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Assessing the Logistic Performance and Export Competitiveness of India: A Comparative Study with Peer Economies

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ABSTRACT

The World Bank Logistics Performance Index (LPI) assesses supply chain efficiency and trade competitiveness globally. This study examined India's logistics performance (2007-2023) and its association with exports. Additionally, this research assessed India's progress against similar economies - Vietnam, Indonesia, and Brazil. Results were estimated using secondary data obtained from the World Bank LPI database and export data by analysing six components: Customs, Infrastructure, International Shipments, Logistics Competence, Tracking and Tracing, and Timeliness. Graphical comparisons and Pearson correlation analysis were used to discuss trends and relationships in logistics performance and exports. The findings suggested that India's LPI improved slightly in recent years. Most of the improvements are attributed to the gains in international shipments and customs performance; however, performance in Infrastructure remains poor. Similarly, Brazil and Vietnam depict modest LPI improvements, while Indonesia shows a minimal change in trends. Among the peer economies, Vietnam leads in logistics performance with the highest ranking LPI and the strongest correlation (0.9) between LPI and exports. While Brazil (0.55) and India (0.43) exhibit a moderate correlation between LPI and exports, Indonesia presents a weak association at 0.16, indicating distinctly different structural characteristics in their logistics environments. The findings indicate that India, Brazil, and Indonesia should evaluate the alignment between their logistics reforms and their export strategy. They must prioritize logistics policy initiatives, such as investment in infrastructure and identifying policy-driven approaches across its peers, like Vietnam's port improvements, upgrades, and improvements in digital tracking and tracing systems.

Keywords: Logistics, LPI, Exports, Customs, Shipment

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1. Introduction

1.1. General Background

Effective logistics systems form an essential foundation of competitive world trade and robust supply chains [1]. With a more integrated world economy, more efficient logics increase the capability of countries to integrate into world value chains, lower the costs of trade, and receive foreign investment [1]. In accordance with the World Bank, enhancing the performance of logistics can lower trade costs by as much as 15% and is thus an important driver of export competitiveness and economic growth [2]. An improvement of 1% in logistics performance can increase trade volumes by 1.5%, highlighting its influence on determining global trade flows and country productivity [2]. To evaluate and track logistics efficiency across the world, the World Bank created the Logistics Performance Index (LPI) as a measuring stick in 2007. The LPI is an aggregation of country performance on six aspects of logistics performance [3]. Customs is the first aspect, which is used to evaluate how efficiently, transparently, and reliably border clearance processes work in order to make the movement of goods smoother [4]. Infrastructure is the quality and provision of physical trade and logistics-related infrastructure (for example, roads, ports, rail, and technology) that enables secure and reliable passage of goods [5]. International Shipping evaluates how simple and cheap it is to organize shipments internationally, indicating how integrated (or not) a nation is in a chain of international trade routes and networks [6]. Logistics Competence considers the professionalism and reliability of providers of logistics, ranging from transporters to freight forwarders [5]. Tracking and tracing reflect how much there is real-time visibility of a company's or buyer's cargo so that they can control supply chains [4]. Lastly, Timeliness captures how regularly shipments arrive at their destination as planned, reflecting logistics systems' overall reliability, realistically operationalized under hardship or cross-border conditions [6].

From the discussion, logistics performance is an essential driver of trade efficiency and international market access for India. Logistics performance improvements lead to reductions in transportation time, reductions in customs-related delays for clearing goods out of a country, and reductions in overall costs of trade. Logistics performance improvements increase the competitiveness of Indian exports in international markets through reliability, lower prices, and on-time delivery. The study emphasizes that India's logistics efficiencies have recently improved due to policy directives such as the National Logistics Policy and programs such as Gati Shakti (fueled by the national logistics policy). The National Logistics Policy (2022) aims to reduce costs to less than 10% of gross domestic product (GDP) by 2030 from 13-14%. The plan will improve the logistics sector by utilizing integrated digital systems, standardizing logistics processes, and expanding logistics infrastructure [7]. The PM Gati Shakti Master Plan (2021) uses a GIS-based digital platform that coordinates 16 ministries to collaboratively plan for

