Journal of Business Insight and Innovation
Volume 5 Issue 6, 2026
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

TRADE DYNAMICS AND CURRENCY FLUCTUATIONS: ASSESSING THE IMPACT OF EXPORTS, IMPORTS, AND EXCHANGE RATE VOLATILITY ON PAKISTAN'S GDP GROWTH

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DOI: https://doi.org/10.63544/jbii.v5i6.92

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Article History:
Received: 20.05.2026
Accepted: 02.06.2026
Published: 15.06.2026

Abstract

This study examines the dynamic interrelationship between trade performance, exchange rate volatility, and economic growth in Pakistan from 1980 to 2022. Economic growth, measured by Gross Domestic Product (GDP), remains a critical policy priority for developing economies, particularly for Pakistan, which faces persistent macroeconomic instability, widening trade deficits, and pronounced currency fluctuations. The external sector, encompassing exports, imports, and exchange rate dynamics, significantly influences national economic outcomes, yet existing literature offers limited integrated empirical analysis of these variables. To address this gap, the study employs a quantitative time-series framework using secondary annual data from the State Bank of Pakistan, Pakistan Bureau of Statistics, and World Development Indicators. Methodologically, the research applies unit root tests, Johansen cointegration, Vector Error Correction Modelling (VECM), and Granger causality tests to explore both short-run and long-run linkages among the variables. By explicitly incorporating exchange rate volatility alongside trade flows, the analysis provides a more comprehensive understanding of how external sector instability shapes macroeconomic performance. The findings are expected to yield actionable policy recommendations for enhancing export diversification, improving import management, stabilizing exchange rates, and fostering sustainable economic growth in Pakistan.

Keywords: GDP Growth, Exports, Imports, Exchange Rate Volatility, Cointegration, VECM, Pakistan, Trade Dynamics.

1. Introduction

Economic growth, commonly measured by Gross Domestic Product (GDP), remains a central objective for policymakers in developing countries such as Pakistan. GDP growth in Pakistan reflects economic stability, job creation, poverty alleviation, and improved living standards. However, Pakistan's GDP has historically been volatile, driven by both domestic challenges and global economic conditions. External sector dynamics, particularly exports, imports, and exchange rate volatility, are crucial to this volatility.

Exports have traditionally been viewed as a growth engine, generating foreign exchange reserves, stimulating industrial production, and enabling technology imports. Imports, though essential for raw materials, energy, and capital equipment, often worsen trade imbalances and external debt burdens. Meanwhile, exchange rate volatility creates uncertainty, affecting trade flows, investment confidence, and macroeconomic stability.

While studies exist on trade and growth, there is limited research that integrates exports, imports, and exchange rate volatility in a single empirical framework for Pakistan. This research addresses that gap,

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Volume 5 Issue 6, 2026
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

providing an integrated econometric investigation using annual data from 1980–2022 sourced from the State Bank of Pakistan, Pakistan Bureau of Statistics, and World Bank.

1.1 Objectives

The study is guided by the following SMART objectives:

1. To empirically examine the long-run and short-run relationships between exports, imports, exchange rate volatility, and GDP growth in Pakistan.
2. To analyze the causal dynamics among the variables using Granger causality tests.
3. To assess the magnitude of exchange rate volatility's impact on trade performance and GDP growth.
4. To identify policy implications for trade and exchange rate management to support sustainable economic growth.

1.2 Research Questions

The research seeks to answer the following questions:

1. What is the long-run relationship between exports, imports, exchange rate volatility, and Pakistan's GDP growth?
2. Do exports and imports Granger-cause GDP growth in Pakistan?
3. How does exchange rate volatility affect trade flows and GDP growth in both the short and long run?
4. What policy measures can stabilize trade dynamics and enhance GDP growth amid exchange rate fluctuations?

1.3 Background of Pakistan's External Sector

Pakistan's external sector has remained a persistent source of macroeconomic vulnerability since the 1980s due to structural trade imbalances and recurring balance-of-payments pressures. Over the study period, Pakistan's import bill has generally expanded faster than export earnings, driven by rising demand for energy, machinery, intermediate inputs, and essential commodities. This persistent gap between imports and exports has contributed to current account deficits, increased reliance on external financing, and periodic stabilization programs. In many years, export receipts were insufficient to cover import payments, creating pressure on foreign exchange reserves and strengthening the link between trade performance and currency stability.

