



**REGIONAL VALUE CHAINS:
OPPORTUNITIES FOR INDIA
AND ASEAN?**

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Abstract

The literature on backward and forward linkages in global value chains (GVCs) explores the interconnectedness of production processes across different stages and locations within the global economy. The significance of imports in value chains, however, is relatively unexplored. Recognizing imports' role in bolstering exports can rejuvenate external demand and spur growth. To examine Indian imports from ASEAN, we utilize the ARDL bounds test for 2011-12 Q1 to 2020-21 Q2. The results reject the null hypothesis of no level relationship between ASEAN imports and other variables. Notably, the positive long-run coefficient of export logs suggests a favourable impact on Indian imports from ASEAN, while the negative COVID-19 dummy coefficient indicates pandemic-induced import setbacks.

Keywords: Imports, exports, import demand function, COVID-19, global value chains

JEL classification: F14, F15, F23

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Regional value chains: Opportunities for India and ASEAN?*

Saon Ray and Vasundhara Thakur

1. Introduction

The decline in world trade during the lockdown in April and May 2020 was nearly as severe as the collapse experienced in January 2009 during the global financial crisis (WTO, 2023). While the global financial crisis in late 2008 and early 2009 saw a greater dip in the exports of emerging economies than in 2020, a notable difference was observed in the impact on different countries. The pandemic's effect on global demand and the subsequent disruption in world trade was widespread across regions, leading to an 8.8 percent decline in export volume and an 8.5 percent decline in import volume in 2020 (based on data for January to May of a year, over the previous year) (UNCTAD, 2020). The Euro area showed the largest decline in the volume of its exports and imports (UNCTAD, 2020). An important difference with the global financial crisis was that developed countries were hit more badly by the pandemic. The East Asian region, initially hit by the pandemic, also became the first to recover. Countries like China, rebounded faster, highlighting the role of global supply chains.

Global value chains (GVCs) refer to the organization of production such that part of the process is completed in one or more countries (Gereffi and Lee, 2012). Backward and forward linkages are important in this context. Backward linkages refer to the relationships between firms involved in earlier stages of production, such as raw material extraction or component manufacturing, and those in later stages, such as assembly or distribution. These linkages involve the flow of inputs and components upstream along the value chain. Forward linkages, on the other hand, involve connections between firms in later stages of production and those in earlier stages or downstream activities. This includes relationships between manufacturers and retailers, wholesalers, or consumers.

Research on backward linkages examines factors influencing the development and strength of backward

linkages, including supplier networks, technology transfer, and investment incentives. Understanding backward linkages is crucial for analyzing industrial development, trade patterns, and economic growth dynamics. On the other hand, in the case of forward linkages, the literature investigates factors affecting the integration of production processes, distribution channels, and market access. It examines how firms coordinate activities, manage distribution networks, and respond to consumer preferences to capture value along the chain. The importance of imports of countries through their participation in value chains, either through intermediate imports (embodied in exports (backward linkages)) or through imports (embodied in partners' exports, and the final demand (forward linkages)) (UNCTAD, 2020), is less investigated.

Member states of the ASEAN have embraced GVCs, their participation has grown and the region has positioned itself as a key global production hub (Lopez Gonzalez, 2016). However, South Asia has the smallest share of foreign value-added in exports due to the significance of service exports, which typically use fewer foreign inputs. Further, recognizing the importance of imports to boost exports can help recover some external demand and boost growth. Given this context, we estimate the import demand function for Indian imports from ASEAN using the ARDL bounds test for the period 2011-12 Q1 to 2020-21 Q2. The results indicate rejection of the null hypothesis of a no-level relationship between the imports from ASEAN and the other explanatory variables considered. Secondly, the long-run coefficient of log of exports is positive whereas that of the COVID-19 dummy is negative thereby implying a positive influence of India's aggregate exports on Indian imports from ASEAN and the adverse effect of the pandemic on Indian imports from ASEAN.

The paper is organized in the following way: section 2 discusses the literature on GVC integration and imports, measuring GVC integration, and the

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importance of imports for GVC integration. Section 3 reviews India's trade with the ASEAN countries. Section 4 discusses India's GVC integration and import policy. In Section 5, the literature on the import demand function is discussed briefly. Section 6 presents the methodology used in the paper – the ARDL bound test. In Section 7, we discuss the results of the empirical exercise conducted in the paper. Section 8 concludes.

2. Literature survey

GVC integration and imports

Over the past 25 years, the proportion of trade involving parts and components among developing nations has surged by more than fourfold (WTO, 2014). Intermediate inputs now constitute up to two-thirds of global trade, according to findings by Johnson and Noguera in 2012. Additionally, there has been a notable rise in imported parts and components embodied in exported goods (Feenstra, 1998). As Koopman et al. (2014) show, gross exports consist of domestic value-added and foreign value added and the role of intermediate imports is very important in estimating gross exports. The value and share of exports dependent on GVCs can come from upstream links (foreign value-added in exports) or downstream links (exports incorporated in other products and re-exported). All countries engage in both backward and forward participation, however, as Kowalski et al. (2015) point out the policy implications of whether they are engaged through backward or forward chains could be different. The traditional way of examining imports and exports ignores the logic of value-added trade. Trade policy needs to consider domestic stakeholders who support liberalization (since exporters of intermediate goods which are embodied in imported final goods favour lower tariffs on those final goods) and exporters also want (due to foreign value added in exports) to liberalise imports of intermediates (Johnson, 2014).

Taglioni and Winkler (2016) highlight that when countries import parts for local assembly and sales, they effectively absorb foreign technology and expertise, termed as 'import to export' (I2E) by Baldwin and Lopez-Gonzalez (2013). This practice enriches the skill set within the country. As nations increasingly rely on imported inputs for processing and subsequent export, their dependence on foreign inputs, measured by the share of foreign value added in gross exports, has grown. Consequently, many

countries have witnessed a significant increase in domestic value added embodied in gross exports, at par with increasing foreign sourcing. Taglioni and Winkler (2016) emphasize that "imports matter as much as if not more than, exports," as the flows of goods, services, people, ideas, and capital are interdependent.

