimation Strategy

To meet the objectives of the study, initially the study will analyze the integration order in our gravity model, which is required for the panel-cointegration test. The study utilized Levin-Lin-Chu (LLC) (1993) and Harris-Tzavalis (1999) unit root tests, respectively. It is an improved variant of the Augmented Dickey-Fuller (ADF) unit root test, determining if a time series is stationary (with no unit root). Both the LLC and HT panel unit root test equations are as follows:

$$\Delta TT_{ijt} = \alpha_{i+} \rho_i T_{i,t-1} + \sum_{k=1}^{n} \eta_{ik} \Delta T_{it-k} + \lambda_{it} + \sigma_i + \mu_{it} \quad (8)$$

In this scenario, under the null hypothesis, it is assumed that each variable has a unit root. Rejecting this null hypothesis will ensure a stationary series. To determine panel cointegration among the variables, we utilized the Kao and Pedroni cointegration tests developed by [28-30], respectively. Furthermore, we employed the Hausman test, proposed by [31], to choose between the PMG and MG estimators. This methodology is dynamic and heterogeneous and addresses the features of individual cross-sections of the panel. In the panel dataset with periods where t = 1,..., T and countries where i = 1,…, N, the following panel ARDL (p, q, q..., q1) model is estimated:

$$TT_{ijt} = \delta_i + \sum_{j=1}^{p} \lambda_{ij} T_{i,t-1} + \sum_{j=0}^{q} \acute{\theta}_{ij} Y_{i,t-1} + \mu_i + \varepsilon_{it} \quad (9)$$

T_{it} (k × 1) demonstrate the vectors of the regressor group *i,* In the above-mentioned panel ARDL (p, q, q……, q1) model. ; λ_{ij} indicates the scalars in the equation; and θ_{ij} demonstrates the (k × 1) coefficient vector and finally, μ_i indicates the fixed effect, the coefficients of the lagged regressand, i.e., T. We included the Vector Error Correction Model (VECM) in all groupings of nations after confirming cointegration. This integration allows for a more comprehensive analysis of the relationships between variables.

$$\Delta TT_{ijt} = \varphi_i(T_{it-1} - \alpha_i' Y_{i,t-1}) + \sum_{j=1}^{p-1} \ddot{\beta}_{ij} \Delta T_{i,t-1} + \sum_{j=0}^{q-1} \dot{\theta}^*_{ij} \Delta Y_{i,t-1} + \mu_i + \varepsilon_{it} \quad (10)$$

In the above equation, $\varphi_i = -\left(1 - \sum_{j=1}^{p} \beta_{ij}\right)$, $\alpha_i' = \sum_{j=0}^{q} \theta_{ij} \Big/ 1 - \sum_k \beta_{ik}$), $\ddot{\beta}_{ij} = -\sum_{m=j+1}^{p} \beta_{im}$, $j = 1,2,3,\ldots,p-1$, *and* $\theta *_{ij} = -\sum_{m=j+1}^{q} \theta_{im}$, j = 1, 2,3,….,q-1.

Furthermore, φ_i (*the error correction term*) in the equation above shows, the speed of the adjustment. If error correction adjustment speed is zero (i.e., φ_i= 0) then the error correction term is expected to be significant and negatively signed, indicating a return to long-run equilibrium based on the variables included in the hypothesis. The term α' represents the long-term relationship between both the regressor and the regrassand. Finally, we have:

$$\Delta TT_{ijt} = \delta_0 + \varphi_{1,i}[\mathrm{T}_{it-1} - \alpha'_{2,i}(\mathrm{GDP_{it}} + \mathrm{POP_{it}} + \mathrm{WDIST_{it}} + \mathrm{INFRA_{it}} + \mathrm{LDLCK_{it}} + \mathrm{CLANG_{it}} + +\mathrm{ETHN_{it}} + \mathrm{CBOR_{it}} + \mathrm{WTO_{it}})'] + \sum_{j=1}^{p-1} \ddot{\beta}_{ij}\, \Delta T_{i,t-1} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta\, \mathrm{GDP_{it-j}} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta\, \mathrm{POP_{it-j}} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta\, \mathrm{WDIST_{it-j}} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta\, \mathrm{INFRA_{it-j}} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta \mathrm{LDLCK_{it-j}} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta \mathrm{CLANG_{it-j}} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta \mathrm{ETHN_{it-j}} + \sum_{j=0}^{q-1} \grave{\theta}^*_{ij} \Delta\, \mathrm{CBOR_{it-j}} + j=0q-1\theta*ij\Delta WTOit-j + \mu i + \varepsilon it \quad (11)$$

The Mean Group (MG) estimator for panel data was created by [32], and it can handle different intercepts, slopes, and error variances across different countries [33, 34]. The PMG estimator was then created, which combined the average and the pool characteristics. The PMG technique reveals that the variable coefficients and error variations tend to differ within groups of countries in the short run. In the long term, however, the coefficients of the regressors show similarity across these groups. This distinction allows for a clearer understanding of the dynamics and relationships between the study variables.