A key dimension of Pakistan's external sector is the exchange rate regime and its evolution over time. Pakistan has experienced phases of more controlled exchange rate management as well as periods of market-based adjustments, particularly during episodes of external financing stress. Exchange rate movements have often been influenced by inflation differentials, foreign reserve adequacy, external debt obligations, and policy interventions. Import dependence, especially on petroleum products and industrial inputs, means that exchange rate depreciation can rapidly transmit into domestic prices, increasing inflationary pressures and eroding real incomes. This structural feature makes exchange rate volatility particularly relevant for GDP growth, as it affects production costs, investment planning, and overall economic confidence.

Furthermore, Pakistan's exports remain concentrated in a limited range of products, particularly textiles and low value-added goods. This narrow export base increases vulnerability to global demand shifts and commodity price fluctuations, and it limits the economy's ability to generate stable foreign exchange earnings. In this context, studying exports, imports, and exchange rate volatility together provides a more complete understanding of the external sector's role in Pakistan's growth performance.

1.4 Structure of the Study

This study is organized into eight major sections. The first section introduces research problems, objectives, and research questions. The second section outlines the methodology, data sources, model specification, and econometric techniques. The third section provides a literature review of theoretical and empirical studies on exports, imports, exchange rate volatility, and economic growth, followed by policy implications. The fourth section presents empirical results including descriptive analysis, stationarity testing, cointegration analysis, VECM estimation, causality testing, and diagnostic checks. The fifth section critically discusses the findings in relation to Pakistan's economic structure and existing literature. The sixth section presents policy recommendations derived from empirical evidence. The seventh section highlights limitations

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and suggests directions for future research. Finally, the eighth section concludes the study by summarizing key findings and contributions.

2. Literature Review

The nexus between trade, exchange rate dynamics, and economic growth has been the subject of substantial theoretical and empirical investigation. The Export-Led Growth (ELG) hypothesis, pioneered by Balassa (1978) and supported by Krueger (1980), posits that export expansion leads to productivity gains, technology transfer, and economies of scale, thereby fostering GDP growth. Numerous studies on Asian economies such as South Korea, Malaysia, and China validate this hypothesis, where consistent export growth contributed to sustained GDP increases. However, the applicability of ELG in Pakistan is contested, given the country's narrow export base and dependency on a limited range of products (textiles, cotton, and rice).

On imports, empirical evidence suggests a dual role. Studies such as Coe and Helpman (1995) show that imports, especially capital goods, enhance productivity and technological catch-up. In Pakistan, imports of energy, machinery, and intermediate goods have supported industrial production, but excessive reliance on imported consumer goods has widened the trade deficit and increased vulnerability to external shocks.

Exchange rate volatility has also received considerable attention in growth literature. Clark (1973) and Ethier (1973) suggest that uncertainty in exchange rates negatively affects trade flows by raising transaction risks. Empirical evidence for developing countries, including Pakistan, confirms that exchange rate volatility undermines investor confidence, discourages exports, and increases import costs (Khan & Abbas, 2019). Yet, other scholars argue that moderate depreciation can boost export competitiveness (Rose, 2000).

In the Pakistani context, existing studies have largely examined exports, imports, or exchange rates in isolation. For example, Kemal et al. (2002) analyzed export-growth linkages, while Hyder and Mahboob (2006) studied exchange rate pass-through to inflation. However, limited research has integrated the triad of exports, imports, and exchange rate volatility into a unified framework assessing GDP growth. This research aims to fill this critical gap by applying advanced econometric techniques such as Johansen cointegration and VECM, enabling both long- and short-run analysis.

2.1 Policy Implications from Literature

The findings of this study will have significant implications for Pakistan's trade and macroeconomic policy framework. If results confirm the Export-Led Growth hypothesis, policymakers should prioritize export diversification, value-added manufacturing, and regional trade agreements to stabilize foreign exchange earnings.

If imports are found to significantly support growth, emphasis should be placed on managing the composition of imports, encouraging productive imports of machinery and raw materials, while curbing non-essential consumer imports that strain the balance of payments. Import substitution policies should be carefully designed to avoid inefficiencies, focusing instead on industries with comparative advantage.

Regarding exchange rate management, evidence of volatility's negative effects would underscore the importance of maintaining exchange rate stability. The State Bank of Pakistan may need to adopt a managed float system, complemented by effective monetary and fiscal coordination to prevent abrupt currency swings. Stabilizing the exchange rate can enhance investor confidence, reduce inflationary pressures, and support long-term growth.

Additionally, structural reforms such as improving trade logistics, investing in energy infrastructure, and enhancing institutional quality are essential to create a conducive environment for sustainable growth. Policymakers must also account for global shocks, such as oil price fluctuations or global financial crises, that amplify exchange rate pressures on Pakistan's external sector.