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infrastructure projects in a common platform across sectors [8]. These action items have enabled the central government to track 430 infrastructure projects costing ₹11.17 lakh crore, through improving connectivity and multimodal logistics between sectors. Both of these initiatives are part of the commitment to increase India's ranking in the World Bank Logistics Performance Index and improve access to Indian goods worldwide [9]. Consequently, the electronics, pharmaceuticals, and textiles sectors have all increased momentum regarding export performance and outlook. Electronics exports also increased 32.46% in FY2024–25, with exports rising from US$29.12 billion to 38.58 billion, as India started to find its place in global electronics supply chains [10]. Pharmaceutical exports increased 9.4% to US$30.47 billion, and they still service more than 200 countries, supplying generic and specialty medicines [11]. The textile industry is also seeing advancements and will soon have a good footprint, especially with the good transport ability and the LHS, where back-end logistics interface to accommodate good turnaround times in international shipments [12]. All three examples reflect a clear association between changes in logistics and export competitiveness.

Apart from these, enhanced logistics also fosters FDI and international linkages for domestic industries [13]. Improvements to freight corridors, digitized cargo tracking, which reduces the overall turnaround time, and lowers the barriers to entry, enable small and medium enterprises (SMEs) to integrate into international supply chains much more readily. All these factors combined have greatly contributed to India's growing reputation as a global FDI hub in manufacturing and services [14]. All of these component enhancements have enabled India to rank among the top countries for FDI in manufacturing and services. The increasing trend contributes to GDP growth. Freight forwarders in logistics services alone employ over 22 million people and create enhanced productivity in agriculture, industry, and services; better logistics compound economic progress through employment generation, increases in industrial production, and enabling market access both domestically and internationally [15,16].

1.2. Literature Review

The exploration of logistic performance and its relationship with trade competitiveness is evident in the literature across the world. In the same domain, a research showcased India’s increasing importance as a strategic player in global supply chains [9]. Using WTO and World Bank data (2011–2021) on trade and logistics indicators, this study employed trend and comparative analysis to evaluate India’s performance. The results indicated the industry's growing manufacturing base, the support of the government in rolling out digital logistics initiatives, and considerable tax and regulatory changes strategically position India in global trade. Moreover, it was revealed that India has substantial potential to position itself as a resilient and low-cost supply chain hub. Furthermore, India enjoyed a comparative advantage with respect to many labor-intensive supply chains while facilitating the transition to self-reliant trade infrastructure.

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The research implied that it is necessary for India to add to the multimodal connectivity of the total supply chain by pursuing the development of transport infrastructure, but it also invests in and improves logistics innovation to continue the momentum towards a sustainable long-term comparative advantage [9]. Another study explored the impact of supply chain relationships on logistics performance in the retail industry in Brazil [17]. Drawing on data from a sample of 199 managers and using Structural Equation Modeling (SEM), the study assessed several factors, including supplier selection, meetings, level of collaboration, and history of the relationship. The findings indicated that relationship history and supplier selection have a significant, positive influence on logistics collaboration and performance, while interpersonal factors such as trust and communication are more important than just operational interaction. Overall, the study highlighted the need to create trust-based, long-term supply chain relationships to realize high levels of logistics efficiency, and highlights the fact that the long-run gains from working collaboratively on logistics are greater than the short-run gains from transactional relationships. The authors also suggested that managers should create continuity and joint goals with critically important supply chain partners [17].

The Sybiria became the focus of a research study that examined how logistics performance affects organizational results across supply chain operations [18]. The study analyzed survey data from 2021 by using regression analysis to study how logistics capability and information sharing, and organizational outcomes relate to each other. The research demonstrated a strong link between organizational performance and logistics performance, which showed that organizations that allocate funds to logistics will achieve better efficiency and customer satisfaction, and market competitiveness. The research showed that logistics functions as essential strategic information which helps organizations improve their performance in current supply chain management. Organizations that focus on logistics innovation and transparent supply chain operations will generate financial success through enhanced productivity and sustained customer loyalty. The research showed that information flow and delivery reactivity function as critical factors which support logistics performance, according to the study [18].