The role of imports in measuring GVC participation is often overlooked. Kowalski et al. (2015) demonstrate a positive change in domestic value added in exports across 152 countries due to favorable foreign sourcing, varying with the income level. For high-income countries, the per capita domestic value added in exports is driven by the sophistication of primary and non-primary intermediates. In low-income countries, the sophistication of non-primary intermediates matters the most. Countries with high backward engagement tend to exhibit lower forward participation and vice versa, indicating a correlation coefficient of -0.43. This suggests that tailored policy recommendations are necessary based on a country's primary integration direction. FDI openness and GVC backward participation are closely related.

Ossa (2015) argues that certain industries heavily depend on imports for economic functioning, highlighting the significant costs associated with a complete shutdown of international trade. He advocates for considering a country's reliance on trade and the upstream industry's role in producing a downstream industry when estimating trade gains, proposing frameworks based on Armington's (1969) and Eaton and Kortum's (2002) models to address productivity differences between domestic and imported goods efficiently. International productivity differences are so large in some industries that replacing efficiently produced imports with inefficiently produced domestic substitutes in these industries would imply extreme costs.

Measuring GVC integration

A significant portion of exports from developed nations consists of value-added exports, which rely on imports. The European Union (EU) economy, known for its high integration, contributes to over 70 percent of exports originating from the EU. Conversely, Japan and the United States have a relatively smaller proportion of foreign value-added content in their exports (UNCTAD, 2013). The development of value chains has been uneven, with only a few emerging economies leading in the supply of intermediate

inputs and final assembly (Pomfret and Sourdin, 2016). Countries can integrate their domestic firms into GVCs in two main approaches: exporting to international buyers or through domestic final producers that import intermediate goods for final production.

Developing nations exhibit an even lower proportion of foreign value-added content in their exports. Among developing countries, those in East and Southeast Asia and Central America, including Mexico, demonstrate the highest share of foreign value-added content. India, on the other hand, is not well integrated with global value chains (Ray and Miglani, 2018).

Several elements of policy determine participation in GVCs: these include regional trade agreements; investment barriers to multinational corporations; infrastructure development; speed and flexibility of movement of physical goods and information; effectiveness of legal and regulatory systems; efficiency of services; a skilled workforce; friendliness of the business climate; and capacity of domestic firms (often SMEs) to contribute to the supply chain (OECD, 2013). Other factors include border administration, market access barriers, and transport logistics (WEF, 2013).

Countries in the upstream position of global value chains primarily produce raw materials or provide knowledge, such as research and design, at the initial stages of the production process. Conversely, countries in the downstream position specialize in assembling processed products and offering customer services. Upstream activities like research and development (R&D) and design, along with certain services, often generate higher value compared to assembly functions (OECD, 2013).

The participation of a country in GVCs is measured in two ways: first, through backward or forward participation, and second, through the length of its chains in specific industries. Gross exports have three parts: value-added exports, domestic content in intermediate exports that finally return home, and

foreign content.¹ The higher the foreign value-added embodied in gross exports, the higher the value of inputs exported to third countries and used in their exports, and the higher the participation of a given country in the value chain.² Countries participate in chains either through intermediate imports embodied in exports which captures the backward linkage or through forward linkage. The backward linkage is captured through transactions in which a country's exports embody value added that has been imported from abroad (Antras, 2019). Forward linkages are captured through transactions (which are not fully absorbed in the importing country) embodied in the importing country's exports to third countries (Antras, 2019). Overall, the literature on backward and forward linkages in GVCs provides insights into the complex relationships and interactions shaping global production networks. It highlights the importance of understanding these linkages for enhancing efficiency, competitiveness, and sustainable development in the global economy.

Alternatively, Fally (2011) suggested that the distance to final demand be calculated³ using the concept of length of the chain when looking forward. Fally (2011) has introduced a measure of "upstreamness" that we can refer to as the "distance to final demand."

What you import matters

Colantone and Crino (2013) investigate the impact of new imported inputs on the introduction of new domestic products across 25 European countries from 1995 to 2007. Utilizing a dataset on domestic production and bilateral trade, they employ an endogenous growth model that accounts for heterogeneous input quality. Their findings reveal three key outcomes: first, new imported inputs significantly stimulate product creation in Europe; second, this effect operates through various mechanisms, enhancing access to a broader and higher-quality range of intermediate products; finally, the introduction of new imported inputs substantially boosts output growth in the manufacturing sector.

Kasahara and Rodrigue (2008) analyze the influence of

1 GVC participation index is obtained by adding the FV and IV shares. Foreign Value Added (FV) is the measure of value-added from foreign sources embodied in a country's gross exports. Domestic value-added can be further decomposed into exported final goods, exported intermediates absorbed by direct importers, exported intermediates that return home and (IV). Indirect value-added exports (IV) is the value-added embodied as intermediate inputs in third countries' gross exports (Koopman et al., 2014).

2 An alternative way of looking at GVC participation is upstream links (by looking back along the value chain and measuring foreign inputs/ value added that are included in a country's exports) or downstream links (by measuring the domestic inputs/ value added of a country contained in a country's exports of other countries by looking forward in the chain) (OECD, 2013).

3 $D_i k = u \cdot (I - G)^{-1}$, where $D_i k$ is the index for industry k in country i , u is the unit vector, I is the identity matrix and G is the Gosh inverse.

importing intermediate goods on plant performance using Chilean manufacturing panel data, addressing the challenge of simultaneous productivity shocks and import decisions. They find that incorporating foreign intermediates enhances productivity.

Amiti and Konings (2007) leverage Indonesian manufacturing census data from 1991 to 2001 to assess the effects of trade liberalization on plant productivity. They distinguish between productivity gains resulting from reduced tariffs on final goods versus those from intermediate inputs. Lowering input tariffs induces tougher import competition, while cheaper imported inputs elevate productivity through learning, variety, and quality enhancements. Their analysis indicates that a 10-percentage-point reduction in input tariffs yields a productivity increase of 12 percent for firms importing inputs, surpassing gains from reducing output tariffs.