This study utilizes VAR tests [35] to address the problem of endogeneity. Panel vector autoregressive (VAR) models use endogenous variables to create a flexible framework. This method estimates simultaneous system parameters using panel data. The panel VAR model includes lagged dependent variables and endogenous-exogenous interactions for a more comprehensive data analysis. The model is estimated as:

$$\begin{aligned}\Delta TT_{ijt} = \alpha_0 &+ \sum_{j=1}^{p} \alpha_{1\mathrm{j}}\, T_{i,t-\mathrm{j}} + \sum_{j=1}^{\mathrm{p}} \alpha_{2j}\, \mathrm{GDP_{it-j}} + \sum_{j=1}^{\mathrm{p}} \alpha_{3_j}\, \mathrm{POP_{it-j}} \\ &+ \sum_{j=1}^{\mathrm{p}} \alpha_{4_j}\, \mathrm{WDIST_{it-j}} + \sum_{j=1}^{\mathrm{p}} \alpha_{5_j}\, \mathrm{INFRA_{it-j}} \\ &+ \sum_{j=1}^{\mathrm{p}} \alpha_{6_j} \mathrm{LDLCK_{it-j}} + \sum_{j=1}^{\mathrm{p}} \alpha_{7_j} \mathrm{CLANG_{it-j}} + \sum_{j=1}^{\mathrm{p}} \alpha_{8_j} \mathrm{ETHN_{it-j}} \\ &+ \sum_{j=1}^{\mathrm{p}} \alpha_{9_j}\, \mathrm{CBORD_{it-j}} + \sum_{j=1}^{\mathrm{p}} \alpha_{10_j}\, \mathrm{WTO_{it-j}} + \lambda_i + \gamma_t \\ &+ \varepsilon_{it} \quad (12)\end{aligned}$$

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The above equation for the panel VAR model shows that gross domestic product, population size, weighted distance, integrated infrastructure, landlocked, common language, ethnicity, common border, and WTO membership are all functions of the lags of endogenous and exogenous variables while controlling for country- and time-specific effects using the autoregressive distributed lag (ARDL) technique. Where, $\lambda_i + \gamma_t + \varepsilon_{it}$ $demonstrates$ country-specific, time-specific, and white noise components. This approach allows us to account for the unique characteristics and temporal variations present in the data, resulting in a clearer analysis of the relationships between variables.

$$\Delta TT_{ijt} = \alpha_0 + \sum_{j=1}^{p-1} \alpha_{1\mathrm{j}} \Delta\, T_{i,t-\mathrm{j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{2j} \Delta\, \mathrm{GDP}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{3\,j} \Delta\, \mathrm{POP}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{4\,j} \Delta\, \mathrm{WDIST}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{5\,j} \Delta\, \mathrm{INFRA}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{6\,j} \Delta \mathrm{LDLCK}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{7\,j} \Delta \mathrm{CLANG}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{8\,j} \Delta \mathrm{ETHN}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{9\,j} \Delta\, \mathrm{CBORD}_{\mathrm{it-j}} + \sum_{j=1}^{\mathrm{p}-1} \alpha_{10\,j} \Delta\, \mathrm{WTO}_{\mathrm{it-j}} + \lambda ECT_{it-1} + \varepsilon_{it} \quad (13)$$

As a result, the VECM equation includes several variables, such as the lag length for both the regressor and regrassand, represented by p-1; λ shows the adjustment speed of the error correction term, ECt_{it-1} is the lagged level of cointegration, and ε_{it} is random error. Furthermore, the study has estimated the Pesaran CD test for the given panel to examine the cross-sectional effect (Pesaran, 2004).

***Data Description*:**

The methodological framework reveals that in this study, total trade is considered a dependent variable. Whereas, *both for source and destination*, independent variables include gross domestic product (GDP) [36], population [37], common border, common language, ethnicity, distance [38], landlocked, world trade organization (WTO), and available infrastructure [39], which are considered independent variables. In this study, common border, common language, ethnicity, landlocked, and WTO will be treated as dummy variables [40-42]. Data on GDP, population, and infrastructure will be collected from various issues of the World Development Indicators. In this study, weighted distance will be used as a proxy for distance. Mathematically, weighted distance is determined as:WDIST_{ijt}=

$(\text{DIST}_{ij} * GDP_{it}) \Big/ \sum GDP_{it}$ where WDIST_{ijt} is the relative (weighted) distance among trading nations , DIS_{ij} is the actual geographical distance, GDP_{it} is the gross domestic product of country i (Pakistan) at time t, $\sum GDP_{it}$ and is the sum of all GDPs in Pakistan during the study time period [43, 44]. Table 1 describes the description of variables.

Table 1: Description of Variables

Name of Variable	Description of Variable	Expected sign	Data Source
TT_{ij}	Total trade flows between country i and j		World Development Indicators
GDPij	Gross domestic Product for country i and j (Proxy for measuring of size of economy)	Source country (+, -) Destination country (+)	World Development Indicators
POPij	Total population of country i and j	+ive , -ive	World Development Indicators
WDISTij	Weighted distance between country i and j	-ive	CEPII
INFRAij	Infrastructure between country i and j	+ive	World Development Indicators
CBORDij (Dummy Variable)	D = 1 If i and j share the border = 0 otherwise	+ive	CEPII
LDLCK (Dummy Variable)	D = 1 If i and j landlocked = 0 otherwise	-ive	CIA (The World Fact book)
CLANG (Dummy Variable)	D = 1 If i and j share a common language = 0 otherwise	+ive	CIA (The World Fact book)
ETHN (Dummy Variable)	D = 1 If i and j same ethnicity = 0 otherwise	+ive	CIA (The World Fact book)
WTO (Dummy Variable)	D = 1 If i and j member with WTO = 0 otherwise	+ive	World Trade Organization

In general, the above table shows that Pakistan's population can have either a positive or negative effect on its self-sufficiency and ability to utilize external resources. A larger population can lead to economies of scale with higher domestic absorption capacity. BRICS countries with larger populations are likely to have a higher import demand, resulting in a positive population coefficient. The weighted distance between the trading partners indicates the level of trade resistance or the ability to continue trading despite transportation costs. Since transportation costs increase with distance, it is expected to have a negative effect on trade. The available infrastructure indicates the comprehensive level of infrastructure of both Pakistan and its partner in areas such as (i.e., transportation, communications, and energy) and is rated on a scale of 1 (highly underdeveloped) to 7 (efficient) [45, 46]. Meanwhile, regression analysis includes five dummy variables for various factors such as landlocked, common language, ethnicity, common border, and WTO membership.