Another research used identical methods to study how supply chain integration (SCI) affects logistics performance while considering supply chain dynamism (SCD) as a moderating variable. The researchers used data from 126 Korean manufacturing businesses to study how internal integration and supplier integration and customer integration functioned through hierarchical moderated regression analysis. The study results demonstrated that all three integration methods produced better logistics performance results which became more apparent when supply chain dynamicity reached high levels. The research found that supply chain integration (SCI) and logistics performance became disconnected because of changing environmental conditions. Organizations that operate in dynamic environments must implement integration as their main

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strategic approach because uncertain business environments produce better results when organizations establish integrated supply chain systems through coordinated operations and shared information and full supply chain response and quick crisis reaction. Organizations that combine supply chain strategies can activate their partner capabilities to defend against external business threats while improving their ability to detect market changes and adjust their operations quickly.

To analyse how logistics performance affects organizational performance within supply chains [20], a separate study used survey data from logistics and supply chain managers in various industries. The authors examined relationships between logistics capabilities, such as delivery reliability, cost efficiency, and flexibility, and various firm performance outcomes. A systematic method was utilized with questionnaires and regression analysis. The results revealed a strong positive correlation, which suggests that firms with high-performing logistics systems will experience better customer service, operational efficiency, and profitability than their competitors. The authors concluded that logistics is a strategic driver of organizational competitiveness and offer a recommendation of continuous improvement to logistics processes in enhancing firm responsiveness and customer satisfaction. The authors similarly emphasized the importance of continuing to invest in a flexible logistics structure to support sustainable long-term growth [20]. Lastly, for a different objective, a study investigated the impact of supply chain linkages, power, benefits, and risk mitigation upon supply chain performance (SCP) [21]. A sample of 145 managers (manufacturing and service sector-based in the U.S.) provided pilot-tested multi-item scales, and multiple regression analysis techniques were applied. Power, benefits, and risk mitigation were identified as significant contributors of SCP and provided strategic distinctions between the two sectors-therefore, manufacturing was defined by power, while services were defined by risk mitigation. Ultimately, this study provided some implications as to the prudent use of the management of inter-organizational relationships as a strategy for achieving performance and improvement across the many areas of industry. Also, it was suggested, each sector needed specific approaches in order to maximize the benefit from their linkages. Therefore, collaborative relationships had greater collaboration to reduce uncertainty, which led to a more predictable and smoother outcome of supply chain activities [21].

1.3. Literature Gap and Rationale of the Study

Despite comprehensive findings, current studies on logistics performance signal several gaps, of which many pertain to India's context more specifically. The majority of the literature assesses logistics and supply chain performance in situational, general, and developed economic settings without thoroughly investigating India's spatial challenges (e.g., the transition of policy to practice, infrastructural asymmetries, or the inception of digital logistics ecosystems and integration in global value chains). Most researches focus on the outcomes at the firm level (e.g.,

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cost, flexibility, and responsiveness) and has a fairly weak link to measures at a macroeconomic level (e.g., GDP, trade volumes, or FDI inflows). Therefore, the literature obscures the importance of logistics capabilities, economic competitiveness, and policy viability at a national and global scale. Lastly, there is a lack of comparative studies that distinguish and compare multiple regions or countries. Therefore, there is a need for research addressing the gaps in the existing papers.

India's goal of becoming a global supply chain hub depends heavily on logistics infrastructure efficiency and systems efficiency. While recent initiatives such as PM Gati Shakti and the National Logistics Policy have made progress, India still experiences very high logistics costs (13-14% of GDP) compared to a global benchmark of 8-10%. The World Bank's Logistics Performance Index provides a robust, globally accepted framework to benchmark logistics efficiency across various aspects (e.g., customs, infrastructure, shipment reliability). However, there is scant academic research that has monitored India's LPI score over time or comparatively benchmarked it with similarly placed economies (e.g., Vietnam, Indonesia, and Brazil). The current study intends to fill this void and provide a longitudinal and comparative analysis of India's logistics performance from 2007 to 2023. The study proposes to examine the relationship between logistics performance and broader economic outcomes, including trade competitiveness and supply chain integration. In so doing, the study will provide timely, evidence-based analyses that are useful for policy making, deciding areas for investment, and operationalizing India's global positioning in trade networks.

