



Impact of Foreign Trade, Foreign Direct Investment, and Capital Expenditure on Nepal's Economic Growth: Evidence from an Autoregressive Distributed Lag Approach

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Abstract

Purpose: This study aims to analyze how exports, imports, foreign direct investment, and government capital expenditure affect Nepal's economic growth over both short-term and long-term periods.

Design/methodology/approach: This research utilizes a quantitative time-series econometric methodology, specifically applying the Autoregressive Distributed Lag (ARDL) bounds testing technique, to examine both the short-term fluctuations and long-term associations among crucial macroeconomic indicators affecting Nepal's economic performance, based on annual data spanning from 1995 to 2023.

Findings: The results reveal the existence of a long-term cointegration relationship between exports, imports, foreign direct investment, government capital expenditure, and real GDP in Nepal. Over the long run, both imports and capital expenditure are found to significantly and positively contribute to economic growth. In contrast, FDI exerts a negative influence, though statistically insignificant, while exports show a positive yet also insignificant effect on real GDP. Similar trends are observed in the short-run analysis, with capital expenditure and imports positively influencing real GDP. On the contrary, FDI has an insignificant and negative impact, and export has a positive and insignificant impact on real GDP.

Conclusions: The evidence presented highlights the critical role of strategic government investment and trade policy in supporting Nepal's economic development. The negligible impact of FDI suggests structural inefficiencies that must be addressed.

Implications: These findings suggest that strategic public investment and efficient import utilization are crucial for sustained growth, while export diversification and FDI-enhancing reforms are necessary to unlock their potential. Policymakers should focus on enhancing productive imports, improving FDI efficiency, and restructuring trade strategies to sustain long-term economic growth.

Originality/Value: Unlike previous studies based on cross-country data, this research provides a focused analysis of Nepal, employing the ARDL approach to assess the short- and long-run effects of exports, imports, FDI, and capital expenditure on economic growth. It adds value to the literature by presenting long-run evidence drawn from a single-country context.

JEL Classification: F41, F43, E62, O53



Introduction

In developing nations, trade and capital flows have become crucial tools for advancing structural change and economic development in an interconnected global economy. Macroeconomic variables like exports, imports, FDI, and government spending have attracted a lot of interest in economic literature as they are essential for the stability and economic growth of any nation. For a nation like Nepal, which has always struggled with ongoing trade deficits and with attracting foreign direct investment (Khatri et al., 2023). Formulating sensible policies and reaching sustainable development targets depend on an awareness of these interactions among macroeconomic indicators and economic growth (Gumata, & Ndou, 2021; Kaphle, 2021).

The country faces low economic growth, high poverty rates, and a growing trade deficit. This is due to its heavy reliance on imports and limited exports. Although it has adopted open economic policies and joined trade agreements, the country has not significantly benefited from trade liberalization (Bastola & Sapkota, 2015). In addition, Nepal is limited to domestic resources and has increasingly turned to FDI to support its economic growth and stock market development. Despite policy reforms and liberalization efforts, FDI inflows remain low compared to similar economies, making it essential to examine how FDI influences Nepal's stock market and overall capital mobilization (Khatri et al., 2023). Governments play a significant role in stimulating economic growth through fiscal policy tools like public expenditure and taxation, which are crucial for influencing macroeconomic performance and achieving sustainable development (Rasaily & Paudel, 2019).

According to Nepal Rastra Bank (2023) reported modest foreign currency reserves of NPR 1767.04 billion as of mid-December 2023, despite a persistent trade deficit in the nation, which is adequate to fund 11.8 months of imports. This resiliency in the face of negative trade dynamics begs a conundrum deserving of further research. According to conventional trade theory, exports greatly increase foreign currency gains, job creation, and GDP growth; imports, especially of capital goods, may improve home production capacity. Increase in import surpluses, however, might tax foreign reserves and aggravate macroeconomic vulnerabilities (Gumata, & Ndou, 2021; Kaphle, 2021).

Furthermore, FDI is very important for knowledge transfer, job creation, and increased production. Similarly, depending on its composition, government spending may boost demand and inspire the growth of infrastructure. Empirical data confirms the favorable correlation between these macroeconomic factors and development in different national settings (Kruskovic & Maricic, 2015; Winters, 2004). But in Nepal, whose geographical restrictions and small industrial base need further research, such interactions remain understudied. Dependency on one major trading partner, India, thus presents difficult issues for its trade and development path (Prasai, 2014).