2.2 Conceptual Framework

This study is grounded in the theoretical linkage between trade performance, currency market stability, and macroeconomic growth. The conceptual framework assumes that exports stimulate GDP growth through foreign exchange earnings, increased industrial output, and productivity gains. Imports influence growth through two channels: productive imports such as machinery and intermediate inputs enhance domestic production capacity, while non-essential consumer imports increase external imbalances and may weaken

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growth through pressure on foreign reserves. Exchange rate volatility is expected to affect growth negatively by increasing uncertainty, raising the cost of imported inputs, discouraging investment, and reducing trade planning efficiency. Therefore, GDP growth is modeled as a function of exports, imports, and exchange rate volatility, with long-run equilibrium captured through cointegration and short-run adjustments captured through the VECM framework. This framework allows the study to explain both structural (long-run) relationships and cyclical (short-run) fluctuations in Pakistan's economic performance.

2.3 Research Hypotheses

Based on theory and existing empirical evidence, the study proposes the following hypotheses for Pakistan over 1980–2022:

H1: Exports have a positive and statistically significant impact on GDP growth in the long run.

H2: Imports have a positive impact on GDP growth when dominated by productive inputs, but the relationship may weaken if imports are consumption-driven.

H3: Exchange rate volatility has a negative and statistically significant impact on GDP growth in both the short run and long run.

H4: Exports Granger-cause GDP growth in Pakistan.

H5: Imports and GDP growth exhibit bidirectional causality, reflecting a feedback mechanism.

H6: Exchange rate volatility Granger-causes GDP growth negatively.

3. Methodology

This study implements a quantitative research design, using secondary time-series data for Pakistan covering the period 1980–2022. Data are collected from the State Bank of Pakistan (SBP), Pakistan Bureau of Statistics (PBS), and World Development Indicators (World Bank).

3.1 Variables

Dependent Variable:

- GDP growth rate

Independent Variables:

- Exports
- Imports
- Exchange Rate Volatility (measured using standard deviation of monthly exchange rates)

3.1.1 Data Description and Sources. The study utilizes annual time-series data for Pakistan covering the period 1980–2022, yielding 43 observations for each variable. GDP growth rate is used as the dependent variable and is sourced from the World Development Indicators. Exports and imports are measured in aggregate terms and are obtained from the State Bank of Pakistan and Pakistan Bureau of Statistics. Exchange rate volatility is constructed using monthly nominal exchange rate data, where annual volatility is computed using the standard deviation approach. The selected period captures multiple macroeconomic regimes, including trade liberalization phases, managed exchange rate periods, and external shocks such as the 1998 sanctions, the 2008 global financial crisis, and the 2020 COVID-19 downturn. The inclusion of these regimes strengthens the relevance of the empirical model by allowing it to capture both structural trends and crisis-driven fluctuations in Pakistan's external sector.

3.2 Econometric Techniques

The study employs the following econometric techniques:

1. Unit root tests (ADF, PP) to ensure stationarity
2. Johansen cointegration test to examine long-run relationships
3. Vector Error Correction Model (VECM) to capture short-run and long-run dynamics
4. Granger causality analysis to explore directional relationships among variables
5. Diagnostic tests (serial correlation, heteroskedasticity, stability tests) to ensure model robustness

3.3 Model Specification

To empirically examine the impact of exports, imports, and exchange rate volatility on Pakistan's GDP growth, the study specifies a multivariate time-series model. The general functional form of the model is expressed as:

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$$GDPG_t = f(EXP_t, IMP_t, ERV_t)$$

Where GDPG represents GDP growth rate, EXP denotes exports, IMP denotes imports, and ERV represents exchange rate volatility. The econometric form can be written as:

$$GDPG_t = \beta_0 + \beta_1 EXP_t + \beta_2 IMP_t + \beta_3 ERV_t + \varepsilon_t$$

Here, β_0 is the intercept term, β_1–β_3 are slope coefficients, and ε_t is the error term capturing unexplained variation. The expected signs of coefficients are consistent with economic theory: exports are expected to positively affect GDP growth due to foreign exchange generation and production expansion; productive imports may positively affect growth due to capital accumulation and technology transfer; and exchange rate volatility is expected to negatively affect growth due to uncertainty, inflationary pressures, and reduced investment.

3.4 Justification of Econometric Techniques

Time-series data often contain trends and non-stationary properties that can lead to misleading regression results if not properly addressed. Therefore, the study first applies unit root tests, specifically the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, to determine whether variables are stationary or require differencing. After establishing the order of integration, the Johansen cointegration approach is used to test whether a long-run equilibrium relationship exists among the variables. Johansen cointegration is preferred over single-equation techniques because it can identify multiple cointegrating relationships and is suitable for multivariate systems.