2. Methodology

2.1. Research Aim and Objectives

The study focuses on tracking and analyzing India's logistics performance over time using the World Bank's Logistics Performance Index (LPI). It investigates how India's supply chain efficiency has evolved, how it compares with other emerging economies, and how logistics capabilities influence trade competitiveness and economic growth. To evaluate the same, the following objectives are explored.

- "To analyze the trend and variation in India's overall LPI score and its six subcomponents- Customs, Infrastructure, International Shipments, Logistics Competence, Tracking & Tracing, Timeliness, from 2007 to 2023."
- "To compare India's logistics performance with similarly placed economies such as Vietnam, Brazil, and Indonesia, and to assess India's relative position in global supply chains."

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- "To examine the correlation between logistics performance and trade competitiveness, focusing on indicators such as export volume, logistics costs, and FDI inflows."

2.2. Data

This study used secondary time series data from the World Bank's Logistics Performance Index (LPI) to analyze trends in logistics performance in India. The LPI is used to benchmark a country's logistics performance using six dimensions: Customs, Infrastructure, International Shipments, Logistics Competence, Tracking & Tracing, and Timeliness. Each component is scored from 1 to 5, where higher scores indicate better performance. The data is longitudinally time-stamped and covers 2007–2023 (with reporting years 2007, 2010, 2012, 2014, 2016, 2018, and 2023), enabling to measurement of India's performance over time. In addition to India, this study examined the countries of Vietnam, Indonesia, and Brazil in comparison to one another, as each is considered a local peer and structurally similar countries for comparative purposes- in terms of similar LPI ranks, stage of economic development, integration into global value chains, and a focus on manufacturing-led exports. Subsequently, comparing India's performance against these countries should provide valuable insight and information regarding India's relative strengths and weaknesses in global logistics. This study also took into account each country's export data to further understand the relationship between logistics performance and trade dynamics. All data in the study were obtained and relied upon the World Bank's official LPI database to ensure all countries and time points were measured similarly.

2.3. Data Analysis Method

The analysis of the data for this study uses the method of trend analysis, which is the examination of data points over a period of time to assess whether the data shows movement in one or more directions, as well as shifts in values over a period to measure performance variance or other relevant explanatory variables. Trend analysis functions as an effective tool for tracking changes through time while serving as a vital resource for policy and economic fields because it enables long-term monitoring of trends and shows how things evolve through time and provides a basis for making comparisons. The study applies trend analysis to evaluate LPI scores of India and its peer economies Vietnam and Indonesia and Brazil during the period from 2007 to 2023. The analysis will consist of creating trend lines for the overall LPI score, as well as for each of the six individual LPI subcomponents: Customs, Infrastructure, International Shipments, Logistics Competence, Tracking and Tracing, and Timeliness. Trend lines are the way of visually displaying data to show a series of data points connected together to show a trend - up, down, or neutral - over time. Additionally, a correlational analysis is conducted to understand the relationship between LPI scores and export competitiveness. Therefore, correlation coefficients were calculated between LPI scores and exports of all the peer economies considered in this

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research. Lastly, the analysis in this report used Microsoft Excel to plot the graphs and estimate the correlation values.

