Macroeconomic Determinants of Bilateral Trade: Evidence from India and Nepal

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Abstract

This study investigates the macroeconomic determinants of bilateral trade between Nepal and India using the Auto-Regressive Distributed Lag (ARDL) model to analyze both short-term and long-term dynamics. The analysis reveals that the GDP of both Nepal and India significantly impacts Nepal's exports, emphasizing the critical role of economic growth in enhancing trade. Financial development and Foreign Direct Investment (FDI) are also found to positively influence Nepal's export performance, highlighting the importance of a robust financial sector and foreign investment. Conversely, Nepal's GDP hurts imports from India, indicating a shift towards domestic production as the economy grows, while India's GDP positively influences Nepalese imports. Financial development further facilitates imports, underscoring the significance of financial infrastructure. Although Indian lending interest rates and FDI inflows showed varied significance, their directional impacts align with theoretical expectations. The study also confirms the stability of the ARDL model through diagnostic tests, reinforcing the reliability of the results. These findings provide critical insights for policymakers aiming to bolster trade relations between Nepal and India, emphasizing the need for macroeconomic stability, financial development, and targeted FDI policies to foster economic growth and regional integration.

Keywords: trade, financial development, GDP, ARDL

Introduction

Bilateral trade between India and Nepal plays a crucial role in the economic development and integration of the South Asian region. India, being one of Nepal's largest trading partners, significantly influences Nepal's trade dynamics through geographical proximity, shared cultural ties, and substantial economic interdependencies (Adhikari, 2019; Adhikari, & Gajurel, 2020; Gajurel, et al., 2021; Pandey, et al., 2022; Adhikari, et al., 2023a; Adhikari & Khadka, 2011). Despite the importance of this bilateral trade, there is a lack of comprehensive studies that analyze the macroeconomic determinants influencing trade flows between India and Nepal. This research aims to fill this gap by examining key macroeconomic

factors such as interest rates, inflation, Foreign Direct Investment (FDI) inflows, and Gross Domestic Product (GDP) and their impact on bilateral trade using the Auto-Regressive Distributed Lag (ARDL) model.

Existing literature has predominantly focused on broader trade relationships or isolated economic variables without providing a holistic understanding of how these factors interact to shape bilateral trade between India and Nepal. For instance, studies on India's trade policies and economic factors (Mohanty & Klau, 2005) rarely contextualize their findings within the specific trade framework with Nepal, and vice versa (Pant, 2002). Furthermore, research on the impact of inflation (Baharumshah & Ariff, 1997; Bahmani-Oskooee & Ratha, 2004) and interest rates (Mbah & Amassoma, 2014; Coulibaly, 2012) has shown significant effects on trade balances through currency valuation and capital flows. However, these studies often fail to integrate these variables into a comprehensive model that captures their combined influence on bilateral trade dynamics.

The role of FDI inflows in trade expansion is well-documented (Chakraborty & Basu, 2002; Agarwal, 1997; Zhang, 2001), yet there is a need to understand how FDI impacts the trade relationship specifically between India and Nepal. Additionally, GDP is a fundamental indicator of economic performance and trade potential, as evidenced by studies on GDP's impact on trade volumes and market structures (Krugman, 1980; Helpman & Krugman, 1985; Rose, 2000; Frankel & Romer, 1999). These macroeconomic variables are crucial for understanding the trade dynamics between India and Nepal, and this study employs the ARDL model to capture both short-term and long-term effects, offering a more nuanced understanding of these relationships.

Given the strategic importance of the India-Nepal trade relationship, understanding these macroeconomic determinants is crucial for policymakers and stakeholders. Enhanced trade relations can lead to mutual economic benefits, including increased market access, improved production capacities, and strengthened economic resilience. This study's findings will offer valuable insights for formulating effective trade and financial policies that promote sustainable economic growth and regional integration. In light of recent geopolitical and economic shifts, this research is timely and significant, addressing the need for updated and comprehensive analyses to support the evolving trade dynamics between India and Nepal.

Literature Review

Interest Rate and Trade

Interest rates significantly influence bilateral trade flows by affecting exchange rates and capital movements. According to Mbah and Amassoma (2014), changes in interest rates impact the exchange rate, which in turn influences the trade balance. Higher interest rates tend to attract foreign capital, leading to an appreciation of the domestic currency, making exports

more expensive and imports cheaper, thereby negatively impacting the trade balance (Mbah & Amassoma, 2014). This dynamic is critical in understanding how monetary policy adjustments can affect trade between India and Nepal.

