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Product Diversification Patterns In India-Asean Trade Post-Aifta

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Abstract

This study examines the patterns of product diversification in India-ASEAN trade relations during 2011-2019, focusing on the period following the implementation of the ASEAN-India Free Trade Agreement (AIFTA). Using the Gini-Hirschman Index (GHI) and correlation analysis, the research reveals significant asymmetries in the evolution of export and import diversification patterns. The findings demonstrate a concerning trend in export diversification, evidenced by a significant positive correlation ($r = 0.52$, $p < 0.001$) between export growth and concentration levels. This relationship suggests a structural tendency toward increased concentration as export volumes grow, particularly evident in major trading relationships such as with Singapore, where concentration in specific commodities persists at high levels (GHI: 60.21-72.31). Conversely, import relationships demonstrate a more favorable trajectory, characterized by a significant negative correlation ($r = -0.65$, $p < 0.001$) between import values and concentration levels. This pattern suggests that import relationships naturally diversify as they mature, exemplified by Thailand's consistently low GHI values (11.23-18.44) and Singapore's substantial improvement in import diversification (GHI declining from 51.61 to 21.26). The study identifies several critical barriers to export diversification, including structural impediments from established trade networks, market access barriers, and policy-related constraints. However, success stories like Indonesia's improvement in export diversification (GHI declining from 66.96 to 35.24) suggest that these barriers can be overcome with appropriate policy interventions. The research contributes to the literature on regional trade integration by highlighting the asymmetric impacts of trade agreements on export and import diversification. The findings suggest that while import diversification may progress naturally under liberalized trade regimes, export diversification requires more targeted and comprehensive policy interventions. The study proposes policy recommendations focusing on export promotion mechanisms, regulatory harmonization, supply chain integration, institutional support frameworks, and technology adoption to enhance trade diversification between India and ASEAN.

Keywords: Trade Diversification, ASEAN-India Free Trade Agreement, Export Concentration, Regional Integration, Product Diversification Index

Introduction

Background

India and the Association of Southeast Asian Nations (ASEAN) share a rich history of cultural, economic, and political interactions that have evolved significantly over the decades. Rooted in shared historical ties and geographical proximity, their trade relationship has matured into one of strategic importance. Established in 1967, ASEAN has transitioned from a modest regional agreement to a dynamic intergovernmental organization comprising ten Southeast Asian nations. Its objectives emphasize economic integration, political stability, and cultural exchange, aligning well with India's interests in the region.

India's engagement with ASEAN gained momentum with the introduction of the "Look East Policy" in 1991, marking a strategic shift in India's foreign relations. This policy aimed to strengthen economic ties with Southeast Asia, driven by the need to revive India's economy amidst a Balance of Payments crisis and the disintegration of the USSR. Over the years, the relationship deepened, with India becoming a sectoral dialogue partner in 1992, a full dialogue partner in 1996, and eventually a summit-level partner in 2002.

Key milestones include the signing of the ASEAN-India Framework Agreement on Comprehensive Economic Cooperation in 2003 and the implementation of the ASEAN-India Trade in Goods Agreement (AITIGA) in 2010 also known as ASEAN-India Free Trade Agreement (AIFTA). These agreements facilitated significant tariff reductions, boosting trade volumes. However, challenges like trade imbalances, high tariffs on Indian goods, and infrastructural barriers persist. The "Act East Policy," introduced in 2014, marked a further strategic enhancement, aiming to deepen India's engagement with ASEAN across economic, cultural, and security dimensions. Today, ASEAN is a vital partner for India, contributing significantly to its trade portfolio, while India plays a key role in

ASEAN's economic diversification strategies, particularly in counterbalancing China's growing influence in the region. Despite current challenges, both entities continue to explore avenues for deeper integration, focusing on mutual benefits and sustainable growth.

Problem Statement

Despite the robust trade relations, there is an over-reliance on a narrow range of products or sectors within the India-ASEAN trade framework, creating significant vulnerabilities for both economies in dynamic and uncertain global markets. A substantial portion of trade is dominated by a few sectors such as petroleum products, electronic goods, and select agricultural commodities, leading to a high level of trade concentration (World Trade Organization, 2020). This concentration exposes both India and ASEAN countries to external shocks like price volatility, geopolitical disruptions, and sector-specific downturns. For instance, during the COVID-19 pandemic, economies heavily reliant on narrowly focused exports experienced sharp contractions in trade volumes (UNESCAP, 2021).