3. Results and Discussion

3.1. Trend Analysis of LPI and its components in India

Figure 1: Trend Line: LPI Score- India (2007-2023)

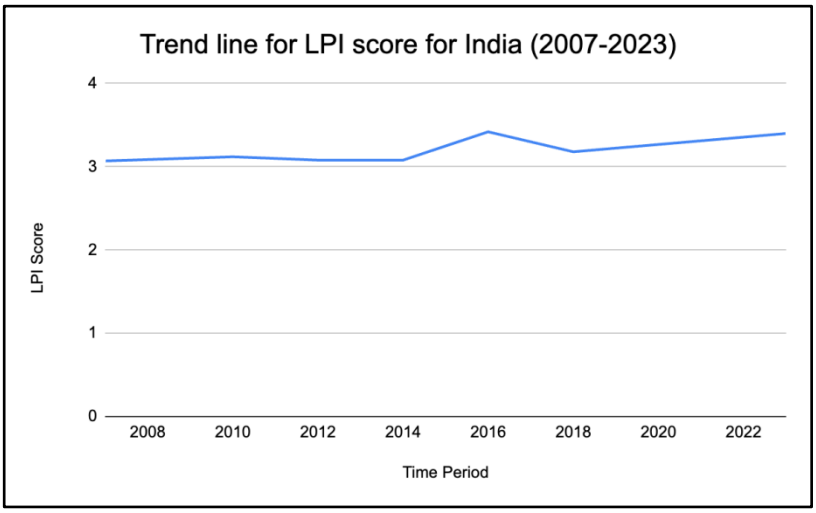

Figure 1 depicts the trends in the LPI score of India from 2007 to 2023. It can be seen that over the last 16 years, India's Logistics Performance Index (LPI) score has shown a moderate level of volatility, usually averaging around 3.0. The score increased slightly from 2007 to 2010, decreased, and after some stagnation periods, remained pretty constant until 2014. In 2016, India was able to achieve its highest score of nearly 3.4, but 2018 saw the lowest score yet after its highest score, which reflects apparent gaps in policy implementation. As of 2023, the score has started to gradually recover due to post-pandemic growth. In short, India has once again demonstrated that its logistics performance is on a slow but progressive trajectory.

India's Logistics Performance Index (LPI) improved from 2014 to 2016 due to several factors. The government implemented logistics development initiatives to enhance infrastructure [22]. Emerging technologies like cloud computing, blockchain, and IoT were emphasized to improve various infrastructural sub-dimensions [22]. Investment in human resources, including training, welfare, and working conditions, led to significant improvements in logistics performance, reducing costs and time while at the same time increasing retention rates [23]. These efforts aimed to address India's low LPI score, focusing on factors such as customs efficiency, infrastructure quality, and shipment timeliness [24]. India's Logistics Performance Index (LPI) has shown a decline in recent years, prompting research into the causes and potential solutions.

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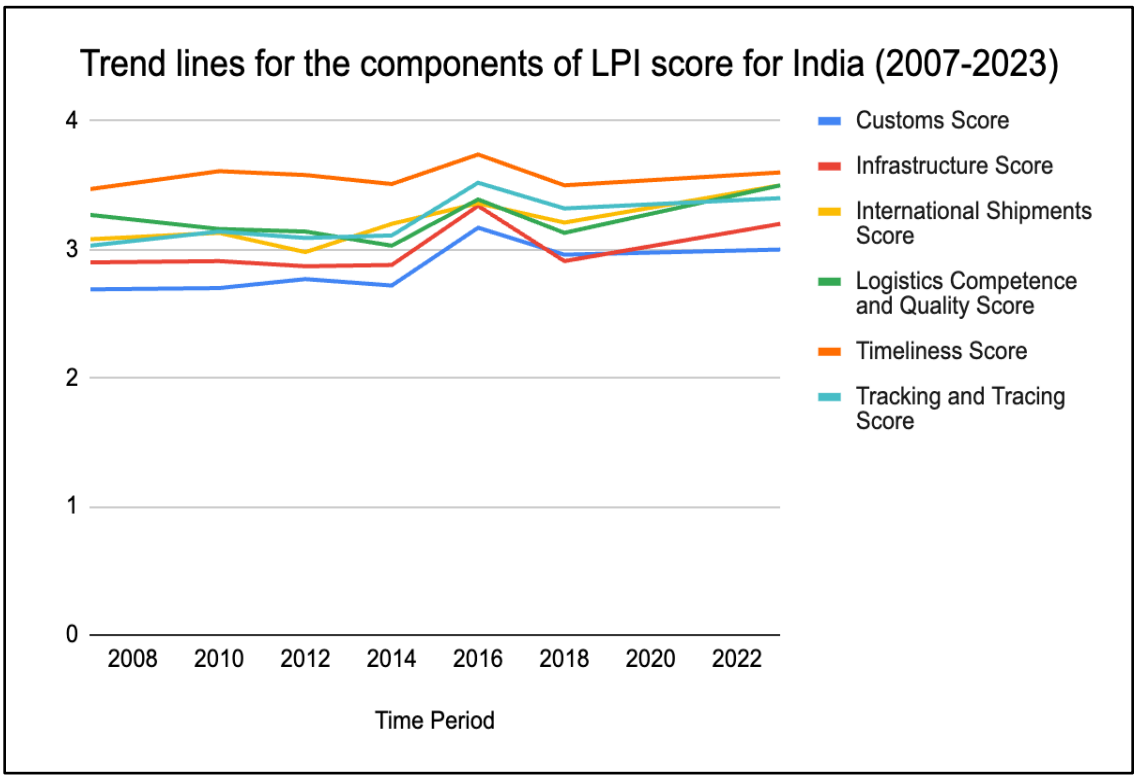
Studies have identified infrastructure as a key area for improvement, with emerging technologies like cloud computing, blockchain, and IoT suggested to enhance various sub-dimensions of logistics infrastructure [22]. The postal sector, in particular, faces challenges in logistics operations, with bureaucracy identified as a major obstacle [25].

