Import Dependency and Trade Deficit in Nepal: An ARDL Bounds Testing Approach

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Abstract

This study examines the long-run relationship between import dependency and trade deficit in Nepal using the Autoregressive Distributed Lag (ARDL) bounds testing approach. Three distinct models with different dependent variables—import-to-GDP ratio, trade deficit, and export-import ratio—are analyzed using annual time series data from 1975 to 2023. The results confirm the existence of cointegration relationships in all three models at the 10 percent significance level. The exchange rate emerges as the most significant determinant of trade imbalances, with substantial positive effects on import dependency and the trade deficit. Remittances demonstrate a significant negative relationship with trade deficit, suggesting their potential in alleviating trade imbalances. The error correction terms indicate varying adjustment speeds across models, reflecting structural rigidities in Nepal's economy. These findings have significant policy implications for addressing Nepal's persistent trade deficit through effective exchange rate management, the productive utilization of remittances, and structural economic transformation.

Keywords: Import dependency, Trade deficit, Cointegration, Exchange rate, Remittances

Introduction

The sustainability of foreign trade deficits has, of late, become one of the major concerns of policymakers, central banks, and market analysts of emerging economies. The existence of cointegration between exports and imports suggests that such trade deficits are

only short-term in nature and therefore sustainable in the long term (Erbaykal & Karaca, 2008; Herzer & Nowak-Lehmann, 2006). A simple foreign trade multiplier implies that higher exports lead to higher income, which in turn induces imports. So, a country's import intensity is an important indicator of how much of an improvement in the balance of trade (BoT) can be expected from an exogenous increase in exports. Following Husted (1992), the existence of cointegration between exports and imports and interest payments on net debt implies that countries do not violate their international budget constraints and therefore support the effectiveness of their macroeconomic policies in restoring the long-run equilibrium.

Nepal, as a small landlocked developing economy, faces persistent challenges with trade imbalances and import dependency. The country's trade deficit has become a chronic macroeconomic issue, raising concerns about external sector sustainability and long-term economic growth prospects. According to recent data, Nepal's trade deficit has consistently exceeded 30% of GDP over the past decade, with imports often surpassing five times the value of exports (Paudel & Burke, 2023). This imbalance has been further exacerbated by structural constraints, limited domestic production capacity, and dependency on remittances to finance consumption-driven imports.

Given the existence of structural breaks in Nepal's trade performance, determining the accurate sequence of such break dates is a major task. If the analysis is done without accounting for the existence of possible endogenous structural breaks, empirical studies using standard unit root and cointegration tests may yield misleading and spurious results (Leybourne & Newbold, 2003). In other words, estimated long-run relationships may not be stable, and conclusions inferred may be highly misleading. This study aims to examine the long-run cointegration relationship between macroeconomic variables and trade performance measures while identifying the key determinants of import dependency and trade deficit in Nepal. Additionally, it seeks to assess the short-run dynamics and adjustment speeds to long-run equilibrium, ultimately deriving policy implications for addressing the country's persistent trade imbalances. Understanding these relationships is crucial for policymakers in designing effective strategies to reduce import dependency, promote export diversification, and achieve a more sustainable external sector position.

The objective of the present paper is to examine the long-run relationship between exports and imports and key macroeconomic variables for the Nepalese economy during the period 1975 to 2023. The study employs recent time-series econometric methods like the unit root test in the presence of endogenous structural breaks (Lee & Strazicich, 2003; Lee & Strazicich, 2004) and cointegration techniques that also allow for endogenously determined structural breaks (Gregory & Hansen, 1996). The findings of this study contribute to the existing literature by providing empirical evidence on the determinants of trade imbalances in Nepal and offering policy recommendations based on robust econometric analysis.

The rest of the paper is organized as follows: Section 2 reviews the relevant literature on trade deficit, import dependency, and their determinants, and presents the theoretical

framework. Section 3 describes the methodology and data employed in this study. Section 4 presents the empirical results and discussion. Finally, Section 5 concludes with policy implications.