Further research by Coulibaly (2012) supports this view, indicating that interest rate differentials between countries can lead to shifts in trade patterns due to their impact on exchange rates. For instance, if India's interest rates are higher than Nepal's, capital inflows into India can cause the Indian Rupee to appreciate relative to the Nepalese Rupee, adversely affecting India's export competitiveness while making Nepalese imports cheaper (Coulibaly, 2012). Such interactions underscore the importance of monitoring interest rate policies in both countries.

Additionally, Mohanty and Klau (2005) examined the effects of interest rates on emerging market economies, including India. They found that changes in interest rates influence domestic economic activities and cross-border capital flows. Their study highlighted that short-term and long-term interest rates should be considered to understand their comprehensive effects on bilateral trade. They pointed out that high interest rates could deter investment and economic growth, leading to lower production and export capacity, while low interest rates could stimulate economic activity and enhance trade (Mohanty & Klau, 2005).

Further empirical evidence from Hsing (2005) indicated that interest rate volatility could lead to uncertainties in trade flows, as businesses may hesitate to engage in international trade under volatile financial conditions. This finding is pertinent to India and Nepal, where economic stability and predictable monetary policies can foster a more conducive environment for bilateral trade. Hence, understanding the implications of interest rate changes is crucial for policymakers aiming to enhance trade relations between these neighboring countries (Hsing, 2005).

Inflation and Trade

Inflation rates are crucial determinants of a country's trade competitiveness. Baharumshah and Ariff (1997) explored the relationship between inflation and trade flows in Southeast Asian countries, finding that higher inflation rates can lead to currency depreciation, making exports cheaper and imports more expensive, thereby affecting the trade balance. This dynamic is particularly relevant for India and Nepal, where inflation rates can significantly influence bilateral trade patterns (Baharumshah & Ariff, 1997).

In a study by Bahmani-Oskooee and Ratha (2004), the authors reviewed the inflation-trade relationship in developing countries. They found that inflation differentials between trading partners could lead to shifts in trade patterns due to changes in relative prices. High inflation can erode a country's export competitiveness, while low inflation can enhance it. This

study emphasized the importance of stable inflation rates for maintaining favorable trade conditions (Bahmani-Oskooee & Ratha, 2004).

Moreover, Fisher (1993) provided insights into how inflation impacts the terms of trade. He argued that countries with higher inflation tend to experience deteriorating terms of trade as their goods become relatively more expensive than those from lower-inflation countries. This phenomenon can be observed of India and Nepal, where differing inflation rates may lead to adjustments in trade flows to maintain competitiveness (Fisher, 1993).

Choudhri and Hakura (2000) extended this analysis by examining the pass-through effects of inflation on exchange rates and trade balances. Their findings suggest that high inflation can lead to significant currency depreciation, affecting trade balances by making exports more competitive and imports more expensive. For India and Nepal, understanding these pass-through effects is essential for devising effective inflation control policies to support bilateral trade (Choudhri & Hakura, 2000).

FDI Inflows and Trade

Foreign Direct Investment (FDI) is important in trade by improving production capacities and technological advancements. Chakraborty and Basu (2002) highlighted that FDI inflows lead to improved infrastructure, higher productivity, and increased export volumes in India. Their study emphasized that FDI is a critical channel through which technological and managerial know-how is transferred to developing countries, boosting their trade potential (Chakraborty & Basu, 2002).

In addition, Agarwal (1997) emphasized the role of FDI in integrating developing economies into global trade networks. The study suggested that FDI boosts exports and facilitates the import of advanced technologies and management practices, thereby influencing the overall trade balance. For Nepal, which receives significant FDI from India, understanding the impact of these inflows on trade can help formulate policies that attract more investment and enhance trade performance (Agarwal, 1997).

Furthermore, Zhang (2001) examined the relationship between FDI and trade in China and found that FDI inflows significantly contributed to the expansion of exports. This finding is relevant for India and Nepal, where increased FDI can lead to higher export volumes and diversification of export products. The study also noted that FDI helps domestic firms integrate into global supply chains, enhancing their competitiveness (Zhang, 2001).

Blonigen (2001) provided a nuanced view by examining how FDI inflows impact the different sectors of an economy. His research indicated that FDI in the manufacturing sector tends to have a more pronounced effect on export growth compared to the services sector. This sectoral analysis is pertinent for India and Nepal, where targeted FDI policies can help boost specific industries that have higher export potential (Blonigen, 2001).