Antras et al. (2017) argue that firms opt to import to lower their marginal costs. They contend that foreign sourcing decisions are interdependent across markets, complicating both theoretical modeling and empirical estimation. Through their research,

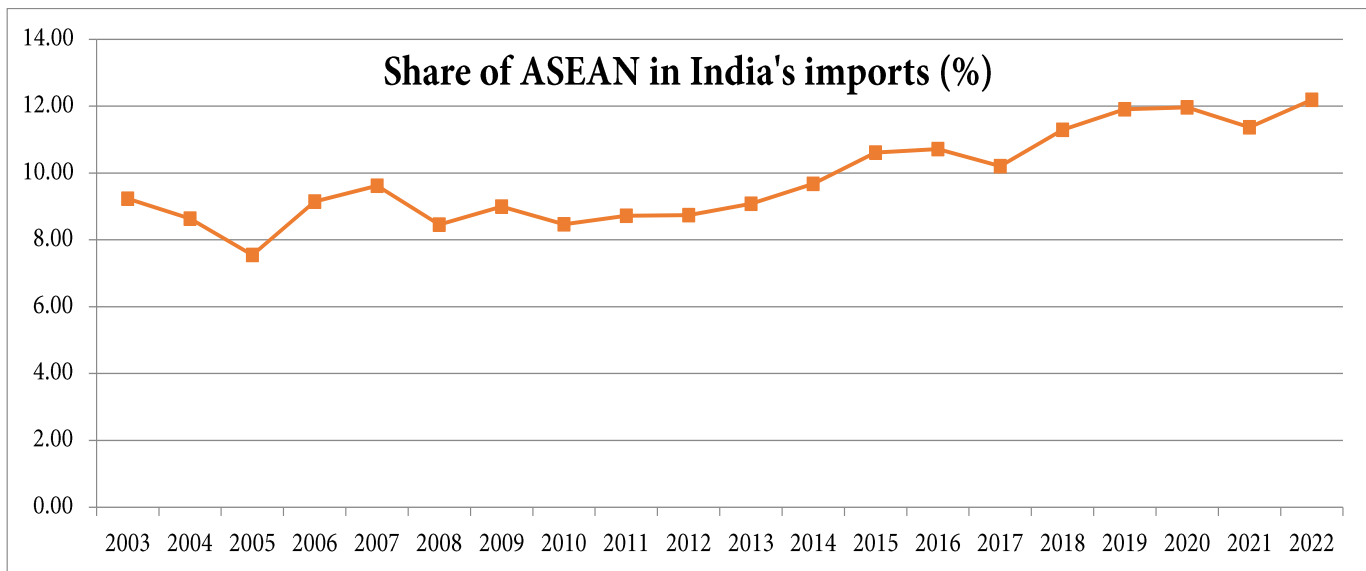
they estimate the fixed costs and sourcing countries associated with imports by the US, highlighting India's high sourcing potential and fixed costs relative to countries like France and Canada.

3. India's trade with ASEAN

India and the Association of South East Nations (ASEAN) signed a Free Trade Agreement (FTA) which came into force on 1 January 2010.⁴ From India's point of view, ASEAN is an important trading partner with increased imports coming to India from the ASEAN countries. From the ASEAN perspective, India's importance in its imports is small but increasing. Both partners would be interested in increasing their share in each other's market and there are implications of tariff reduction that have been committed under the agreement (Ray, 2021).

Figure 1 captures how the share of ASEAN in Indian imports has been increasing steadily. Figure 2 shows the share of exports of India to ASEAN, which has shown a marginal increase from 8 % 2003 to less than 10% in 2022.

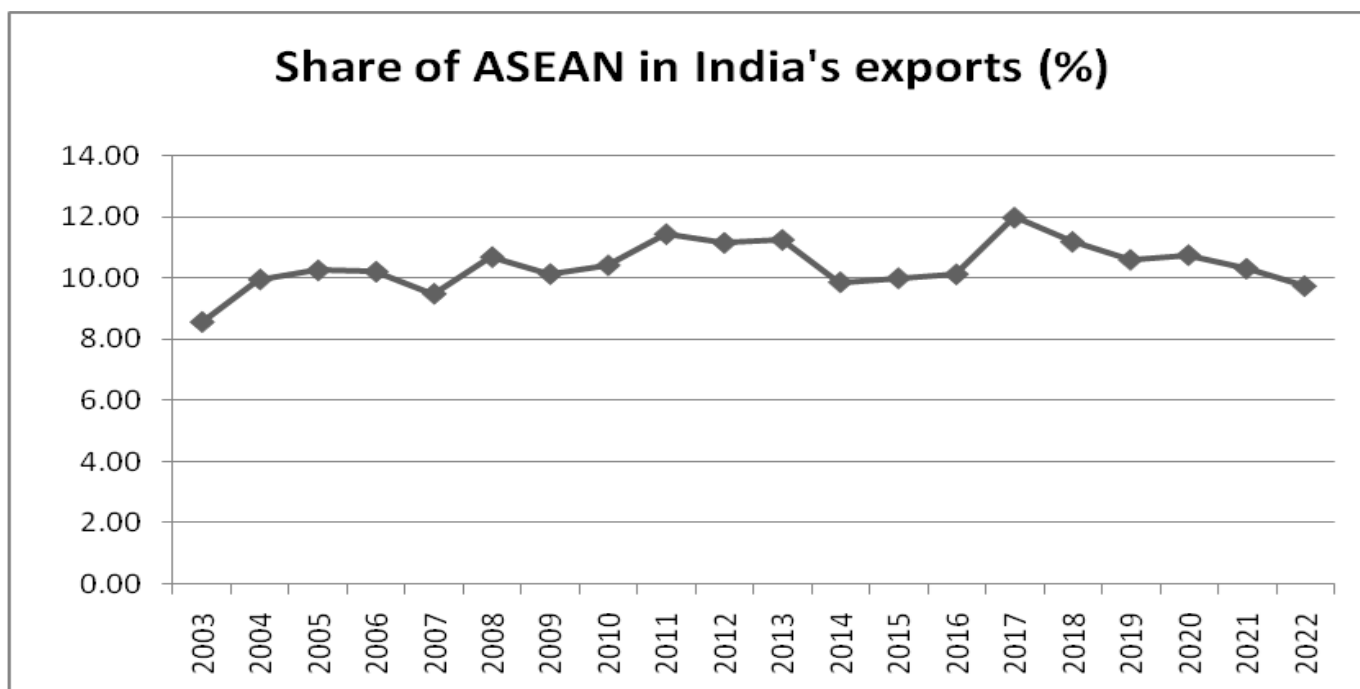
Figure 1: ASEAN's share in Indian imports (2003 to 2022)