IV. Results and Discussion

This section demonstrates the estimated results and their discussion with existing literature. To set the stage, table 2 shows the descriptive statistics of all given variables. Descriptive statistics normally show data variability and its dispersion. It includes the mean, standard deviation, minimum, and maximum values.

Table 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
TT_{ij}	160	3.0778	0.1676	2.7298	3.6199
GDP_{it}	160	1.5705	1.7672	1.0143	7.7058
GDP_{jt}	160	5.2366	3.3615	0.3878	14.5310
POP_{it}	160	2.2768	0.6205	1.2040	3.2974
POP_{jt}	160	0.9790	0.6181	0.0130	3.0783
$WDIST_{ij}$	160	-1.2366	0.2780	-1.8153	0.7683
$INFRA_{ij}$	160	1.2366	0.2780	1.81530	0.7683

The descriptive statistics indicate that the average trade flow is 3.0778, with the smallest and greatest values of 2.7298 and 3.6199, respectively. The average value of the gross domestic product of the host country is 1.5705, with the smallest and highest values of 1.0143 and 7.7058. Moreover, the average value of the GDP of the trading country is 5.2366, with the lowest value of 0.3878 and the maximum value of 14.5310, respectively. The average value of the population of Pakistan is 2.2768, with a standard deviation of 3.3615, while the smallest and greatest values are 1.2040 and 3.2974, respectively. The population of the trading countries has the smallest and largest values of 0.0130 and 3.0783, with an average of 2.2768. Moreover, the average value of the weighted distance is -1.2366, ranging from a low of -1.8153 to a high of 0.7683. Subsequently, the integrated infrastructure shows an average of 1.2366, with low and high values of 1.81530 and 0.7683.

The correlation analysis shows the direction and degree of association between the given variables. Accordingly, Table 3 shows the correlation matrix of the given variables.

Table 3: Correlation Matrix

Variables	TTij	GDP_{it}	GDP_{jt}	POP_{ij}	POP_{ij}	$WDIST_{ij}$	$INFRA_{ij}$
T_{ij}	1						
GDP_{it}	-0.594**	1					
GDP_{jt}	0.369**	0.129	1				
POP_{ij}	-0.569**	-0.140	0.153	1			
POP_{ij}	0.441**	0.753**	-0.511**	0.222	1		
$WDIST_{ij}$	-0.426**	-0. 580**	-0.219***	-0.238	-0.391**	1	
$INFRA_{ij}$	0.248***	-0.412**	-0.289***	-0.271	-0.391**	0.098	1

&* show 5 per cent and 10 per cent level of significance.

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The correlation results show that trade flow positively correlates with the gross domestic product and integrated infrastructure. Weighted distance, the host country's population, and gross domestic product indicate a negative correlation with trade flows.

Table 4 shows results regarding the tests of multicollinearity for given variables, i.e., GDP, population size, weighted distance, and integrated infrastructure. Based on our analysis, we find that the tolerance values of the independent variables are greater than 0.20, while the VIF (variance inflation factor) values are below 5, hence the results reveal that there is no problem of multicollinearity. Moreover, it is also evident that the regressors are uncorrelated with the error term.

Table 4: Tests of Multicollinearity

Variables	**VIF**	**Tolerance values**
POP_{ij}	1.13	0.886338
$INFRA_{ij}$	2.88	0.347048
$WDIST_{ij}$	1.25	0.802691
GDP_{ij}	1.19	0.840667
POP_{ij}	1.15	0.869274
GDP_{ij}	1.11	0.896918
Mean VIF	**1.78**	

The unit root tests are applied to examine the stationarity of given variables. As stated previously, this study is examining the stationarity of data series through LLC and HT unit root tests for a given panel of data. Table 5 shows results regarding unit root tests as follows:

Table 5: Panel Unit Root Tests

	Levin–Lin–Chu Test		**Harris-Tzavalis Test**	
	At Level	At First Difference	At Level	At First Difference
TT_{ij}	-12.292	-5.834***	15.238***	-2.739***
GDP_{it}	-5.834	-7.088***	-2.047***	-2.686***
GDP_{jt}	-2.946	-6.008***	4.729***	-2.697***
POP_{ij}	-2.654*	-7.035***	-6.261	-3.928***
POP_{ij}	-4.665***	6.164***	-12.469***	-2.875 ***
$WDIST_{ij}$	-3.378*	-3.899***	-0.882***	-4.983***
$INFRA_{ij}$	-0.354***	-12.292***	-0.828	-0.881***
*p < 0.05; **p < 0.01; ***p < 0.001				

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Table 5 demonstrates the findings for two frequently utilized unit root tests. Before using the ARDL model, it is important to check whether it is stationary or not. The results of the Levin-Lin-Chu unit root test demonstrate that the trade flows, GDP of host and partner countries, and population of partner countries are not stationary at level I (0), while only the population of the trading country, distance, and integrated infrastructure are stationary at level I (0) and first difference I (I). At the difference level, all variables are found to be stationary. The Harris-Tzavalis unit root test indicates that the host country's population size and integrated infrastructure have unit roots at level I (0). However, all series become stationary after their first integration order (I) at a 1% significance level. suggesting that the variables are stable at both the level and first difference, suggesting the use of the panel ARDL model for the subject analysis. It is evident that cross-sectional dependency is used to examine the strengths or weaknesses of various factors.