Figure 2: Trend Lines: Components of LPI- India (2007-2023)



The trend lines in Figure 2 represent the trends in the components of the LPI of India from 2007 to 2023. India's results across the six components of the Logistics Performance Index (LPI) have improved gradually, but inconsistently. In the case of Customs, a steady increase since 2007 can be depicted, with a steep increase in 2016 due to telematics and trade facilitation reforms, but which then fell after 2018, gradually rising again to 2023, although it remains the weak spot. In the case of Infrastructure, between 2007 and 2023, greater stability has been seen, peaking in 2016 and dipping in 2018, and stabilizing again in 2023 with the PM Gati Shakti framework supporting it. For International Shipments, while a steady improvement is experienced, two dips in 2012 and 2018 are depicted from the trend line. This dimension has remained one of the relative strengths since 2016. Logistics Competence improved slowly – plateaued for four years (2010 to 2014), peaked in 2016, fell in 2018, returned to the 2016 score by 2023, and, as indicated above, demonstrates recent growth in the sector. Timeliness was consistently the

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strongest dimension for India, and in 2016 was indicative of greater reliability with respect to consistently meeting delivery timelines. Despite minor declines in timeliness, stable scores were noted from the last survey, suggesting consistency. Tracking and Tracing was an improvement in 2014, which began as a fairly modest value proposition, then returned to momentum in 2016, fell in 2018, and then finished well above the base value in 2023, showing an evident erratic growth trend from there on. The growth in this dimension suggests an increased adoption of digital tracking and monitoring systems and an awareness of real-time supply chain technologies.

Between 2014 and 2016, India made remarkable strides across all components of the Logistics Performance Index (LPI), reflecting reforms, investments, and technological advancements [26]. Customs efficiency improved through digitization, risk-based management, and 24x7 clearance at major ports and airports, lifting India's ranking from 65 to 38 [6]. Infrastructure also advanced due to large-scale public and private investments, including trade corridors, moving India from 58 to 36 [27]. International Shipments became more competitive, improving India's position by five places. Logistics Competence rose significantly, supported by skills development and private sector engagement, with India climbing from 52 to 32 [28]. Tracking and Tracing witnessed major gains from IT innovations and digital platforms, improving from 57 to 33. Finally, Timeliness advanced as computerized scheduling and better coordination enhanced reliability, helping India move up nine positions. Collectively, these improvements highlight India's rapid progress in logistics efficiency and its growing integration into global trade [28].