Source: ITC Trade Map, based on WITS UN Comtrade and DGCIS database

⁴ Press Trust of India, "Review of India-ASEAN Goods Agreement to help realise trade potential: Puri", Business Standard, August 4, 2020, https://www.business-standard.com/article/economy-policy/review-of-india-asean-goods-agreement-to-help-realise-trade-potential-puri-120080401562_1.html

Figure 2: ASEAN's share in Indian exports (2003 to 2022)



Source: ITC Trade Map, based on WITS UN Comtrade and DGCIS database

Examining the products in detail, Jena and Saini (2020) note that in 2016-17, Coke, Refined Petroleum Products and Nuclear fuel, Basic Metals and Fabricated Metal Products, Transport Equipment, Food Products, Beverages and Tobacco accounted for 60 percent of India's total exports to ASEAN; while Coke, Refined Petroleum Products and Nuclear fuel, Food Products, Beverages and Tobacco, Electrical and Optical Equipment and Basic Metals and Fabricated Metal Products accounted for 60 percent of India's imports from ASEAN.

4. India's GVC integration and import policy regime

India's linkages with GVCs

India's backward participation rate was 22 percent and the forward participation rate was 19 percent in 2009 (OECD, 2013). The foreign value-added content of India's exports decreased from 25.1 percent in 2011 to 16.1 percent in 2016. The share of imported intermediate inputs embodied in exports has

increased in manufacturing and much of the decline is due to a decline in the imported intermediate content in services. OECD (2018) highlights the importance of imports for exports – for India, the industries with the most foreign value-added content in their exports were Coke and Refined Petroleum (47 percent), Basic Metals (38 percent), and Information and Communication Electronics (36.8 percent). This is consistent with the broad patterns of imports that we discuss below.

Broad Economic Classification

Ray and Miglani (2021) use Broad Economic Categories (BEC) to analyse India's imports patterns by these three classes of goods over the period 2008-2017. The BEC is a three-digit classification, that groups transportable goods according to their main end use.⁵ The BEC classification can be used to categorise goods into intermediate goods, final goods, and capital goods. Ray and Miglani (2021) observe that imports of intermediate goods account for 83 percent of total imports by India in 2017 compared

5 The BEC classification groups goods into 19 categories. Of these, 16 basic categories make up the three broad end use categories. The Broad Economic Categories classification was introduced by the UN statistical Commission in 1961. There have been 4 revisions to BEC since 1961 mainly coinciding with revisions to Standard International Trade Classification (SITC). The fifth revision of BEC was endorsed for international use by UN Statistical Commission in March 2016 (BEC5), but the trade data is not yet available and concordances between BEC and HS have not yet been developed. Therefore, BEC4 is used to analyse the Indian trade patterns. This paper uses data for 10 years 2008-2017. Data is extracted from the UNCOMTRADE website using HS2007 and BEC4 Concordance for the years 2009-2017 while the data for the year 2008 is extracted using HS2002 and BEC4 concordance.

to 82 percent of imports in 2008.⁶ Thus, there is not much of a change in the import pattern of India as far as intermediate goods are concerned. Imports of final goods and capital goods made up 6 percent and 11 percent respectively in 2017 compared to 3 percent and 15 percent in 2008. The compound annual growth rate of total Indian imports is 0.99 percent over the period 2008-2017. There is a fall in the imports of capital goods by 1.36 percent whereas the growth is positive for intermediate and final goods across this period.⁷

Import policy

India followed a restrictive trade policy for many years after its independence and then liberalized its regime in 1991. Before 1991, India had a policy of import licensing applicable to all consumer goods, textile fabrics, and most agricultural products. In the liberalization initiated in 1991, not only were tariffs rationalized by India to a large extent thus permitting the imports of several products, but quantitative restrictions were phased out in the nineties. Before 1991 India's tariff was one of the highest in the world and in 1988 when they peaked, they averaged between 120 and 140 percent. Many inputs could not be imported before 1991 due to this restrictive regime.

Goldberg et al. (2009) demonstrate a significant surge in India's overall imports from 1987 to 2000, with real imports soaring by 130 percent. This increase was primarily driven by a substantial increase in intermediate imports, which surged by 227 percent, while final goods experienced a more modest rise of 90 percent. Notably, two-thirds of the rise in imported inputs comprised products not previously imported before the reforms. Key non-oil imports included mineral products, chemical products, and machinery and mechanical equipment. These new imported inputs largely originated from more technologically advanced countries. The study suggests that India's trade liberalization eased technological constraints for domestic firms under import substitution policies. In a subsequent study, Goldberg et al. (2010) employ detailed trade and firm-level data from India to

explore the link between declines in trade costs, imports of intermediate inputs, and the product scope of domestic firms. They estimate substantial static gains from trade resulting from access to new imported inputs, with the introduction of new imported varieties contributing to an additional 4.7 percent reduction in the import price index for intermediate goods annually. Lower input tariffs, on average, accounted for 31 percent of new products introduced by domestic firms, indicating potential dynamic gains from trade. The expansion of firms' product scope was primarily driven by increased access to new input varieties rather than solely by cost reductions of existing imported inputs. The study suggests that input tariff liberalization played a crucial role in relaxing technological constraints for firms by facilitating access to new imported inputs previously unavailable.