Table 6 presents the assessment of cross-sectional dependence among the variables. The CD (cross-sectional dependency) test results indicate that all variables are stable, rejecting the hypothesis of no cross-sectional dependency and suggesting that the trading nations have cross-sectional dependency over a period.

Table 6: Cross-Sectional Dependency Test

Variables	CD test	Correlation
TT_{ij}	7.5700*	0.4230
GDP_{it}	17.890*	0.8654
GDP_{jt}	3.2300*	0.1810
POP_{ij}	17.890*	0.6433
POP_{ij}	8.5900*	0.4800
$WDIST_{ij}$	17.8900*	0.9860
$INFRA_{ij}$	17.6300*	0.8960

*$p < 0.05$

The results of the Kao and Pedroni cointegration tests are presented in Table 7. The data provide evidence that cointegration exists across regressors and regressands throughout the sample of study nations. In this test, the null hypothesis of no integration was evaluated using

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an enhanced version of the Dickey-Fuller approach. The alternative hypothesis was also considered. This test confirms the existence of intercepts for cross sections and homogeneous coefficients for first-stage regressors. The findings of both the Pedroni and Kao tests suggest that cointegration is significant, indicating the presence of integration among the research variables. This finding is consistent with the hypothesis that integration exists. This study also employed the Westerlund (2007) cointegration test because it utilizes the bootstrap approach to eliminate cross-sectional dependency effects among variables. The results in Table 7 show that co-integration exists, confirming the long-run relationship between research variables. The significance P-value shows that H0 was not accepted, which suggests that there is cointegration and a long-term connection between the study variables.

Table 7 Panel Cointegration Tests

	Statistics	*p* value
Kao Cointegration Test		
Modified Dickey-Fuller t stat:	-3.8919	0.0203
Dickey-Fuller t stat:	-2.9455	0.0253
Augmented Dickey-Fuller t stat:	-2.5601	0.0259
Unadjusted modified Dickey-Fuller t	-5.6259	0.0000
Unadjusted Dickey-Fuller t	-3.3393	0.0000
Pedroni Cointegration Test		
Modified Phillips-Perron t stat:	3.0462	0.0014
Phillips-Perron t stat:	-3.0799	0.0001
Augmented Dickey-Fuller t stat:	-5.0358	0.0000

The findings of the pooled mean group ARDL in the short- and long-run elasticities of total trade flow with GDP, population size, weighted distance, integrated infrastructure, common border and language, landlocked status, ethnicity, and WTO membership are summarized in Table 8. The Hausman's test is used to determine the best estimation method between PMG and MG. The Hausman chi^2revealed that the PMG estimation was more accurate than the MG estimation.

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Table 8: PMG Estimators

Variables	Coefficient	Std. Dev.	Z value	*p* value
Long-Run Coefficient				
GDP_{it}	0.3618***	0.1239	2.9195	0.0061
GDP_{jt}	0.9024*	0.4465	2.0212	0.0523
POP_{ij}	-0.4217***	0.0491	-8.5886	0.0000
POP_{ij}	0.7091***	0.2571	2.7580	0.0095
$WDIST_{ij}$	-0.7148*	0.2837	-2.5197	0.0173
$INFRA_{ij}$	0.8398***	0.2358	3.5614	0.0011
$CBORD_{ij}$	0.7693***	0.2653	2.9008	0.0069
$CLANG_{ij}$	0.2816	0.0420	0.6704	0.6667
$lDLCK_{ij}$	-0.8362***	0.2513	-3.3275	0.0023
$ETHN_{ij}$	-1.4802***	0.2837	-5.2179	0.0000
WTO_{ij}	0.7622***	0.113	6.7445	0.0000
Short-Run Coefficients				
ECT (-1)	-0.4487***	0.1397	-3.2118	0.0012
GDP_{it}	-0.4863***	0.1641	-2.9634	0.0057
GDP_{jt}	0.6631***	0.7781	0.85218	0.0000
POP_{ij}	-0.1397**	0.0443	-3.1534	0.0001
POP_{ij}	0.1585***	0.0486	3.2652	0.0027
$WDIST_{ij}$	-0.7119***	0.1837	-3.8753	0.0004
$INFRA_{ij}$	0.4678***	0.1134	4.1252	0.0003
$CBORD_{ij}$	0.5873***	0.265	2.2162	0.0044
$CLANG_{ij}$	0.2196	0.945	0.2324	0.8178
$lDLCK_{ij}$	0.8276***	0.2513	-3.2934	0.0024
$ETHN_{ij}$	-0.3319**	0.1238	-2.6809	0.0115
WTO_{ij}	0.6398***	0.3358	1.9053	0.0057
Constant	1.1608	0.3819	3.0395	0.0021
Hausman chi^2	6.8392	*p* value	0.0012	
*p < 0.05; **p < 0.01; ***p < 0.001				

The results show that a short-term relationship between Pakistan's gross domestic product and the trading nation has a negative effect on bilateral trade performance. On the other hand, a long-term relationship has a positive effect and is still statistically significant at the 5% level of significance. This is interesting because when GDP goes up, trade between trading partners goes up by 0.3618 percent and 0.9024 percent, respectively. These findings provide evidence that larger economies of trading partners are linked to higher levels of bilateral trade.

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It is suggested that Pakistan concentrate on enhancing the investment environment within the country, fostering conditions that attract foreign direct investment. It is important to prioritize the expansion of bilateral trade agreements while simultaneously reducing trade barriers among trading partners, including tariffs and non-tariff barriers. Additionally, offering tax incentives to investors can serve as a stimulus for investment in various projects and contribute to the growth of trade opportunities in host nations. Our results align with the findings of previous studies [47, 48], which showed that an increase in the host country's GDP corresponds to greater purchasing power and the ability to accommodate imports.