Such concentrated trade patterns hinder the development of broader economic capabilities, limiting opportunities for technological advancement and participation in high-value global supply chains (Balassa, 1982). Empirical studies have consistently demonstrated that diversifying export baskets contributes to enhanced economic resilience and improved growth trajectories, particularly for emerging economies (Imbs & Wacziarg, 2003; Cadot et al., 2011). While India's agricultural trade with ASEAN is comparatively diversified on the export side, imports remain more focused, potentially undermining long-term trade stability (Pandey, 2019). Additionally, limited diversification in sectors such as intermediate goods and high-value manufacturing highlights missed opportunities for deeper integration into ASEAN's dynamic regional supply chains (Mukherjee, 2016). Therefore, there is a pressing need for strategic diversification to ensure sustainable growth and economic resilience in India-ASEAN trade.

Objectives of the Study

The primary objective of this study is to examine the extent of diversification in the import and export of intensively traded commodities between India and ASEAN and to identify strategies to enhance this diversification post AIFTA period. To achieve this, the study will analyze current trade patterns to determine the levels of commodity diversification or concentration, assessing whether trade is spread across a wide range of products or limited to a few key items. It will also evaluate historical trends to understand if diversification has progressed or stagnated over time, providing insights into the dynamics of trade evolution between the two regions. Additionally, the study aims to identify the barriers limiting diversification, such as policy constraints, infrastructural challenges, and market dynamics that may hinder the expansion into new commodity areas. By addressing these factors, the study seeks to propose strategic recommendations and actionable policies that can promote diversification, enhance trade resilience, and yield mutual economic benefits for both India and ASEAN member states.

Significance of the Study

This study holds significant importance for policymakers, businesses, and academia. For policymakers, understanding the risks associated with trade concentration can inform strategic decisions to invest in diversified sectors, enhancing economic resilience and sustainable growth. Businesses can benefit by identifying new market opportunities and adjusting their strategies to mitigate risks associated with sector-specific downturns. For academia, the study contributes to the literature on international trade diversification, providing empirical evidence on the India-ASEAN context.

By embracing diversification, both India and ASEAN can mitigate risks and enhance mutual economic complementarities, solidifying their roles as key players in a multipolar global economy. The study's insights can facilitate collaborative mechanisms that integrate trade facilitation, knowledge-sharing, and capacity-building initiatives, unlocking underexplored potential in India-ASEAN trade relations (OECD, 2021).

Literature Review

Historical Context of India-ASEAN Trade

The trade relationship between India and the Association of Southeast Asian Nations (ASEAN) has evolved significantly since the early 1990s. The establishment of the ASEAN-India Partnership in 1992 marked the beginning of formal economic engagement between the two regions. Initially characterized by limited trade

volumes, the partnership gained momentum with the signing of the ASEAN-India Framework Agreement on Comprehensive Economic Cooperation in 2003, which laid the groundwork for future trade liberalization efforts (ASEAN Secretariat, 2020).

A pivotal development was the implementation of the ASEAN-India Free Trade Agreement (AIFTA) in 2010, aiming to eliminate tariffs on over 80% of traded goods. This agreement substantially increased bilateral trade volumes, with studies documenting significant growth post-AIFTA (Chandran, 2015). However, scholars have noted that this growth has been concentrated in a few key sectors, including petroleum products, textiles, and machinery (World Bank, 2020; Banik & Kim, 2020). While ASEAN has become India's fourth-largest trading partner, the trade relationship often appears skewed, with ASEAN nations offering diversified imports compared to India's concentrated export structure (Pandey, 2019).

Historical analyses underscore that the foundation of India-ASEAN trade relations is rooted in geographical proximity, shared cultural heritage, and complementary economic structures (Das, 2014). Despite these favorable conditions, a consistent theme in the literature is the lack of diversification in traded commodities, which has limited the potential of bilateral trade to adapt to global economic shifts and exploit emerging opportunities (Kumar, 2019). Recent studies emphasize the need for policy interventions to expand trade into emerging sectors such as pharmaceuticals, digital technology, and renewable energy, which remain underexploited despite significant potential (Mukherjee & Bhattacharya, 2021; Gupta, 2019).

Theoretical Framework

Trade diversification is underpinned by several economic theories that link diversified trade portfolios with enhanced economic resilience and growth. Classical theories, such as Ricardo's theory of comparative advantage, advocate for specialization based on relative efficiency but also caution against the risks of over-reliance on a narrow range of exports (Ricardo, 1817). The Heckscher-Ohlin model suggests that nations export goods that intensively use their abundant factors, but as economies develop, they often seek to diversify their exports to mitigate risks associated with market volatility (Ohlin, 1933).

Modern theoretical frameworks, such as the "Stages of Diversification" proposed by Imbs and Wacziarg (2003), posit a non-linear relationship between economic development and diversification. In the early stages of development, economies tend to diversify their production and export structures, leading to increased economic stability and growth. As they reach higher income levels, a re-specialization in high-value-added sectors often occurs, leveraging advanced technologies and skills.