GDP and Trade

Gross Domestic Product (GDP) is a primary indicator of economic performance and a crucial determinant of trade potential. Krugman (1980) argued that GDP growth in trading nations significantly impacts their trade volumes, as higher GDP growth indicates increased production and consumption, leading to higher exports and imports. This theoretical framework is essential for understanding the trade dynamics between India and Nepal (Krugman, 1980).

Helpman and Krugman (1985) further explored the relationship between market structure, foreign trade, and economic growth. They posited that differences in GDP levels between countries influence their comparative advantages and trade patterns. Countries with higher GDP are likely to have more diversified and competitive industries, leading to increased trade flows. This framework can be applied to analyze the trade dynamics between India and Nepal, where GDP growth can drive trade by creating more goods and services for export and increasing the demand for imports (Helpman & Krugman, 1985).

Additionally, Rose (2000) studied the effect of GDP on trade and found a strong positive correlation between a country's GDP and its trade volume. His empirical analysis showed that as countries grow economically, their trade with other nations increases proportionally. This relationship underscores the importance of economic growth in fostering bilateral trade between India and Nepal (Rose, 2000).

Frankel and Romer (1999) also provided empirical evidence supporting the positive impact of GDP on trade. Their study concluded that countries with higher GDP tend to engage more in international trade, benefiting from economies of scale and increased market opportunities. For India and Nepal, this implies that policies aimed at boosting economic growth can have a significant positive impact on bilateral trade relations (Frankel & Romer, 1999).

Domestic Context of Macroeconomic Determinants of Trade

The trade dynamics between Nepal and India have been extensively studied, highlighting various macroeconomic determinants influencing bilateral trade. Shrestha and Pant (2009) discussed the challenges in Nepal's trade policy, underscoring the need for reforms to boost trade efficiency and competitiveness. Similarly, Khadka (2013) explored the relationship between financial development and economic growth, further supporting the notion that a well-developed financial sector is crucial for trade enhancement. The significant positive impact of financial development on imports is consistent with Pandey et al. (2022), who highlighted the importance of financial reforms and development in facilitating trade by improving access to credit and reducing transaction costs.

Moreover, Pant and Maharjan (2007) highlighted the role of FDI in the industrial sector, noting its positive impact on economic growth and trade. This is corroborated by Bhatt and Sharma (2011), who examined bilateral trade relations between Nepal and India,

identifying both prospects and challenges in enhancing trade flows. The influence of inflation on trade competitiveness was discussed by Acharya and Pant (2012), who analyzed the empirical relationship between inflation and economic growth in Nepal. Their findings suggest that managing inflation is essential for maintaining export competitiveness. Additionally, Khanal and Karki (2004) analyzed the impact of trade liberalization on industrial growth in Nepal, providing insights into how policy changes can affect trade dynamics.

The interplay between financial development, foreign direct investment (FDI), and economic growth offers valuable context for understanding the macroeconomic dynamics influencing Indo-Nepal bilateral trade. Adhikari et al. (2023b) highlight that fiscal and financial reforms, particularly in VAT and investment, have been key drivers of Nepal's GDP growth, while Pandey et al. (2024) emphasize the role of financial system advancements and FDI in fostering capital formation and technology transfer. However, persistent barriers such as uneven financial access and regulatory shortcomings, as noted by Pandey et al. (2022), continue to constrain economic progress. Adhikari et al. (2023a) further demonstrate that positive financial shocks significantly enhance GDP, whereas negative shocks yield limited effects. These findings align with broader regional studies, such as Pandey (2024), who underscores the importance of financial development and FDI in driving economic growth across SAARC nations. This paper integrates these insights to explore how macroeconomic factors, including financial development and FDI, shape trade flows between India and Nepal, influencing bilateral trade patterns and economic outcomes.

Despite the extensive body of literature on bilateral trade determinants, there is a noticeable gap in comprehensive studies specifically focused on the macroeconomic factors influencing trade between India and Nepal. Existing research has predominantly examined broader trade relationships or isolated economic variables without integrating a holistic analysis that includes interest rates, inflation, FDI inflows, and GDP. While some studies have investigated individual aspects such as the impact of inflation on trade balances (Baharumshah & Ariff, 1997) or the role of FDI in economic growth and trade (Chakraborty & Basu, 2002), a combined and nuanced understanding of how these macroeconomic determinants interact to shape bilateral trade between India and Nepal remains underexplored. Additionally, the majority of previous research has focused on either India or Nepal in isolation or within the context of larger regional trade dynamics, often neglecting the unique bilateral relationship between these two neighboring countries.

