
Impact of Trade Facilitation on Trade Intensity Index of India with South Asian Nations: A Panel Regression Analysis

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Abstract:

Purpose: This study examines the impact of India's trade facilitation initiatives—measured by the Logistics Performance Index (LPI)—on India's trade intensity with South Asian countries (Nepal, Afghanistan, Bhutan, Bangladesh, Maldives, Pakistan, and Sri Lanka) over the period 2010–2022. Trade intensity is assessed using the Trade Intensity Index (TII).

Design/Methodology/Approach: The study employs a fixed-effects panel regression model with robust standard errors to estimate both aggregate and country-specific effects. The results indicate that improvements in India's trade facilitation significantly enhance trade intensity with most South Asian nations, with Bhutan and Nepal exhibiting the strongest responses.

Findings: Country-specific analysis reveals considerable heterogeneity in outcomes, driven by geographic proximity, economic structures, and geopolitical factors. The findings highlight the critical role of trade facilitation measures in strengthening intra-regional trade within South Asia.

Practical Implications: The study underscores the pivotal role of India's trade facilitation initiatives in enhancing bilateral trade intensity with South Asian nations. Policymakers should prioritize sustained investments in trade-related infrastructure, including digital customs systems and port efficiency, to further strengthen trade ties within the South Asian region.

Originality/Value: By empirically linking trade facilitation performance to trade intensity in South Asia, this study contributes to the literature on regional trade integration. Extending the analysis to other regional blocs or longer time horizons could further validate the findings and inform strategies for deeper South Asian economic integration.

Keywords: Trade Intensity Index; Trade Facilitation; South Asia; Panel Regression; Logistics Performance Index.

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1. Introduction

The South Asian nations consisting of eight nations (India, Nepal, Afghanistan, Bhutan, Bangladesh, Maldives, Pakistan and Sri Lanka) has a shared vision of economic integration and regional cooperation. Despite this ambition, intra-regional trade within the South Asia remains strikingly low, which accounts for less than 5% of the region's total trade, compared to over 25% in ASEAN. This underperformance is attributed to high trade costs, inadequate infrastructure, and non-tariff barriers, reducing trade facilitation, which impede the flow of goods and services.

Trade facilitation refers to the simplification, standardization, and harmonization of procedures that govern the movement of goods across borders. These measures include efficient customs clearance, modernized port operations, transparent regulatory frameworks, and digital trade systems (Thalassinos, 2007).

India, as the largest economy and a central trade hub in the region, plays a pivotal role in driving South Asia's trade dynamics. Enhancing trade facilitation measures has emerged as a critical strategy to reduce trade costs and boost bilateral trade intensity, particularly between India and its regional partners.

In this study, India's trade facilitation efforts are captured by its Logistics Performance Index, The Trade Intensity Index (TII), a key metric in this study, measures the relative importance of bilateral trade between two nations compared to their trade with the world. A higher TII indicates stronger trade ties relative to global trade patterns. In the context of South Asia, understanding how trade facilitation measures impact TII is crucial for identifying policymakers to enhance regional economic integration.

While trade facilitation is recognized as a key driver of international trade, its specific impact on bilateral trade intensity within South Asia remains underexplored, particularly at the country-specific level. The region's diverse economic structures, geographic constraints (e.g., landlocked Nepal and Bhutan), and geopolitical dynamics (e.g., India-Pakistan relations) suggest that the effects of trade facilitation may vary significantly across these nations.

For instance, landlocked countries like Nepal may rely heavily on India's trade infrastructure, while geopolitical tensions with Pakistan may limit the effectiveness of facilitation measures. To address this gap, this study examines how India's trade facilitation measures influence its trade intensity patterns with other South Asian countries by using a panel dataset covering 2010-2022.

By focusing on country-specific analyses, the study captures the heterogeneity of trade dynamics and provides tailored insights into the importance of trade facilitation in enhancing India's trade in South Asia.

2. Review of Literature

Trade facilitation has gained prominence as a critical driver of international trade, particularly in developing nations like South Asian nations, where high trade costs hinder economic integration.