In contrast, an increase in the trading countries' income will result in a higher production capacity and an increased ability to export. When considering a country's trade relationships, it is important to consider both its size and population. Contrary to popular belief, having a larger population does not always result in increased trade. Research has shown that higher production costs and a lack of motivation to engage in trading activities can hinder the potential benefits.

The PMG panel ARDL model results revealed that Pakistan's population had a statistically significant negative influence on bilateral trade performance in the long run.

These results aligned with those of [49, 50], who also observed a negative correlation between population size and trade volume. However, there are differing opinions on this matter, as [51] have found evidence of a positive effect on trade volume. In addition, the coefficient for the population of the trading countries is positive and shows significant associations with the long-term effect of population size on total trade flow. Furthermore, our data demonstrate that a 1% increase in the population size of a trading partner enhances trade performance by about 0.7091% in the long term.

Our results demonstrate that population size strongly influences the long term; however, this influence is weaker in the short-term. These results aligned with those of [52].

The estimated results of distance demonstrate a negative and significant association with trade volume. It is evident that due to variations in distance, both short-run and long-run trade volumes between Pakistan and its trading partner change by 0.7119 percent and 0.7148 percent, respectively. Our results, aligned with those of [14, 36], suggested that international trade performance is affected by transportation costs. Due to the higher cost of shipping products over long distances, countries farther away trade less. In another study [53], it was estimated that the distance negatively and significantly influenced trade between Pakistan and China.

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The short- and long-run findings obtained from the PMG analysis demonstrate a statistically positive and significant association between economic growth and integrated infrastructure in trading countries. These results align with the gravity model of trade, which posits that infrastructure plays an important role in augmenting trade flows and fostering economic growth. It is evident that integrated infrastructure leads to approximately 0.8398 percent and 0.4678 percent enhancements in long- and short-term trade performance, respectively.

Our findings aligned with those of [54], who found that good infrastructure leads to increased regional trade and economic growth. Additionally, [36, 55] give similar conclusions, suggesting that Pakistan should transition from labor-intensive, low-value-added manufacturing to technology-intensive, high-value-added manufacturing. These findings align with trade literature, which emphasizes that well-developed infrastructure plays a crucial role in boosting exports and imports of goods and services, thereby positively impacting a country's trade potential.

The study also found that modernizing cross-border facilities, such as paperless trade, one-stop customs procedures, and single-window systems, can reduce trade costs and time between countries. The long-run effect of border crossings on bilateral trade was even more significant. Our findings are consistent with the research conducted by [36, 56], highlighting that borders and cultural similarities positively affect economic growth. Specifically, our findings highlight the increasing trading connections between Pakistan and its neighboring countries, indicating a positive border effect. However, in the case of India, the positive border effect may be diminished despite its status as a neighboring country. This can be attributed to various trade barriers, including tariffs and non-tariff barriers, which hinder trade relations between the two nations. Additionally, military conflicts and political tensions between Pakistan and India further inhibit their trade relations. These observations align with the trade literature, which suggests that trade barriers can impede trade despite countries' geographic proximity.

The results of the common language show that the common language (the native language of the bordering economies) had a positive but statistically insignificant effect in the short run and long run, varying between 0.281 and 0.219. The findings on common languages demonstrate that countries with a common language have no favorable influence on Pakistan's trade performance. These results contradict the findings of [24, 57] who found significant results for trade between India and its trade partners.

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The study reveals substantial evidence that ethnicity, membership in the World Trade Organization (WTO), and landlocked status have notable effects on trade flows, persisting in the short run and long run. Based on the PMG estimators, our findings indicate that a one-unit decrease in the ethnic similarity between nations corresponds to a short- and long-run decrease of 0.3319 and 1.4802 in the trade performance of the countries, respectively. Moreover, ethnic divisions can pose trade barriers, impeding its progress. Our results align with [57] findings, which suggest that ethnicity can hinder trade and reduce bilateral trade for countries in the region.

The coefficient for landlocked status is -0.8276 and -0.8362 in the short run and long run, indicating that landlocked countries have lower levels of trade than their non-landlocked counterparts. [58] found that landlocked countries face greater logistical and transportation costs, which can limit their ability to engage in international trade.

The WTO estimates show that WTO member countries tend to have high levels of trade in both the short and long term, with coefficients of 0.6398 and 0.7622, respectively. This supports the idea that the WTO plays a role in promoting global trade through its regulations. The Error Correction Term (ECT) coefficient was also negative and significant, indicating a long-term relationship between the variables. The ECT coefficient of 0.44 suggests that any differences between the variables will self-correct at an annual rate of 44 percent.

Table 9 demonstrates the panel VAR model results, which indicate that the gross domestic product of the host and trading countries, the population size of the trading country, and integrated infrastructure positively impact trade flows for sample countries. Pakistan's trade performance demonstrates a significant and positive relationship with its GDP. Specifically, income increases in BRICS countries correspond to a 0.252 percent increase in Pakistan’s trade, resulting in increased trade flows between the two countries. These findings indicate that policies fostering economic growth and GDP enhancement in one country can positively affect the GDP of another country. Further, the result shows that a 1 percent increase in the gross domestic product and population size of trading countries can increase trade flow by approximately 0.1825 percent and 0.1930 percent, respectively. The findings of our study are consistent with the previous investigations of [36, 55].