Hirschman's (1958) "Linkage Theory" further emphasizes that diversification creates forward and backward linkages within the economy, fostering industrialization and reducing vulnerability to sector-specific shocks. Cadot et al. (2011) formalized the relationship between export diversification and macroeconomic stability, demonstrating that countries with more diversified export baskets experience lower output volatility and higher long-term growth rates.

These theoretical perspectives provide a foundation for analyzing the India-ASEAN trade relationship, highlighting the importance of diversification in enhancing economic resilience, promoting sustainable growth, and integrating into global value chains.

Empirical Studies on Diversification

Empirical research consistently affirms the benefits of trade diversification for emerging economies. Imbs and Wacziarg (2003) found that diversification contributes to macroeconomic stability and is associated with higher income levels. Similarly, Cadot et al. (2011) provided evidence that countries with broader export bases are less susceptible to external economic shocks, underscoring the importance of diversification in the context of globalization.

In the context of India-ASEAN trade, several studies have analyzed trade patterns to identify challenges and opportunities for diversification. Mukherjee and Bhattacharya (2021) examined trade data and concluded that sectors such as pharmaceuticals, information technology services, and renewable energy technologies present significant untapped potential for diversification. Despite India's comparative advantages in these sectors, they remain underrepresented in trade with ASEAN countries.

Banik and Kim (2020) utilized the Revealed Comparative Advantage (RCA) index to assess India's export structure to ASEAN, finding a heavy reliance on traditional sectors like textiles and pharmaceuticals. They

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highlighted the need for India to diversify its exports to include more value-added products and services. Similarly, Pandey (2019) observed that while ASEAN countries offer a diversified range of imports to India, India's exports to ASEAN remain concentrated, leading to trade imbalances and limiting the potential for deeper economic integration.

Challenges to diversification have also been documented. Kumar (2019) pointed out structural constraints such as inadequate infrastructure, regulatory barriers, and policy mismatches that hinder the expansion of trade into new sectors. Ghoshal and Ghosh (2019) emphasized that over-reliance on a limited set of products increases vulnerability to external shocks, as evidenced during global economic crises when concentrated economies faced sharper downturns.

Empirical studies suggest that enhancing trade facilitation measures, investing in capacity-building programs, and improving connectivity are critical to overcoming barriers to diversification (UNESCAP, 2021). Gupta (2019) argued that by leveraging digital technologies and participating in regional value chains, India could significantly diversify its exports and strengthen its trade position in the ASEAN region.

Overall, the literature converges on the necessity of moving beyond traditional sectors to harness the full potential of India-ASEAN trade relations. Diversification not only enhances economic resilience but also aligns with broader goals of sustainable development and integration into global value chains.

Research Methodology

Research Design

The study employs a quantitative approach to analyze the dynamics of India-ASEAN trade relations, particularly focusing on trade diversification. The study is based on secondary data spanning 2011 to 2019, sourced from the International Trade Center (ITC), Geneva: Bilateral trade data. The choice of 2011 as the starting year ensures the inclusion of the full effects of the ASEAN-India Free Trade Agreement (AIFTA) implemented in 2010. The study avoids 2020 onward to exclude pandemic-related anomalies in global trade patterns.

Data Analysis Techniques

For the entire study period GDP, deflator will be used to covert nominal values into the real ones.

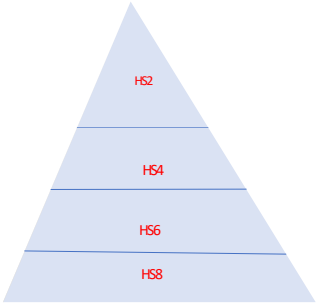
The formula of GDP deflator is as follows

$$GDP\ Deflator = \frac{\text{Nominal GDP}}{\text{Real GDP}} * 100$$

The formula to use GDP deflator to convert nominal values into a real value is as follows—

$$\text{Real Value} = \frac{\text{Nominal Value}}{\text{GDP deflator}} * 100$$

For the study, the commodities are chosen at HS 4-digit classification. The HS disaggregation level of commodities can be shown with the help of the following diagram



In the above diagram we can see that at further disaggregation level, the range of commodities under disaggregated classification goes wider and wider. The reason for choosing a higher aggregation level like HS 4 is because in such a case more commodity groups are covered and the analysis becomes more reflective. However, in HS 4 classification there are more than thousands of commodities or commodity groups so, practically tallying all the commodities is not feasible considering time and data constraints, so among the commodities, it is required to

choose only those commodities which reflected trade between India-ASEAN in a more promising way. Therefore, a proper choice mechanism requires for this purpose.

The mechanism that for the study is based on Yeates's (1997) Regional Intensity of Trade index. This index shows the intensity of trade between two parties for commodities relative to the rest of the world. The index lies between 0 and ∞, suggesting an index greater than 1, intensive nature of trade.