Literature Review and Theoretical Framework

A plethora of empirical studies have been conducted in recent times to analyze the existence and the nature of long-run or cointegrating relationships between exports and imports. One of the pioneering works in this area has been the study by Husted (1992). Using quarterly US trade data for the period 1967–1989, Husted (1992) has shown that there is a long-run relationship between imports and exports and that the sign on the estimated cointegrating coefficient is positive. This implies that the US trade deficit is sustainable, and if in the short run exports and imports drift apart, they are taken into a long-run equilibrium through the effective implementation of macroeconomic policies. These findings have been in sharp contrast to those of Fountas and Wu (1999), who observed that the hypothesis of no long-run relationship between exports and imports cannot be rejected, implying thereby that the US trade deficits may not be sustainable.

The determinants of trade deficits have been analyzed through various theoretical lenses, including the elasticity approach, absorption approach, and monetary approach (Gylfason & Risager, 2021). The elasticity approach, rooted in the Marshall-Lerner condition, emphasizes the role of exchange rate adjustments in improving trade balance, provided that the sum of import and export elasticities exceeds unity. The absorption approach, championed by Alexander (1952), views the trade deficit as the excess of domestic absorption over production, highlighting the importance of domestic demand management. The monetary approach, on the other hand, considers trade imbalances as a monetary phenomenon reflecting differences in money demand and supply across countries (Mukhtar & Malik, 2019).

Empirical studies on trade deficits have employed various methodologies to identify determinants and assess their relative importance. Narayan and Smyth (2018) applied the ARDL bounds testing approach to analyze trade balance determinants in 30 Asian countries, finding that exchange rate, domestic income, and foreign income were significant factors, though with considerable heterogeneity across countries. Khan and Qayyum (2019) conducted a panel ARDL analysis of trade deficit sustainability in South Asian countries, concluding that exchange rate depreciation had limited effectiveness in improving trade balance due to structural constraints and low export elasticities. Their findings highlighted the importance of addressing supply-side constraints alongside exchange rate management.

Focusing specifically on Nepal, Sharma and Bhattarai (2022) examined the relationship between remittances, imports, and trade deficit using an ARDL approach. Their results indicated that remittances contributed to increased imports and widening trade deficits through consumption effects, though they also found evidence of productive investment effects in specific sectors. Empirical evidence on the sustainability of the trade deficit for the Indian economy has been mixed. Based on Augmented Dickey–Fuller (ADF) and Phillips–

Perron (PP) (1988) tests and the residuals from the cointegration regressions for the period 1949–50 to 2004–05, Upender (2007) has shown that India's nominal exports and imports are cointegrated. Upender's findings are in line with an earlier study by Arize (2002) covering 50 countries for the period 1973–1998. Using cointegration analysis based on Johansen (1995) and the single equation approaches of Phillips and Hansen (1990) and Stock and Watson (1993), Arize (2002) provides evidence of a long-run equilibrium relationship between exports and imports for the Indian economy. On the other hand, Konya and Singh (2008), using unit-root and cointegration approaches that allow for a one-time structural break in 1992–93, found no evidence of cointegration between India's exports and imports for the period 1949–50 to 2004–05.

Nag and Mukherjee (2012) examined the sustainability of trade deficits in India in the presence of endogenous structural breaks. Their findings suggested that India's macroeconomic policies had not been very effective in ensuring the sustainability of trade deficits in the long run, with evidence that India violated its international budget constraint. The relationship between exchange rate and trade balance has received considerable attention in the literature, with mixed findings across different countries and periods. Arize et al. (2020) investigated the impact of exchange rate changes on trade balance using an asymmetric nonlinear cointegration approach, finding evidence of significant but asymmetric effects in developing economies. Bahmani-Oskooee and Harvey (2020) examined the impact of exchange rate volatility on import-export ratios in developing economies, concluding that volatility had negative effects on trade performance, particularly in countries with underdeveloped financial markets and limited hedging opportunities. For Nepal specifically, Paudel and Burke (2023) found that the exchange rate had significant effects on trade deficit, though the magnitude of these effects was constrained by structural factors such as limited export diversification and high import dependency for essential goods.

Remittances constitute a significant source of external finance for Nepal, with important implications for the trade balance. Meyer and Shera (2019) examined the impact of remittances on economic growth across developing economies, finding positive growth effects but also noting increased consumption of imported goods. Lopez et al. (2022) analyzed household spending patterns in response to remittance inflows, documenting that remittances often lead to increased consumption expenditure with high import content, potentially exacerbating trade deficits. Khurshid et al. (2020) investigated the effects of workers' remittances on exchange rates and trade balance, finding evidence of Dutch disease effects in some remittance-dependent economies, where currency appreciation due to remittance inflows negatively affected export competitiveness.