Economic growth is a fundamental aim of national development programs, particularly in South Asian states, where the combination of international trade, investment flows, and fiscal policy greatly impacts macroeconomic outcomes (Qamruzzaman & Jianguo, 2018). Moreover, exports and imports, as key parts of business, dramatically affect a nation's productivity and income creation. Empirical studies demonstrate a beneficial long-term association between trade openness and economic growth in countries such as

India, Bangladesh, and Sri Lanka (Tahir & Khan, 2014). Exports enhance foreign currency income, give employment opportunities, and encourage industrialization. Conversely, imports reduce supply-side bottlenecks and boost industrial efficiency. The total effect of trade on growth may vary depending on a country's economic structure and trade balance (Ali & Hussain, 2017).

In addition to trade, foreign direct investment, and government expenditure are vital macroeconomic determinants that impact growth trajectories in developing economies. FDI contributes to capital formation, technology transfer, and managerial skill enhancement, which is demonstrated in the context of Pakistan and Nepal (Kunwar, 2020). Similarly, government expenditure, both capital and recurrent, can stimulate demand and infrastructure development. As a result, it leads to improved economic performance if efficiently managed (Nordin et al., 2024).

Time series analyses across South Asian nations have consistently revealed complex but significant interactions among these variables and their aggregate impact on GDP growth, suggesting the need for nuanced policy responses tailored to national contexts (Rahman et al., 2021).

Historical patterns indicate that Nepal's external trade was largely confined to India and Tibet, transitioning only post-1951 toward broader international engagement (Magar, 2021). Efforts to liberalize trade since the 1980s, including tariff reforms and deregulation, have not yielded proportional gains in export performance or competitiveness. Imports have consistently outpaced exports, contributing to a widening trade deficit that reached nearly 38% of GDP in FY 2017/18 (Ministry of Finance [MOF], 2019). Furthermore, the country's economic structure, where over 70% of the population is engaged in subsistence agriculture, contributing merely 31% to GDP, suggests a misallocation of labor and resources, which foreign trade could help rectify (Khadka, 2019).

Although numerous studies have examined the relationship between macroeconomic variables and economic growth in South Asia, most rely on cross-country panel data or simple regression techniques that fail to capture country-specific dynamics (Chhetri, 2022; Acharya, 2019). In the Nepalese context, limited research has employed time-series approaches, particularly an autoregressive distributed lag (ARDL) approach, to analyze the long-run and short-run impacts of trade, FDI, and government spending simultaneously. This presents a significant gap in the methodology and variables used in understanding the unique macroeconomic mechanisms influencing Nepal's economic performance (Dahal et al., 2024; Pokharel, & Gurung, 2024).

The primary objective of this study is to investigate the impact of external factors that are exports, imports, FDI, and capital expenditure, on Nepal's economic growth using time-series data. It aims to identify both the short-run and long-run relationships among these variables through the application of the ARDL framework. The findings can inform strategic decisions on trade, investment, and fiscal policy aimed at fostering sustainable economic development in Nepal. Likewise, the findings are expected to shed light on the optimal policy mix required to transform Nepal's trade vulnerabilities and capital expenditure into opportunities for sustained economic advancement.

Literature Review

Endogenous Growth Theory

The Endogenous Growth Theory, advanced notably by Lucas (1988) and Romer (1994), addresses the limitations of neoclassical growth models by shifting the focus from exogenous technological change to internal drivers of economic expansion. It posits that long-term growth arises from factors within the economic system, particularly investments in human capital, innovation, and knowledge spillovers, rather than being externally imposed.

A central tenet of the theory is that trade liberalization (through exports and imports) facilitates productivity growth by enabling the diffusion of new technologies, learning-by-doing, and exposure to competitive global practices. These spillover effects enhance the efficiency and innovation potential of domestic firms (Shaw, 1992).

Similarly, FDI plays a catalytic role by transferring capital, advanced technology, and managerial know-how. It stimulates domestic capacity through backward and forward linkages, thereby contributing to endogenous innovation and productivity gains. FDI is seen not merely as a source of funding but as a channel for international knowledge transfer, which supports sustained economic growth. Moreover, public capital expenditure, particularly on education, research, infrastructure, and innovation systems, complements the private sector's efforts in generating human capital and technological progress. As Fine (2000) highlights, such investments address market failures by ensuring that the social returns to innovation and learning, which typically exceed private returns, are realized through effective policy intervention.

Thus, endogenous growth theory provides a comprehensive explanation of how trade, FDI, and capital expenditure are interlinked mechanisms that collectively foster long-term economic development. These components are not isolated; rather, they synergistically reinforce productivity, technological advancement, and human capital formation, forming the backbone of a sustainable growth trajectory.

