



Panel Data Analysis of International Trade and Its Influence on Economic Growth in Selected South Asian Countries

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Abstract: This research investigates the Influence of International Trade on economic growth in selected South Asian Countries: Afghanistan, Bangladesh, India, and Pakistan (2002–2020). The study considers total trade, the exchange rate, and population as explanatory variables, while GDP serves as the dependent variable. To analyze the data, panel data methods, including Pooled Ordinary Least Squares (OLS), Fixed Effects, Random Effects, and the Hausman test, were employed. The Hausman test indicates that the Fixed Effects model is the most appropriate for the data. Empirical findings demonstrate that both trade openness and population positively and significantly influence economic growth, whereas the exchange rate negatively affects growth. Given these findings, the study recommends that governments of the selected countries prioritize export-oriented strategies to stimulate growth. Furthermore, establishing free trade zones to enhance regional trade and implementing policies to manage and stabilize the real exchange rate are advised. These measures are expected to reinforce economic performance both at the country level and across the South Asian region. Additionally, this study contributes to the existing literature by providing updated empirical evidence from four strategically important South Asian economies using a comprehensive panel data framework. The findings offer valuable insights for policymakers, development institutions, and economic planners seeking to design effective trade and macroeconomic policies. By identifying the relative roles of trade, population, and exchange rate dynamics, the study enhances understanding of the mechanisms through which international integration influences growth in developing economies. The results emphasize that sustained economic development in South Asia depends not only on expanding trade volumes but also on maintaining macroeconomic stability and strengthening institutional capacity.

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INTRODUCTION

Trade involves the exchange of goods and services among individuals, businesses, or countries, often using money as a medium of exchange. Historically, trade began with barter systems, in which goods and services were exchanged directly without currency. In modern economies, monetary transactions facilitate trade, and markets serve as structured systems that enable these exchanges (Kenton, 2023). For centuries, trade was restricted mainly within

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national borders due to various limitations. However, globalization and trade liberalization have expanded trade beyond national boundaries, leading to the growth of global trade (Surugiu & Surugiu, 2015).

Trade liberalization, which involves reducing restrictions on imports and exports, has been instrumental in promoting international trade. By minimizing tariffs, quotas, and other barriers, countries have been able to participate more actively in the global economy, fostering economic interdependence and allowing businesses to access foreign markets (Mullen et al., 2009; Mizan, 2019). Trade openness goes a step further by creating an environment free from taxes, levies, and customs duties, facilitating smoother and more efficient cross-border trade (Smith, 1776). Open trade policies are linked to higher economic development, job creation, higher wages, and broader availability of goods and services (World Bank, 2018).

Infrastructure plays a central role in facilitating trade (IMF, 2016). In South Asia, inadequate infrastructure, incompetent customs procedures, and bureaucratic hurdles limit trade flows. Improving roads, highways, and border facilities, as well as enhancing transparency, can significantly reduce trade costs and upsurge market access, predominantly for less developed countries such as Afghanistan, Bangladesh, and Nepal). Landlocked countries face additional challenges due to their reliance on transit permits and cross-border logistics, underscoring the importance of trade facilitation (WTO, 2021).

The South Asian Association for Regional Cooperation (SAARC), established in 1985, aims to promote economic development and regional collaboration among its member countries, including Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka (SAARC, n.d.). Through agreements such as the South Asian Free Trade Agreement (SAFTA), SAARC seeks to reduce trade barriers and promote intra-regional trade (Roy, 2016; SAARC, 2020). Despite these initiatives, political tensions, institutional weaknesses, and procedural constraints have limited the effectiveness of trade agreements, particularly in bilateral trade between Pakistan and India, which remains minimal due to high tariffs and restrictive trade policies (Iqbal & Nawaz, 2017; Weerakoon & Thennakoon, 2008).