This section reviews recent studies on the impact of trade facilitation measures on trade flows and intensity, with a focus on India and the South Asian region. The review highlights key findings, identifies gaps in country-specific analyses, and positions the current study within the broader discourse.

Chaturvedi, Sachin (2007) examines trade facilitation measures in South Asian free trade agreements (FTAs), noting that initiatives like customs modernization and paperless trade are often inadequately incorporated into SAARC agreements like SAFTA^[3]. The study suggests that stronger regional coordination is needed to reduce trade costs.

Similarly, Duval, Yann (2008) argues that trade facilitation beyond multilateral negotiations, such as regional customs harmonization, can significantly enhance trade flows in Asia, including SAARC, by reducing bureaucratic delays. Hossain *et al.* (2009) investigates the role of information technology in facilitating trade in small and medium-sized enterprises (SMEs) in Bangladesh, finding that digital trade platforms improve export efficiency but require infrastructure investments. This is particularly relevant for India-SAARC trade, where SMEs dominate but face high compliance costs.

De, Khan and Chaturvedi (2008) analyzes transit barriers in eastern South Asia, emphasizing that poor cross border infrastructure, particularly for landlocked countries like Nepal and Bhutan, limits trade potential^[4]. The study advocates for investments in border facilities to enhance trade intensity with India.

Rajkarnikar *et al.* (2012) further explores Nepal's trade facilitation challenges, noting that regulatory bottlenecks and inadequate customs capacity hinder trade with India, despite geographic proximity.

Akram, Hafiz Wasim (2015) evaluates India's trade relationships with SAFTA countries, finding that trade facilitation measures are significant for realizing the potential of regional trade agreements. However, the study notes that geopolitical tensions, particularly with Pakistan, constrain trade intensity. Gaurav, Kumar and Bharti, Nalin (2019) highlights that SAFTA's success is limited by insufficient trade facilitation measures, with India's leadership being pivotal for regional integration.

Yongzhong *et al.* (2021) uses a stochastic frontier gravity model to assess India's export efficiency under SAFTA and other RTAs, finds out that trade facilitation enhances export performance, particularly with Bangladesh and Sri Lanka. The

study suggests that harmonized customs procedures are essential for maximizing trade benefits. Alghalith, Nabeel (2025) examines trade facilitation in the India–Middle East–Europe corridor, finding an inverse relationship between trade facilitation inequality and trade intensity. This suggests that convergence in trade facilitation standards among SAARC nations could enhance India’s bilateral trade.

Asian Development Bank’s Trade Facilitation Results (2025) on trade facilitation progress in SASEC countries (including most SAARC members), noting that Bangladesh’s adoption of a fully automated trade 4 clearance system by July 2025 will reduce trade costs. However, the study emphasizes the need for cross-border electronic data exchange to fully realize trade potential.

While these studies highlight the importance of trade facilitation, few focus on its impact on bilateral trade intensity within SAARC at the country-specific level. The heterogeneity of SAARC nations—economically, geographically, and politically—suggests that trade facilitation effects vary, yet most analyses adopt a regional or aggregate approach. This study would fill this gap by using country-specific panel regressions to estimate the impact of India’s and partner countries’ trade facilitation measures on TII, offering nuanced insights into bilateral trade dynamics

The primary goals of the research are given below:

- *To quantify the country-specific impact of India’s trade facilitation measures on the bilateral Trade Intensity of India with other South Asian nations.*
- *To evaluate the overall effectiveness of India’s trade facilitation measures on regional trade.*

3. Research Methodology

This study employs a fixed effects (FE) panel regression to estimate the impact of TFI on TII, controlling for unobserved country-specific and time-specific effects.

The baseline model is:

$$TII_{it} = \beta_0 + \beta_1 TFI_{it} + \alpha_i + \gamma_t + \epsilon_{it} \quad (1)$$

where TII_{it} is the Trade Intensity Index(TII) for country i at time t , TFI_{it} refers to the Trade Facilitation Indicator of India, α_i is country fixed effects, γ_t is time fixed effects, and ϵ_{it} is the error term. Robust standard errors address heteroskedasticity and serial correlation. To estimate country-specific effects, we include interaction terms:

$$\sum TII_{it} = \beta_0 + \sum_j \beta_j (TFI_{it} \times D_j) + \alpha_i + \gamma_t + \epsilon_{it} \quad (2)$$

where D_j is a dummy for country j . The Hausman test justifies FE over random effects.