Empirical Review

A growing body of empirical literature affirms that foreign trade and FDI have the potential to drive economic growth in developing nations, including Nepal, though the nature and strength of these effects remain highly context-dependent. Studies using time-series econometrics, particularly the ARDL and VECM frameworks, consistently identify foreign trade as a statistically significant growth enhancer under certain structural conditions. For instance, Sharma and Bhandari (2006) validated the export-led growth hypothesis in Nepal using linear and log-linear models, showing that export and import growth significantly contribute to GDP growth and per capita income. Similarly, Monyela and Saba (2024) demonstrated a strong long-run equilibrium and unidirectional causality from trade openness to GDP growth in South Africa's post-BRICS period, reinforcing the idea that trade liberalization fosters sustained growth in structurally transitioning economies.

Extending this evidence, Wondimu (2023) and Hordofa (2023) employed ARDL models in the Ethiopian context and found robust short- and long-run impacts of FDI and trade-related variables on

economic expansion. These findings are consistent with Dutta et al. (2017) in Bangladesh, who reported that FDI leads to economic growth and that domestic investment and trade openness are mutually reinforcing. Importantly, these studies point to complementarities: trade and FDI tend to amplify each other's impact when supported by adequate domestic investment, human capital, and infrastructure.

However, contrasting perspectives emerge when examining more recent or geographically distinct contexts. Singh (2021), for example, found that while exports boost GDP per person employed in India, both FDI and imports had adverse long-term effects, imports showing a particularly strong negative impact. This challenges the uniformity of FDI's benefits and suggests that without adequate absorptive capacity or domestic regulatory alignment, capital inflows may crowd out local industries or fail to create meaningful employment. Echoing this, Nguyen (2022), in a cross-country VAR study of five South Asian nations, found that while FDI spurs GDP growth, it simultaneously raises unemployment, suggesting that capital-intensive FDI inflows may not translate into inclusive growth unless supported by labor-absorbing policies.

Within Nepal, Paudel (2023) adds further complexity by demonstrating that neither capital nor current government expenditure alone significantly fosters economic development, questioning long-held assumptions about the superiority of capital expenditure. Instead, Paudel's ARDL analysis showed that targeted investment in education, whether capital or current, yields stronger growth dividends, highlighting the importance of the quality and purpose of expenditure rather than its sheer volume. This finding resonates with Azolibe et al. (2020) in Nigeria, who reported that infrastructure spending (e.g., roads and healthcare) exhibits long-run links to domestic and foreign investment but statistically insignificant short-term impacts, suggesting a lag effect contingent upon project execution quality and institutional efficiency.

Differences also arise in how trade deficits are interpreted about growth. Lakhan et al. (2021) found a positive but statistically significant relationship between Pakistan's trade deficit and macroeconomic indicators like GDP and exchange rate. However, this pattern reflects structural import dependence rather than productive expansion, indicating a fragile, consumption-driven growth trajectory. In contrast, Sahoo et al. (2025), analyzing top global economies, observed that foreign trade (exports and imports) had an insignificant impact on growth compared to factors like macroeconomic stability and infrastructure, emphasizing that once countries mature economically, internal dynamics play a more dominant role than external trade variables.

The causal direction among variables further deepens the analytical debate. In Ethiopia, Wondimu (2023) used the Toda-Yamamoto causality test to reveal that growth leads FDI rather than vice versa, suggesting that investors are attracted to growing economies rather than necessarily being the source of growth. Likewise, Singh (2021) observed long-run causality flowing from GDP per person employed, exports, and imports to FDI, and not the reverse. These findings problematize the common policy assumption that increasing FDI inflows will automatically result in economic growth.

Collectively, these empirical insights underscore the critical need to contextualize the relationship between foreign trade, FDI, and capital expenditure within Nepal's unique economic and institutional landscape. The convergence of findings across Nepal, South Africa,

Ethiopia, and Bangladesh points to the importance of aligning foreign engagement (trade and investment) with sector-specific strategies such as education, infrastructure, and industrial capacity building. On the other hand, the divergence found in studies from India, Nigeria, and multi-country comparisons warns against adopting blanket economic prescriptions without understanding sectoral vulnerabilities, employment linkages, and institutional readiness.

Methods

This study adopts a quantitative, deductive approach grounded in positivist philosophy. It employs a time-series econometric framework to examine both the short-run dynamics and long-run relationships among key macroeconomic indicators influencing Nepal's economic growth. The analysis follows a sequential econometric procedure that begins with testing for stationarity in the data series to ensure valid model specification and meaningful interpretation of results. The Augmented Dickey-Fuller (ADF) test is used to determine the presence of unit roots and identify the order of integration, whether at level $I(0)$ or first difference $I(1)$.

