

LOGISTICS PERFORMANCE AS FACILITATOR TO TRADE PERFORMANCE: AN INDIAN PERSPECTIVE

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1. **Abstract:** With the growing realisation of the importance of global integration in the production and consumption value chain, the importance of maritime logistics and transportation facilitating international trade is profoundly recognised. Further, a proliferation of collaborative trade agreements among different trade partners is ascribed to play a significant role. However, such external dynamics and engagements in international trade would propel blue economic growth if backed by strong maritime logistics initiatives and establishment. In this context, deep routed challenges, particularly in the domestic maritime logistics sector in manufacturing hubs like India, could potentially hamper her comparative advantages in international trade. It is in this context that this paper comes as an intercession by analysing India's Logistics Performance Index (LPI) and its impact on trade performance. Also, this paper provides a comparative analysis of India's LPI with that of other trade competitors from South and East Asia and tries to find out challenging areas of maritime logistics for India and suggest the required policy prescription thereof. Such acknowledgement is a compulsion for a country like India when escalated uncertainties due to episodes of COVID-19, the Russia-Ukraine War, and dips in the business cycles of many countries that demanded green and resilient supply chain and logistics practices. The paper prescribes that domestic reforms to ease out challenges in Indian maritime logistics coupled with external engagements would provide a flat form for India to reap the optimal gains from international trade.

Keywords: Logistics Performance Index, Trade Performance, maritime logistics, India, Southeast Asia

1. INTRODUCTION: IMPACT OF TRADE FACILITATION ON INTERNATIONAL TRADE

The conventional knowledge on the impact of tariff and non-tariff barriers on international trade flows is much scientifically acknowledged. Such knowledge has created initiatives for trade liberalisation among many trade partners. In this context, the evidence of the co-existence of trade and economic growth is much established and has given further boost to such collaborative efforts towards trade liberalisation. This linkage is further facilitated by the proliferation of trade integration agreements, particularly in the nature of regional agreements.

In the contextual rising global trade, trade facilitation measures, particularly in terms of logistics, play a prominent role in facilitating global trade flows. Trade facilitation measures, in a narrower sense, could be any reduction in redundancy and increase in transparency in trade procedures (export import procedures, customs clearance, information technology use in trade procedures, etc.), which would reduce the trade costs (Milner *et al.*, 2008). In a broader sense, trade facilitation may include the development of infrastructure like roads, ports, etc (World

Trade Organisation, 2015). Trade facilitation measures could also include pre-trade measures like domestic logistics and transportation systems (Go, 2018). Such measures are essential, particularly in view of global trade integration, which not only resulted in global value chains in the form of offshoring of production bases, but also has demanded strengthening of domestic logistics to facilitate such global changes. The importance of trade facilitation measures is further illuminated by the fact that with increasing global integration and reduced tariff and non-tariff measures, the focus of policy has shifted to trade facilitating measures (UNCTAD, 2016), if not addressed, could have potential trade impeding effects by increasing the time of the trade particularly in the case perishable goods and loss of business opportunity for importers. Inefficient transport and logistics systems may create delays at ports, increase time and distance between trade partners, delays due to redundant and non-transparent custom clearance processes, and the resulting escalated last mile delivery cost due to delay in delivery. Supply chain disruptions and non-uniform trade facilitation measures between trading partners only add to such worries of stakeholders involved in international trade. Thus, as Milner *et al.* (2008) point out, such redundancies in the logistics system are reflected in increased transaction and trade costs. Increasing logistics costs could affect the choice of a supplier or trade partner and act as a trade barrier (Arvis *et al.*, 2007). For instance, the study by Djankov *et al.* (2006) finds that a day's delay in pre-shipment leads to a reduction in trade by one percentage. Using a gravity model, Djankov *et al.* (2006) confirm that a day's delay in trade leads to an increase in the distance between trading partners by seventy kilometres. Further, the study by Hiraide *et al.* (2022) finds that export efficiency is positively related to electronic documentation systems, enhancement of customs procedures and strengthening border infrastructure. This is more so in the case of developing countries wherein redundant trade facilitation processes and measures may lead to hampering comparative advantage. As pointed out by Moisé *et al.* (2011), the Trade Facilitation Indicators could potentially lead to a decrease of 10 per cent in trade costs. Suryanta and Patunru (2023) argue in a similar line for Indonesia. In this context, the estimates on the welfare impact of trade facilitation measures, as pointed out by Moisé and Sorescu (2013) as that of reduction in total trade costs by 14.5 per cent, 15.5 per cent and 13.2 per cent for low-income countries, lower middle-income countries and upper-middle income countries, respectively. Also, the estimates of Wilson *et al.* (2005) show a simulated model wherein improvements in trade facilitation measures like port efficiency, customs environment, regulatory environment, and service sector infrastructure would fetch a \$377 billion increase in global trade flows. In a differentiated line of research, Kurul (2023), based on empirical estimates of trade facilitation measures, focuses that for sustainable exports, developing countries would reduce regulatory regimes and improve infrastructure, whereas LDCs can concentrate on creating a conducive business environment and improvement in ICTs. Further, Nguyen and Tran (2021), in their paper on trade facilitation and trade flows among ASEAN countries, show a positive relation between the two in a gravity model framework of estimation. In this context, the study by Ding *et al.* (2022) depicts a positive correlation between logistics performance and export competitiveness for China.

2. MEASUREMENT OF TRADE FACILITATION

There exists a set of indicators for measuring trade facilitation. In this regard, Beverelli *et al.* (2023) illuminate the top-down approach to estimating the impact of trade facilitation on trade flows using the gravity model and the bottom-up approach of using the OECD Trade Facilitation Indicators and World Bank's Logistics Performance Indicator. Also, Beverelli *et al.* (2023) acknowledge that since the existing indicators are not sufficient to have an analytical outlook on the implementation of trade facilitation agreements, the use of WTO's Trade Facilitation Agreement Database could be explored. In this context, Janno *et al.* (2021) highlight that continuous improvement in data may also improve the quality of data framing the Logistics Performance Index.