Materials and Methods

Data

This study used the World Bank and IMF data to analyze the determinants of bilateral trade between Nepal and India (Svirydzenka, 2016; World Bank, 2022). lnExp and lnImp represent the natural log of Exports and Imports from Nepal to India. lnigdp and lnngdp

represent the natural log of GDP of India and Nepal respectively. IND_INF and NPL_INF represent the consumer price index inflation in India and Nepal. IND_INT represents the lending interest rate in India. FDEV represents the financial development index ranging from 0 to 1 where 1 is the highest financial development index. FDI is taken as a ratio of foreign direct investment to GDP for normalization. The data ranges from 1980 to 2021. IND_INF, NPL_INF, IND_INT, FDEV, and FDI are the control variables that have been used which have an impact on exports and imports.

Methodology

The Gravity Model of Trade posits that the volume of trade between two countries is directly proportional to the size of their economies (measured by GDP) and inversely proportional to the distance between them. The Gravity Model, initially proposed by Tinbergen (1962) and further developed by Anderson (1979) and Deardorff (1998), can be augmented to incorporate other macroeconomic variables such as interest rates, inflation, and FDI inflows. Thus, these variables are added as the control variables for the study.

$$EXP = f\,(GDPI, GDPN)\ldots.(1)$$

$$IMP = f\,(GDPI, GDPN)\ldots..(2)$$

Where EXP is exporting from Nepal to India, IMP is importing from India to Nepal, GDP captures the economy in both countries, INF captures the inflation in both countries, FDI indicates foreign direct investment in Nepal, FD captures the financial development in Nepal, and INT indicates the lending interest rate in India. The extended form of equations (1) and (2) in levels form is expressed in equations (3) and (4).

$$Exp_t = \alpha + \beta_1\,GDPI_t + \beta_2\,GDPN_t + \beta_3\,CV_t + \varepsilon_t \ldots(3)$$

$$Imp_t = \alpha + \beta_1\,GDPI_t + \beta_2\,GDPN_t + \beta_3\,CV_t + e_t \ldots(4)$$

where EXP_t is the exports from Nepal to India, IMP_t is the imports from India to Nepal, $GDPI_t$ is the GDP of India, $GDPN_t$ is the GDP of Nepal, CV = INFI, INFN, INT, FD, and FDI are the control variables, α = Intercept, $\beta_1, \beta_2,$ and β_3 are respective coefficients, ε_t and e_t are error terms.

The Auto-Regressive Distributed Lag (ARDL) model, introduced by Pesaran and Shin (1998), is a powerful econometric method used to analyze dynamic relationships between economic variables. One of the key benefits of the ARDL approach is its applicability regardless of whether the variables are stationary ($I\,(0)$) or integrated of order one ($I(1)$). This makes it particularly well-suited for examining the determinants of bilateral trade between India and Nepal, where the economic data may display mixed integration properties.

The ARDL model involves estimating a dynamic error correction model (ECM) that captures both short-term adjustments and long-term equilibrium relationships between

variables. The ARDL model addresses potential endogeneity and dynamic interactions in the data by including lags of both dependent and independent variables. This comprehensive approach allows for an in-depth analysis of how changes in interest rates, inflation, FDI inflows, and GDP influence trade flows between India and Nepal across different time horizons. It provides a framework to understand the immediate and delayed impacts of economic policies and external shocks on bilateral trade, making it a valuable tool for policymakers and researchers.

$$\Delta EXP_t = \alpha + \beta_1 \, EXP_{t-1} + \beta_2 \, GDPI_{t-1} + \beta_3 \, GDPN_{t-1} + \beta_4 \, CV_{t-1} + \sum_{i=1}^{p} \theta_i \, \Delta \, EXP_{t-1} + \sum_{i=1}^{q} \gamma_i \, \Delta \, GDPI_{t-1} +$$

$$\sum_{i=1}^{r} \delta_i \, \Delta \, GDPN_{t-1} + \sum_{i=1}^{s} \varphi_i \, \Delta \, CV_{t-1} + \vartheta_t$$

$$\Delta IMP_t = \alpha + \beta_1 \, IMP_{t-1} + \beta_2 \, GDPI_{t-1} + \beta_3 \, GDPN_{t-1} + \beta_4 \, CV_{t-1} + \sum_{i=1}^{p} \theta_i \, \Delta \, IMP_{t-1} + \sum_{i=1}^{q} \gamma_i \, \Delta \, GDPI_{t-1} +$$

$$\sum_{i=1}^{r} \delta_i \, \Delta \, GDPN_{t-1} + \sum_{i=1}^{s} \varphi_i \, \Delta \, CV_{t-1} + \vartheta_t$$