The index is as follows

$$R_k^{ij} = \frac{X_k^{ij}/X_k^i}{X^{ij}/X^i}$$

Where Xijk be country i 's exports of good k to country j, Xij refers to country i's all export to country j, Xik refers to country i's export of k to the world, Xi refers to country i's export of all commodities aggregate to the world.

This index can be computed from the import side as well.

Those commodities are selected both from the import and export side, which have been showing consistently an index over 1 for the study period, meaning that for the particular commodity, the trade is intensive so the commodity chosen under the criteria will be reflective of trade intensity between India-ASEAN. The list of the selected commodities is provided in annexure 1.

For calculating product diversification, Gini-Hirschman Index (GHI) is calculated. This index quantifies the concentration level of products or markets in a country's trade. The index is calculated using the following formula:

$$GHI = 100\sqrt{\sum_{j=1}^{n}(\frac{X_{jt}}{X_t})^2}$$

Where X_jt is the export (or import) value of a specific product j in period t.

X_t is the total export (or import) value in period t.

The GHI ranges from a minimum value 100/√n where n is the number of different products or markets, to a maximum value of 100, indicating extreme concentration (only one product or market). A high GHI value indicates high concentration and low diversification and low GHI value indicates low concentration and high diversification.

To determine whether there is any relationship between export/import value and GHI value the study undertakes the Pearson correlation coefficient (r) between export/import and GHI. This coefficient measures the strength and direction of the linear relationship between the two variables. The Pearson correlation is chosen because it provides a direct measure of the linear association, which aligns with the initial visual observations.

To determine whether the observed correlation is statistically significant, I have conducted a hypothesis test on the Pearson correlation coefficient:

Null Hypothesis (H0): There is no linear relationship

Alternative Hypothesis (H1): There is a linear relationship

To test the hypothesis t-test is used

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$$t_{n-1} = \frac{\bar{d}}{\sqrt{\frac{s^2_d}{n}}}$$

Where n-1 is the degrees of freedom

$\bar{d}$ is the mean of differences

s^2_d is the sample variance of the differences

n is the number of observations

Analysis of Product Diversification Patterns in India-ASEAN Trade

Export Diversification Analysis

India's exports to ASEAN (Table 4.1) show considerable volatility over the study period, declining from USD 18,676,865.9 thousand in 2011 to USD 14,456,888 thousand in 2019. The pattern isn't linear, with the lowest value recorded in 2015 (USD 11,674,053 thousand) followed by a recovery phase. This volatility in aggregate exports provides important context for understanding concentration patterns. Notably, the period coincides with shifts in export shares among ASEAN partners, suggesting ongoing realignment of trade relationships.

Table 4.1- India-ASEAN export during 2011-2019 (In USD thousands)

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Indian export to									
Brunei	643854.019	7604.74	9007.692	9464.413	14960.72	11557.4	20660.51	14156.78	12129.5
Cambodia	8638.28025	7997.045	15892.08	15164.52	22644.93	13724.34	9344.154	22885.34	14526.06
Indonesia	3628948.71	3156627	2769846	2182273	1379425	1550468	1413024	2104247	2419159
Laos	2753.15445	8657.307	13875.36	25255.78	17277.11	3477.662	1656.906	4916.771	5188.09
Malaysia	1389455.98	1585581	2503039	2380930	2625318	2222374	3158600	3907662	2851167
Myanmar	41431.0282	49371.63	27180.43	38649.15	33512.81	45989.43	127419.6	463927.2	227962.3
Phillipines	234764.54	223261.4	224013.3	357153	335172.5	391564.3	399475.4	405773.1	290907.2
Singapore	10626939.9	8958376	8790220	5826917	3884294	4254149	7886353	6445321	6347450
Thailand	572071.975	734316.1	935840.4	1024212	855428	652897.9	764082.2	885805.6	738537
Vietnam	1528008.33	1639309	2488650	2937572	2506020	2755656	3184291	2342610	1549863
Total	18676865.9	16371102	17777564	14797590	11674053	11901859	16964907	16597306	14456888

Source: Prepared by the author from ITC database

The volatility in export values might help explain the tendency toward concentration during growth periods. When export growth occurs in an uncertain environment, firms might focus on their most established products and markets, leading to higher concentration.

The analysis of India's export diversification to ASEAN reveals complex patterns characterized by significant country-specific variations.