One of the earliest theoretical frameworks of the long-run equilibrium relationship between exports and imports was provided by Husted (1992), who attempted to identify the "long-runtendency" of the U.S. current account balance and investigate its behavior. He has considered a representative consumer who lives in a small open economy that produces and exports a single composite good and has no government. The agent can borrow and lend in international markets using one-period financial instruments, faces a given world rate of

interest, and is assumed to maximize lifetime utility subject to budget constraints. The current period budget constraint of this individual is given by:

$$C_0 = Y_0 + B_0 - I_0 - (1 + r)B_1 \quad \ldots\ldots(1)$$

where C_0 is current consumption; Y_0 is output; I_0 is investment; r is the one period world interest rate; B_0 is international borrowing, which could be positive or negative; and $(1 + r)B_1$ is the historically given initial debt of the representative agent, corresponding to the country's external debt.

Since Eq. (1) must hold for every period, these period-by-period budget constraints can be combined to form the economy's intertemporal budget constraint (Konya & Singh, 2008). In other words, the amount that a country can borrow (lend) in international markets should equal the present value of the future trade surpluses (deficits). Using several assumptions, Husted (1992) arrived at the following testable model for the long-run relationship between exports (X_1) and imports, and interest payments on net debt

$$(MM_1): X_1 = \alpha + \beta MM_1 + \varepsilon_1 \quad \ldots\ldots(2).$$

Alternatively, Arize (2002) suggested estimation of the following

model: $MM_1 = \alpha + \beta X_1 + \varepsilon_1 \quad \ldots\ldots(3).$

Under the null hypothesis, the economy is satisfying its intertemporal budget constraint, such that $\beta = 1$ and ε_1 would be stationary. Thus, if MM_1 and X_1 are non-stationary, then under the null, they are cointegrated.

Methodology and Data

Data Description

This study employs annual time series data spanning from 1975 to 2023, covering a period of significant economic and political transformations in Nepal. The dataset includes the following variables:

1. IGDPRATIO: Import-to-GDP ratio, measuring the degree of import dependency 2. TRADEDEF: Trade deficit as a percentage of GDP
3. lnEIRATIO: Natural logarithm of export-import ratio, representing trade balance 4. lnREMIT: Natural logarithm of remittances as a percentage of GDP
5. GDPG: Annual GDP growth rate
6. lnER: Natural logarithm of real effective exchange rate (an increase indicates depreciation)
7. INF: Inflation rate measured by annual percentage change in a consumer price index
8. D2000: Dummy variable for the structural break in 2000 (political instability) 9. D2015: Dummy variable for the structural break in 2015 (earthquake and trade blockade)

The data were compiled from multiple sources, including the Nepal Rastra Bank, Central Bureau of Statistics, World Development Indicators, and International Financial Statistics. All variables were subjected to standard data transformation procedures and tested for stationarity using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests.

Methodology

ARDL Bounds Testing Approach

This study employs the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001) to examine the long-run cointegration relationship between variables. The ARDL approach offers several advantages over traditional cointegration techniques, including:

1. Flexibility in handling variables with different orders of integration (I(0) and I(1)) 2. Better small sample properties
3. Simultaneous estimation of short and long-run parameters
4. Ability to incorporate structural breaks

Three separate ARDL models are estimated with different dependent variables:

1. Model 1: IGDPRATIO (Import-to-GDP Ratio)
2. Model 2: TRADEDEF (Trade Deficit)
3. Model 3: lnEIRATIO (Export-Import Ratio)

The general form of the ARDL model can be expressed as:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{q_1} \gamma_i \Delta X_{1,t-i} + \sum_{i=0}^{q_2} \delta_i \Delta X_{2,t-i} + ... + \lambda_1 Y_{t-1} + \lambda_2 X_{1,t-1} + \lambda_3 X_{2,t-1} + ... + \varepsilon_t$$

where Y is the dependent variable, X represents the explanatory variables, p and q are the optimal lag lengths, λ captures the long-run relationships, and ε is the error term.