Moreover, the UN.ESCAP (2017) highlights various databases with indicators that could be used to measure trade facilitation, which includes ESCAP World Bank Trade Costs Data Base, World Bank Doing Business Across Borders, World Bank Enterprise Survey, United Nations Global Survey on Trade Facilitation and Paperless Trade Implementation, World Economic Forum's The Global Enabling Trade Report, etc.

Also, there are attempts to create a trade facilitation index. For instance, Li(2023) combines the methodology provided by Duan and Huang (2011) with the contemporary trade facilitation regime in China to illuminate a methodology for creating a trade facilitation index for the Zhejiang province of China. She finds that transportation followed by customs are the two most important factors impacting trade facilitation.

Some of the measurement efforts on the impact of trade facilitation measures on international trade are in the nature of using gravity models for estimation. These studies are in the likes of Weerahewa (2009), who uses the sectoral gravity model for South Asian countries. Felipe and Kumar (2012) use the gravity model for central Asian countries, Wilson *et al.* (2013) for APEC countries, Finot (2017) estimates a gravity model for Central America, Nguyen and Tran(2021) use the gravity model for ASEAN countries to measure the relationship between trade flows and trade facilitation measures.

Other attempts in the nature of econometric studies include Gani (2017) uses regression for sixty countries to measure trade facilitation on trade flows. Also, Gani (2017) points out that the limitations of measuring trade facilitation measures on trade flows are due to a paucity of data.

From the above discussion, it is evident that research on the measurement of trade facilitation is evolving, and the application of sophisticated methodologies to estimate the impact of trade facilitation measures on trade performance is limited. Also, such studies with a specific focus on South Asian countries are scanty in nature. India is not an exception in this case. With a much wider approach towards escalating recognition of blue economic growth by the Indian government reflected via various initiatives like Sagarmala, Gati Shakti, and Maritime India Vision, etc., such limited research on the linkage between trade facilitation measures and international trade flows would potentially restrict productive knowledge-based interventions for the growth of India's international trade flows. Such research is also essential when the logistics performance of competitive economies is much improved which in turn could potentially hamper India's comparative advantage. It is in this context that this study attempts to understand the logistics performance (trade facilitation) of India and its impact on India's trade volume. Therefore, this study is timely for suggesting trade facilitation-related governance measures for improvement in India's logistics performance and, in turn, trade performance.

3. CONCEPTUAL FRAMEWORK

As discussed in the previous section efficient and transparent trade facilitation measures could reduce trade cost and transaction time. In this context, traditional trade theories do not consider trade costs. For instance, classical trade theories are free trade theories which do not consider barriers to trade and trade costs. Only the contemporary models consider fixed trade costs or trade costs as a part of the cost of the supply chain (WTO, 2015). If trade costs are included in the classical trade theories, as pointed out by WTO, 2015, it will increase the prices in the international market, which may be equal to or more than the autarky price prevailed in a country and thus may hamper comparative advantage based on factor abundance and intensity. Therefore, it may reduce the possibility of international trade flows. In this context, WTO (2015), which describes the iceberg model as propounded by Samuelson (1954) for transport costs, could be extended to explain the impact of trade procedures, which may be reflected in

rising trade costs, in turn, creates deadweight losses for consumers by reducing the consumer surplus and to producers by reducing the producer's surplus. The price differential between the price charged by the producer of the exporting country and the price paid by the importing country consumers is the defined trade cost. If trade costs are reduced by improving trade procedures (reflected in the improvement of terms of trade between countries), it would lead to a rise in the consumer as well as producer's surplus. Worth mentioning here is that trade costs could also be worsened by inefficient and non-transparent trade facilitating measures (delays at ports, delays in customs procedures, age-old infrastructure, and delays in international shipments, etc), which may hamper international trade flows.