Where Δ represents the initial difference, t the time period (year), and v_t is a serially independent, homoscedastic, and normally distributed stochastic error term. The α is the intercept, β_1, β_2, β_3, and β_4 are the coefficient of first-order variables whereas $\theta_i, \gamma_i, \delta_i, and \, \omega_i$ are the parameters of the error correction model. The optimum values of lags p, q, r, and s are determined by using AIC and SC (BIC).

Results and Discussion

Unit Root Testing

Table (1) presents the results of the unit root tests conducted using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods. These tests reveal that some variables were stationary at their original levels, while others achieved stationarity after taking the first difference, as determined by both testing techniques. Specifically, inflation in Nepal (npl_inf) and foreign direct investment in Nepal (fdi) were stationary at this level. In contrast, the other variables were stationary at the first difference. Notably, none of the variables exhibited stationarity at the second difference or higher levels, meeting a crucial requirement for applying the Autoregressive Distributed Lag (ARDL) bounds test (Pesaran et al., 2001; Pesaran et al., 1999).

Table 1

Unit Root Tests

	ADF				PP			
	Level		First Difference		Level		First Difference	
Variables	Constant	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend
lnexp	-0.1367	-3.7671**	-6.0439***	-6.074***	-0.3147	-2.1375	-6.1134***	-6.1425***
lnimp	0.9891	-2.4766	-5.3644***	-5.6322***	1.1223	-2.4393	-6.0210***	-6.2552***
ln_igdp	0.1878	-2.5544	-6.2745***	-6.1979***	0.2756	-2.3891	-6.2862***	-6.2084***
ln_ngdp	-1.4357	-3.3104	-7.4149***	-7.3251***	-2.0655	-3.2271*	-16.134***	-18.609***
ind_inf	-0.4529	-3.4949	-6.3367***	-6.2696***	-0.1309	-2.9592	-9.3769***	-9.2241***
npl_inf	-4.231***	-4.762***	-8.151***	-8.039***	-4.147***	-4.788***	-24.716***	-24.230***
ind_int	-0.4529	-3.4949*	-6.3367***	-6.2696***	-0.1309	-2.9592	-9.3769***	-9.2241***
fdev	0.447	-2.075	-7.796***	-8.104***	2.052	-2.075	-8.049***	-9.765***
fdi	-1.816	-4.260***	-10.346***	-10.218***	-3.052**	-4.260***	-13.396***	-13.281***

ARDL Model Estimation

The Akaike Information Criterion (AIC) was utilized to determine the optimal lag length for the ARDL model. For exports and imports as the dependent variables, the selected ARDL models are ARDL (1, 2, 0, 0, 0, 2, 0, 0) for exports and ARDL (2, 1, 1, 0, 1, 0, 0, 0) for imports.

Diagnostic Tests

The model exhibits a strong fit, having successfully passed all residual diagnostic tests. The R-Squared values for the three models are moderately high, indicating a satisfactory level of overall fit. Additionally, the Durbin-Watson (DW) statistics for all models are higher than the R-Squared values, confirming that the models are not spurious. The rejection of the null hypothesis—that all regressors have zero coefficients—is supported by the computed F-statistics being higher for each model, further validating their effectiveness. The diagnostic results, as shown in Table 2, confirm that the models are free from common regression issues such as serial correlation, incorrect functional form, deviations from normality, and heteroscedasticity, ensuring their reliability and accuracy in predicting outcomes.