Table 4.2- Year and country wise export diversification

	Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Brunei	GHI	95.9	69.21	70.23	71.54	74.5	68.4	69.29	67.2	66.31
Cambodia	GHI	40.08	42.95	46.32	43.59	41.19	42.3	40.82	49.3	38.66
Indonesia	GHI	66.97	51.33	58.82	52.68	44.93	30.3	30.17	33.1	35.25
Laos	GHI	68.49	97.25	91.41	72.26	73.57	44.9	49.59	69.4	52.89
Malaysia	GHI	39.8	35.19	48.18	48.27	43.17	39.6	55.67	67.1	53.02
Myanmar	GHI	64.96	54.22	34.28	29.5	28.85	29.6	49.93	64.5	51.87

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Philippines	GHI	42.15	40.82	41.03	53.68	53.24	57.9	58.76	59.4	56.35
Singapore	GHI	70.6	69.82	71.21	68.21	64.5	65.6	72.31	67.2	60.21
Thailand	GHI	35.3	40.45	42.31	43.11	41.3	40.4	41.61	42.3	38.61
Vietnam	GHI	45.5	44.45	52.41	55.22	52.3	51.5	53.56	49.3	48.41

Source: Prepared by the author

Brunei reveals extremely volatile export patterns, with the highest value recorded in 2011 (USD 643,854.019 thousand) followed by a dramatic decline (Table 4.1). The GHI values range from 66.31 to 95.85 (Table 4.2), indicating high concentration. This concentration is particularly evident in 2011, where 98% of exports were concentrated in commodities like HS codes 8428, 8430, 8901, 8905, 9002, and 9015.

Cambodia exhibits fluctuating export patterns without a clear trend. The GHI values range from 38.66 to 49.29 (Table 4.2), with the highest diversification observed in 2019. Notably, while 2018 saw the largest export value, it also showed the highest concentration (GHI: 49.3), demonstrating the trade-off between export growth and diversification.

Indonesia shows a notable trend toward improved diversification, with GHI values declining substantially from 66.96 in 2011 to 35.24 in 2019 (Table 4.2). The export pattern shows significant fluctuations (Table 4.1), with the highest value in 2011 coinciding with the highest concentration, suggesting successful later diversification efforts.

Laos demonstrates highly volatile export patterns with extreme concentration levels. GHI values range from 44.90 to 97.24 (Table 4.2), with 2012 showing the highest concentration where a single commodity (0202) accounted for 97% of exports.

Malaysia presents increasing concentration over time, with GHI values rising from 39.80 in 2011 to 53.01 in 2019 (Table 4.2). Table 4.2 shows significant export growth, particularly between 2016 and 2018, but this growth coincided with increased concentration, especially in commodity 2710.

Myanmar shows dramatic export growth, particularly during 2016-2018 (Table 4.1). The GHI values fluctuate significantly, ranging from 28.84 to 64.96 (Table 4.2), with the lowest concentration in 2015 followed by increasing concentration during the high-growth period.

Philippines demonstrates a general upward trend in exports (Table 4.1) with GHI values ranging from 40.82 to 59.43 (Table 4.2). The analysis shows an inverse relationship between export diversification and value, with higher exports typically accompanying higher concentration.

Singapore maintains the largest share of Indian exports to ASEAN but shows high concentration levels with GHI values between 60.21 and 72.31 (Table 4.2). Table 4.1 illustrates volatile export patterns, with concentration primarily in commodity 2710 (63-71% of exports).

Thailand maintains moderate diversification levels with GHI values ranging from 35.32 to 43.11 (Table 4.2). Table 4.1 shows steady export growth from 2011 to 2014, followed by fluctuations, with diversification levels remaining relatively stable.

Vietnam shows substantial export growth until 2017 followed by decline. GHI values range from 44.45 to 55.22 (Table 4.2), indicating moderate to high concentration levels correlating with export volumes.

The statistical analysis reveals a significant positive correlation ($r = 0.52$) between export values and GHI levels, with a t-statistic of 8.24 ($p < 0.001$) and a 95% confidence interval of (0.353, 0.655) as shown in Table 4.3.

Table 4.3 Pearson correlation result

Statistic	Value
Pearson Correlation Coefficient	0.52
t-Statistic	8.24
p-Value	<0.001
95% Confidence Interval	(0.353, 0.655)
Number of Observations	90

Source: Calculated by the author

The correlation coefficient of 0.52 suggests a moderate to strong positive relationship between export growth and concentration. The high t-statistic (8.24) and low p-value (<0.001) provide strong evidence against the null hypothesis of no relationship, indicating that the observed correlation is highly unlikely to have occurred by chance.

Import Diversification Analysis

India's imports from ASEAN (Table 4.19) show a more stable upward trend, increasing from USD 22,659,649.4 thousand in 2011 to USD 30,211,139 thousand in 2019. This represents a more consistent growth pattern compared to exports, with temporary declines only in 2015-2016.