If the variables are found to be a mix of $I(0)$ and $I(1)$, the Autoregressive Distributed Lag (ARDL) bounds testing approach, as proposed by Pesaran et al. (2001), is employed. This model is particularly advantageous in small-sample studies and allows for the inclusion of appropriate lags to capture the dynamic nature of the variables, thereby mitigating autocorrelation and omitted variable bias.

The study examines 28 annual observations of different variables, covering the period from FY 1995/96 to 2022/23. In this context, FY 1995/96 is represented as 1996, and the subsequent years are labeled consecutively.

Table 1: Variables and Data Source

Variables	Proxy	Measurement
Economic growth or annual Real GDP	RGDP	RGDP (in Million)
Exports from Nepal	EXP	EXPORT (in Million)
Imports conducted by Nepal	IMP	IMPORT (in Million)
Foreign direct investments in Nepal	FDI	FDI (in Million)
Capital expenditure from the Nepal Government	CAPEXP	CAPEXP (in Million)

Information regarding five macroeconomic variables was obtained from the Nepal Rastra Bank, the official World Bank website, particularly from the World Development Indicator (WDI) and Macro Trends, concentrating on the main explanatory variables.

Real Gross Domestic Product is the overall dependent variable. Based on the work of (Gyang et al., 2018), a model was developed to show these relationships.

Linear specification:

$$RGDP = f(EXP, IMP, FDI, CapExp) \text{ ----- (1)}$$

From the above linear specification, the statistical model was derived

$$RGDP = \beta_1 EXP_t + \beta_2 IMP_t + \beta_3 FDI_t + \beta_4 CapExp_t \text{ ----- (2)}$$

The linear function was changed into log form for better interpretation of results

$$\log RGDP_t = \alpha + \beta_1 \log EXP_t + \beta_2 \log IMP_t + \beta_3 \log FDI_t + \beta_4 \log CapExp_t + \mu_{it} \text{ ----- (3)}$$

Where:

RGDP: Real Gross Domestic Product

EXP: Export

IMP: Import

FDI: Foreign Direct Investment

CapExp: Capital Expenditure

α is a constant

The symbols β_1 , β_2 , and β_3 represent the estimated coefficients of the parameters, while μ denotes the error term.

After conducting the stationarity assessment through the ADF test, the ARDL bounds testing procedure is applied to examine the existence of cointegration. When the calculated F-statistic exceeds the upper critical bound, the null hypothesis of no long-run relationship is rejected, confirming the presence of equilibrium among the variables over time. As a result, both the long-run coefficients and short-run dynamics are estimated within the ARDL framework. The long-run specification integrates both differenced and lagged level terms, allowing the model to capture both immediate and persistent effects.

When a long-run cointegration relationship is confirmed, an error correction model (ECM) is employed to estimate the speed at which short-term imbalances adjust back to long-run equilibrium. The ECM incorporates an error correction term (ECT), which captures the pace of this adjustment process. A negative and statistically significant coefficient on the ECT indicates that any short-run deviations are gradually corrected, thereby reinforcing the model's stability and credibility over time (Banerjee et al., 1998).

To assess the consistency of the estimated parameters, stability diagnostics such as the CUSUM and CUSUM of Squares tests, as proposed by Brown et al. (1975), are conducted. These procedures are designed to identify potential structural shifts or parameter instability throughout the sample period. The model is considered stable if the corresponding test statistics remain within the 5% confidence boundaries over the entire duration of analysis.

Results and Analysis

Unit Root Test

Establishing the stationarity of time series data is a crucial step in avoiding spurious regression results. To assess whether the variables contain unit roots, the Augmented Dickey-Fuller (ADF) test was employed. Under this test, the null hypothesis suggests the presence of a unit root, implying that the series is non-stationary, whereas the alternative hypothesis supports the stationarity of the data.