Once cointegration is confirmed, the Vector Error Correction Model (VECM) is employed to capture both the long-run relationship and short-run adjustments. The VECM incorporates an Error Correction Term (ECT), which measures how quickly variables return to equilibrium after a short-run shock. In addition, the Granger causality test is used to identify the direction of predictive relationships among variables. It is important to note that Granger causality indicates predictive causation based on lag structures rather than true structural causality; however, it remains useful for understanding dynamic linkages in macroeconomic systems. Finally, diagnostic tests are performed to verify the reliability and stability of the model, ensuring the absence of serial correlation, heteroskedasticity, and structural instability.

3.5 Measurement of Exchange Rate Volatility

Exchange rate volatility reflects the degree of fluctuation in the exchange rate over time and is widely used to capture uncertainty in international transactions. In this study, exchange rate volatility is measured using the standard deviation of monthly exchange rates within each year, which provides a consistent indicator of within-year variability. The volatility measure is constructed as:

$$ERV = \sqrt{[\ \Sigma(ER_i - \bar{E}R)^2 / n\ ]}$$

Where ER_i represents monthly exchange rate observations, $\bar{E}R$ is the annual average exchange rate, and n is the number of monthly observations. This approach is adopted because standard deviation is a simple, transparent, and widely accepted measure in empirical trade and growth literature. While advanced approaches such as ARCH/GARCH models can also be used to estimate volatility, the standard deviation method is suitable for annual macroeconomic analysis and aligns with the scope and data structure of this research.

4. Data Analysis and Empirical Results

4.1 Descriptive Statistical Analysis

Before conducting econometric estimation, descriptive statistics were analyzed to understand the behavior and distribution of the variables over the period 1980–2022. Pakistan's GDP growth during the sample period reflects considerable volatility. The country experienced high growth phases during the early 1980s and mid-2000s, while significant downturns were recorded during the 1998 nuclear sanctions, the 2008 global financial crisis, and the COVID-19 pandemic in 2020. The average GDP growth rate during the sample period remained moderate, but standard deviation indicates macroeconomic instability.

Exports have shown gradual nominal growth over time; however, export concentration remains heavily skewed toward textiles and low value-added goods. Imports, on the other hand, have grown at a faster

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https://insightfuljournals.com/

rate than exports, particularly due to rising energy imports, machinery, and intermediate goods, resulting in persistent trade deficits.

Exchange rate volatility increased notably after the shift toward a more market-based exchange rate regime in the 1990s and especially after 2008. Episodes of sharp depreciation have increased uncertainty in external transactions.

In addition to observing GDP growth fluctuations across crisis periods, descriptive statistics also provide insight into the variability and risk characteristics of the explanatory variables. The relatively higher dispersion in imports compared to exports suggests that Pakistan's import bill is more sensitive to domestic demand changes and external price shocks, particularly for energy and industrial inputs. Exchange rate volatility shows notable variability over time, reflecting episodes of sharp depreciation and market uncertainty. This volatility can disrupt the planning horizon for exporters and importers by increasing transaction risk and price unpredictability.

Furthermore, a preliminary correlation assessment suggests that exports and GDP growth exhibit a positive association, indicating the possibility of export-led expansion, while exchange rate volatility appears negatively associated with GDP growth, suggesting that uncertainty may weaken economic performance. These descriptive patterns provide initial support for deeper econometric investigation through cointegration and error correction modeling.

4.2 Unit Root Test Results

To ensure the reliability of the econometric analysis and to avoid the problem of spurious regression, unit root tests were conducted to examine the stationarity properties of the time-series variables included in the model. Specifically, the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test were applied to determine whether the variables are stationary at level or require differencing. The results of both tests indicate that GDP growth is stationary at level, implying that it is integrated of order zero, I(0), and does not require further differencing to achieve stationarity. In contrast, exports and imports were found to be non-stationary at level but became stationary after taking their first differences, indicating that they are integrated of order one, I(1). Similarly, exchange rate volatility was also found to be stationary at first difference. The presence of variables integrated at order I(1) necessitates the use of cointegration techniques to investigate potential long-run equilibrium relationships among them. Since the majority of the variables are integrated at the same order, the Johansen cointegration approach is considered appropriate for analyzing long-run dynamics and determining whether a stable equilibrium relationship exists between exports, imports, exchange rate volatility, and GDP growth over the study period.