Import Tariffs

WTO (2021) assessed India's trade policy regime and provided a comprehensive assessment of India's trade policies and practices. It evaluates India's trade regime, covering areas such as trade policies, regulatory frameworks, and market access conditions. The basic tariff structure has remained unchanged since 2015. However, following the adoption of the GST in 2017, the additional duties and special additional duties previously added to the basic tariff were removed. The introduction of the GST has been a major change regarding other duties and charges affecting imports. The GST, which replaced several taxes, applies to both domestic and imported goods.

The simple average MFN tariff rate rose to 13% in 2014-15, up from 12% in 2010-11. This reflects a rise in tariffs in agriculture, particularly for cereals and preparations thereof, oilseeds and fats, and sugars and confectionery. India's applied tariff has increased to an average of 17.6% in 2019 from 13.5% in 2014. Trade-weighted average tariff rose from 7% to 10.3% between 2014 and 2018.⁸ The foreign trade policy of India was revised in 2023 and streamlined many procedures related to exports and imports of goods.⁹ Certain inversion of duties have also been corrected.¹⁰

6 Ray and Miglani (2018) analyse the shares of imports goods in terms of the BEC categories from 2009-15. They find that in the category Food and Beverages (BEC 1), primary intermediates account for 0.08 percent, while consumption account for 1.19 percent. Processed intermediate products account for 2.36 percent while consumption account for 0.18 percent. In the category, Industrial supplies not elsewhere specified (BEC 2), primary intermediates accounted for 7.93 percent while processed intermediates accounted for 31.20 percent. Fuel and lubricants (BEC 3) accounted for 35 percent, of which intermediates was about 3 percent. In the category, Capital Goods (except transport equipment) and parts and accessories thereof (BEC 4), the share of capital goods was 9.57 percent, while that of intermediates was 6.27 percent. Finally, among Transport Equipment and parts and accessories thereof (BEC 5), the share of intermediates is 2.31 percent. Adding all the intermediates across the BEC categories, their share in total imports of India, in 2009-15, is more than 51 percent. Hence the share of consumption goods in total imports is less than 10 percent.

7 OECD (2018) observe that the share of imported intermediate inputs embodied in exports has increased for most manufactured goods during 2005-2015.

8 <https://www.financialexpress.com/economy/policy-reversal-import-tariffs-up-4-pps-since-2014-seem-rising-further/2021775/>

9 <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1912572#:~:text=The%20FTP%202023%20is%20facilitating,abling%20merchanting%20trade%20from%20India.&text=Greater%20faith%20is%20being%20reposed,approvals%20in%20the%20new%20FTP.>

10 *ibid*

India's sourcing patterns of imports have also changed in the last nineteen years. The most noticeable change has been the growing importance of China in India's imports from a mere 2 percent in 1995 to 16 percent in 2017. Ray and Miglani (2021) show that since 2007, India's exports have increased significantly in two categories: chemicals and vehicles. In imports, India has significantly increased its share of chemicals, stone, machinery, and electronics in 2017 compared to 2007. Gross exports of goods increased from \$166 billion in 2007 to \$297 billion in 2017, and the country had a trade deficit in all the years till 2019. Looking at the imports of India in the years 2016-2018, 40 items constituted 51 percent of total imports in 2016 and 57 percent of total imports in 2018. Petroleum products dominate the consumer goods segment in all years, and petroleum and diamonds dominate the raw materials. The imports of capital goods segment are dominated by telephone equipment and parts of automobiles.

Mishra and Choudhry (2019) examine the reasons why imports have increased at a faster pace as compared to India's exports, after India entered into trading agreements with ASEAN, Japan, or South Korea. In contrast, in the case of ASEAN countries, the decomposition of the import basket does not reveal any specific bias in favour of consumer goods or capital goods. Imports of food and beverages, industrial supplies, and consumer goods have gone up whereas inward shipments of fuels and lubricants, capital goods, and transport equipment have declined.

5. Import demand function

The aggregate import demand function has been estimated by several authors in India. Examples include Dutta and Ahmed (2004), and Maitra (2020).¹¹ Dutta and Ahmed (2004) analyze India's aggregate import demand functions. Their findings indicate that import demand is primarily determined by real GDP, suggesting that changes in import prices have a limited impact on import demand. This implies that reducing import prices by eliminating tariff and non-tariff barriers may not proportionally increase import flows, highlighting the non-competitive nature of India's imports. However, it is important to consider the study period, since the quantity of imports is influenced largely by changes in real GDP than import prices which underscores the limited effectiveness of exchange rate policy in shaping import demand. Other studies have shown different results.

Maitra (2020) estimated the import demand function for India in the post-reform period and found that the estimate of imports is significant at the 1 percent level. As in the short run, in the long run too, imports have an appreciable impact on raising income. Hence, the import-led growth hypothesis is also corroborated in the long run. The paper has not isolated the channels that can explain the transmission process of the positive impact of imports on income growth. However, the liberalization policy in India resulted in a substantial decline in input tariffs and other trade costs, which helped the domestic firms to expand their existing products and also to introduce new products. This also contributed to growth.

Intermediate import demand

Fukomoto (2012) analyzes China's disaggregated import demand elasticity for relative prices during 1988–2005. Using BEC trade data, to obtain three SNA classes and estimates the import demand function for consumer, capital, and intermediate goods. Cointegration is observed between capital goods imports and GDP, as well as aggregate investment. Additionally, intermediate goods imports are cointegrated with exports, while consumption goods imports are cointegrated with GDP and disposable income. Short-run price elasticities are found to be inelastic, aligning with existing literature. However, long-run price elasticities vary across SNA classes: intermediate and capital goods exhibit inelastic long-run price elasticities, whereas consumption goods display elastic long-run price elasticity.

6. Estimation Methodology

The methodology followed in this paper is empirical. We focus on the role of imports in India's GVC integration with the ASEAN countries. In the context of India's links with ASEAN GVCs, there is a need to disaggregate India's imports and disentangle its import policy to focus on regional value chains. Here, we attempt to estimate a region-specific import demand function for India for the imports coming from ASEAN.