Recent events, such as the COVID-19 pandemic, have further challenged global trade, causing significant disruptions to supply chains and trade flows (World Economic Forum, 2020). In 2020, international trade in goods and services declined by 9.6%, while global GDP fell by 3.3% (WTO, 2021). Despite these challenges, trade remains a vital driver of economic growth, poverty reduction, and sustainable development. It enables countries to leverage comparative advantages, foster innovation, increase productivity, and expand employment opportunities (World Bank, 2023).

Numerous empirical investigations have examined the nexus between trade and economic growth across regions worldwide, yielding mixed results. Some scholars highlight beneficial impacts of trade on growth, while others highlight adverse or context-dependent effects. In the case of Asian economies, researchers such as Tahir and Khan (2014), Nguyen

and Bui (2021), Chowdhary and Joshi (2022), and Kong et al. (2022) applied various econometric approaches to analyze this relationship. The evidence broadly suggests that trade has a noteworthy and positive influence on promoting economic growth in Asia.

Turning to Sub-Saharan Africa, Brueckner and Lederman (2015) and Cinar and Nulambeh (2018) employed panel data techniques to assess the relationship, finding that trade exerts a favorable and significant effect on growth in the region. Similarly, Aremo and David (2021) evaluated both the separate and joint effects of trade and financial openness from 1980 to 2017, categorizing countries into low- and middle-income groups. Using the generalized method of moments (GMM) and system GMM estimations, their study found that while trade openness boosts growth in low-income economies, financial transparency, either alone or combined with trade openness, does not deliver a meaningful positive effect. In middle-income countries, the influence of trade openness appeared more mixed, showing both positive and negative associations, while financial openness continued to demonstrate little growth-enhancing influence.

In emerging economies, trade liberalization is often regarded as an engine of growth through technology transfer and increased cross-border exchange. Raghutla (2020), analyzing five developing market economies between 1993 and 2016 using panel data methods, found evidence of a long-term relationship among trade openness, growth, financial development, inflation, labor force, and technological progress. The study highlighted that trade openness significantly stimulates long-term economic growth. At the same time, causality analysis indicated bidirectional links between growth and inflation, as well as unidirectional causality from growth to both trade openness and financial development in the short run.

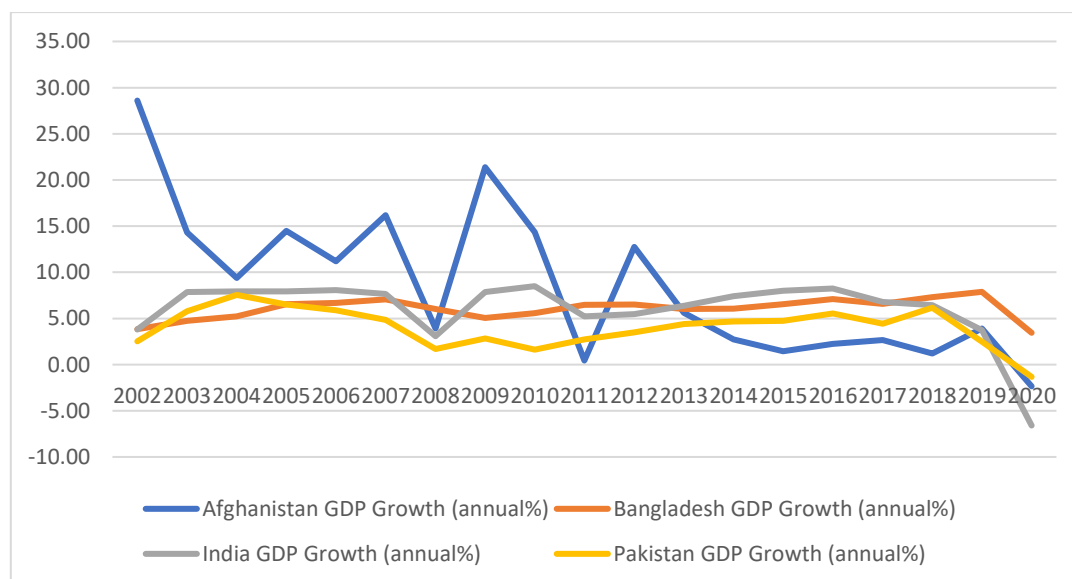


Figure 1: Gross Domestic Product (GDP) Trends

Source: World Development Indicators WDI, 2021

Figure 1 above depicts the GDP growth rates of Afghanistan, Bangladesh, India, and Pakistan from 2002 to 2020, revealing significant differences in economic performance across