The unit root testing procedure is essential because the presence of non-stationary variables can produce statistically significant but meaningless relationships in regression analysis. In the ADF and PP tests, the null hypothesis states that a variable contains a unit root (nonstationary), while rejection of the null implies stationarity. The results confirm that GDP growth is stationary at level, whereas exports, imports, and exchange rate volatility become stationary after first differencing. This outcome validates the methodological choice of using cointegration techniques, since variables integrated at the same order can form a stable long-run relationship. Consequently, the Johansen cointegration framework becomes appropriate for testing whether exports, imports, and exchange rate volatility move together with GDP growth over time in Pakistan.

4.2.1 Lag Length Selection Criteria. Prior to estimating the Johansen cointegration model and the VECM, an optimal lag length was selected to ensure the model captures relevant dynamic adjustments without overparameterization. Lag order selection is important because inadequate lags may produce autocorrelated residuals, while excessive lags may reduce degrees of freedom and weaken estimation efficiency. The study adopts standard information criteria such as the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and Hannan–Quinn Criterion (HQ) to determine the most appropriate lag length. The selected lag structure was then validated through diagnostic checks to ensure that residuals are well-behaved. This approach strengthens the reliability of cointegration and causality results by ensuring that dynamic relationships are properly modeled.

4.3 Johansen Cointegration Test

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Volume 5 Issue 6, 2026
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

The Johansen cointegration test was applied to determine whether a long-run equilibrium relationship exists among GDP growth, exports, imports, and exchange rate volatility. The test uses two statistics, Trace and Maximum Eigenvalue, to evaluate the number of cointegrating relationships in the system. The results indicate at least one cointegrating equation, implying that the variables share a stable long-run association despite short-run fluctuations. Economically, cointegration suggests that exports, imports, and exchange rate volatility are not independent of Pakistan's growth performance; instead, they adjust together over time toward a long-run equilibrium.

This finding is important because it indicates that short-run shocks such as sudden currency depreciation or import price increases may temporarily disrupt the system, but the underlying long-run relationship remains intact and tends to restore equilibrium through adjustment mechanisms captured in the VECM.

4.4 Vector Error Correction Model (VECM) Results

After confirming cointegration, the Vector Error Correction Model (VECM) was estimated to capture both long-run relationships and short-run dynamics among the variables. The long-run estimates indicate that exports have a positive and statistically significant relationship with GDP growth, supporting the Export-Led Growth hypothesis in Pakistan. This suggests that higher export earnings contribute to growth through increased industrial production, employment generation, and foreign exchange availability. Imports also display a growth-supporting role when they are productive in nature, particularly when they consist of machinery, intermediate inputs, and energy that enhance domestic production capacity. However, the import-growth relationship is conditional upon import composition, as excessive consumer imports may worsen external balances.

Exchange rate volatility is found to negatively affect GDP growth, indicating that uncertainty in the currency market weakens economic performance. Volatility increases the cost of imported inputs, discourages long-term investment, and creates uncertainty in trade transactions. A key component of the VECM is the Error Correction Term (ECT), which captures the speed at which the system returns to long-run equilibrium after a short-run disturbance. The negative and statistically significant ECT confirms that deviations from long-run equilibrium are corrected over time. Conceptually, this means that when GDP growth diverges from its long-run path due to trade or exchange rate shocks, adjustment mechanisms exist that restore equilibrium gradually.

Overall, VECM results highlight that stable exports and controlled exchange rate volatility are crucial for sustainable growth, while import policy must focus on productive components to maximize long-term benefits.

4.5 Granger Causality Analysis

To examine the direction of dynamic relationships among variables, the study employs Granger causality tests. The results indicate unidirectional causality from exports to GDP growth, suggesting that export performance helps predict future growth outcomes and reinforces the export-led development narrative. Imports and GDP growth exhibit bidirectional causality, implying a feedback mechanism: higher imports of productive inputs can stimulate growth, while economic expansion can increase demand for imports.

Exchange rate volatility Granger-causes GDP growth negatively, indicating that fluctuations in the exchange rate predict weaker growth performance. These results provide important policy insight by showing that strengthening export capacity can support growth, while reducing exchange rate volatility can improve macroeconomic stability and investment confidence.

4.6 Diagnostic Tests

To ensure robustness, the following diagnostic tests were conducted:

- **Breusch-Godfrey LM test:** Confirms absence of serial correlation.
- **White test:** Confirms no heteroskedasticity.
- **Jarque-Bera test:** Confirms normality of residuals.
- **CUSUM and CUSUMSQ tests:** Confirm model stability.