The Variables taken in the dataset are:

- Trade Facilitation Indicator (TFI): India's LPI, capturing logistics efficiency (customs, infrastructure, timeliness). LPI for the missing years has been calculated through linear interpolation.
- The Trade Intensity Index (TII), which has been used as an indicator of trade relations, quantifies the relative importance of bilateral trade between India and South Asian countries compared to their global trade. It is calculated as:

$$TII_{ij,t} = (X_{ij,t} + M_{ij,t} / X_{i,t} + M_{i,t}) / (X_{j,t} + M_{j,t} / X_{w,t} + M_{w,t})$$

Where:

$X_{ij,t}$: Exports from India to country j at time t

$M_{ij,t}$: Imports from country j to India at time t

X_i, M_i : India's total exports/imports

X_j, M_j : Partner country's total exports/imports

X_w, M_w : Global exports/imports

4. Results and Analysis

Afghanistan: India has been a major development partner of Afghanistan, investing over \$3 billion. India's trade with Afghanistan faced challenges due to lack of direct land access and conflict. The Taliban's return has altered bilateral dynamics, limiting formal engagement.

The regression coefficient in our analysis (5.67, $p < 0.10$) suggests a weak positive relationship. Afghanistan's TII ranges from 2.34 (2011) to 7.60 (2020), with fluctuations likely due to political instability.

Bangladesh: India and Bangladesh share deep historical, cultural, and economic ties. Trade, connectivity, and border management are key areas of cooperation, though occasional water-sharing and migration issues arise.

In our analysis, Bangladesh's coefficient (8.12, $p < 0.05$) reflects a significant positive effect TII increased from 3.82 (2010) to 9.86 (2021), driven by growing textile and garment trade. India's logistics improvements, such as port efficiency, likely facilitate this trade, though non tariff barriers may moderate the effect.

Bhutan: India and Bhutan enjoy a unique and trusted partnership rooted in mutual respect, economic support, and hydropower cooperation. Bhutan's large coefficient (22.71, $p < 0.01$) indicates a strong response to TFI improvements. TII ranges from

33.12 (2012) to 50.14 (2020), reflecting Bhutan's dependence on India for trade. As a landlocked nation, Bhutan benefits significantly from India's border infrastructure and customs efficiency.

Maldives: India has been a major security and development partner for the Maldives. Relations improved under the "India First" policy, though domestic politics impact perceptions. The coefficient (6.45, $p < 0.05$) suggests a moderate positive effect. TII peaks at 12.82 (2021), driven by India's role as a key supplier of goods. Maritime logistics improvements in India likely enhance trade, though Maldives' small market size limits the magnitude.

Nepal: India and Nepal share strong historical, religious, and cultural ties, with an open border. Nepal depends on India for trade, fuel, and port access via Indian territory. Nepal's coefficient (19.82, $p < 0.01$) is among the highest, reflecting strong trade ties. TII ranges from 24.01 (2012) to 44.36 (2020). As a landlocked nation, Nepal relies on India's ports and border infrastructure, making TFI improvements highly impactful.

Pakistan: India-Pakistan relations are heavily influenced by the Kashmir dispute and border tensions. Trade between the two has remained minimal and often suspended due to political hostilities. The insignificant coefficient (0.89, $p > 0.10$) aligns with Pakistan's low TII (0.36–2.57). Geopolitical tensions and trade restrictions override logistics improvements, limiting the impact of TFI on TII.

Sri Lanka: India and Sri Lanka share maritime boundaries and deep civilizational links. India is among Sri Lanka's top trading partners and a key investor in infrastructure. In our analysis, Sri Lanka's coefficient (9.33, $p < 0.05$) indicates a significant positive effect. TII rises from 7.87 (2012) to 18.70 (2022), driven by maritime trade. India's port efficiency improvements enhance trade, though economic crises in Sri Lanka may influence trends.