Unit Root Tests

Traditionally, the stationary properties of variables are examined by using the ADF unit root test. However, as suggested by Perron (1989), standard unit root tests are biased towards the non-rejection of the null hypothesis in the presence of structural breaks. Data on Nepal's export and import suggest the existence of multiple regime shifts, via the widening current account deficit in the early 2000s; the rising trend in exports since 2000 after experiencing almost a flat trend in the 1990s; the global financial crisis in 2008-09, etc. Given the strong likelihood of structural breaks in the series under consideration, the standard unit root tests for stationarity are prone to yield misleading conclusions.

To overcome this problem, Lee and Strazicich (2003) and Lee and Strazicich (2004) have developed an alternative (at most two) endogenous break unit root test that

uses the Lagrange Multiplier (LM) test statistic, and allows for breaks both under null and alternative hypotheses. Thus, rejection of the unit root null hypothesis based on the LM test provides quite strong evidence of stationarity.

Bounds Testing for Cointegration

The existence of a long-run cointegration relationship is tested using the bounds testing procedure. The null hypothesis of no cointegration (H_0: $\lambda_1 = \lambda_2 = \lambda_3 = ... = 0$) is tested against the alternative hypothesis (H_1: $\lambda_1 \neq 0$ or $\lambda_2 \neq 0$ or $\lambda_3 \neq 0$ or ... $\neq 0$).

The test statistic is compared with critical value bounds provided by Pesaran et al. (2001), with an upper bound assuming all variables are I(1) and a lower bound assuming all variables are I(0). If the test statistic exceeds the upper bound, the null hypothesis of no cointegration is rejected, indicating the existence of a long-run relationship.

Gregory-Hansen Cointegration Test

Standard cointegration tests tend to falsely accept the null hypothesis of no cointegration when there is a structural break under the alternative hypothesis (Herzer & Nowak-Lehmann, 2006). The study applies the Gregory and Hansen (1996) cointegration technique, which allows for one endogenously determined structural break in the cointegration relationship.

The test presents three models, whereby the shifts can be either in the intercept alone (C):
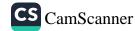
$y_1 = \mu_1 + \mu_2\varphi + \alpha^T y_2 + \varepsilon$, $t = 1, ..., n$ (4)

or, in both trend and level (C/T)

$y_1 = \mu_1 + \mu_2\varphi + \beta t + \alpha^T y_2 + \varepsilon$, $t = 1, ..., n$ (5)

or, a full break (C/S)

$y_1 = \mu_1 + \mu_2\varphi + \alpha_1^T y_2 + \alpha_2^T y_2\varphi + \varepsilon$, $t = 1, ..., n$ (6)

where in the present model, y_1 and y_2 are the (log) of exports and imports, respectively; μ_1, β_1, and α_1 are the intercept, trend coefficients, and slope coefficients, respectively, before the regime shift, and μ_2, β_2, and α_2 are the corresponding changes after the break.

Results and Discussion

Unit Root Tests

Before proceeding with the ARDL analysis, unit root tests were conducted to determine the order of integration of the variables. The results (not reported for brevity) indicated that all variables were either I(0) or I(1), confirming the appropriateness of the ARDL bounds testing approach.

Bounds Test Results

Table 1 presents the results of the bounds test for cointegration for all three models.

Table 1

Bounds Test Results

Model	F-statistic	Lower Bound I(0)	Upper Bound I(1)	Conclusion
IGDPRATIO	3.254477	2.27	3.28	Cointegration at 10%
TRADEDEF	3.471646	2.27	3.28	Cointegration at 10%
LNEIRATIO	3.336140	2.27	3.28	Cointegration at 10%

Note: Critical values at 5% significance level.

The bounds test results indicate that all three models exhibit evidence of cointegration at the 10% significance level, as the F-statistics exceed the upper bound critical value at this level. However, none of the models achieve cointegration at the 5% significance level, suggesting that the evidence for long-run relationships, while present, is not overwhelmingly strong.

Long-Run Coefficients

Table 2 presents the estimated long-run coefficients for all three models.