For estimating India's import demand function for imports from the ASEAN region, the autoregressive distributed lag (ARDL) bounds testing procedure given by Pesaran et al. (2001) has been used.¹²

The import demand function for imports from ASEAN in our case can be expressed as:

11 Many other studies have established similar results in different periods. These studies have been summarised in Mishra and Mohanty (2017).

12 Ideally the intermediate import demand should be estimated. This can be done in a later version of the paper.

$$ASEANIMP_t = f(EXP_t, EXRT_t, \text{and } TRADEGDP_t)$$

The variables considered for the estimation are imports from ASEAN, include aggregate exports, exchange rate with the US dollar, and trade as a percent of GDP. The frequency of the data is quarterly with

the period ranging from 2011-12 Q1 to 2020-21 Q2. Additionally, we have included a COVID-19 dummy in the model to capture the impact of COVID-19. Table 1 captures variable details.

Table 1: Variables in the model

Notation	Variable	Detailed description	Source
ASEANIMP	Imports from ASEAN	Value of imports from the ASEAN region	Directorate General of Commercial Intelligence and Statistics. Government of India. Ministry of Commerce and Industry
EXP	Aggregate exports	Exports of goods and services	Reserve Bank of India Handbook of Statistics on the Indian economy
EXRT	Exchange rate	Exchange rate of INR vis-à-vis US dollar	Reserve Bank of India Handbook of Statistics on the Indian economy
TRADEGDP	Trade as percent of GDP	India's trade as a percent of GDP has been calculated	Reserve Bank of India Handbook of Statistics on the Indian economy
D	COVID-19 dummy	COVID-19 dummy captures the impact of the pandemic	The dummy variable for COVID-19 takes the value of 1 for 2019-20 Q4 to 2020-21 Q2 and 0 otherwise ¹³

For estimation purposes, the log form of all the variables has been used. As a first step, the order of integration of all the variables has been ascertained by the Augmented Dicker Fuller (ADF) test. The results of the test have been appended in Annexure 1. The ADF test indicates that some variables are integrated of order 0 (or I(0)) and some are integrated of order 1

(or I(1)). This warrants the use of the ARDL bounds test since it can be applied in cases where the variables are a combination of I(0) and I(1) (Pesaran et al., 2001).

The ARDL model from Kripfganz and Schneider (2018) has the following form in our case

$$LASEANIMP_t = c_0 + \sum_{i=1}^p \phi_i LASEANIMP_{t-i} + \sum_{i=0}^q \beta'_i \Omega_{t-i} + u_t$$

Where, the vector Ω_t contains the explanatory variables of the model: $LEXP_p$, $LXRT_p$, $LTRADEGDP_p$, and D_t .

The equation in the reparameterized form in conditional EC form from Kripfganz and Schneider (2018) has also been estimated and takes the following form in our case¹⁴

$$\Delta LASEANIMP_t = c_0 - \alpha(LASEANIMP_{t-1} - \theta \Omega_t) + \sum_{i=1}^{p-1} \psi_{yi} \Delta LASEANIMP_{t-i} + \sum_{i=0}^{q-1} \psi'_{xi} \Delta \Omega_{t-i} + u_t$$

Where,

$$\alpha = 1 - \sum_{j=1}^p \phi_j \text{ (speed-of-adjustment coefficient)}$$

$$\theta = \frac{\sum_{j=0}^q \beta_j}{\alpha} \text{ (long run coefficients)}^{14}$$

¹³ The first reported case of COVID-19 in India was in January 2020 as per media reports hence the dummy variable has been defined accordingly.

¹⁴ The lag structure for our model is (2,3,4,4,1).

7. Empirical Results and Findings

The following results were obtained: the ARDL bounds test show that the null hypothesis of no levels relationship can be rejected. The estimated F-statistic

is greater than the critical values for I(1) regressors and the t-statistic is less than the critical value for I(1) regressors as indicated in Table 2. The short-run and the long-run estimations have been conducted and coefficients for the same have been included in Table 3.

Table 2: ARDL bounds test¹⁵ results

Test statistic	Estimated value	Critical value (1 per cent) ¹⁶		Critical value (5 per cent)	
		I (0)	I (1)	I (0)	I(1)
F-statistic	10.198	3.74	5.06	2.86	4.01
t-statistic	-4.927	-3.43	-4.60	-2.86	-3.99

Table 3: Short-run and long-run coefficient estimates from ARDL model of imports

Variable	Coefficient (p-value)
Long run	
lEXP _t	1.324 (0.000)*
lEXRT _t	-0.190 (0.748)
lTRADEGDP _t	-0.088 (0.728)
D _t	-0.636 (0.000)*
Short run	
dEXP _t	-1.937 (0.002)*
dEXP _{t-1}	-2.176 (0.001)*
dEXP _{t-2}	-0.926 (0.014)**
dEXRT _t	1.378 (0.042)**
dEXRT _{t-1}	1.451 (0.054)***
dEXRT _{t-2}	1.031 (0.100)
dEXRT _{t-3}	-0.672 (0.228)
dTRADEGDP _t	1.253 (0.002)*
dTRADEGDP _{t-1}	1.759 (0.000)*
dTRADEGDP _{t-2}	1.482 (0.001)*
dTRADEGDP _{t-3}	1.007 (0.014)**
dD _t	0.698 (0.000)*
Constant	-0.986 (0.590)
ECT _{t-1}	-1.114 (0.000)*
Adjusted R ²	0.813

* significant at 1 per cent, ** significant at 5 per cent, and *** significant at 10 per cent

Among the long-run coefficients, only the coefficients of log of exports and the COVID-19 dummy are statistically significant at 1 per cent level of significance. While the long-run coefficient of log of exports is positive, the long-run coefficient of the COVID-19 dummy is negative.

As for the short-run coefficients, all the coefficients of the log of exports and the log of trade to GDP are statistically significant albeit at different levels of significance. All of the short-run coefficients of log of exports are negative whereas all the coefficients of log of trade to GDP are positive. The short-run coefficient of the first difference and first lagged difference of the log

¹⁵ The test is given by Pesaran et al. (2001).