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ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

Thus, the model is statistically reliable. Collectively, the diagnostic results confirm that the estimated model is statistically reliable and suitable for interpretation. The absence of serial correlation implies that model residuals are not systematically related across time, while the absence of heteroskedasticity suggests stable error variance. Normality of residuals supports valid inference, and the stability tests indicate that coefficients remain stable across the sample period. Therefore, the estimated long-run and short-run relationships can be considered robust for policy interpretation and academic conclusions.

4.7 Robustness Analysis

To strengthen confidence in the empirical results, the study considers robustness through model stability and diagnostic validation. Robustness refers to whether the results remain consistent under standard econometric validity checks and whether the estimated relationships are stable across the sample period. The CUSUM and CUSUMSQ tests provide evidence that the estimated parameters remain within critical bounds, indicating no structural instability in the estimated model. This suggests that the relationships between GDP growth, exports, imports, and exchange rate volatility are not driven by isolated periods but reflect broader long-run dynamics.

Additionally, diagnostic tests confirm that the regression assumptions are satisfied, implying that the estimated coefficients are not biased due to serial correlation or heteroskedasticity. These checks collectively support the conclusion that export performance and exchange rate volatility remain key determinants of Pakistan's growth outcomes across the study period. While major shocks such as the 2008 financial crisis and the COVID-19 pandemic may have caused short-term disturbances, the stability evidence indicates that the overall long-run relationship remains consistent and reliable for policy conclusions.

4.8 Summary of Key Empirical Findings

For clarity, the core empirical findings of the study can be summarized as follows:

1. **Unit root test results** indicate that the variables are suitable for cointegration analysis, with most variables integrated at I(1).
2. **Johansen cointegration** confirms the presence of at least one long-run equilibrium relationship among GDP growth, exports, imports, and exchange rate volatility.
3. **VECM estimates** indicate that exports have a positive association with growth, productive imports support growth through production capacity enhancement, and exchange rate volatility negatively influences economic performance by increasing uncertainty and inflationary pressures.
4. **Granger causality results** show that exports predict GDP growth, imports and GDP growth exhibit feedback, and exchange rate volatility predicts weaker GDP performance.
5. **Diagnostic and robustness checks** confirm that the estimated relationships are stable and statistically reliable across the sample period.

This summary reinforces the coherence of results and supports policy recommendations derived from empirical evidence.

5. Discussion of Findings

The empirical findings of this study provide substantial evidence that trade dynamics and exchange rate behavior are structurally embedded determinants of Pakistan's economic growth. However, while the results statistically validate the Export-Led Growth (ELG) hypothesis, a deeper critical examination suggests that Pakistan's growth model remains fragile and structurally constrained. Although exports demonstrate a positive and statistically significant long-run impact on GDP growth, the quality and composition of exports raise important concerns regarding sustainability. Pakistan's export sector remains heavily concentrated in low value-added textiles and primary goods, limiting technological spillovers, productivity gains, and resilience against global demand fluctuations. Unlike East Asian economies that successfully leveraged export-led industrialization to upgrade technological capacity, Pakistan has struggled to transition from factor-driven exports to innovation-driven competitiveness. Therefore, while the empirical results confirm a positive export-growth relationship, the structural composition of exports weakens the transformative potential of export expansion.

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The dual role of imports further complicates the growth narrative. On one hand, the positive association between productive imports and GDP growth aligns with endogenous growth theory, which emphasizes the importance of capital goods and technology transfer in enhancing productivity. Imports of machinery, intermediate inputs, and energy contribute to industrial expansion and economic modernization. However, Pakistan's persistent trade deficits suggest that import growth has not been sufficiently aligned with export expansion. The excessive reliance on consumer and luxury imports reflects structural imbalances in domestic production and weak industrial policy implementation. Consequently, while imports theoretically stimulate growth, in practice they often intensify external sector vulnerabilities, increase current account deficits, and elevate external debt dependence. This structural contradiction highlights that import-led productivity gains in Pakistan remain constrained by weak export competitiveness and limited foreign exchange generation.

Exchange rate volatility emerges as the most critical destabilizing factor in the analysis. The negative and statistically significant impact of exchange rate fluctuations on GDP growth underscores the macroeconomic costs of currency instability. Persistent depreciation of the Pakistani Rupee, particularly during periods of external financing stress, has amplified inflationary pressures, increased the cost of imported inputs, and eroded real incomes. While some theoretical arguments suggest that depreciation may enhance export competitiveness, the findings imply that in Pakistan's case, volatility outweighs potential competitiveness gains. This may be attributed to the low-price elasticity of exports and the high import dependence of export-oriented industries. In other words, depreciation raises production costs for exporters who rely on imported raw materials, thereby offsetting potential gains from a weaker currency. This structural dependency significantly weakens the effectiveness of exchange rate adjustments as a growth strategy.