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Table 9 Panel VAR Results

Variables	Coefficient	Std. Dev.	t-Statistic
GDP_{it} (-1)	0.2525	0.0596	4.2314
GDP_{jt} (-1)	0.1826	0.0730	2.5006
POP_{ij} (-1)	-0.6488	0.2801	-2.3161
POP_{ij} (-1)	0.1930	0.0984	1.9617
$WDIST_{ij}$ (-1)	-0.5745	0.2287	2.5109
$INFRA_{ij}$ (-1)	0.4767	0.2707	-1.7606

However, Pakistan's population size and distance have a negative impact on its trade performance. Therefore, this study suggests that the government should lead policies and initiatives to reduce population growth and boost economic competitiveness by investing in education, healthcare, and infrastructure. Furthermore, our findings indicate that the government should adopt policies that reduce the distance between two countries, such as trade facilitation, which can speed up customs and trade operations. Digital networks and telecommunications infrastructure can improve supply chain management and communication. Governments can also promote customized logistics and trade zones near borders or critical regions. Finally, bilateral or regional trade agreements and exporter assistance can reduce trade obstacles and improve market access, boosting trade among nations [59, 60].

Vector Error Correction Model (VECM)

Table 10 shows the panel VECM model results. The VECM results demonstrate long-term and short-term results for all independent variables. Pakistan's population's domestic demand negatively impacts short- and long-term trade, according to the VECM model. However, both short-term and long-term population growth in trading countries indicates an expansion in trade flows among the trading partners.

Table 10: Panel VECM Results

Long Run Result		Short Run Result	
GDP_{it} (-1)	0.0447 (0.0160) [2.7830]	D(GDPit (-1))	-0.0015 (0.1179) [-0.0134]
GDP_{jt} (-1)	0.4782 (0.0842) [5.6780]	D(GDPjt (-1))	0.0314 (0.0534) [0.5873]

POP_{ij} (-1)	-0.5778 (0.0685) [-8.4300]	D(POPi (-1))	-0.0245 (0.0453) [-0.5414]
POP_{ij} (-1)	0.0923 (0.0963) [0.9586]	D(POPj (-1))	0.0671 0.1108 [0.6056]
$WDIST_{ij}$(-1)	-0.8772 (0.00013) [0.202]	D(WDISTij (-1))	-0.0013 (0.0004) [-3.4981]
$INFRA_{ij}$(-1)	0.0111 (0.0286) [0.3887]	D(INFRAij (-1))	0.8064 (0.0771) [10.4597]
ECT(-1)	-0.01491 0.00702 [-2.12525]		

(Standard errors are presented in parentheses, while the t-statistics are denoted within square brackets)

Moreover, Pakistan's gross domestic product positively affects trade flow. However, in the short term, our results show a decrease in GDP, which can harm the total trade flow with partner countries. Despite this, Pakistan's GDP still significantly impacts trade flows. Further, the findings of integrated infrastructure show a positive impact on trade performance, indicating that it facilitates increased export and import flows of goods and services between countries both in the short and long run. In conclusion, the study revealed a negative impact of distance on trade among the examined countries. This indicates that greater geographical distance leads to higher transportation costs and, subsequently, reduced trade flows. The authors [61, 62] discovered similar results, indicating that distance has a significant and negative impact on international trade.

V. Conclusion and Policy Recommendations

This study investigates the relationships between the gross domestic product, population size, distance, integrated infrastructure, landlocked status, common language, ethnicity, common border, WTO membership, and total trade flow of Pakistan and BRICS economies over a period of 1990 to 2021. The Levin-Lin-Chu and Harris-Tzavalis tests are applied to examine levels of stationarity between the variables. Cointegration tests, such as Kao (1999) and Pedroni (2004), have been utilized for empirical purposes to estimate the objectives of the study. The PMG estimator was determined to be most applicable via the Hausman test. The pooled mean group analysis results demonstrated a positive association between a common language and trade volume, indicating that countries sharing a common language tend to have

higher trade volumes. Conversely, a negative effect was observed for GDP, population size, and integrated infrastructure, suggesting that these factors could hinder trade between countries.

Furthermore, it is shown that shared borders positively affect trade, while landlocked countries are at a disadvantage when trading with coastal countries. Finally, the study concludes that WTO membership positively affects bilateral trade due to lower tariffs and other inducements. The results from panel VAR and VECM models show that GDP, integrated infrastructure, and economic mass positively influence the total trade flow, while distance has a negative influence. Landlocked status and ethnicity were found to have a detrimental impact on trade flows.

Based on the findings, it is suggested that cross-border infrastructure be integrated to create one-stop border posts and offer special trading privileges to landlocked countries. In addition, Pakistan and other BRICS countries should open their economies through WTO membership, allowing the countries to trade beyond their geographic and physical boundaries.

In the context of sustainable development, the United Nations' Agenda 2030 emphasizes the significance of international trade in achieving the Sustainable Development Goals (SDGs). Goal 17 specifically calls for enhancing global partnerships for sustainable development, including promoting a universal, rules-based, open, non-discriminatory, and equitable multilateral trading system. The findings of this study align with the SDGs, highlighting the importance of trade policies that contribute positively to economic growth and international cooperation. This study has various limitations; there is a need to expand the application of these frameworks to a broader sample of countries and trade determinants, fostering more inclusive and harmonized policies.

References

1. Lei, T. and P. Xie, *Fostering enterprise innovation: The impact of China's pilot free trade zones.* Journal of the Knowledge Economy, 2023: p. 1-30.
2. Moughari, M.M. and T.U. Daim, *Developing a model of technological innovation for export development in developing countries.* Technology in Society, 2023. **75**: p. 102338.
3. Hoekman, B., *Global trade governance*, in *International organization and global governance*. 2023, Routledge. p. 644-657.
4. Brotto Reigado, A., S.J. Evenett, and F. Martin, *Towards meaningful transparency at the WTO: Reinforcing the trade policy review mechanism 1.* The World Economy, 2023.
5. Vijayalakshmi, S. and B. Mathavan, *INDIA'S HANDOUT IN TRADE SERVICES TO REGIONAL TRADING BLOCS WITH SPECIAL REFERENCE TO SAARC AND BRICS.* 2023.