¹⁶ Critical values are from Pesaran et al. (2001) for both the levels of significance.

of exchange rate are positive and statistically significant. The short-run coefficient of the first difference of the COVID-19 dummy is positive as well as statistically significant. The error correction term that reflects the speed with which adjustment towards equilibrium is made is negative and statistically significant. India, in particular, enforced strict lockdown measures

to contain the virus, halting numerous productive activities nationwide. Certain diagnostic tests were conducted for testing the estimated model for serial correlation, heteroskedasticity, and specification. The results of the diagnostic tests have been tabulated in Table 4.

Table 4: Model Diagnostics

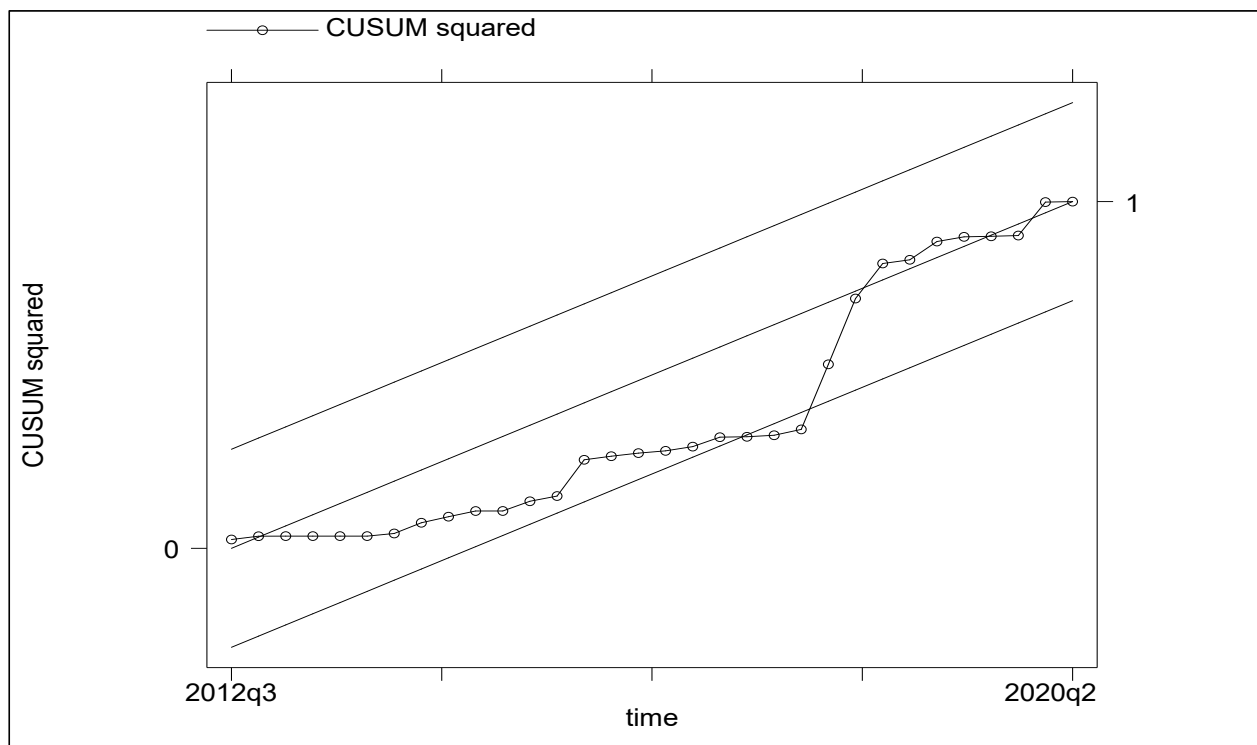
Diagnostic test	Estimated test statistic (p-value)
Breusch-Godfrey LM test (for serial correlation)	0.913 (0.3394)
White's test (for heteroskedasticity)	34.00 (0.4192)
Ramsey RESET test (for model specification)	0.62 (0.6150)

The Breusch-Godfrey LM test for autocorrelation has been used for testing serial correlation. The null hypothesis of no serial correlation cannot be rejected at 5 per cent level of significance. For testing heteroskedasticity, White's test has been used. The null hypothesis of homoskedasticity cannot be rejected at 5 per cent level of significance. From these tests, it can be concluded that the model does not show any evidence of serial correlation and heteroskedasticity at the 5 per cent level of significance.¹⁷ Further, we also fail to reject

the null hypothesis of the Ramsey RESET test that the model has no omitted variables at 5 per cent level of significance.

As a test of model stability, the CUSUM squared has been plotted (Figure 3). The plot reveals that it lies within the bounds of the 95 per cent confidence band with the exception of slight portion of the line that lies outside of the band.

Figure 3: CUSUM squared for the model



¹⁷ This corroborates the findings of Dutta and Ahmed (2004).

8. Conclusion

The COVID-19 pandemic struck amid India and other Asian nations' efforts to streamline and integrate their supply chains, both domestically and internationally. A revival in global goods trade was witnessed in the latter half of 2020, with economic recovery and the relaxation of transport and supply chain constraints across the world. As consumer spending rebounded, nations and enterprises were compelled to reconnect with the global economy.

This paper examines India's level of GVC integration concerning ASEAN and explores potential opportunities for both entities. Consequently, an import demand analysis for ASEAN imports was conducted using the ARDL bounds test. The ARDL bounds test results indicate rejection of the null hypothesis of a no level relationship between the imports from ASEAN and the other explanatory variables considered. Subsequently, both short-run and long-run coefficients have been calculated. A notable finding is the positive long-run coefficient of the log of exports, contrasting with the negative coefficient of the COVID-19 dummy variable.

The policy implications of the paper are the recognition that the short and the long run coefficients behave differently: all of the short-run coefficients of log of exports are negative whereas in the long run all the coefficients of log of exports are positive. There are two implications for policy: first, the behaviour in the short and the long run may be different. Second, it underlines the relation between imports and exports and this interdependence needs to be understood and reflected in laying down the policy in future that can promote greater regional integration. The paper also highlights the role of imports in exports or 'import to export' (Baldwin and Lopez-Gonzalez, 2013). Recognising the importance of importance of imports to boost exports can help recover some external demand and boost growth. Particularly, imports of intermediate goods have to be viewed favourably. This is one aspect of GVC integration that needs to be focused more. As discussed in the literature, countries imbibe foreign technology and know-how through imports of parts for assembly for sales in the domestic market (Taglioni and Winkler, 2016). This has implications for signing of free trade agreements as well as reviewing existing ones.