Table 2

Model Diagnostic Test Results

Tests	F-Value		p-value	
	(1)	(2)	(1)	(2)
Breusch-Godfrey Serial Correlation LM Test	0.9206	0.703	0.412	0.504
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.9825	0.5074	0.494	0.891
Jarque-Bera Normality Test	1.778	2.1913	0.4109	0.334

ARDL Bound Test

After the model successfully passed all diagnostic checks, a bounds test was conducted to determine the presence of co-integration among the variables. This test uses the joint F-statistics and its asymptotic distribution, with the null hypothesis being that no co-integration exists. The F-statistics values for both models exceeded the critical upper bound values, even at a 1% significance level, as shown in Table 3. This indicates a long-term relationship among the variables when export and import are considered the dependent variables. To ensure that this co-integration relationship is valid and not spurious, further verification was performed using t-statistics, which confirmed the significance of the identified long-run relationship.

Table 3

ARDL Bound Test Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significant Level	I(0)	I(1)
F-statistic (Exports)	7.1831	1%	4.31	5.96
F-statistic (Imports)	6.7912	1%	4.31	5.96
Actual Sample Size: 40; K-Value: 7				

Long-run and Short-run Relationship

Long-run Relationship

Using the Autoregressive Distributed Lag (ARDL) model with a maximum lag length of two, the analysis explored the long-term relationships within the economy. Table 4 presents the findings of the long-run coefficients, highlighting the results for both exports and imports.

The analysis indicates that the GDP of both Nepal and India has a statistically significant positive impact on Nepal's exports to India. This finding aligns with the Gravity Model of Trade, suggesting that larger economies with higher GDP engage more in trade due to their increased production capacities and market demand. As Nepal's GDP grows, its ability to produce and supply exportable goods increases, while a growing GDP in India indicates a rising demand for imports. Additionally, financial development and FDI inflows in Nepal positively impact exports, as improved financial systems and foreign investments enhance production capabilities, technology adoption, and integration into global supply chains, making Nepalese products more competitive in the Indian market.

Inflation in Nepal also significantly affects its export performance. Higher inflation can lead to currency depreciation, making Nepalese goods cheaper and more attractive in the Indian market. However, while Indian inflation has a positive effect on Nepalese exports, it is not statistically significant, possibly due to other mitigating factors. Furthermore, the impact of Indian lending interest rates on Nepal's exports is negative but not statistically significant, suggesting that while higher interest rates might reduce Indian demand for imports, and their

effect is overshadowed by more dominant trade determinants. These findings highlight the importance of maintaining economic growth, financial development, and a stable investment climate to boost Nepal's exports to India.

The analysis of imports from India to Nepal reveals different dynamics compared to exports. Nepal's GDP has a significant negative impact on imports from India, suggesting that as Nepal's economy grows, it might substitute imports with domestic production. Conversely, India's GDP positively impacts Nepal's imports, indicating that a larger Indian economy boosts its production and export capacity, making more goods available for import to Nepal. Additionally, the study finds that Indian lending interest rates have a statistically significant impact, with higher rates potentially reducing Nepalese imports due to increased costs for Indian producers and exporters.

Financial development in Nepal shows a positive and significant impact on imports from India, highlighting that better financial systems and increased access to credit facilitate higher import volumes. Although FDI inflows into Nepal negatively impact imports, this effect is not statistically significant, suggesting that while foreign investment might enhance domestic production and reduce reliance on imports, and its influence is overshadowed by other factors. These findings underscore the complex interplay between economic growth, financial development, and trade policies in shaping Nepal's import patterns from India.

Table 4

Long-run coefficients ARDL (1, 2, 0, 0, 0, 2, 0, 0) and ARDL (2, 1, 1, 0, 1, 0, 0, 0)

Dependent Variable (GGDPC)	(1)	(2)
LN_NGDP	9.667528*** (0.813058)	-3.687565*** (.1021488)
LN_IGDP	0.987986** (.059295)	3.926785** (0.186545)
IND_INF	0.10366 (0.081305)	0.039749 (0.028046)
IND_INT	-0.297591 (0.1481)	0.016982** (0.025694)
NPL_INF	-0.172405*** (0.009901)	-0.116438*** (0.003797)
FDEV	6.047201** (0.49915)	4.518773** (0.0870266)
FDI	0.107666** (0.006542)	-0.040928 (0.003264)

*Note. p-values and any subsequent tests do not account for model selection

Short run Dynamics

Tables 5 and 6 highlight the model's short-term dynamics, illustrating a substantial long-term relationship between the variables through significantly negative error correction term (ECT) coefficients, present at the 1% level in all models. This signifies an effective mechanism for correcting short-term imbalances within the same period, with notably rapid adjustment rates, as indicated by coefficients of -0.69156 and -0.58635, respectively. By utilizing the Error Correction Model (ECM), the study examined both short-term relationships and their enduring impacts, with detailed results in Tables 5 and 6. A key observation is the model's ability to return to its long-term equilibrium approximately seventeen to twenty months after a disturbance, following a path of damped oscillations. This demonstrates the model's robustness in promptly addressing short-term disequilibria and steering towards long-term stability.