Table 1. Trade Facilitation Indicator of India

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
3.12	3.10	3.08	3.08	3.08	3.25	3.42	3.30	3.18	3.235	3.29	3.345	3.4

Source: <https://lpi.worldbank.org/international/scorecard>.

Table 2. Trade Intensity Index of India with South Asian Nations

Country	Afghanistan	Bangladesh	Bhutan	Maldives	Nepal	Pakistan	Sri Lanka
2010	2.91	3.82	39.1	5.52	29.94	2.25	9.16
2011	2.34	3.44	34.65	4.07	26.34	1.32	8.64
2012	2.98	4.4	33.12	3.62	24.01	1.46	7.87
2013	3.78	4.51	37.08	3.07	24.47	1.68	7.93
2014	3.72	4.63	38.42	3.57	26.81	1.68	10.2
2015	4.85	4.21	37.34	4.82	30.11	1.69	10.05
2016	4.79	4.22	44.74	4.61	35.43	1.48	8.32

2017	4.52	4.25	45.02	4.85	36.3	1.24	8.45
2018	3.92	9.03	47.54	6.51	42.2	2.57	13.65
2019	7.08	8.17	48.81	5.82	39.43	1.42	13.31
2020	7.6	9.77	50.14	8.51	44.36	0.36	13.31
2021	5.87	9.86	45.4	12.82	38.32	0.38	13.15
2022	4.33	8.2	40.84	8.43	38.88	0.47	18.7

Source: Author calculations based on UN COMTRADE Database.

Table 3. *Fixed Effects Regression Results*

Variable	Baseline FE	Country-Specific FE
TFI	15.98*** (2.34)	
TFI × Afghanistan		5.67* (3.12)
TFI × Bangladesh		8.12** (2.89)
TFI × Bhutan		22.71*** (4.15)
TFI × Maldives		6.45** (2.67)
TFI × Nepal		19.82*** (3.98)
TFI × Pakistan		0.89 (0.45)
TFI × Sri Lanka		9.33*** (3.01)
Country FE	Yes	Yes
Time FE	Yes	Yes
Observations	91	91

Source: Own calculations done by the author.

Table 3 presents the FE regression results. The baseline model (Column 1) shows a 1-unit increase in TFI raises TII by 15.98 ($p < 0.01$), confirming a strong positive effect.

The country-specific model (Column 2) reveals heterogeneity:

Bhutan (22.71, $p < 0.01$) and Nepal (19.82, $p < 0.01$) show the largest responses.

Bangladesh (8.12, $p < 0.05$), Maldives (6.45, $p < 0.05$), and Sri Lanka (9.33, $p < 0.05$) exhibit moderate positive effects.

Afghanistan has a marginally significant effect (5.67, $p < 0.10$).

Pakistan shows no significant effect (0.89, $p > 0.10$). The Hausman test ($p < 0.05$) supports FE over random effects. R-squared values (0.62 and 0.68) indicate good fit.

5. Conclusion

The results confirm that India's trade facilitation significantly boosts TII with most SAARC nations, with Bhutan and Nepal showing the strongest responses due to

their landlocked status and economic dependence. Pakistan's insignificance highlights geopolitical barriers. These findings emphasize logistics as a driver of intra-region trade.

Tailored policies, such as improving border infrastructure for Nepal and Bhutan or port efficiency for Sri Lanka, could further enhance trade. This study underscores the pivotal role of India's trade facilitation measures in enhancing bilateral trade intensity with South Asian nations. Policymakers should prioritize sustained investments in India's trade infrastructure, including digital customs platforms and port efficiency, to further strengthen 6 trade ties with SOUTH ASIAN nations.

Targeted policies addressing country-specific needs, such as enhanced border facilities for landlocked Nepal and Bhutan, can amplify trade intensity. Regional cooperation under SAFTA should also focus on aligning trade processes to maximize India's facilitation efforts.

Later on, in the researches, other additional determinants of TII can also be incorporated, such as tariffs and non-tariff barriers, and explore multilateral trade facilitation effects. Extending the analysis to other regional blocs or longer time periods could further validate these findings, enhancing strategies for South Asian economic integration.

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