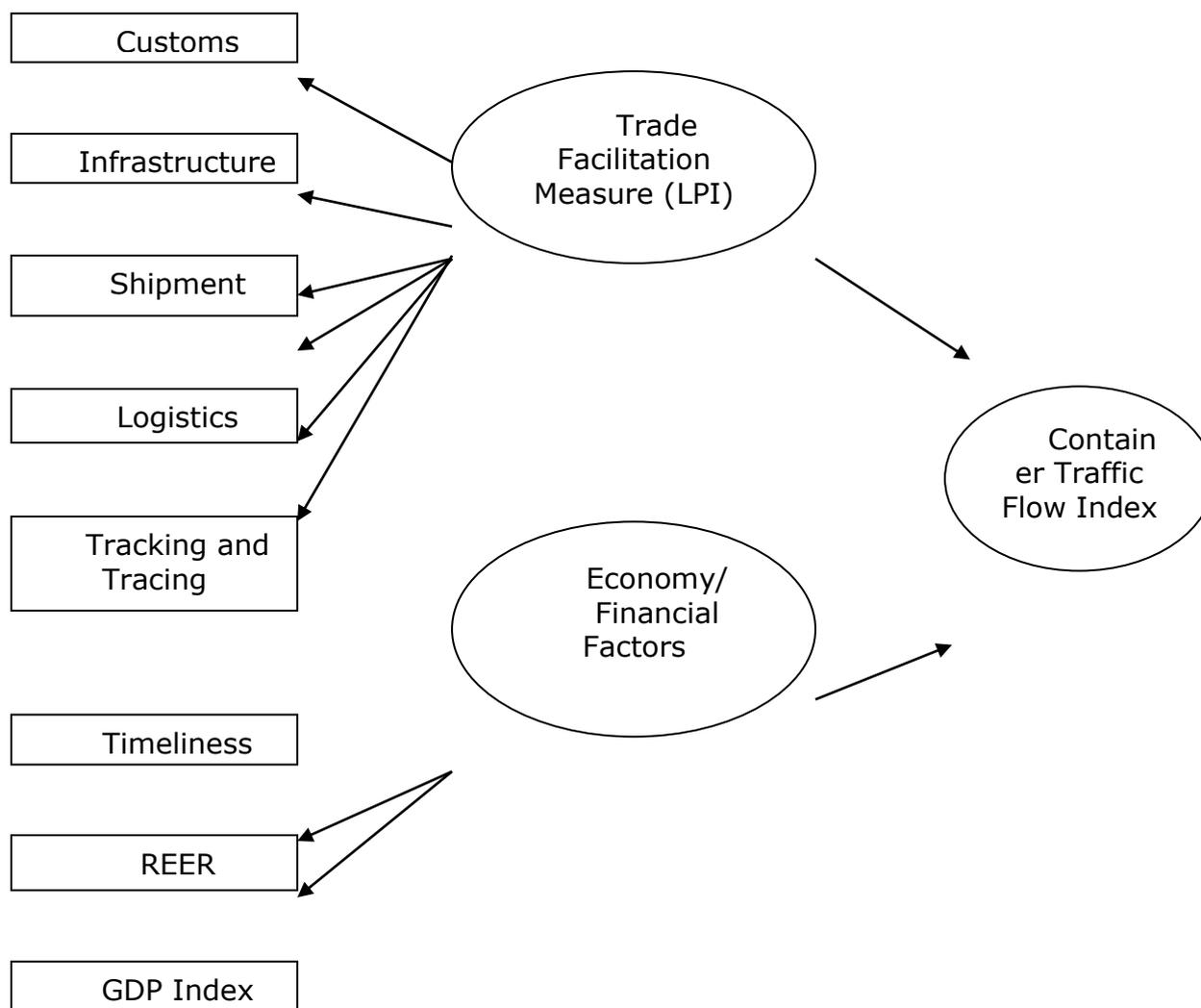
4. METHODOLOGY

As already discussed in the previous sections, inefficient trade facilitation measures could hamper the international trade flows of a country. In this regard, in the foregoing, the current study considers that inefficient trade facilitating measures as measured by inefficient logistics procedures which could lead to delay, rising costs and prices of exported and imported products and services, thus hampering international trade flows. To measure this, the present study takes into account a conventional trade function and includes trade facilitation measures to quantify the impacts. In this model, trade flows are a function of Gross Domestic Product, Real Effective Exchange Rate, and various indicators of the Logistics Performance Index (LPI). This exercise is done for India. In this context, the study considers India's Real Effective Exchange Rate (REER) as an index of the Nominal Effective Exchange Rate adjusted for inflation. REER of India is considered India's currency in relationship to the weighted basket of currency of other countries. In this case, a higher REER means lower trade competitiveness, which means that exports would be costlier and imports would be cheaper. This, in turn, may also lead to productivity gains and thus has a positive impact on trade (RBI, 2021). Since, in the Indian scenario, imports are higher than exports, a higher REER leads to more imports and a positive impact on trade. The base year for REER calculation, as provided by the Reserve Bank of India, is 2015-16. LPI data is also considered for the same period.

The study takes into account the GDP of India at constant prices(2011-12 prices) to avoid any inflationary spikes in GDP. GDP is considered in the estimation function as it is an indicator of the production capacity of an economy in a given accounting year. We assume a prior relationship between GDP and trade flows is that a higher GDP may mean that more is produced and thus traded (exported and imported) (Fatima *et al*, 2020). However, unlike existing studies, to avoid high levels of fluctuation in GDP, an index of constant GDP is calculated with the base year of 2016 in line with the base year of REER. Some studies, in line with Bleaney and Tian (2022), also considered REER in their trade openness function.

Like the existing studies on trade facilitation in the nature of Gani (2017), the present study considers LPI published by the World Bank to measure trade facilitation measures of India.

Figure 1.1: Analytical Framework of the Study



Source: Authors own depiction of the model

The LPI is a composite index which measures the logistics performance of 139 countries (as of 2023) based on six indicators, namely efficiency of Customs, quality of Trade and Transport infrastructure, Ease of arranging competitively priced shipments, Competence and Quality of Logistics, Ability to Tracking and Tracing of consignments, and Timeliness in terms of the frequency with which shipments can reach consignee within the scheduled or expected delivery time (Arvis *et al.*, 2023). The six indicators are measured on a 5-point scale, 1 being the lowest (worst) performance and 5 being the highest (best) performance. The data is collected based on the perception of respondents (logistics professionals) who participated in the LPI survey. The LPI uses a non-random survey methodology. Using the response and Principle component analysis, LPI determines and rank and score of each country. The six indicators could be read in the words of Arvis *et al.* (2023) as

- *“The efficiency of customs and border clearance, rated from “very low” (1) to “very high” (5) in the survey.*
- *The quality of trade and transport infrastructure, rated from “very low” (1) to “very high” (5) in the survey.*
- *The ease of arranging competitively priced shipments, rated from “very difficult” (1) to “very easy” (5) in the survey.*
- *The competence and quality of logistics services, rated from “very low” (1) to “very high” (5) in the survey.*
- *The ability to track and trace consignments, rated from “very low” (1) to “very high” (5) in the survey.*
- *The frequency with which shipments reach consignees within scheduled or expected delivery times, rated from “hardly ever” (1) to “nearly always” (5) in the survey”.*

The study takes six LPI indicators as a reflection of the efficiency of logistics performance and thus could have a positive relationship with trade flows. As illuminated by Arvis *et al.* (2007), if the LPI score is reduced by one point, it indicates 6 days of additional delay in receiving the cargo by importer from the port and for exporters, it would mean three days of additional delay. In this context, this study assumes a positive relationship between LPI indicators and trade volume. It is more so in a partial equilibrium analysis of an export or import demand function. For instance, as pointed out by Arvis *et al.* (2023), the Customs, Infrastructure and, competency and quality of logistics service could act as inputs to the supply chain system, which are affected by policy regulation, whereas timeliness, international shipment and tracking and tracing are outcomes of supply chain process which may affect service delivery.