South Asia. Afghanistan experienced extremely high and volatile growth in the early 2000s, peaking at 28.6% in 2002, driven by post-conflict reconstruction and foreign aid inflows. Yet, this growth proved unsustainable, with sharp declines in later years, including near-zero growth in 2011 and negative growth of -2.4% in 2020, reflecting political instability and economic disruptions. In contrast, Bangladesh displayed consistent and steady growth throughout the period, ranging from 3.45% in 2020 to nearly 7.9% in 2019, highlighting its economic resilience and gradual structural transformation despite global financial shocks.

India and Pakistan show contrasting growth dynamics. India generally maintained high growth rates above 6% for nearly all of the period, except during global crises, including the 2008 financial downturn and the COVID-19 pandemic in 2020, which led to a sharp contraction of -6.6%. Pakistan, on the other hand, exhibited moderate, relatively stable growth, mainly fluctuating between 2% and 6%, but consistently lower than India's and Bangladesh's, indicating structural challenges and slower economic expansion. Overall, the data illustrate that while Bangladesh and India have sustained growth momentum, Afghanistan's economy remains highly volatile, and Pakistan faces moderate yet slower development compared to its regional peers.

This research aims to analytically examine the relationship between international trade and economic growth across four South Asian countries—Afghanistan, Bangladesh, India, and Pakistan—using panel data. The research relies on secondary data compiled from journals, statistical yearbooks, and databases such as the World Bank. This paper is arranged as follows: the next section scrutinises empirical studies on trade openness and economic growth, followed by a section outlining the study's methodology. Subsequent sections present the empirical results and discuss policy implications, concluding with final remarks and recommendations.

This study seeks to address the following research questions:

- What is the impact of international trade on economic growth in Afghanistan, Bangladesh, India, and Pakistan?
- How does trade openness influence economic performance in the selected South Asian countries?
- What is the relationship between population growth and economic growth in the study countries?
- How does the official exchange rate affect economic growth in South Asia?
- Which econometric model (Pooled OLS, Fixed Effects, or Random Effects) best explains the relationship between international trade and economic growth in the selected countries?

RESEARCH METHOD

The data was gathered from the World Bank website (WDI, 2022) for the years 2002- 2020. GDP, as a proxy for economic growth, is the dependent variable. However, total trade (as a proxy for international trade), population, and the exchange rate are the independent

variables in the model. The model examines the relationships among trade openness, the exchange rate, and economic growth in four selected South Asian countries. Table 1 presents the description of the variables in the article.

Table 1: Data Description and Sources

Variables	Symbol	Definition of measuring method	Data source
Gross Domestic Product	GDP	GDP (current US\$)	WDI
Total Trade	TRADE	Trade (Export + Import)	WDI
Population	POP	Population, total	WDI
Official Exchange Rate	ER	LCU per US\$, period average	WDI

Fixed Effect Model

A fixed effects regression is a panel data estimation technique that permits one to take into consideration time-invariant unnoticed individual characteristics that can be correlated with the observed independent variables and such model used by (Adu-Gyamfi, Nketiah, Obuobi, & Adjei, 2020). The equation for the fixed effects model becomes:

$$Y_{it} = \beta_1 X_{it} + a_i + \mu_{it}$$

Where:

a_i ($i = 1, \dots, n$) is the intercept unique to each entity, giving n entity-specific intercepts.

Y_{it} represent dependent variable (DV) where i = entity and t = time.

X_{it} represent the independent variable (IV).

β_1 is the coefficient for that IV;

μ_{it} is the error term

The model for GDP growth is as follows:

$$\ln GDP_{it} = \alpha + \beta_1 \ln TRADE_{it} + \beta_2 \ln POP_{it} + \beta_3 \ln ER_{it} + \dots + u_{it}$$

Where:

GDP represents economic growth; TRADE represents trade openness; POP represents population; and ER represents the exchange rate. All variables are converted to natural logarithms, and the (i) and (t) represent the countries and periods, respectively.