Table 2: Unit Root Analysis, Augmented Dickey-Fuller Test (ADF)

Test Variables	Level		1st difference		Result
	t-statistics	p-values	t-statistics	p-values	
LNRGDP	-0.240035	0.9216	-5.676152	0.0001	I(1) (Stationary at first difference)
LNEXP	-1.595559	0.4711	-3.870389	0.0069	I(1) (Stationary at first difference)
LNIMP	-2.025974	0.2744	-5.732345	0.0001	I(1) Stationary at first difference
LNCAPEXP	-0.088559	0.9411	-4.335287	0.0023	I(1) Stationary at first difference
LNFDI	-3.370007	0.0213	-8.497482	0.0000	I (0) Stationary in level

Note. Authors' Estimation

The results of the ADF unit root test, presented in Table 2, reveal that the variables exhibit a mixed integration order. Real GDP (LNRGDP), exports (LNEXP), imports (LNIMP), and capital expenditure (LNCAPEXP) are found to be non-stationary in their level form but attain stationarity after first differencing, indicating they are integrated of order one, I(1). In contrast, foreign direct investment (LNFDI) is stationary at the level, signifying integration of order zero, I(0). Notably, none of the

variables are integrated at the second order, I(2), thereby fulfilling a key requirement for the application of the Autoregressive Distributed Lag (ARDL) modeling technique. The presence of variables integrated at both I(0) and I(1) validate the appropriateness of employing the ARDL bounds testing framework to analyze both short-term dynamics and long-run equilibrium relationships.

Table 3: Descriptive Analysis of Variables

Variable	Mean	SD	Min	Max	Skewness	Kurtosis
LNRGDP	14.21028	0.3433632	13.6529	14.76294	0.0660354	1.784664
LNEXP	11.06914	0.5176916	9.897525	12.20623	-0.19058	3.478501
LNIMP	12.73075	1.077179	11.21794	14.46807	0.1577643	1.5496
LNFDI	0.257632	0.2113472	-0.09837	0.6774399	0.0486852	1.994587
LNCAPEXP	11.00115	0.8919965	10.01485	12.50882	0.5344595	1.750896

Note. Authors' Estimation

Skewness values indicate slight asymmetry in the distributions, with all variables displaying near-zero skewness, suggesting relative symmetry, although LNCAPEXP is moderately positively skewed. Kurtosis values, all below 3 except for LNEXP (3.48), imply that most distributions are platykurtic (flatter than the normal distribution), while LNEXP is slightly leptokurtic, indicating a more peaked distribution.

Correlation Analysis

Table 4 displays a correlation analysis that shows that all independent variables are positively related to real GDP (LNRGDP).

Descriptive Statistics

Table 3 presents the descriptive statistics for the log-transformed variables used in the analysis. The mean values indicate the average of each variable over the study period, with LNRGDP showing the highest mean (14.21) and LNFDI the lowest (0.26). The standard deviations suggest moderate variability, with LNIMP being the most volatile (SD = 1.08) and LNRGDP the most stable (SD = 0.34). The minimum and maximum values provide insight into the range of each variable, showing notable spread, particularly in LNIMP and LNCAPEXP.

Table 4: Correlation

Variables	LNRGDP	LNEXP	LNIMP	LNFDI	LNCAPEXP
LNRGDP	1.0000				
LNEXP	0.9175	1.0000			
LNIMP	0.9923	0.8819	1.0000		
LNFDI	0.3350	0.0752	0.3995	1.0000	
LNCAPEXP	0.9378	0.7815	0.9484	0.4252	1.0000

Note. Authors' Estimation

Likewise, Imports (LNIMP) have the strongest correlation (0.9923), followed by capital expenditure (LNCAPEXP) at 0.9378 and exports (LNEXP) at 0.9175, indicating their significant roles in driving economic growth. Foreign direct investment (LNFDI) has a weaker but positive correlation (0.3350), indicating a favorable relationship with RGDP.

Criteria for Selecting the Lag Order in VAR

Before performing the cointegration test, it is crucial to determine the optimal lag length. Based on the results presented in Table 5, the majority of the selection criteria indicate that a lag length of one is most appropriate for subsequent analyses (Smith, 2001).

Table 5: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-6.822786	NA	0.106876	0.601753	0.650141	0.615687
1	61.74082	126.5790*	0.000591*	-4.595448*	-4.498671*	-4.567580*
2	62.06759	0.578122	0.000623	-4.54366	-4.398495	-4.501858

Note. Denote the optimal lag length

ARDL Bound Test

The findings reported in Table 6 from the ARDL Bounds Test for co-integration provide evidence of a statistically significant long-term association among the variables incorporated in the model.

Table 6: Bound Test Result for Co-integration Analysis

Critical Value Bonds	Lower Bound I(0)	Upper Bound I(1)
10%	2.45	3.52
5%	2.86	4.01
2.50%	3.25	4.49
1%	3.74	5.06
Model	F-statistic	Cointegration Status
f_{RGDP} (EXP, IMP, FDI, CapExp)	6.450787** K=4	Cointegrated

Note. **denote statistical significance at the 5% level.