References

- Amiti, M., and Konings, J. (2007)** Trade Liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *American Economic Review*, 97 (5), 1611-1638.
- Antras, P. (2019)** Conceptual Aspects of Global Value Chains, NBER Working Paper 26539.
- Antras, P., Fort, T., and Tintelnot, F. (2017)** The Margins of Global Sourcing: Theory and Evidence from US Firms. *American Economic Review*, 107 (9), 2514- 2564.
- Antras, P. and De Gortari, A. (2020)** On the Geography of Global Value Chains, *Econometrica*, 88 (4), 1553-1598.
- Balassa, B. (1965)** Trade Liberalization and Revealed Comparative. *The Manchester School of Economic and Social Studies*, 33, 99-123.
- Baldwin, R. and Lopez-Gonzalez, J. 2013.** "Supply-Chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses." NBER Working Paper 18957.
- Batra, A., and Z. Khan, (2005)**, Revealed Comparative Advantage: An Analysis for India and China, ICRIER Working Paper, August.
- Colantone, I., and Crino, R. (2014)** New imported inputs, new domestic products. *Journal of International Economics*, 92 (1), 147-165.
- Dutta, D., and Ahmed, N. (2004)** An aggregate import demand function for India: a cointegration analysis, *Applied Economics Letters*, 11(10), 607-613.
- Fally, T. (2011)** 'On the Fragmentation of Production in the US', European Trade Study Group.
- Feenstra, R. (1998)** Integration of Trade and Disintegration of Production in the Global Economy, *Journal of Economic Perspectives*, 12 (4), 31-50.
- Fukumoto, M. (2012)** Estimation of China's disaggregate import demand functions. *China Economic Review*, 23 (2). DOI: 10.1016/j.chieco.2012.03.002
- Gereffi, G. and J. Lee (2012)** Why the World Suddenly Cares About Global Supply Chains, *Journal of Supply Chain Management*, Volume 48 (3). <https://doi.org/10.1111/j.1745-493X.2012.03271.x>
- Goldberg, P., Khandelwal, A., Pavcnik, N., and P. Topalova (2009)** Trade Liberalization and Imported Inputs, *American Economic Review*, 99 (2), 494-500.
- Goldberg, P. K., Khandelwal, A. K., Pavcnik, N., and Topalova, P. (2010)** Imported intermediate inputs and domestic product growth: Evidence from India, *The Quarterly Journal of Economics*, 125 (4), 1727-1767.
- Johnson, R. (2014)** Five Facts about Value-Added Exports and Implications for Macroeconomics and Trade Research, *Journal of Economic Perspectives*, 28 (2), 119-142.
- Johnson, R.C., and Noguera, G. (2012)** "Accounting for Intermediates: Production Sharing and Trade in Value Added." *Journal of International Economics* 82(2): 224 –36.
- Kasahara, H., and Rodrigue, J. (2008)** Does the use of imported intermediates increase productivity? Plant-level evidence. *Journal of Development Economics*, 87 (1), 106-118.
- Koopman, R., Wang, Z., and Wei, S. J. (2014)** Tracing Value Added and Double Counting in Gross Exports, *American Economic Review*, 104 (2), 459-94.
- Kowalski, P., Lopez-Gonzalez, J., Ragoussis, A., and Ugarte, C. (2015)** Participation of Developing Countries in Global Value Chains, OECD Trade Policy Papers 179.

- Kripfganz, S., & Schneider, D. C. (2018).** ardl: Estimating autoregressive distributed lag and equilibrium correction models. London Stata Conference. September 7
- Maitra, B. (2020)** Exploring Import-led Growth for India: Evidence from Post-reform period. *South Asian Journal of Macroeconomics and Public Finance*. February 2020.
- Mishra, B. R. and Mohanty, A. (2017)** An Empirical Analysis of Aggregate Import Demand Function for India, *Global Economy Journal*.
- OECD TIVA.** Trade in Value Added Link: <https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm>
- Ossa, R. (2015)** Why trade matters after all? *Journal of International Economics*, 97, 266-277.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001).** Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16, 289–326.
- Pomfret, R. and Sourdin, P. (2016)** Value Chains in Europe and Asia: Which Countries Participate? *International Economics*, 153.
- Ray, S. and Miglani, S. (2018)** *Global Value Chains and the Missing Links: Cases from Indian Industry*. Routledge.
- Ray, S. (2021)** GVCs: Opportunities for India and ASEAN Post-Covid-19. In De, P. and S. Chirathivat (eds.) *ASEAN and India: Strengthening Partnership and the Post-Pandemic Future*. KW. ISBN: 978-93-91490-47-8.
- Ray, S. and Miglani, S. (2021)** Implications of US-China trade war for India, In Choudhury, R. N. (eds.) *The China– US Trade War and South Asian Economies*, Routledge.
- UNCTAD (2020)** *Trade and Development Review 2020*.
- WTO (2015)** *Trade Policy Review: India*. WT/TPR/S/313.
- WTO (2021)** *Trade Policy Review: India*. WT/TPR/S/ 403. https://www.wto.org/english/tratop_e/tpr_e/tp503_e.htm

Annexures

Annexure 1: ADF test results

Table 1A: Augmented Dickey Fuller Test Results (At level)

Variable	Test statistic	MacKinnon approximate p-value/ p-value	5% critical value
IASEANIMP	-1.823	0.0390	-1.696
IEXP	-1.830	0.0384	-1.696
IEXRT	-3.802	0.0165	-3.556
ITRADEGDP	-2.038	0.5808	-3.556

Table 1B: Augmented Dickey Fuller Test Results (First difference)

Variable	Test statistic	MacKinnon approximate p-value/ p-value	5% critical value
ITRADEGDP	-6.133	0.0000	-2.972

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