The shortcomings of LPI are that the perception of international freight forwarders may not properly reflect the logistical environment in poor countries, and in the case of landlocked countries, the score of various indicators may be read with caution as these countries depend on gateway ports situated in other countries. Therefore, any inefficiency or procedural delays in the gateway port may be reflected in the LPI score and rank of a landlocked country in the LPI survey. Also, LPI may be affected by the number of respondents, and it does not quantify the steps taken for reform in logistics performance. Further, given these shortcomings, minute changes in LPI score should be read with caution (Arvis *et al.*, 2023). In this context, Beysenbaev and Dus (2020) propose a new methodology to calculate the International Logistics Performance Index (ILPI) to address the methodological glitches of the existing World Bank LPI rank and scores.

The dependent variable that the present study considers to measure trade flows from India is the container traffic flow, which mostly accounts for the maritime transportation of containers in terms of TEUs. These include containers from land to maritime transport and from sea to land transport. This measure also includes the return of empty containers and transshipment of containers. Instead of total exports and imports volume, in this study, we have taken container traffic flow as 95 per cent of India’s trade (by volume) is by maritime transportation (Dasgupta, 2018). Therefore, considering total container flow would truly reflect India’s trade flows. To avoid any large diversion in the data, we prepared an index again, considering 2016 as the base year.

The data on GDP at constant prices and REER is taken Reserve Bank of India, and the LPI data and container traffic data are taken from UNCTAD (as published by the World Bank). The period considered is 2014–2023. LPI, as published by the World Bank, is considered for the same time period.

The present study considers the use of a Structural Equation Model (SEM) to measure the impact of trade facilitation measures on international trade in the Indian context. SEM is a multivariate regression which provides relative importance to various factors contributing to the dependent variable. SEM is used because it is a non-parametric model which measures the unobserved (latent variable); thus, SEM is an improved version of multiple regression to measure the relationship between estimates. The use of SEM in the logistics sector is not new; however, studies on measuring linkages between trade facilitation and trade flows are limited.

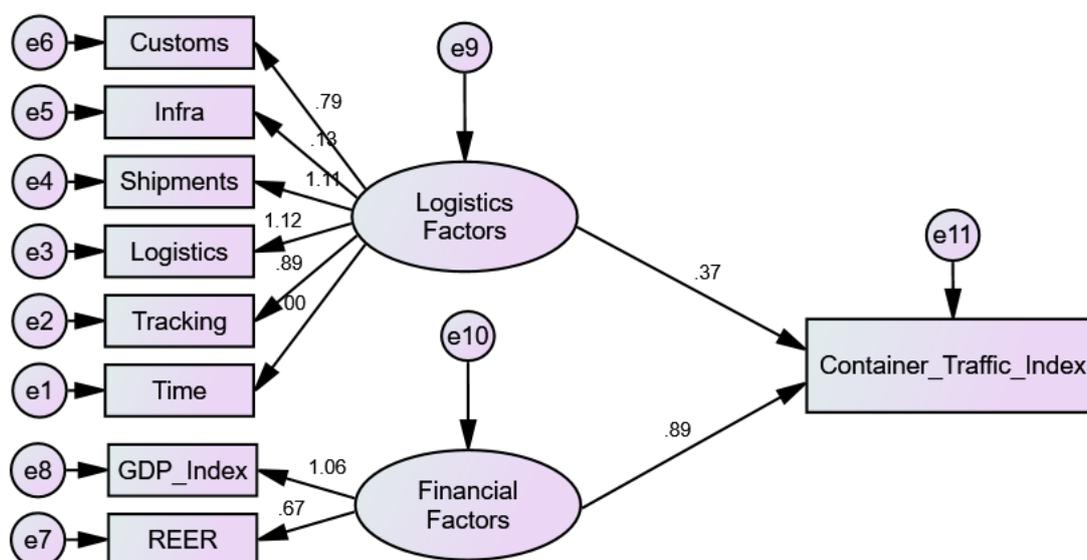
Once such an analysis is done, we have taken a sample of countries for each LPI indicator to find out India's comparative stance. These countries are China, Malaysia, Thailand, Vietnam, Indonesia, Sri Lanka, and Bangladesh. These economies are considered due to the following reasons.

- China and India play crucial manufacturing hubs and competitive roles in international trade (Lemoine and Kesenci, 2007).
- Vietnam, Thailand, and Malaysia are all emerging economies (Sarel, 1997).
- Further, two economies, i.e., Sri Lanka and Bangladesh, are considered due to their immense and long history of maritime and also as South Asian countries. Noteworthy, in terms of LPI score and rank, these economies do not have a data set available for all years under consideration. Therefore, the LPI rank and scores of these countries should be read with caution.

5. RESULTS AND DISCUSSION

As discussed in the earlier section, in the current study, an SEM is used to estimate the linkage between trade facilitation measures and trade flows. We constructed two latent variables; one is 'Logistics Factors' consisting of six observed variables, viz., Customs, Infrastructure, Shipment, Logistics services, Tracking and tracing and timeliness. The six observed variables are the six indicators of the Logistics Performance Index. The other latent variable called 'Financial Factors' consists of two observed variables viz., REER and Constant GDP Index. The dependent variable is the Container Traffic Index.

Figure 1.2: Impact of Logistics Performance Indicators and Financial Factors on Container Traffic Index



Source: Authors' own estimation

The relationship between the latent variable and the Index of Container Traffic movement is reflected in Figure 1.2, which is based on the analytical framework as discussed in Figure 1.1. The results of the SEM are provided in Table 1.1.