Table 4.4- India-ASEAN import during 2011-2019 (In USD thousands)

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Indian import from									
Brunei	9.211666	6.780529	31.82656	2.402542	16.87736	30.33438	252.2692	927.3521	9.359185
Cambodia	6115.38076	5518.246	4024.245	3477.334	24391.66	21242.5	19280.31	15547.71	7817.925
Indonesia	10259250.3	11253355	12733603	13526861	12349707	11018720	14453210	14379079	12515495
Laos	55.4503613	164.8855	488.373	4591.695	29415.13	10774.36	12625.72	2399.041	955.413
Malaysia	4044066.91	5443295	4909523	5796675	6194833	5472345	5547986	5306384	6145741
Myanmar	1213416.76	1425508	1471553	1575182	1196594	1265111	847450.8	538813.4	509015.1
Phillipines	142093.695	153796.1	136804.1	167448.4	190326.4	168197.2	262749.1	256900.1	229558.2
Singapore	4281152.08	3064273	3165046	3353111	3669536	3445012	3448341	5720971	5583446
Thailand	2272005.8	2436971	2480855	2882739	2952849	2839240	3259786	3547423	2796158
Vietnam	441483.835	631328.1	838382.1	810343.1	932971.1	1227971	1424820	2020070	2422943
Total	22659649.4	24414216	25740311	28120431	27540640	25468644	29276502	31788513	30211139

Source: Prepared by the author from ITC database

The steady growth in imports aligns with the observed pattern of increasing diversification, suggesting that stable trade growth might facilitate product diversification.

As in the above table we can see that country Brunei, Cambodia and Laos had a very minimalistic share so from the analysis these three countries are excluded.

Table 4.5 Year and country wise import diversification

	Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Indonesia	GHI	47.5	46.8	46.2	45.7	46.3	47.1	45.1	45.3	46.1
Malaysia	GHI	35.8	34.26	36.57	35.56	35.3	36.1	36.61	35.9	35.52
Myanmar	GHI	48.5	48.26	47.51	45.11	69.3	67.1	71.37	73.6	74.41
Philippines	GHI	28.5	27.36	28.57	25.11	24.4	30.4	28.47	31.4	33.26
Singapore	GHI	51.6	40.01	30.33	25.26	25.4	22.4	21.57	20.4	21.26
Thailand	GHI	18.3	15.56	15.33	13.36	14.5	18.4	17.39	11.2	12.51
Vietnam	GHI	26.4	24.16	24.23	24.59	23.2	22.1	22.64	20.4	19.33

Source: Prepared by the author

Indonesia as the largest import source, maintains stable diversification with GHI values between 45.10 and 47.50 (Table 4.5). Table 4.4 shows consistent import growth with occasional fluctuations, demonstrating stable diversification despite volume changes.

Malaysia shows relatively stable diversification with GHI values ranging from 34.26 to 36.61 (Table 4.5). Table 4.4 illustrates fluctuating import patterns, with diversification generally improving during periods of import growth.

Myanmar demonstrates declining import trends (Table 4.4) with increasing concentration, as shown by rising GHI values from 45.11 to 74.41 (Table 4.5).

Philippines maintains high diversification levels with GHI values between 24.36 and 33.26 (Table 4.5). Table 4.4 shows overall import growth with fluctuations, accompanied by relatively stable diversification.

Singapore shows dramatic improvement in import diversification, with GHI values declining from 51.61 to 21.26 (Table 4.5). Table 4.4 illustrates significant import volatility, particularly the sharp increase in 2018.

Thailand emerges as the most diversified import source with remarkably low GHI values ranging from 11.23 to 18.44 (Table 4.5). Table 4.4 shows steady import growth with high diversification maintained throughout.

Vietnam demonstrates consistent diversification improvement with GHI values declining from 26.43 to 19.33 (Table 4.5), alongside strong and consistent import growth.

The import analysis reveals a contrasting pattern with a significant negative correlation ($r = -0.65$) between import values and GHI levels, supported by a t-statistic of -5.83 ($p < 0.001$) and a 95% confidence interval of (-0.75, -0.55) as shown in Table 4.6.

Table 4.6 Pearson correlation result

Statistic	Value
Pearson Correlation Coefficient	-0.65
t-Statistic	-5.83
p-Value	<0.001
95% Confidence Interval	(-0.75, -0.55)
Number of Observations	63

Source: Calculated by the author

The correlation coefficient of -0.65 indicates a strong negative relationship between import growth and concentration. The t-statistic of -5.83 and p-value <0.001 provide robust evidence of a significant negative relationship between import values and concentration levels.

4.3 Statistical Validation and Implications

The contrasting statistical relationships between trade volumes and diversification in exports and imports provide crucial insights into the dynamics of India-ASEAN trade. These opposing patterns suggest fundamental differences in how export and import relationships evolve within the India-ASEAN trade framework.

The tendency toward concentration in exports (positive correlation) likely reflects several underlying factors. First, as export volumes grow, Indian firms appear to specialize in products where they have established competitive advantages. This is particularly evident in the case of Singapore, where commodity 2710 dominates the export basket, accounting for 63-71% of exports. Such specialization might result from economies of scale, established market networks, or specific bilateral trade arrangements. The pattern is also visible in Malaysia's case, where increasing export values coincided with rising GHI values from 39.80 in 2011 to 53.01 in 2019.