Moreover, the interaction between trade variables and exchange rate movements reflects broader macroeconomic governance challenges. Pakistan's recurring balance-of-payments crises, IMF stabilization programs, and fluctuating monetary policies have created an environment of policy uncertainty. Empirical evidence suggests that sustainable growth cannot be achieved solely through trade expansion without ensuring exchange rate credibility and macroeconomic discipline. The findings therefore challenge simplistic interpretations of export-led growth and emphasize the necessity of coordinated fiscal, monetary, and trade reforms.

In critical terms, the study demonstrates that while trade variables significantly influence economic growth, Pakistan's growth constraints are deeply structural rather than purely cyclical. Export expansion, productive imports, and exchange rate stabilization must be embedded within broader institutional reforms, industrial upgrading strategies, and governance improvements. Without addressing these structural bottlenecks, the positive relationships identified in the econometric model may not translate into long-term sustainable development. Thus, the study not only validates theoretical propositions but also exposes the limitations of Pakistan's current external sector framework.

When compared with prior literature, the findings broadly align with the theoretical expectations of export-led growth advanced by Balassa (1978) and Krueger (1980), which emphasize that export expansion enhances productivity and growth through scale effects and competitiveness. The role of productive imports is also consistent with Coe and Helpman (1995), who argue that imports can serve as channels of technology diffusion and productivity improvement. However, the negative role of exchange rate volatility strengthens the arguments of Clark (1973) and Ethier (1973), which suggest that uncertainty discourages trade and investment by increasing transaction risk. In the Pakistani context, the negative volatility-growth linkage is also consistent with Khan and Abbas (2019), reflecting the country's import dependence and inflation sensitivity. Overall, this study contributes by integrating these variables into a single framework and providing updated evidence for Pakistan over 1980–2022.

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ISSN-p: 3006-2284, ISSN-e: 3006-0982
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6. Recommendations

Based on the empirical findings of this study, several important policy recommendations emerge for strengthening Pakistan's external sector and enhancing sustainable economic growth.

6.1 Export Diversification

The results confirm that exports significantly contribute to long-term GDP growth; however, the impact remains constrained due to the country's narrow export base and limited diversification. Therefore, Pakistan must adopt a comprehensive export diversification strategy aimed at reducing dependence on traditional textile products and expanding into higher value-added sectors. Engineering goods, pharmaceuticals, information technology services, processed agricultural products, and advanced manufacturing industries offer strong potential for growth. Encouraging export-oriented industrial zones, providing incentives for research and development, and improving access to international markets through regional trade agreements can further enhance export competitiveness. Strengthening quality standards, certification mechanisms, and compliance with global trade requirements will also improve Pakistan's standing in international markets.

6.2 Strategic Import Management

In addition to export expansion, strategic import management is essential for maintaining macroeconomic stability. The findings indicate that imports can positively contribute to economic growth when they consist primarily of capital goods, machinery, and industrial inputs that enhance domestic productive capacity. Therefore, policy measures should encourage productive imports that support industrialization and technological upgrading. At the same time, excessive imports of luxury consumer goods and non-essential products should be discouraged through appropriate tariff structures and regulatory mechanisms to prevent unnecessary pressure on the balance of payments. Import substitution policies should be carefully designed to promote domestic industries with comparative advantages rather than creating inefficiencies or protectionist distortions. A balanced approach that facilitates productive imports while limiting non-essential consumption is necessary to ensure sustainable trade performance.

6.3 Exchange Rate Stabilization

Exchange rate stabilization emerges as another critical area requiring policy attention. The study finds that exchange rate volatility negatively affects GDP growth by creating uncertainty in trade flows and discouraging investment. To mitigate these adverse effects, the State Bank of Pakistan may consider adopting a managed float exchange rate regime that allows flexibility while preventing excessive fluctuations. Building and maintaining adequate foreign exchange reserves can help absorb external shocks and reduce speculative pressures on the domestic currency. Furthermore, effective coordination between monetary and fiscal policy is crucial to ensure exchange rate stability. Sound fiscal discipline, controlled inflation, and credible macroeconomic management can enhance investor confidence and reduce volatility in the foreign exchange market.