Table 1.1 : The relationship between Logistics Factor and Financial Factors on the Index of Container Traffic Movement

Parameter	←		Estimate	P
Time	←	Logistics_Factors	0.004	0.00*
Tracking	←	Logistics_Factors	0.89	0.00*
Logistics	←	Logistics_Factors	1.124	0.00*
Shipments	←	Logistics_Factors	1.113	0.01**
Infra	←	Logistics_Factors	0.128	0.19
Customs	←	Logistics_Factors	0.791	0.00*
REER	←	Financial_Factors	0.666	0.00*
GDP_Index	←	Financial_Factors	1.06	0.01**
Container_Traffic_Index	←	Logistics_Factors	0.366	0.01**
Container_Traffic_Index	←	Financial_Factors	0.885	0.00*

Source: Authors' own estimation

*means 1% level of statistical significance, ** means 5% level of statistical significance

The above table 1.1 shows both the latent factors have positive and significant impacts on the dependent variable. That means LPI, GDP, and REER have a positive and statistically significant relationship with the dependent variable, i.e. container traffic. This result is very important for the knowledge of trade facilitation, which shows that trade facilitation measures measured in terms of LPI are an important determinant of international trade. The result is consistent with the findings of Gani (2017). Also, as expected, the variable GDP_Index has a positive and significant impact on international trade. Further, the positive relationship between REER and trade flow is confirmed by RBI (2021).

In terms of effects, it is evident from Table 1.1 that logistics competence and quality (variable named 'Logistics') and international shipment (variable 'Shipment') have statistically significant and higher positive impacts on container traffic, and so with the variable GDP (GDP_Index). The results are expected as the competence and quality of logistics services improve the predictability and reliability of such a supply chain. In this context, Arvis *et al.* (2023) highlight that time and costs are not the only concern of an efficient logistics system. It has more so to do with reliability (also pointed out by Dobbersteine *et al.*, 2005) and predictability of such a system which may increase the confidence of stakeholders of international trade.

Interestingly, in the latent variable 'Logistics Factor', one of the observed variables, 'Infra' (the quality of trade and transport infrastructure), does not have a statistically significant effect on container traffic. This means that in the Indian context, container traffic movement is not significantly affected by infrastructure availability. Gani (2017) also finds such a relationship between infrastructure and international trade. However, such a finding is not in line with the conventional knowledge that infrastructure could increase international trade. The study by Munim and Schramm (2018) confirms that infrastructure has a positive impact on trade. Two tentative reasons could explain such tendencies. One could be the response bias in the collection of LPI data on infrastructure (Arvis *et al.*, 2016), and another could be that in the SEM model, we considered all the indicators of LPI at ones which may create multicollinearity problem among variables which may make a relationship between variables (which assumed to be significant) statistically insignificant.

Therefore, to understand further, a detailed analysis of LPI score and rank for a sample of countries is carried out. The justification for the choice of the sample countries is provided in the methodology section.

Table 1.2. Economy wise LPI score

Economy/LPI score	a) 2007	a) 2010	a) 2012	a) 2014	a) 2016	a) 2018	a) 2023
China	b) 3.32	b) 3.49	b) 3.52	b) 3.53	b) 3.66	b) 3.61	b) 3.7
Malaysia	c) 3.48	c) 3.44	c) 3.49	c) 3.59	c) 3.43	c) 3.22	c) 3.6
Thailand	d) 3.31	d) 3.29	d) 3.18	d) 3.43	d) 3.26	d) 3.41	d) 3.5
India	e) 3.07	e) 3.12	e) 3.08	e) 3.08	e) 3.42	e) 3.18	e) 3.4

Vietnam	f) 2.89	f) 2.96	f) 3.00	f) 3.15	f) 2.98	f) 3.27	f) 3.3
Indonesia	g) 3.01	g) 2.76	g) 2.94	g) 3.08	g) 2.98	g) 3.15	g) 3.0
Sri Lanka	h) 2.40	h) 2.29	h) 2.75	h) 2.70	h) N.A	h) 2.6	h) 2.8
Bangladesh	i) 2.47	i) 2.74	i) N.A	i) 2.56	i) 2.66	i) 2.58	i) 2.6

Source: Arvis et al., Logistics Performance Index (various issues)

The analysis in Table 1.2 shows that in terms of LPI score on the 5–point scale, India’s position has been more than the average score but not improving. However, most of the sample countries have similar tendencies. Nevertheless, the silver lining is that India’s performance in logistics is better compared to other South Asian countries included in the analysis. Worth mentioning here is that, unlike other countries, China has a consistent rise in the LPI score but is not very significantly different from India. Further, most of the country’s LPI score has improved, if not to a great extent in 2023. These scores have to be analysed with caution as scores are dependent on the number of respondents who participated from each country in the survey. As pointed out by Arvis et al. (2023), the larger number of participants from a country participating in the LPI survey may improve the LPI score for the country. Also, since these scores are perceptions, minute changes may be read with limitations. In this context, it is important to analyse the LPI rank, which may reflect further insights. Such information is provided in Table 1.3.

Table 1.3. Economy wise LPI Rank

Economy/LPI Rank	2007	2010	2012	2014	2016	2018	2023
China	30	27	26	28	27	26	19
Malaysia	27	29	29	25	32	41	26
Thailand	31	35	38	35	45	32	34
India	39	47	46	54	35	44	38
Vietnam	53	53	53	48	64	39	43
Indonesia	43	75	59	53	63	46	61
Sri Lanka	92	137	81	89	N.A	94	73
Bangladesh	87	79	N.A	108	87	100	88

Source: Arvis et al., Logistics Performance Index (various issues)

It is evident from Table 1.3 that India’s LPI rank has improved but is far behind China, which is its significant competitor in international trade. However, India’s rank is closer to other emerging economies in the region, which may challenge her comparative advantage if suitable policy prescriptions to improve logistics performance are not taken on time. Nevertheless, compared to other South Asian countries, India’s rank has significantly improved. Worth mentioning here is that the LPI rank is also based on the number of countries participating, as illuminated by Arvis et

al. (2023). An improvement in the rank does not necessarily mean improved logistics performance. It may even mean that less number of countries have participated in the survey.