The calculated F-statistic of 6.450787 surpasses the upper bound critical value of 4.01 at the 5% level of significance. Based on the bounds testing approach proposed by Pesaran et al. (1999), an F-statistic exceeding the upper bound I(1)) leads to the rejection of the null hypothesis of no co-integration. This outcome provides clear evidence of a long-run equilibrium relationship among the variables under investigation.

ARDL Error Correction Regression

Table 7 presents the results of the ARDL error correction regression, offering strong empirical support for the short-run factors influencing economic growth. The model demonstrates statistical significance and substantial explanatory capacity, with an R-squared value of 0.7382 and an adjusted R-squared of 0.716. This implies that approximately 71.60% of the fluctuations in real GDP are accounted for by the short-run behavior of the included explanatory variables. Furthermore, the model's overall significance is confirmed by an F-statistic of 33.85 with a p-value below 0.01. The absence of serial correlation is also affirmed by the Durbin-Watson statistic of 2.17.

The error correction term (CointEq(-1)) is negative and statistically significant, with a coefficient of -0.226813 and a p-value of 0.0010. This suggests that approximately 22.7% of the short-term disequilibrium is adjusted each period, thereby confirming the presence of a stable long-run relationship among the variables in the model. Additionally, LNCAPEXP exerts a positive and statistically significant influence on real GDP, as reflected by a coefficient of 0.02297 and a p-value of 0.0302. Although LNEXP also has a positive coefficient (0.0309), its impact on GDP is statistically insignificant ($p = 0.1116$). In contrast, LNIMP demonstrates a strong and highly significant positive effect

on real GDP, with a coefficient of 0.1308 and a p-value of 0.000. In contrast, LNFDI is negatively and statistically insignificant ($p = 0.8863$) on the real GDP.

Table 7: ARDL Error Correction Regression Result (Short-run)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.136743	0.824723	2.590863	0.0175
LNEXP	0.030921	0.018576	1.664563	0.1116
LNCAPEXP	0.022976	0.009845	2.333794	0.0302**
LNFDI	-0.002554	0.017642	-0.144772	0.8863
LNLNIMP	0.130777	0.02408	5.430862	0.0000***
CointEq(-1)	-0.226813	0.059148	-3.834673	0.0010***
R-squared	0.738252	Sum squared resid		0.003479
Adjusted R-squared	0.71644	Log likelihood		82.60525
S.E. of regression	0.01204	F-statistic		33.84563
Prob(F-statistic)	0.00000	Durbin-Watson stat		2.171429

Note(s). Dependent Variable: LNRGDP; ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Long-run Coefficient Estimates

The long-run coefficient estimates displayed in Table A1 reflect the underlying determinants of Nepal's real GDP, as identified through the ARDL modeling approach. The coefficient for LNEXP is positive (0.136) and exhibits marginal statistical significance at the 10% level ($p = 0.0558$), indicating that a 1% rise in exports is linked to an approximate 0.14% increase in real GDP over the long term. Similarly, LNIMP shows a statistically significant and positive long-run association with real GDP, with a coefficient of 0.178 and a p-value of 0.0102. In the same vein, LNCAPEXP is positively related to GDP in the long run (coefficient = 0.101), and this relationship is statistically significant at the 10% threshold ($p = 0.093$). Conversely, LNFDI presents a negative coefficient (-0.011) that is not statistically significant ($p = 0.8864$), indicating no meaningful long-term effect on GDP.

Normality Test

The Jarque-Bera test is employed to evaluate whether the distribution of a model's variables aligns with the normality assumption. This test is essential as it aids in determining if the variables exhibits a normal distribution. The outcomes of the test are as follows:

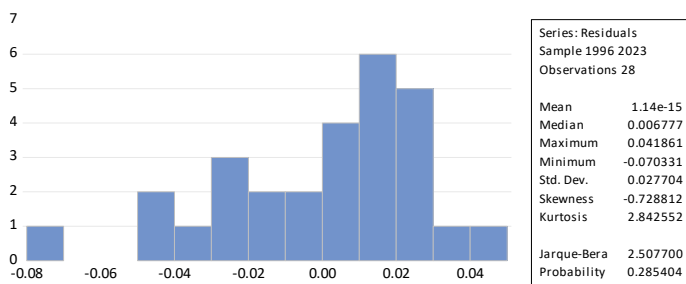


Figure 1: Jarque-Bera Normality Test

The results of the Jarque-Bera test suggest that the null hypothesis of normality cannot be rejected, as the associated probability value of 0.285404 surpasses the 5% significance level. This implies that the residuals of the model appear to follow a normal distribution.