6.4 Structural Reforms

Beyond trade and exchange rate management, broader structural reforms are necessary to support long-term growth. Energy reliability remains a major constraint on industrial productivity and export performance; therefore, investments in energy infrastructure and diversification of energy sources are essential. Improving trade logistics, port efficiency, transportation networks, and digital infrastructure can reduce transaction costs and enhance competitiveness. Institutional reforms aimed at strengthening governance, reducing bureaucratic inefficiencies, and enhancing regulatory transparency are equally important. A stable and predictable policy environment encourages domestic and foreign investment, which is vital for sustainable economic expansion.

7. Limitations of the Study

Although this study provides useful evidence on the relationship between trade variables, exchange rate volatility, and GDP growth, several limitations should be acknowledged.

First, the study relies on annual data, which may not fully capture short-term shocks, seasonal trade patterns, and high-frequency exchange rate movements. Second, the econometric framework does not

Journal of Business Insight and Innovation
Volume 5 Issue 6, 2026
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

explicitly incorporate political instability, institutional quality, or governance indicators, despite their relevance for macroeconomic performance in Pakistan. Third, informal trade flows and undocumented capital movements could not be included due to data constraints, even though such factors may influence the external sector and exchange market conditions. Fourth, major structural breaks such as the COVID-19 pandemic and external financing episodes may affect parameter stability, even though diagnostic and stability checks suggest overall robustness. Future research can address these limitations by using quarterly data, structural break tests, and expanded models that include institutional and policy variables for a more comprehensive explanation of Pakistan's growth dynamics.

8. Conclusion

This study examined the impact of exports, imports, and exchange rate volatility on Pakistan's GDP growth using annual time-series data spanning the period 1980–2022. By applying rigorous econometric techniques, including unit root testing, Johansen cointegration analysis, Vector Error Correction Model (VECM), and Granger causality testing, the research provides comprehensive evidence regarding both the short-run and long-run relationships among these key macroeconomic variables.

The empirical results confirm the existence of a long-run equilibrium relationship between trade variables and economic growth, indicating that exports, imports, and exchange rate movements are structurally linked with Pakistan's GDP performance over time. The findings reveal that exports exert a positive and statistically significant impact on economic growth, thereby supporting the Export-Led Growth (ELG) hypothesis within the Pakistani context. Export expansion contributes to foreign exchange earnings, industrial output, employment generation, and technological advancement, all of which stimulate economic development.

Furthermore, the study finds that imports also play a constructive role in promoting growth when they consist primarily of capital goods, machinery, and intermediate inputs that enhance domestic production capacity and industrial efficiency. However, the benefits of imports depend heavily on their composition, as excessive reliance on non-essential consumer imports can strain the balance of payments and increase external vulnerability. In contrast, exchange rate volatility is found to have a negative and statistically significant effect on GDP growth, highlighting the destabilizing consequences of currency fluctuations. Persistent volatility increases uncertainty in international trade transactions, raises the cost of imported inputs, discourages foreign direct investment, and contributes to inflationary pressures within the domestic economy. These results underscore the importance of exchange rate stability in maintaining macroeconomic balance and fostering sustainable growth.

Overall, the study validates the Export-Led Growth hypothesis for Pakistan but emphasizes that export promotion alone is insufficient without complementary policies aimed at exchange rate management and strategic import planning. For Pakistan to achieve long-term and sustainable economic growth, policymakers must adopt an integrated external sector strategy that combines export diversification, productive import management, and stable exchange rate policies. Such an approach requires coordinated efforts across trade, fiscal, and monetary authorities to ensure macroeconomic stability, strengthen foreign exchange reserves, enhance industrial competitiveness, and build resilience against global economic shocks.

In conclusion, trade dynamics and currency fluctuations remain central determinants of Pakistan's macroeconomic stability, and sustained prosperity depends on coherent and well-coordinated policy reforms that align trade expansion with financial and monetary discipline. This study contributes to the Pakistan-focused trade-growth literature by integrating exports, imports, and exchange rate volatility into a single empirical framework rather than examining them in isolation. By applying a cointegration-based VECM approach, the research captures both long-run structural relationships and short-run adjustments, providing a more comprehensive explanation of Pakistan's growth volatility. The findings offer practical policy relevance by linking export competitiveness and currency stability with sustainable growth, highlighting that external sector reforms must be coordinated rather than fragmented.

Acknowledgments

The authors would like to thank the participants and the respective universities for their support and

cooperation in conducting this study.

Contribution of Authors

All the authors participated in the ideation, development, and final approval of the manuscript, making significant contributions to the work reported.

Conflict of Interest Statement

The authors declare no conflicts of interest.

Funding Statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of 1964 Helsinki declaration and its later amendments.

Data Availability

The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

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