The analysis based on the LPI score shows that India’s LPI score has improved over time, but not significantly. To further understand the intricacies of such a strayed knowledge, we have carried out an analysis of scores of individual LPI indicators. Since the LPI score is a composite score of Individual scores, the LPI score may not truly reflect a country’s score for each of the logistics performance indicators, which may provide insightful findings about the logistics performance of a country that is based on the overall composite score. In this regard, table 1.4 shows the LPI score of sample countries over time.

Table 1.4. Economy wise score on “Customs”

Economy/ Customs Score	2007	2010	2012	2014	2016	2018	2023
China	2.99	3.16	3.25	3.21	3.32	3.29	3.3
Malaysia	3.36	3.11	3.28	3.37	3.17	2.9	3.3
Thailand	3.03	3.02	2.96	3.21	3.11	3.14	3.3
India	2.69	2.70	2.77	2.72	3.17	2.96	3.0
Vietnam	2.89	2.68	2.65	2.81	2.75	2.95	3.1
Indonesia	2.73	2.43	2.53	2.87	2.69	2.67	2.8
Sri Lanka	2.25	1.96	2.58	2.56	N.A	2.58	2.5
Bangladesh	2.00	2.33	N.A	2.09	2.57	2.3	2.3

Source: Arvis et al., *Logistics Performance Index (various issues)*

Table 1.4 shows that India’s score on ‘Customs’ has been mediocre compared to her trade competitors like China, which has always maintained an average score of more than 3. Also, economies like Malaysia and Thailand have maintained higher scores for Customs compared to India. This illuminates that the efficiency of customs and border clearance in India is lower, and such procedures take longer time in the Indian context compared to these countries. Worth mentioning is that India’s score has been improving for ‘efficiency of customs and border clearance’ over time and in recent times, India’s score is almost in line with other trade competitors from the region. Important to note is that the customs score for other South Asian countries has been quite low compared to China, Malaysia, and Thailand. For instance, Bangladesh is a textile manufacturing hub, but the efficiency of customs and border procedures is almost 1 point lower than China, which means additional delays observed by exporters and importers from Bangladesh, hampering its comparative advantage. In the Indian scenario, too, sustainability of the score on the efficiency of customs and border clearance is important to maintain her comparative advantage. As pointed out by Martincus et al.(2015), a delay in customs procedures could hamper international trade.

Table 1.5. Economy wise score on “Infrastructure”

Economy/Infrastructure wise Score	2007	2010	2012	2014	2016	2018	2023
China	3.20	3.54	3.61	3.67	3.75	3.75	4.0
Malaysia	3.33	3.50	3.43	3.56	3.45	3.15	3.6
Thailand	3.16	3.16	3.08	3.40	3.12	3.14	3.7
India	2.90	2.91	2.87	2.88	3.34	2.91	3.2
Vietnam	2.50	2.56	2.68	3.11	2.70	3.01	3.2
Indonesia	2.83	2.54	2.54	2.92	2.65	2.9	2.9
Sri Lanka	2.13	1.88	2.50	2.23	N.A	2.49	2.4
Bangladesh	2.29	2.49	N.A	2.11	2.48	2.39	2.3

Source: Arvis et al., Logistics Performance Index (various issues)

An analysis of the score of quality of trade and transport infrastructure shows similar trends in line with custom scores wherein India’s performance has not been very significant compared to her significant trade competitors. In fact, China’s improvement in trade and transport infrastructure score has been consistently improving and has gone to higher levels in recent times. In this regard worth mentioning that is lack of sufficient infrastructure has been a problem for the Indian logistics sector.

Table 1.6. Economy wise score on “International Shipment”

Economy wise International shipments score	2007	2010	2012	2014	2016	2018	2023
China	3.31	3.31	3.46	3.50	3.70	3.54	3.6
Malaysia	3.36	3.50	3.40	3.64	3.48	3.35	3.7
Thailand	3.24	3.27	3.21	3.30	3.37	3.46	3.5
India	3.08	3.13	2.98	3.20	3.36	3.21	3.5
Vietnam	3.00	3.04	3.14	3.22	3.12	3.16	3.3
Indonesia	3.05	2.82	2.97	2.87	2.90	3.23	3.0
Sri Lanka	2.46	2.48	3.00	2.56	N.A	2.51	2.8
Bangladesh	2.31	2.99	N.A	2.82	2.73	2.56	2.6

Source: Arvis et al., Logistics Performance Index (various issues)

In this context, an analysis of other indicators of LPI shows that India's score on arranging competitively priced shipments (international shipment), for instance, is almost on par with other trade competitors (Table 1.6). Such a tendency may have positive impacts on the trade competitiveness of India. Such a tendency may have positive impacts on the trade competitiveness of India.

Table 1.7. Economy wise score on "Logistics Competence and Quality Score"

Economy wise Logistics Competence and Quality Score	2007	2010	2012	2014	2016	2018	2023
China	3.40	3.49	3.47	3.46	3.62	3.59	3.8
Malaysia	3.40	3.34	3.45	3.47	3.34	3.30	3.7
Thailand	3.31	3.16	2.98	3.29	3.14	3.41	3.5
India	3.27	3.16	3.14	3.03	3.39	3.13	3.5
Vietnam	2.80	2.89	2.68	3.09	2.88	3.4	3.2
Indonesia	2.90	2.47	2.85	3.21	3.00	3.10	2.9
Sri Lanka	2.45	2.09	2.80	2.91	N.A	2.42	2.7
Bangladesh	2.33	2.44	N.A	2.64	2.67	2.48	2.7

Source: Arvis et al., *Logistics Performance Index (various issues)*

Further, table 1.7, read along with Table 1.8, shows that India's score on logistics competence, quality and timeliness is on par with most of the other trade competitors. As pointed out earlier, the competence and quality of logistics services facilitate international trade to a significant level. Also, the timely arrival of cargo increases the robustness of business planning and also facilitates just-in-time methodology in manufacturing which in turn may lead to lean manufacturing practices. Timeliness also improves the predictability of logistics activities and confidence in supply chain processes in an economy.