When comparing the components of India's Logistics Performance Index (LPI) from 2007 to 2023, some remarkable trends appear. Tracking and Tracing show the most noticeable improvement over time, especially with a sharp increase around 2016, reflecting India's growing adoption of digital logistics solutions. Though it dipped slightly in 2018, it rebounded steadily through 2023. Similarly, International Shipments experienced a decline between 2012 and 2014, followed by a steep rise in 2016, likely due to reforms and infrastructure investments, but then dropped again in 2018 before recovering. Logistics Competence and Quality also followed this "dip-then-rise" trend, with a notable increase from 2016 onwards, suggesting improvements in training, standards, and service quality. Timeliness, which started as one of the highest-scoring components, saw a small decline between 2012 and 2014, then peaked around 2016, and remained relatively stable and strong afterward. In contrast, Customs Score showed a modest and slow rise over time, with a dip in 2014, a significant jump in 2016, and then a slight drop followed by a slow recovery. Finally, Infrastructure showed the most gradual progress with minimal fluctuations, indicating steady but slower development over the years. Overall, most components experienced a peak in 2016, a dip in 2018, and a recovery phase toward 2023, showing that while India made significant logistics improvements, the progress has been uneven across components.

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3.2. Country-wise comparison of LPI Scores

Figure 3: Trend Lines: LPI Score- India, Indonesia, Brazil, Vietnam (2007-2023)