Table 2

Long-Run Coefficients

Variable	IGDPRATIO	TRADEDEF	LNEIRATIO
LNREMIT	-0.742815 (0.6755)	-6.554122** (0.0284)	-1.529695 (0.2856)
GDPG	0.390842 (0.1474)	1.250446* (0.0809)	-0.002200 (0.9876)
LNER	10.13418*** (0.0000)	16.96971*** (0.0000)	0.094219 (0.8587)
INF	0.085908 (0.6859)	0.129397 (0.6564)	-0.154447 (0.3194)
D2000	-1.511110 (0.7553)	-0.179046 (0.9823)	2.730630 (0.4531)
D2015	1.316746 (0.5233)	-3.704585 (0.2582)	0.582417 (0.6923)
C	-9.791305** (0.0382)	-16.35600** (0.0251)	4.156728** (0.0267)

Note: p-values in parentheses. *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

The long-run coefficients reveal several important findings: The exchange rate exhibits strong positive and highly significant coefficients in both the IGDPRATIO (10.13) and TRADEDEF (16.97) models, indicating that currency depreciation is associated with higher import dependency and larger trade deficits. This counterintuitive finding may reflect the inelastic nature of Nepal's imports and limited export response to exchange rate changes. Remittances show a significant negative relationship with trade deficit (-6.55) in the TRADEDEF model, suggesting that remittance inflows help reduce trade deficits. However, the relationship is not significant in the other two models. GDP growth has a positive

coefficient in both the IGDPRATIO and TRADEDEF models, with statistical significance at the 10% level in the latter. This suggests that economic growth in Nepal is associated with increased import dependency and wider trade deficits, reflecting the consumption-driven nature of growth. Inflation does not show statistically significant long-run relationships with any of the dependent variables, suggesting limited price effects on trade performance. The structural break dummies do not exhibit statistically significant long-run coefficients in any of the models, suggesting that the effects of these events may have been temporary or absorbed by other variables.

Error Correction Model Results

Table 3 presents the error correction coefficients and selected short-run dynamics for all three models.

Table 3

Error Correction Model Results

Variable	IGDPRATIO	TRADEDEF	LNEIRATIO
ECT(-1)	-0.640097*** (0.0003)	-0.510861*** (0.0001)	-0.108326 (0.2407)
D(Dependent(-1))	0.205155 (0.2104)	-	-
D(LNREMIT)	-2.724163 (0.1954)	-	0.378172 (0.1048)
D(GDPG)	-	0.416471** (0.0421)	0.018715* (0.0667)
D(LNER)	-2.799539 (0.6757)	-8.335925 (0.3303)	1.381382*** (0.0049)
D(INF)	-	-	-0.016731** (0.0496)

Note: p-values in parentheses. *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

The error correction model results provide valuable insights into short-run dynamics and adjustment processes: The error correction terms in the IGDPRATIO (-0.64) and TRADEDEF (-0.51) models are negative and highly significant, indicating relatively fast adjustment to long-run equilibrium. In contrast, the ECT in the LNEIRATIO model (-0.11) is not statistically significant, raising concerns about the stability of this specification. GDP growth shows significant positive short-run effects on trade deficit (0.42) and export-import ratio (0.02). The exchange rate has a significant positive short-run effect on the export-import ratio (1.38). Inflation demonstrates a significant negative short-run effect on the export-import ratio (-0.02). The adjustment speeds vary considerably across models, with the import-GDP ratio adjusting most rapidly (64% per year), the trade deficit adjusting moderately (51% per year), and the export-import ratio adjusting most slowly (11% per year, though not statistically significant).

Discussion of Results

The empirical results reveal several important features of Nepal's trade performance and its determinants. The strong positive relationship between exchange rate and both the import-GDP ratio and trade deficit contradicts the traditional view that currency depreciation improves trade balance. This finding aligns with Paudel and Burke (2023), who noted that