6. WITS, W., *World integrated trade solution.* 2021.
7. Stafford-Smith, M., et al., *Integration: the key to implementing the Sustainable Development Goals.* Sustainability science, 2017. **12**: p. 911-919.
8. Li, Y. and X. Zhu, *The 2030 agenda for sustainable development and China's belt and road initiative in Latin America and the Caribbean.* Sustainability, 2019. **11**(8): p. 2297.
9. Aksenov, G., et al., *Development of Trade and Financial-Economical Relationships between China and Russia: A Study Based on the Trade Gravity Model.* Sustainability, 2023. **15**(7): p. 6099.
10. Liang, W., *9. The Guardian of Global Trade Governance? Examining the Role of the WTO Secretariat.* Global Institutions in a Time of Power Transition: Governing Turbulence, 2023: p. 159.
11. Neroorkar, S. and P. Gopinath, *Immediate Employability and Trade Sustenance of Graduates from Government Industrial Training Institutes in Mumbai, India.* The Indian Journal of Labour Economics, 2023: p. 1-22.
12. Nuti, D.M., *The impact of the global crisis on transition economies*, in *Collected Works of Domenico Mario Nuti, Volume II: Economic Systems, Democracy and Integration*. 2023, Springer. p. 555-604.
13. PASWAN, A.S., *REVEALED COMPARATIVE ADVANTAGE AND TRADE INTENSITY: AN ANALYSIS OF INDIAN ECONOMY AND INDIA'S TRADE WITH BRICS NATIONS.*
14. Stuenkel, O., *The BRICS Grouping*, in *Oxford Research Encyclopedia of International Studies*. 2022.
15. Sahoo, P.M., H.S. Rout, and M. Jakovljevic, *Dynamics of health financing among the BRICS: a literature review.* Sustainability, 2023. **15**(16): p. 12385.
16. Iqbal, A., X. Tang, and S.F. Rasool, *Investigating the nexus between CO2 emissions, renewable energy consumption, FDI, exports and economic growth: evidence from BRICS countries.* Environment, Development and Sustainability, 2023. **25**(3): p. 2234-2263.
17. Jameel, M.A., H. Hina, and J. Ul-Haq, *Sectoral and regional impacts of trade liberalization on the skilled-unskilled wage-gap in Pakistan.* Edelweiss Applied Science and Technology, 2023. **7**(2): p. 87-103.
18. Akhuand, A. and S. Abbas, *Modeling determinants of competitiveness: a case of textile sector of Pakistan.* The Journal of the Textile Institute, 2023. **114**(1): p. 22-31.
19. Sadi, H., *Us-China Trade War-Implications on Global and Regional, Economic Landscape.* International Journal of Social Science Archives (IJSSA), 2023. **6**(1): p. 42-57.
20. Khurshid, N., *Does the causality between environmental sustainability, non-renewable energy consumption, geopolitical risks, and trade liberalization matter for Pakistan? Evidence from VECM analysis.* Heliyon, 2023. **9**(11).
21. Serfraz, A., M. Qamruzzaman, and S. Karim, *Revisiting the nexus between economic policy uncertainty, financial development, and FDI inflows in Pakistan during Covid-19: does clean energy matter?* International Journal of Energy Economics and Policy, 2023. **13**(4): p. 91.
22. Abbas, S., *Causality between exports and economic growth: Investigating suitable trade policy for Pakistan.* Eurasian Journal of Business and Economics, 2012(5): p. 91-98.

23. Mishra, A.K., et al., *Trade flows between India and other BRICS countries: An empirical analysis using gravity model.* Global Business Review, 2015. **16**(1): p. 107-122.
24. Panda, R., M. Sethi, and M. Kumaran, *A study of bilateral trade flows of China and India.* Indian Journal of Science and Technology, 2016. **9**(15).
25. Rasoulinezhad, E. and F. Jabalameli, *Russia-EU gas game analysis: Evidence from a new proposed trade model.* Environmental Science and Pollution Research, 2019. **26**: p. 24482-24488.
26. Ahmed, N., *Export response to trade liberalization in Bangladesh: a cointegration analysis.* Applied Economics, 2000. **32**(8): p. 1077-1084.
27. Umair, M., M.R. Sheikh, and A. Tufail, *Determinants of Pakistan'S bilateral trade with major trading partners: an application of heckscher-ohlin model and tinbergen gravity model.* Bulletin of Business and Economics (BBE), 2022. **11**(1): p. 24-36.
28. Kao, C., *Spurious regression and residual-based tests for cointegration in panel data.* Journal of econometrics, 1999. **90**(1): p. 1-44.
29. Pedroni, P., *Critical values for cointegration tests in heterogeneous panels with multiple regressors.* Oxford Bulletin of Economics and statistics, 1999. **61**(S1): p. 653-670.
30. Pedroni, P., *Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis.* Econometric theory, 2004. **20**(3): p. 597-625.
31. Hausman, J.A., *Specification tests in econometrics.* Econometrica: Journal of the econometric society, 1978: p. 1251-1271.
32. Pesaran, M.H. and R. Smith, *Estimating long-run relationships from dynamic heterogeneous panels.* Journal of econometrics, 1995. **68**(1): p. 79-113.
33. Pesaran, M. and B. Pesaran, *Working with Microfit 4.0: An interactive approach*. 1997, Oxford: Oxford University Press.
34. Pesaran, M.H., Y. Shin, and R.P. Smith, *Pooled mean group estimation of dynamic heterogeneous panels.* Journal of the American statistical Association, 1999. **94**(446): p. 621-634.
35. Holtz-Eakin, D., W. Newey, and H.S. Rosen, *Estimating vector autoregressions with panel data.* Econometrica: Journal of the econometric society, 1988: p. 1371-1395.
36. Masood, S., et al., *Trade potential of Pakistan with the South Asian Countries: A gravity model approach.* Asia Pacific Management Review, 2023. **28**(1): p. 45-51.
37. Emikönel, M., *The impact of international organizations on Chinese trade as the determiner of trade: the gravity model approach.* The Chinese Economy, 2022. **55**(1): p. 26-40.
38. Cai, M., *A calibrated gravity model of interregional trade.* Spatial Economic Analysis, 2023. **18**(1): p. 89-107.
39. Shen, C., *The Impact of Infrastructure Development on China–ASEAN Trade-Evidence from ASEAN.* Sustainability, 2023. **15**(4): p. 3277.
40. Gul, N., *The Trade Potential of Pakistan: An Application of the Gravity Model Nazia Gul and Hafiz M. Yasin.* Lahore Journal of Economics, 2011. **16**(1): p. 23-62.
41. Abbas, S. and A. Waheed, *Pakistan's global trade potential: A gravity model approach.* Global Business Review, 2019. **20**(6): p. 1361-1371.
42. Santana-Gallego, M., F.J. Ledesma-Rodríguez, and J.V. Pérez-Rodríguez, *International trade and tourism flows: An extension of the gravity model.* Economic Modelling, 2016. **52**: p. 1026-1033.