FINDINGS

Table 1 presents the descriptive statistics for the variables used in the analysis, including Ln GDP, Ln TRADE, Ln POP, and Ln ER, based on 76 observations. The mean value of Ln GDP is 25.72 with a standard deviation of 1.80, indicating moderate variability in the gross domestic product across the sample. The minimum and maximum values of Ln GDP are 22.12 and 28.67, respectively, reflecting differences in economic output among the observations. Ln

TRADE has a mean of 27.90 and a relatively high standard deviation of 3.42, suggesting significant variation in trade levels across the sample, with values ranging from 21.53 to 32.04. Ln POP has a mean of 19.00 and a standard deviation of 1.33, indicating that population sizes are relatively stable, ranging from 16.93 to 21.05. Ln ER shows the least variability, with a mean of 4.19, a standard deviation of 0.29, and values ranging from 3.72 to 5.09, reflecting relatively stable exchange rates during the period.

Table1: Descriptive Statistics

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
Ln GDP	76	25.71729	1.79691	22.12326	28.67185
Ln TRADE	76	27.90274	3.4152	21.53197	32.04303
Ln POP	76	19.00186	1.331104	16.93349	21.04535
Ln ER	76	4.185404	0.289368	3.722037	5.086599

Source: Authors' Calculations.

The correlation outcomes are presented in Table 2. We observe that trade and population exhibit statistically significant and positive correlations with gross domestic product. However, the official exchange rate shows no statistical significance and is negatively correlated with gross domestic product.

Table 2: Correlation matrix of data series

	Ln GDP	Ln TRADE	Ln POP	Ln ER
Ln GDP	1.0000			
Ln TRADE	0.00802	1.0000		
Ln POP	0.01176	0.9870	1.0000	
Ln ER	-0.0471	-0.1100	-0.0944	1.0000

Source: Author's Calculation, 2024

Panel unit root tests proposed by Levin et al. (2002) and Im & Pesaran (2003) were performed on the concentration variables in the estimation process. These tests were implemented to address potential systematic patterns in time series data that, if ignored, could lead to spurious regression outcomes with significant negative consequences. The panel unit root tests, both with and without a trend component, indicated that Ln GDP and Ln TRADE were stationary at their levels. In contrast, Ln POP and Ln ER were stationary only after first differencing. Additionally, all results were statistically significant at the 1% and 5% levels. Consequently, the null hypothesis of a unit root was rejected. The detailed results are provided in Table 3.

Table 3: Unit root test

Variables	Levin et al		Im et al		Levels
	With trend	Without trend	With trend	Without trend	
Ln GDP	-5.23345***	-11.3307***	-4.264567***	-6.878611***	I(0)
Ln TRADE	-6.32100***	-6.91263***	-6.245549***	-3.96718***	I(0)
Ln POP	-6.4564***	-3.654***	-12.15557***	-10.8711***	I(1)
Ln ER	1.23345	-0.54816	-8.03407**	-5.672911**	I(1)

Source: Author's Calculation, 2024

***, ** indicates the level of significance at 1% and 5%, respectively

The Breusch-Pagan test (Table 4) is used to assess whether pooled OLS is appropriate or whether a fixed- or random-effects model is better. The null hypothesis assumes no panel effects or unit-level variation. Given the highly significant cross-sectional p-value (0.0001) and the time-specific p-value (0.0023), we reject the null, indicating the presence of both cross-sectional and temporal effects. These results suggest that a fixed- or random-effects model is preferable to pooled OLS. Given the low cross-sectional p-values, fixed effects may be more suitable, though a Hausman test is needed to choose between fixed and random effects definitively.