Table 5

Short-run Dynamics Result for Exports

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-62.4224	12.5062	-4.99132	0.000
@TREND	-0.1411	0.028847	-4.8913	0.000
D(LN_NGDP)	-0.18851	1.535705	-0.12275	0.9032
D(LN_NGDP(-1))	-3.99213	1.498943	-2.6633	0.0131
D(NPL_INF)	-0.02904	0.009257	-3.13683	0.0042
D(NPL_INF(-1))	0.02642	0.009623	2.74548	0.0108
CointEq(-1)*	-0.69156	0.057195	-5.00652	0.000

Table 6

*Short-run Dynamics Result for Imports*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNIMP(-1))	0.505558	0.152863	3.307257	0.0026
D(LN_NGDP)	-2.89239	0.763061	-3.79051	0.0007
D(LN_IGDP)	-0.08418	0.517489	-0.16268	0.8719
D(NPL_INF)	-0.01465	0.003925	-3.73189	0.0009
CointEq(-1)*	-0.58635	0.06209	-6.22242	0.000

Stability of Model

The structural stability of the model was evaluated using the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests, with the results depicted in Figure (1) and Figure (2). For stability confirmation, the CUSUM and CUSUMSQ plots must remain within the critical 5% confidence level boundaries. As shown in Figure (1) and Figure (2), the plots consistently stayed within these boundaries, confirming the model's stability and indicating no significant structural shifts at the 5% confidence level throughout the study period.
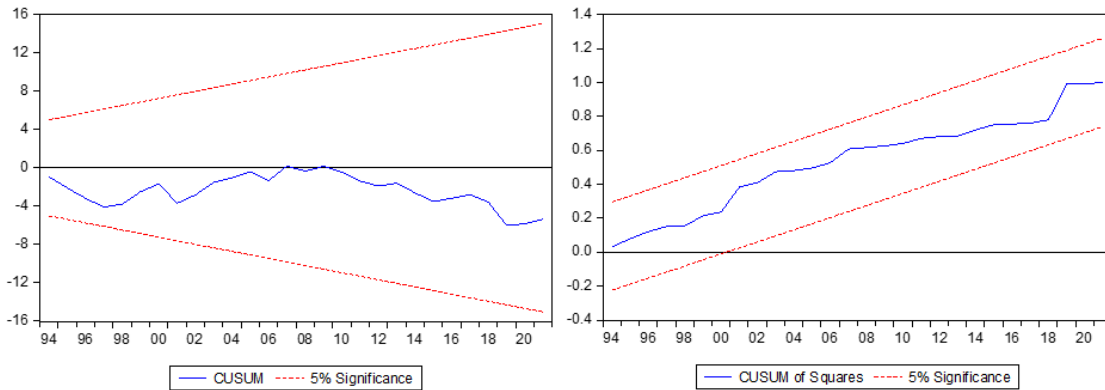
Figure 1

CUSUM and CUSUM of Squares for Exports
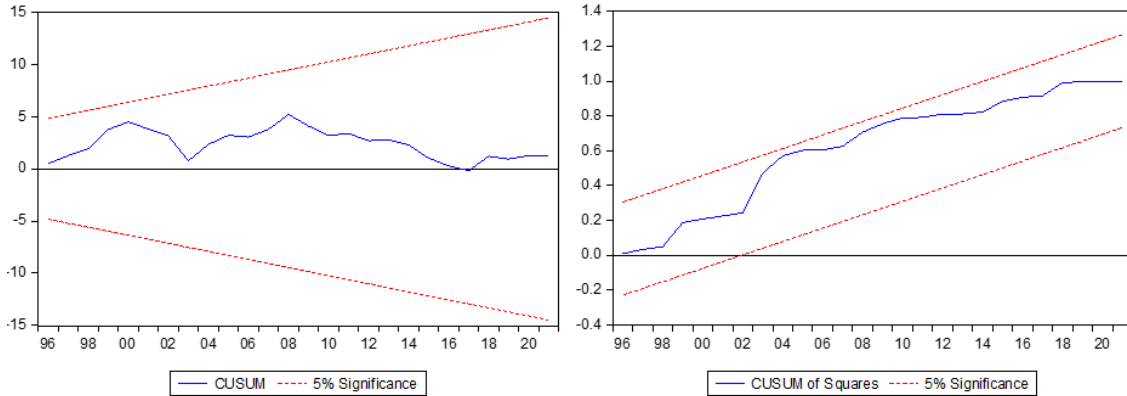
Figure 2