43. Bekele, W.T. and F.G. Mersha, *A dynamic panel gravity model application on the determinant factors of Ethiopia's coffee export performance.* Annals of Data Science, 2019. **6**: p. 787-806.
44. Melitz, J., *North, South and distance in the gravity model.* European Economic Review, 2007. **51**(4): p. 971-991.
45. Martínez-Zarzoso, I. and F. Nowak-Lehmann, *Augmented gravity model: An empirical application to Mercosur-European Union trade flows.* Journal of applied economics, 2003. **6**(2): p. 291-316.
46. Golovko, A. and H. Sahin, *Analysis of international trade integration of Eurasian countries: Gravity model approach.* Eurasian Economic Review, 2021. **11**: p. 519-548.
47. Karamuriro, H.T. and W.N. Karukuza, *Determinants of Uganda's export performance: A gravity model analysis.* International Journal of Business and Economic Research, 2015. **4**(2): p. 45-54.
48. Elshehawy, M.A., H. Shen, and R.A. Ahmed, *The factors affecting Egypt's exports: Evidence from the gravity model analysis.* Open Journal of Social Sciences, 2014. **2**(11): p. 138.
49. Siddiqui, A.H. and J. Iqbal, *Impact of trade openness on output growth for Pakistan: An empirical investigation.* 2005.
50. Sheikh, M.R., et al., *What determines bilateral trade flows? Evidence from ECO region.* Review of Economics and Development Studies, 2019. **5**(1): p. 165-182.
51. Emikönel, M., et al., *The Advantage of Being a Small Country on Economic Growth Spillovers: A Review on Spain and Portugal with ARDL Approach.* WSEAS Transactions on Business and Economics, WSEAS Transactions on Business and Economics, 2022: p. 376-385.
52. Noble, A.M., M.R.M. Molina, and D.M. Canto, *Philippines-ASEAN Trade Potential: An Application of Intra-ASEAN Augmented Gravity Model.* Journal of Economics, Finance and Accounting Studies, 2022. **4**(1): p. 552-568.
53. Abdul Kamal, M., et al., *Who is trading well with China? A gravity and constant market share analysis of exports of Pakistan and ASEAN in the Chinese market.* Journal of Asian and African Studies, 2022. **57**(6): p. 1089-1108.
54. Omaku, A.A., *Foreign direct investment and economic growth in Nigeria.* Lafia Journal of Economics and Management Sciences, 2019. **4**(2): p. 54-70.
55. Ahsan, M., et al., *The impact of trade facilitation on Pakistan's international trade.* Dimensión Empresarial, 2021. **19**(3).
56. Gul, N., et al., *Untapping the role of trade facilitation indicators, logistics and information technology in export expansion and diversification.* The Journal of International Trade & Economic Development, 2023: p. 1-21.
57. Hassan, M.S., A. Wajid, and R. Kalim, *Factors affecting trade deficit in Pakistan, India and Bangladesh.* Economia Politica, 2017. **34**: p. 283-304.
58. Buvik, A.S. and T.B. Takele, *The role of national trade logistics in the export trade of African countries.* Journal of Transport and Supply Chain Management, 2019. **13**(1): p. 1-11.
59. Hassani, F., T. Torabi, and S. Gharibzadeh, *Effect of information and communications technology on trade flows using gravity model.* Asia Pasific Institute of Advanced Research, 2015: p. 30-39.
60. Tranos, E. and P. Nijkamp, *Digital infrastructure and physical proximity*, in *Regional development and proximity relations*. 2014, Edward Elgar Publishing. p. 267-290.

February, 2024 Volume: 9, No: 1, pp. 1835-1860
ISSN: 2059-6588(Print) | ISSN 20596596(Online)
61. Wu, Z., et al., *A topological analysis of trade distance: Evidence from the gravity model and complex flow networks.* Sustainability, 2020. **12**(9): p. 3511.
62. Heriqbaldi, U., M.A. Esquivias, and K.S. Agusti, *The role of cultural distance in boosting international tourism arrivals in ASEAN: a gravity model.* Consumer Behavior in Tourism and Hospitality, 2023. **18**(1): p. 97-109.