Table 1.8. Economy wise score on "Timeliness"

Timeliness Score	2007	2010	2012	2014	2016	2018	2023
China	3.68	3.91	3.80	3.87	3.90	3.84	3.7
Malaysia	3.95	3.86	3.86	3.92	3.65	3.46	3.7
Thailand	3.91	3.73	3.63	3.96	3.56	3.81	3.5
India	3.47	3.61	3.58	3.51	3.74	3.50	3.6
Vietnam	3.22	3.44	3.64	3.49	3.50	3.67	3.3
Indonesia	3.28	3.46	3.61	3.53	3.46	3.67	3.3

Sri Lanka	2.69	2.98	2.90	3.12	N.A	2.79	3.3
Bangladesh	3.33	3.46	N.A	3.18	2.90	2.92	3.0

Source: Arvis et al., Logistics Performance Index (various issues)

Table 1.9. Economy wise score on “Tracking and Tracing”

Tracking and Tracing Score	2007	2010	2012	2014	2016	2018	2023
China	3.37	3.55	3.52	3.50	3.68	3.65	3.8
Malaysia	3.51	3.32	3.54	3.58	3.46	3.15	3.7
Thailand	3.25	3.41	3.18	3.45	3.20	3.47	3.6
India	3.03	3.14	3.09	3.11	3.52	3.32	3.4
Vietnam	2.90	3.10	3.16	3.19	2.84	3.45	3.4
Indonesia	3.30	2.77	3.12	3.11	3.19	3.30	3.0
Sri Lanka	2.58	2.23	2.65	2.76	N.A	2.79	3.0
Bangladesh	2.46	2.64	N.A	2.45	2.59	2.79	2.4

Source: Arvis et al., Logistics Performance Index (various issues)

Further to this analysis, table 1.9 shows that India’s score on tracking and tracing is again in line with significant trade competitors in the Asian region. This, as Arvis et al. (2023) point out, increases the reliability and robust predictability of the supply of a country. Ease of tracking and tracing of cargo also facilitates the implementation of transport planning, which in the current Indian context is the biggest challenge in logistics. However, with the use of modern technology, India has been able to maintain a decent score on tracking and tracing over time.

From the above analysis, it is clear that the two biggest challenges to India’s logistics performance are inefficiencies in customs and border procedures and lack of infrastructure. India has been maintaining a decent score in other indicators compared to trade competitors from Asia; however, as pointed out before, the sustainability of such a stance requires thoughtful interventions.

Table 1.10. Economy wise number of forms involved in Exporting and Importing

Country	Number of forms									
	Imports					Exports				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
China	5.36	6	5	5	4	4.87	5	4	4	4
Malaysia	3.17	2	4	N.A	2	2.67	2	4	N.A	2
Thailand	3.33	5	2	2	2	2.67	4	2	1	2
India	5	6	4	5	3	4	5	4	5	3
Vietnam	6.5	5	5	4	3	5.5	4	3	3	2
Indonesia	5	5	5	4	5	3.5	3	4	3	3
Sri Lanka	4.33	5	4	4	4	4	5	3	3	4
Bangladesh	6.5	5	5	5	N.A	8	4	5	4	N.A

Note: N.A is data Not Available

Source: Arvis et al., Logistics Performance Index (various issues)

In this respect, India's proactive steps to facilitate international trade are illuminated by Table 1.10, which shows that India has reduced the number of forms from 5 to 3 for imports and from 4 to 3 for exports. Such a step reduces the time taken for the process to complete and takes out inefficiency from the system. This also reduces the cycle time of such processes, which is reflected in the clearance time of the cargo, which has reduced for India from 2 days to 1 day in the case of without physical inspection of cargo and almost 3.5 days to 2 days in the case with physical inspection of the cargo (Table 1.11).

Table 1.11. Economy wise clearance time (days)

Country	Clearance time (days)									
	Without physical inspection					With physical inspection				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
China	1.7	2	2	2	1	3.38	4	3	3	2
Malaysia	0.74	1	1	N.A	0	2.08	1	2	N.A	1
Thailand	0.71	1	1	1	1	1.41	1	1	2	1

India	1.92	2	1	2	1	3.45	4	2	3	2
Vietnam	1.41	1	1	1	1	3.46	2	2	3	3
Indonesia	2.14	1	2	2	1	5.12	4	5	4	7
Sri Lanka	0.79	1	1	1	2	1.59	2	3	2	4
Bangladesh	2.83	3	2	2	N.A	4.47	4	3	3	N.A

Note: N.A is data Not Available

Source: Arvis et al, Logistics Performance Index (various issues)

Table 1.12. Economy wise number of agencies involved in Exporting and Importing

Country	Number of agencies									
	Imports					Exports				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
China	4.2	3	3	3	3	4.06	3	3	3	3
Malaysia	3	2	2	N.A	2	2.86	3	2	N.A	2
Thailand	2.25	5	4	1	3	1.75	4	3	1	3
India	3.71	3	3	3	3	3.43	3	3	4	3
Vietnam	5.5	4	4	4	3	3	4	4	3	2
Indonesia	3.67	5	4	2	4	2.5	5	3	2	3
Sri Lanka	3	4	4	3	4	3.33	3	4	3	N.A
Bangladesh	2.5	4	4	4	N.A	2.5	4	4	3	N.A

Note: N.A is data Not Available

Source: Arvis et al., Logistics Performance Index (various issues)

However, as evident from Table 1.12, India has maintained the number of agencies involved in exports and imports. If Table 1.10 is read along with Table 1.12, a reduced number of forms may increase efficiency gains; however, a similar number of agencies may tentatively increase time delays if inefficiencies exist. Procedural delays reflected in non-transparent paperwork, under-skilled manpower, and rigid border control measures could have an impact on slowing down the trade flow and thus increase the time and cost of trade, leading to a reduction in the comparative advantage of a country. In this regard, a very specific bottleneck creating inefficiency in the Indian logistics sector is acknowledged by KPMG India (2007) as a skill gap which requires attention and intervention. The study describes that human resource

development through skill gain would lead to a more aware and efficient workforce in the Indian logistics sector, which has paramount significance for its sustainability, too.