The concentration tendency in exports might also reflect market access barriers or specific demand patterns in ASEAN countries. For instance, the high concentration in exports to Brunei suggests limited market penetration across diverse product categories. This could be due to competitive pressures, non-tariff barriers, or specific market requirements that favor certain product categories over others. As Goreczky, 2022 studied that market-specific demand, regulatory barriers, or established trade networks, limits India's role in ASEAN's supply chains concentrating in few products and sectoral engagement.

In contrast, the negative correlation in imports suggests that increased import volumes facilitate greater product diversification. This pattern might emerge from several mechanisms. First, higher import volumes likely indicate broader engagement with ASEAN suppliers across different industries. Thailand's case exemplifies this,

maintaining remarkably low GHI values despite substantial import growth. This suggests that as trade relationships mature, Indian importers become more adept at sourcing diverse products from ASEAN markets.

The import diversification pattern might also reflect the success of trade liberalization under AIFTA in reducing barriers across multiple product categories. Singapore's dramatic improvement in import diversification, with GHI values declining from 51.61 to 21.26 demonstrates how reduced trade barriers can facilitate diversification. Similarly, Vietnam's consistent improvement in import diversification alongside strong import growth suggests that newer trade relationships can develop in a more diversified manner under the current trade regime. Earlier research also found that maintaining open trade policies may suffice to sustain healthy import diversification, as evidenced by the success of partners like Thailand and Vietnam (Bhowmik, 2019).

The asymmetry between export and import diversification patterns has important implications for trade policy. The natural tendency toward export concentration suggests that achieving export diversification may require targeted interventions. These could include:

- Export promotion in non-traditional product categories
- Development of new competitive advantages across different industries
- Addressing specific market access barriers in ASEAN countries
- Support for smaller exporters to enter ASEAN markets

Conversely, the organic improvement in import diversification suggests that maintaining open trade policies and reducing trade barriers might be sufficient to maintain healthy import diversification. The success stories of Thailand, Singapore, and Vietnam in maintaining or improving import diversification provide models for enhancing trade relationships with other ASEAN partners.

These statistical relationships therefore reveal not just patterns in trade data, but fundamental aspects of how India-ASEAN trade relationships evolve. The tendency toward export concentration appears to be a structural feature of the current trade relationship, possibly reflecting both market forces and policy constraints. Meanwhile, the consistent pattern of import diversification suggests that the institutional framework of AIFTA may be more effective at facilitating diverse import relationships than at promoting export diversification.

Diversification trend post AIFTA period

The temporal analysis of India-ASEAN trade diversification reveals distinct evolutionary patterns characterized by notable asymmetry between export and import trajectories during 2011-2019. The empirical evidence demonstrates that export diversification has largely stagnated or deteriorated, while import diversification has exhibited consistent improvement across most trading partnerships.

The historical trajectory of export diversification presents concerning patterns, evidenced by the significant positive correlation ($r = 0.52$, $p < 0.001$) between export growth and concentration. This statistical relationship indicates a structural tendency toward higher concentration as trade volumes increase, suggesting a systematic deterioration rather than progression in export diversification over time. This pattern is particularly pronounced in India's relationship with Singapore, its largest export destination, where concentration levels remained persistently high with GHI values ranging from 60.21 to 72.31. However, some relationships demonstrate potential for diversification. Indonesia presents a notable exception, showing substantial improvement in export diversification with GHI values declining from 66.96 to 35.24. This successful case suggests that structural barriers to diversification can be overcome under appropriate conditions. Conversely, smaller trading partners like Brunei and Laos exhibited extreme concentration levels, with GHI values reaching 95.85 and 97.24 respectively, highlighting the particular challenges faced in developing diversified trade relationships with smaller economies.

In contrast, import diversification demonstrates more positive historical development, characterized by a significant negative correlation ($r = -0.65$, $p < 0.001$) between import values and concentration. This relationship suggests that import partnerships naturally diversify as they mature. Thailand exemplifies this pattern, maintaining consistently high diversification with GHI values between 11.23 and 18.44. Similarly, Singapore's import relationship showed substantial improvement, with GHI values declining from 51.61 to 21.26, while Vietnam demonstrated steady diversification progress as GHI values fell from 26.43 to 19.33.

Barriers to trade diversification

Structural impediments emerge from established trade networks and economies of scale, exemplified by the dominance of specific commodities such as product code 2710 in Singapore exports. These entrenched patterns create path dependencies that resist diversification efforts, a phenomenon consistent with previous studies indicating that India's exports to ASEAN are characterized by limited structural changes and a focus on a narrow range of high-volume products (Gulnaz and Manglani, 2023). Market access barriers, including non-tariff measures and regulatory requirements, further compound these challenges, as seen in high export concentration levels to countries like Brunei. Such constraints reflect similar findings that emphasize the restrictive impact of non-tariff measures on India's ability to fully capitalize on export potential to ASEAN nations (Khati and Kim, 2022).