Heteroskedasticity Test

The Breusch-Pagan-Godfrey test is employed to detect heteroskedasticity, a condition that can undermine the reliability of regression results in econometric analysis. The outcomes of this diagnostic test are displayed in the following table.

The results of the Breusch-Pagan-Godfrey test, presented in Table A2, indicate that the model does not exhibit significant heteroskedasticity. The F-statistic is 1.194154, and the p-value is 0.34, which exceeds the 5% significance threshold, suggesting that heteroskedasticity is not an issue. Likewise, the Obs*R-squared value of 4.815032, with a p-value of 0.3068, also does not indicate heteroskedasticity.

Breusch-Godfrey Serial Correlation LM Test

To assess the presence of serial correlation in the residuals of a regression model, the Breusch-Godfrey Serial Correlation LM (Lagrange Multiplier) test is employed. Serial correlation arises when the error terms are correlated across different periods or observations, violating the assumption of error independence and potentially leading to inefficient parameter estimates.

Table A3 presents the findings from the Breusch-Godfrey Serial Correlation LM Test, which confirm that the model does not suffer from autocorrelation. Specifically, the p-values associated with both the F-statistic (0.6450) and the Obs*R-squared statistic (0.4250) are greater than the 5% significance level. Consequently, the null hypothesis of no serial correlation cannot be rejected, suggesting that the model's residuals are not serially correlated.

Stability Test in ARDL

Conducting a stability test is essential to ensure that the relationships identified in the model remain stable over time. This process allows researchers to evaluate the reliability of the model's estimates and detect any potential issues related to parameter consistency. The Cumulative Sum (CUSUM) test, in particular, examines the cumulative deviations of estimated coefficients from a reference value.

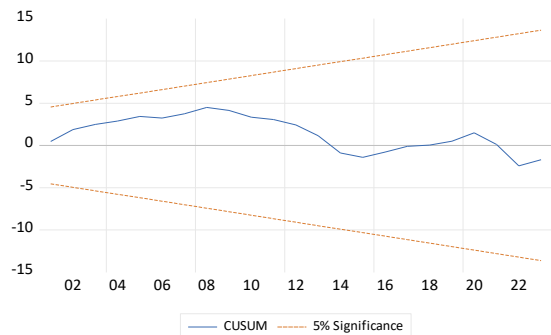


Figure 2 : Results of the CUSUM test

Figure 2 presents the results of the CUSUM test, where the blue line represents the cumulative sum of residuals and the red lines denote the 5% confidence interval. The fact that the blue line remains within these boundaries throughout the analysis period suggests parameter stability, indicating the absence of structural breaks and affirming the reliability of the model's estimates.

Figure 3 illustrates the results of the CUSUM of Squares test, with the blue line indicating the calculated test statistic and the red lines denoting the 5% confidence interval boundaries.

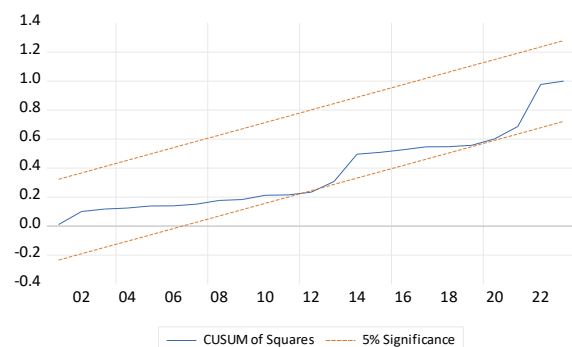


Figure 3: Results of the CUSUM Square test

The consistent position of the blue line within the established boundaries over time indicates that the model's variance remains stable, implying the absence of structural breaks and confirming the reliability of its parameters throughout the examined period.

Discussions

The study offers valuable evidence on how Nepal's economic growth is shaped by core macroeconomic indicators, namely exports, imports, FDI, and government capital spending. Applying the ARDL bounds testing methodology, the research identifies a long-term cointegrating relationship among these variables, suggesting their joint influence on the country's economic performance over both short and extended periods. These findings are consistent with the principles of endogenous growth theory, which underscores the significance of trade, investment, and public expenditure in promoting long-term development through mechanisms such as technology transfer, knowledge diffusion, and infrastructure enhancement (Romer, 1994; Lucas, 1988).