Nepal's trade response to exchange rate changes is constrained by structural factors. Several factors may explain this counterintuitive relationship: Nepal's imports are dominated by essential goods with low price elasticity of demand (fuel, food, machinery); the export base is narrow and faces supply-side constraints, limiting its ability to respond to exchange rate incentives; and as noted by Bahmani-Oskooee and Ratha (2022), currency depreciation may initially worsen trade balance before improvements materialize through J-curve effects. The significant negative relationship between remittances and trade deficit suggests that remittances play a role in alleviating trade imbalances. This finding contrasts with some previous studies (e.g., Sharma & Bhattarai, 2022) that emphasized the consumption-enhancing and import-inducing effects of remittances. The divergent findings may reflect that a portion of remittances may be channeled into productive investments that enhance domestic production capacity and reduce import dependency; remittance effects may vary across sectors, with potential import substitution effects in some areas offsetting increased consumption imports in others; and the relationship between remittances and trade performance may have evolved with changes in remittance utilization patterns. The positive relationship between GDP growth and trade deficit highlights the import-dependent nature of Nepal's economic growth, aligning with Gaire (2022), who identified structural constraints in domestic production capacity as key contributors to import dependency. This growth-trade deficit nexus reflects the consumption-driven nature of Nepal's economic growth with a significant import component, heavy reliance on imported machinery and equipment for capital formation, and limited domestic production capacity due to structural constraints. The different adjustment speeds across models reveal important insights about structural rigidities in Nepal's economy: the fast adjustment of import-GDP ratio (64% per year) suggests that import behavior responds relatively quickly to economic changes; the moderate adjustment of trade deficit (51% per year) reflects a combination of import flexibility and export rigidity; while the slow and statistically insignificant adjustment of export-import ratio (11% per year) highlights the structural challenges in export promotion and diversification. These findings are consistent with the literature cited in the introduction regarding the persistent nature of trade imbalances in landlocked economies with structural constraints (Erbaykal & Karaca, 2008; Herzer & Nowak-Lehmann, 2006) and provide empirical support for Husted's (1992) framework on the long-run equilibrium relationship between exports and imports.

Conclusions and Implications

This study examined the dynamic relationship between import dependency and trade deficit in Nepal using the ARDL bounds testing approach. The empirical analysis based on annual data from 1975 to 2023 yields several important conclusions. There is evidence of cointegration in all three models, confirming the existence of long-run relationships between macroeconomic variables and trade performance measures, though at the 10% significance level rather than the more conventional 5% level. Exchange rate emerges as the most significant determinant of import dependency and trade deficit, with currency depreciation associated with worsening trade performance, highlighting the structural constraints in Nepal's trade sector. Remittances demonstrate a significant negative relationship with trade deficit, suggesting their potential role in alleviating trade imbalances through channels beyond consumption. GDP growth shows a positive association with trade deficit, reflecting

the import-dependent nature of Nepal's economic growth process. The error correction terms indicate varying adjustment speeds across models, with the import-GDP ratio adjusting most rapidly, the trade deficit adjusting moderately, and the export-import ratio adjusting most slowly. These findings contribute to a more nuanced understanding of Nepal's trade performance and provide empirical support for targeted policy interventions.

The policy implications of these findings are substantial and multifaceted. Given the positive relationship between exchange rate depreciation and trade deficit, exchange rate policy should be approached with caution, requiring a more comprehensive approach that addresses structural constraints in both import and export sectors rather than relying solely on currency adjustments. Policies should aim to channel remittances toward productive investments that enhance domestic production capacity and reduce import dependency, including targeted incentives for remittance-backed investments in priority sectors with import substitution potential. The varying adjustment speeds across models highlight the need for structural economic transformation focused on developing domestic production capacity in sectors with high import dependency, enhancing export competitiveness through quality improvements and value addition, and addressing supply-side constraints in export sectors. Given the high import-GDP ratio and persistent trade deficit, targeted import substitution strategies in sectors where Nepal has comparative advantage potential (agriculture, light manufacturing, energy) could help reduce import dependency, while export promotion policies should aim to expand the export base beyond traditional products and markets, with a focus on products with higher value addition and growth potential. Finally, the negative short-run effect of inflation on the export-import ratio suggests that price stability is important for maintaining trade balance, indicating that monetary policy should aim to maintain inflation within a moderate range. Our results can be compared with the findings of Nag and Mukherjee (2012) for the Indian economy; while they found no evidence of cointegration between exports and imports in India, our study shows cointegration in Nepal, albeit at a weaker significance level (10%), suggesting that Nepal's trade deficit may be more sustainable in the long run compared to India, though with important structural challenges that need to be addressed.

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