Policy-related asymmetries are evident in the differential impact of the ASEAN-India Free Trade Agreement (AIFTA) on export and import diversification. While AIFTA has effectively facilitated diverse import relationships, it has struggled to promote export diversification. This reflects broader patterns identified in the literature, where FTAs significantly reduce import costs but have a less pronounced impact on exports, partly due to entrenched comparative advantages and market-specific demand preferences (Trung etc., 2018). Market dynamics also exacerbate these challenges, as competitive pressures and entrenched preferences for specific export categories limit diversification opportunities (Joseph and Hari, 2019).

The findings suggest that while import diversification progresses organically within the existing institutional framework, export diversification requires targeted policy interventions. Successful import diversification, as seen in the ASEAN context, underscores the institutional effectiveness of AIFTA. However, persistent challenges in export diversification point to structural barriers and policy gaps, such as limited market access and insufficient export promotion measures, that require immediate attention (Mondal and Sirohi, 2016)These insights highlight the need for tailored strategies that balance maintaining liberalized import regimes with addressing unique barriers to export diversification, providing a framework for enhancing trade resilience and diversification patterns.

Conclusion and Policy recommendation

This study examines trade diversification patterns between India and ASEAN during 2011-2019, revealing significant asymmetries in the evolution of export and import relationships post-AIFTA implementation. The empirical evidence demonstrates a concerning trend in export diversification, characterized by a significant positive correlation ($r = 0.52$, $p < 0.001$) between export growth and concentration. This relationship suggests a structural tendency toward increased concentration as export volumes grow, particularly evident in major trading relationships such as with Singapore, where concentration in specific commodities persists at high levels (GHI: 60.21-72.31).

Conversely, import relationships demonstrate a more favorable trajectory, evidenced by a significant negative correlation ($r = -0.65$, $p < 0.001$) between import values and concentration levels. This pattern suggests that import relationships naturally diversify as they mature, exemplified by Thailand's consistently low GHI values (11.23-18.44) and Singapore's substantial improvement in import diversification (GHI declining from 51.61 to 21.26). The contrasting patterns indicate that while AIFTA has effectively facilitated diverse import relationships, its impact on export diversification has been limited.

The findings identify several critical barriers to export diversification, including structural impediments from established trade networks, market access barriers, and policy-related constraints. The persistence of high concentration in exports to smaller ASEAN economies (e.g., Brunei's GHI reaching 95.85) highlights the particular challenges faced in developing diversified trade relationships with emerging markets. However, success stories like Indonesia's improvement in export diversification (GHI declining from 66.96 to 35.24) suggest that these barriers can be overcome with appropriate policy interventions.

Based on these findings, several policy interventions emerge as crucial for enhancing trade diversification. First, policymakers should focus on developing comprehensive export promotion mechanisms that specifically target non-traditional product categories and emerging sectors. This approach should be complemented by market intelligence systems that can identify and capitalize on new export opportunities within ASEAN markets. Second, regulatory harmonization emerges as a critical area for policy intervention. The study suggests that streamlining compliance procedures and enhancing transparency in non-tariff measures could significantly facilitate export diversification. This should be pursued through bilateral and multilateral mechanisms within the AIFTA framework. Third, supply chain integration requires strategic policy attention. The analysis indicates that deeper integration into ASEAN value chains could enhance export diversification. This necessitates policies that promote investment in export-oriented manufacturing facilities and strengthen logistics linkages with ASEAN countries.

The success of import diversification in countries like Thailand and Vietnam provides valuable models for such integration. Fourth, institutional support frameworks need strengthening, particularly for SME exporters entering ASEAN markets. The evidence suggests that smaller firms face significant barriers in diversifying their export baskets, indicating the need for specialized financing schemes and capacity-building programs focused on new export sectors. Fifth, technology and innovation support emerges as a crucial policy area. The findings indicate that sectors with higher technological content show greater potential for diversification. Therefore, policies should promote technology adoption in export-oriented industries and facilitate collaboration with ASEAN partners in emerging sectors.

The study's findings contribute significantly to the literature on regional trade integration by highlighting the asymmetric impacts of trade agreements on export and import diversification. The evidence suggests that while import diversification may progress naturally under liberalized trade regimes, export diversification requires more targeted and comprehensive policy interventions. This understanding is crucial for policymakers seeking to enhance the effectiveness of regional trade agreements in promoting balanced and diversified trade relationships.

Future research could explore sector-specific dynamics of diversification and the role of global value chains in shaping trade patterns between India and ASEAN. Additionally, investigating the specific mechanisms through which successful cases like Indonesia achieved improved export diversification could provide valuable insights for policy formulation.

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