Table 4: Breusch-Pagan Test results

	Cross-section random	Time	Both
Breusch - Pagan	23.6788	5.455	25.345
	0.0001	0.0023	0.0002

Source: Author's Calculation, 2024

Fixed Effect

The model shows that all the variables (Ln TRADE, Ln POP, Ln ER) are significant at a 5 per cent level of significance, and the coefficient of (Ln TRADE) is 0.667, which means if a trade increases by 1%, then it will increase the GDP by 0.667 per cent. The coefficient of (Ln POP) is 2.136, which means if a population is growing by 1%, then it will drive an increase in the GDP by 2.136 percent. The coefficient of (Ln ER) is -0.823, which means if the exchange rate increases by 1 percent, this will result in a decrease in the GDP by 0.823 percent. It is mentioned that both trade and population have a positive and significant impact on GDP. However, the exchange rate has a negative and significant impact on GDP.

Table 3: Fixed effects regression results

GDPX	Coefficient	Std.Error	t-Statistics	p-Value
C	-30.05002	4.565683	-6.581714	0.001
Ln TRADE	0.667003	0.041101	16.22847	0.002
Ln POP	2.136806	0.283983	7.524413	0.003
Ln ER	-0.823623	0.136905	-6.016013	0.004
Adjusted R-squared	0.994967			
R-squared	0.995369			
F-statistics	2472.008			
Prob (F-statistics)	0.0000			
No of observation	76			

Source: Author's Calculations.

Hausman Test

To determine whether the fixed-effects or random-effects model is appropriate, the Hausman test has been performed. The null hypothesis of the test is that the random effects model is applicable. At the 5 per cent significance level, the alternative hypothesis is accepted, indicating that the fixed effects model is suitable. Given the data's heterogeneity, the fixed-effects model provides a better fit than any other model.

Table 4: Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	p-Value
Cross-section random	394.858319	3	0.000

Source: Authors' calculations by using Eviews 12 Statistical Software.

DISCUSSION

This research examined the influence of international trade on the economic growth of Afghanistan, Bangladesh, India, and Pakistan from 2000 to 2020 using panel data methods. The analysis demonstrates that trade and population have a positive, substantial effect on GDP, whereas the real exchange rate negatively affects economic growth. These findings are consistent with previous studies, such as Bajwa and Siddiqi (2011) and Kong et al. (2022), which similarly reported that increased trade openness stimulates economic growth in South Asian and other developing countries by providing access to larger markets, attracting investment, and encouraging specialization. The adverse effect of exchange rate fluctuations is consistent with Alam and Sumon (2020), who suggest that currency volatility can discourage investment and trade, thereby slowing growth. However, some studies, such as Safi and Maurya (2025), report mixed or insignificant effects of exchange rates on GDP, suggesting that outcomes may vary across countries and methodological approaches.

These results carry significant policy implications. To maximize the benefits of trade openness, South Asian countries should invest in trade infrastructure, reduce bureaucratic barriers, and promote regional integration through initiatives such as SAFTA. Stabilizing exchange rates and encouraging export diversification can further enhance economic resilience and growth. Additionally, improving governance, institutional quality, and investment in physical and human capital are essential to sustain long-term economic development. Overall, the study supports the view that trade openness is a critical driver of regional growth. At the same time, exchange rate management and structural reforms are necessary to realize its potential fully.

Linking these findings directly to the research questions, the positive, statistically significant effect of trade openness provides a clear answer to the first research question, confirming that international trade plays a decisive role in promoting economic growth in the selected South Asian countries. The strong positive coefficient of population addresses the second research question, indicating that labor force expansion contributes meaningfully to output growth when supported by appropriate economic policies and employment opportunities. The adverse effects of exchange rate instability directly address the third research question, suggesting that it constrains economic performance by raising production costs, reducing investor confidence, and weakening trade competitiveness.

Beyond descriptive interpretation, these results imply that growth in South Asia is not solely driven by trade volume but by the quality of macroeconomic management and institutional capacity. Countries that effectively coordinate trade liberalization with sound

exchange rate policies, governance reforms, and human capital development are more likely to convert openness into sustained economic growth.