The empirical analysis demonstrates that, in the long run, both imports and government capital spending have a significant and positive impact on Nepal's economic growth. These results are consistent with prior research by Sharma and Bhandari (2006) and Dutta et al. (2017). The positive effect of capital expenditure lends further support to endogenous growth theory (Lucas, 1988), which identifies public investment as a catalyst for sustained economic advancement. Moreover, the negative and statistically significant error correction term indicates a stable adjustment toward long-run equilibrium, affirming the reliability and validity of the ARDL framework. In contrast, FDI exerts a negative and statistically insignificant influence on economic growth, diverging from the findings reported in studies such as Wondimu (2023) and Dutta et al. (2017). Similarly, while exports show a positive relationship with growth, their marginal significance reflects persistent structural weaknesses in Nepal's export capacity (Bastola & Sapkota, 2015).

Furthermore, the model's stability, validated through CUSUM and CUSUMSQ diagnostic tests, reinforces the credibility of the empirical findings and underscores their relevance for formulating long-term economic policy. These findings highlight the need for policies that improve the efficiency of FDI, diversify exports, and strategically leverage imports and public investment for sustainable economic growth.

From a theoretical perspective, the results of this study add strong support to endogenous growth theory, highlighting the critical role of strategic, policy-led investments in infrastructure and human capital as key drivers of sustained economic development. At the same time, the mixed effects of trade variables emphasize the need for Nepal to move beyond traditional export-led growth models and adopt a more diversified and strategic approach to trade and investment policy (Romer, 1994).

Conclusion and Implications

This study investigates how exports, imports, foreign direct investment, and government capital expenditure influence Nepal's economic growth, utilizing annual time-series data from 1995 to 2023 and applying the ARDL bounds testing approach. The findings reveal the presence of a stable long-run relationship among the variables. Over the long term, imports and capital spending exert a significant positive influence on economic growth, whereas FDI displays a negative but statistically insignificant effect. Similarly, exports contribute positively, though their impact is not statistically significant. The short-run results mirror these trends, with capital expenditure and imports positively influencing real GDP, and FDI and exports remaining insignificant.

These findings contribute to endogenous growth theory by emphasizing the role of internal, policy-driven investments, particularly government capital expenditure, in driving growth. They also refine trade-growth models by showing that trade openness alone is insufficient; Nepal's experience underscores the need for export diversification and structural reforms to convert trade and investment into sustained growth.

Policy implications are clear: First, while exports are a potential growth driver, their limited diversification reduces effectiveness, calling for targeted trade and industrial strategies. Second, the strong impact of capital expenditure highlights the importance of sustained public

investment, especially in infrastructure. Third, the limited role of FDI signals the need for structural reforms to improve the investment climate. Lastly, the stability of model parameters, confirmed by CUSUM tests, reinforces the reliability of these insights.

Limitations and Further Research

While the study offers valuable insights, it is subject to several limitations. It relies solely on secondary time series data from 1995 to 2023, which may not fully capture the effects of recent policy reforms or structural shifts in the Nepalese economy. The macro-level focus may obscure sector-specific variations and regional disparities in growth patterns. Additionally, the model does not account for external shocks such as global financial instability, geopolitical tensions, or climate-related disasters. Institutional factors, such as regulatory quality, governance, and ease of doing business, are also excluded, despite their known influence on trade and investment outcomes.

Future research could incorporate institutional variables and global shock indicators to enhance the understanding of Nepal's growth dynamics. Employing non-linear models or panel data covering comparable South Asian economies may also yield deeper insights into the structural drivers of economic growth in developing contexts.

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Conflict of interest

The authors declare no conflict of interest related to this study.

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Ethical statement


This research did not require ethical approval as it does not involve any human or animal experiments.

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Annex

Table A1: Results of Estimated Long-run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXP	0.136328	0.067139	2.030533	0.0558*
LNIMP	0.177928	0.062732	2.836348	0.0102***
LNCAPEXP	0.101298	0.057418	1.764218	0.0930*
LNFDI	-0.011261	0.07785	-0.144649	0.8864

Note(s). Dependent Variable: LNRGDP; ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively.

Table A2: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.194154	Prob. F(4,23)	0.3400
Obs*R-squared	4.815032	Prob. Chi-Square(4)	0.3068
Scaled explained SS	2.99315	Prob. Chi-Square(4)	0.559

Note: Authors' Estimation

Table A3: Breusch-Godfrey Serial Correlation LM Test

F-statistic	3.788635	Prob. F(1,22)	0.6450
Obs*R-squared	4.113509	Prob. Chi-Square(1)	0.4250

Note. Authors' Estimation

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