In the Indian scenario, the peculiar characteristic of logistics is that the manufacturing points are concentrated, whereas the distribution channels are geographically diverse, which leads to high demand for infrastructure development for ease of transportation. However, managing such transport infrastructure is also a challenge because of the lack of skilled manpower having managerial abilities, lengthy domestic border clearance, overloading of trucks, transport cartels, particularly in road transportation, and the lack of proper use of transport planning, lack of warehousing facility, to mention a few (Chandra and Jain, 2007). However, the growth of infrastructure is the need of the hour, and government initiatives have been focused on these aspects. In this respect, Raghaveni (2023) highlights underutilised ICT in logistics, lack of sufficient infrastructure, rigid regulations, and redundant paperwork have all increased inefficiency in the Indian logistics sector. Adhikary and Bora (2014) also share similar views. A study by NITIE (2023) shows that lack of modal integration, high logistics cost on account of delays at ports due to poor forecast of demand, delays due to documentation process, high port charges, poor quality transport infrastructure in terms of road transport and non-reliability and high freight tariff rates of rail transport have all added up to already existing infrastructure woes in the Indian logistics sector. The same study also highlights that in inland waterways transport, the major challenges to use are lack of depth and terminals, insufficient use of technology and navigation infrastructure, jurisdictional issues reflected in non-uniform policy for inland waterways vessels across Indian states, geographical hurdles, and reduced water flow in water tributaries, etc. The study by Gupta *et al.* (2018) and Rautia and Barge (2020) share similar findings wherein the authors show that in the Indian logistics sector, service providers face many challenges, namely a lack of awareness of sustainable business practices and, therefore, dependency on traditional operational practices, inefficient and rigid customs and border procedures are biggest challenges to the growth of Indian logistics sector. From the above discussion, it is clear that improper infrastructure, high logistics costs, which is 14 per cent of GDP higher than in advanced countries (Aritua *et al.*, 2018), uncertain delays, underutilised coastline and minor ports, less tapped inland waterways due to operational challenges, mundane technological development has been lowering down India's logistics potentials in the international market.

6. CONCLUSION AND POLICY PRESCRIPTIONS

The paper acknowledges that efficient trade facilitation measures (in terms of an efficient logistics system) lead to lower trade costs and time of international trade. The model estimation (SEM) shows a positive and significant impact of the Logistics Performance Index (LPI) on container traffic movement in India. Further, the analysis of LPI scores for India, along with other sample countries, illuminates that the major inefficiency of India in logistics performance is the lack of proper trade and transport infrastructure and rigid customs and border procedures. Such findings are in conformity with Pohit *et al.* (2019), who show that customs procedures, documentation, and infrastructure are the biggest components of the logistics cost of India.

Although India's LPI scores are quite improved compared to her South Asian trade competitors but, they are not in comparison to trade competitors from Asia. This may be because of the external sector approach of India towards exports since the first five-year plan, which focused more on imports and re-exports leads to creating a pessimistic environment for exports (Cherunilam, 2006). Such policy changed later but had already created a backlog in the mindset of exporters and importers. Further policy focused on promoting exports but without concrete

interventions did not lead to much productive results. For instance, India has signed trade agreements with other countries but has failed to create the required levels of awareness among exporters and importers of such measures. Adding to this, India does not manufacture containers but rather purchases them from other countries. Only recently, sporadic attempts have been made to manufacture containers. Such dependency also hampers India's comparative advantage, particularly during supply chain disruptions like COVID-19, which created a shortage of containers in India.

India's recognition of the structural problems in trade policy and domestic logistics system is only recent. India has recognised that logistics and transportation are the backbone of any economy. Such recognition, although it has come very late, is reflected at the policy levels. The recent government initiatives of easing out transportation and logistics procedures could be seen in terms of the National Logistics Policy, which is a detailed framework involving various strategies to increase infrastructure and integrated logistic services with a focus on sustainable transportation. India has also come up with PM GatiShakti plan, state-level logistics policy, Industrial corridors, freight corridors, six-lane expressways, Maritime India Vision, Sagarmala initiatives, coastal corridors and promoting inland waterways, which aims at resolving major transportation and logistical inefficiencies. India is also promoting the digitalisation of the process of international trade. The results of the initiatives taken by India in recent times are to be seen in the upcoming days. However, India's immediate focus would be to develop qualified, skilled and efficient human resources in the logistics sector. Also, India needs to take steps to create awareness among exporters and importers about foreign trade integration agreements. Lack of such knowledge leads to underutilisation of such trade agreements and thus productivity gains from such exercises. Also, apart from the WTO trade facilitation agreement, India could also explore making trade facilitation as a part of bilateral and regional trade agreements. This may bring fruitful results apart from commitments at WTO. Therefore, India's major actionable focus to promote international trade could be external economic integration with major trading partners coupled with domestic reforms in the customs and infrastructure segments of the logistics and transportation sector. Such a step would bring efficiency gains and increase trade flows, which is going to be a win-win situation for India and her trade partners.

7. **LIMITATIONS OF THE STUDY AND FURTHER RESEARCH**

The study suffers from the following limitations.

- The limitation of the calculation of LPI in terms of the number of respondents, perception-based surveys, and non-random sampling methods adopted to collect data for LPI are also applicable to the analysis of this study.
- Also the results of the SEM could also be read in light of the limitations of the LPI data.
- In the absence of many trade facilitation indicators, the study adopts LPI data. However, the construction of trade facilitation indicators based on WTO trade facilitation data would be a true reflection and indicator of trade facilitation. Also, simulation studies focusing on the impact of liberalised trade facilitation scenarios on trade flows could be a future scope for research.

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