CUSUM and CUSUM of Squares for Imports

Discussion

The findings of this study provide significant insights into the macroeconomic determinants of bilateral trade between Nepal and India, revealing both short-term and long-term dynamics. The ARDL model's ability to capture these relationships is demonstrated by the robust statistical significance of GDP, financial development, and FDI in influencing Nepal's exports and imports. These results align with and expand upon existing literature, offering a nuanced understanding of trade dynamics in the region.

The analysis shows that the GDP of Nepal and India has a statistically significant positive impact on Nepal's exports to India, which corroborates the findings of Krugman (1980) and Helpman and Krugman (1985). They posited that larger economies tend to engage

in higher trade volumes due to increased production capacities and market demands. The positive impact of Nepal's GDP on its exports indicates that as the country's economy grows, its export capacity also increases, enhancing trade with India. Similarly, India's GDP growth boosts demand for imports, including those from Nepal.

Financial development and FDI are shown to have a positive and statistically significant impact on Nepal's exports, a finding supported by Chakraborty and Basu (2002) and Zhang (2001). Improved financial systems facilitate better access to credit and reduce transaction costs for exporters, enhancing their ability to compete in international markets. The significant role of FDI in boosting exports is also highlighted in Adhikari et al. (2023a), who found that FDI inflows contribute to economic growth by improving infrastructure and technology, which in turn enhances export performance.

The study also finds that inflation in Nepal has a statistically significant impact on export performance. This result is consistent with Baharumshah and Ariff (1997) and Bahmani-Oskooee and Ratha (2004), who noted that inflation can affect trade balances through its impact on currency valuation and price competitiveness. However, while Indian inflation has a positive effect on Nepalese exports, it is not statistically significant, suggesting other mitigating factors may be at play, such as relative stability in Indian inflation rates.

The negative impact of Indian lending interest rates on Nepal's exports, though not statistically significant, aligns with the theoretical expectations outlined by Coulibaly (2012) and Mohanty and Klau (2005). Higher interest rates can increase borrowing costs for Indian businesses, reducing their investment and consumption, which in turn lowers demand for imports from Nepal. However, the lack of statistical significance indicates that this effect may be overshadowed by more dominant trade determinants.

In terms of imports from India to Nepal, the study finds that Nepal's GDP has a significant negative impact, suggesting that as Nepal's economy grows, it may substitute imports with domestic production. This is contrasted by the positive impact of India's GDP on Nepalese imports, indicating that a larger Indian economy can produce and export more goods to Nepal. These results echo the findings of Helpman and Krugman (1985), who discussed the role of economic size in trade flows.

The stability of the ARDL model, confirmed through the CUSUM and CUSUMSQ tests, further supports the reliability of these findings. This methodology has been used by various researchers for time series analysis in context of Nepal (Adhikari et al., 2023a; Dangal & Gajurel, 2022, Gajurel et al., 2021). The model's robustness in addressing short-term disequilibria and steering towards long-term stability underscores its effectiveness in capturing the complex dynamics of Nepal-India trade relationships.

Conclusion

This study analyzes the macroeconomic determinants of bilateral trade between Nepal and India using the ARDL model to capture both short-term and long-term dynamics. The findings reveal that the GDP of both countries positively impacts Nepal's exports, emphasizing the importance of economic growth in driving trade. Financial development and FDI significantly enhance Nepal's export performance, highlighting the crucial role of financial sector improvements and foreign investment. Additionally, Nepal's inflation shows a significant effect on exports, suggesting that stable inflation is vital for maintaining trade competitiveness.

On the import side, Nepal's GDP negatively impacts imports from India, indicating a shift towards domestic production as the economy grows, while India's GDP positively influences Nepalese imports. Financial development also positively impacts imports, underscoring the importance of a robust financial system. Although the impacts of Indian lending interest rates and FDI inflows into Nepal varied in significance, the overall findings underscore the need for macroeconomic stability and targeted policies to attract FDI. These insights provide a valuable foundation for policymakers to strengthen trade relations and economic integration between Nepal and India.

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