Nevertheless, the study faces certain methodological and contextual limitations. The analysis is based on aggregate national data, which may obscure significant sectoral differences and country-specific institutional conditions. Excluding variables such as political stability, infrastructure quality, financial development, and technological progress may limit the model's explanatory power. Furthermore, extraordinary events such as political transitions and the COVID-19 pandemic may have introduced structural changes that are difficult to capture within the empirical framework fully.

Additionally, this study also proposes directions for future research. Future investigations could incorporate additional growth determinants such as foreign direct investment, education, technological innovation, and governance quality. Applying dynamic panel models, nonlinear approaches, or country-specific case studies would provide deeper insight into long-run dynamics and heterogeneity across South Asian economies.

CONCLUSION

A country's total trade reflects the extent to which it participates in international trade, exchanging goods and services with other nations. Greater openness allows countries to access larger markets, thereby expanding opportunities for commerce and fostering economic growth. International trade promotes efficiency and specialization, enabling countries to concentrate on their comparative advantages, increase productivity, and contribute to overall economic development. By participating in global trade, nations can diversify their income sources, which helps mitigate risks during economic downturns. The relationship between trade openness and economic growth remains a complex and widely discussed issue in financial literature.

In South Asia, increased trade has generally been linked to higher economic growth. By opening up to international markets, countries attract foreign investment, stimulate export-led growth, and diversify their economies, reducing dependency on specific sectors and enhancing economic stability. Regional initiatives such as SAARC aim to strengthen trade integration, but political tensions have often hindered progress. Furthermore, South Asian economies remain vulnerable to global economic trends, including fluctuations in commodity prices, external demand, and geopolitical events, which all influence trade patterns and financial performance.

This study empirically investigates the relationship between trade and economic growth in four South Asian countries: Afghanistan, Bangladesh, India, and Pakistan. Using panel data from 2000 to 2020, the study employed Pooled Ordinary Least Squares (OLS), Fixed Effects, and Random Effects models. The Hausman test indicated that the fixed-effects model was most appropriate for the analysis. The outcomes suggest that trade and population have a positive, statistically significant effect on GDP, whereas the real exchange rate has a negative,

significant impact. The combined effect of trade, population, and the exchange rate is also statistically significant, with an adjusted R-squared of 0.99, indicating that these variables effectively explain variations in GDP.

Based on the empirical findings, the following recommendations are proposed:

- Since trade openness and population positively influence GDP, governments should strengthen trade relations, establish free trade zones, and invest in infrastructure to facilitate cross-border commerce.
- Given the adverse effect of the exchange rate on GDP, policies should focus on maintaining a stable domestic currency to balance imports and exports effectively.
- Trade liberalization should be prioritized to boost economic growth, particularly given the adverse impacts of the COVID-19 pandemic on regional economies.
- Additional investment is essential to expand production and create employment opportunities for the growing labor force, particularly in Bangladesh, India, and Pakistan. Increasing investment in physical capital will support sustained economic growth.
- Open economies should leverage foreign technologies by importing advanced capital goods to improve domestic production capabilities.
- Governments should strengthen governance and institutional frameworks to promote efficiency, reduce corruption, and enhance the quality of education, thereby supporting economic development.
- Bilateral and multilateral trade agreements must be fully implemented, ensuring that political disputes and procedural barriers do not restrict cross-border trade.
- Policymakers should adopt strategies to further liberalize the economy, enabling South Asian countries to reap the full potential of trade-driven growth.

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AUTHORS CONTRIBUTIONS

Waheedullah Hemat produced the discussion and conclusion parts and carried out the data analysis and research methods. The preface was written by Abdullah Nael, who also corrected and edited the language. The literature review was prepared by Hekmatullah Haqyar. The

manuscript was reviewed and refined by Jawed Ahmad Shahidi. The final text was examined and approved by all authors.

CONFLICT OF INTEREST STATEMENT

We, the authors of the study, declare that we have no conflicts of interest

DATA AVAILABILITY STATEMENT

We, the authors of the study, declare that the data supporting the findings of this study are available from the corresponding author upon reasonable request.

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