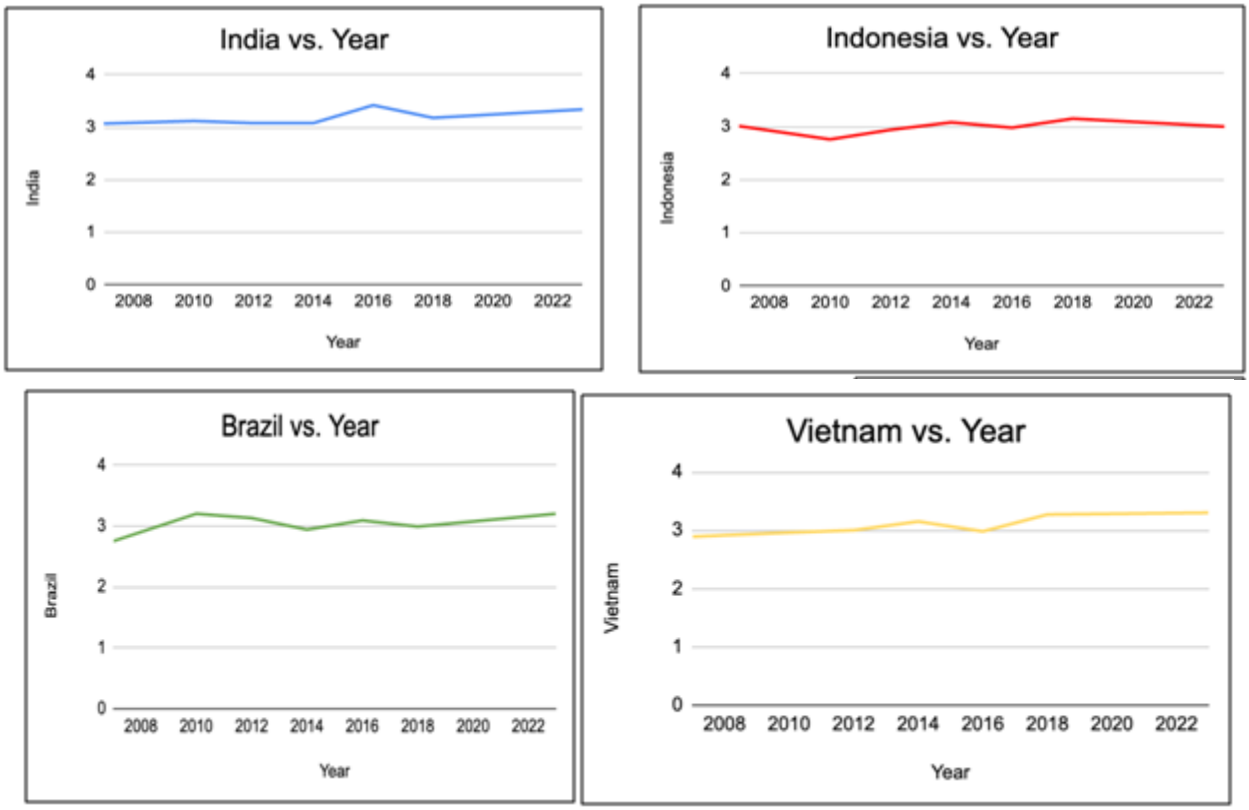

Figure 3 shows the trend lines of LPI scores for the peer economies- India, Indonesia, Brazil, and Vietnam. As discussed in Section 3.1, India's LPI depicts a moderate rise from 2007 to 2023, with a peak in 2016. Indonesia's LPI reading exhibits small variations over time. The index dipped around 2010, recovered slowly until 2014, and stayed around 3.0 during 2018–2023. No significant upward or downward spikes are found, which indicates that logistics advancements have been scarce and progress has been slow and irregular in Indonesia. The LPI score for Brazil varies the most. Its score rose markedly around 2010, declined slightly by 2014, and varied in subsequent years. In 2023, it recovered some stability, reaching closer to its previous high. This trend suggests cycles of advancement in Brazil interspersed with reversals, which are indicative of uneven logistics reform and policy effects. Lastly, Vietnam's score displays slow improvement, with a slight peak sometime in 2014 before it dipped again and recovered by 2018. From 2018 to 2023, the score was stable with incremental gains. Hence, Vietnam's improvement seems steady without any strong spikes, displaying consistent but small improvements in logistics.

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It can be assessed that Indonesia's LPI score remained within the range of 3.0 throughout the period 2007–2023. The scores varied little throughout this time but have declined slightly since 2010. The country is slowly improving logistics efficiency, with only modest improvement visible by 2014 and no significant long-term trend. Brazil's scores had risen meaningfully around 2010, decreased by 2014, and changed upwardly from there. By 2023, Brazil's score indicated some improvement to reach close to its previous peak, indicating cycles of policy-driven progress followed by decline. Vietnam's trend indicates steady but small growth. It reached a small peak in 2014, dropped subsequently, and again picked up by 2018, remaining stable through 2023. India, relative to these nations, showed the largest improvement, with a big spike in 2016, presumably because of trade facilitation improvements and investment in infrastructure, and a minor decline followed by a steady build-up towards 2023. India and Brazil exhibit more visible fluctuations overall, Vietnam depicts steady but slow improvement, and Indonesia is the most sluggish, with small visible improvements in logistics performance throughout the years.

Overall, the performance gap between high-performance (high-income) and low-performance (lower-income) nations still existed in both customs and infrastructure scores. High-income OECD nations still dominated in both components in 2016, but some rising nations, such as India, showed big jumps by concentrating on digital systems in customs and infrastructure modernization. The variation in customs performance was most consequential for developing economies, where efficiency of customs clearance had a more powerful impact on trade expansion than incremental gains in already robust infrastructure in highly developed nations [29]. On a nation-by-nation level, the highest LPI performers of 2014 (e.g., Germany, the Netherlands, and Singapore) repeated their position in 2016 with slight fluctuations in scores, indicating continued high standards in customs and infrastructure. Lower-ranked nations still struggled with the efficiency of customs because of bureaucracy and corruption, and infrastructure due to insufficient investment [26]. In total, from 2014 to 2016, LPI data indicate that both customs and infrastructure scores around the world did advance, though the degree of improvement hung largely in the balance of national policy intensity and investment. Nations with focused customs reforms and upgraded infrastructure achieved more, while others slumped or stagnated [29].

3.3. Relationship between LPI and Export Competitiveness

As seen in Table 1 correlation between the Logistics Performance Index (LPI) and exports varies significantly across countries. Vietnam shows the strongest positive correlation at 0.9, indicating that improvements in logistics are closely tied to rising export levels. Brazil demonstrates a moderate correlation of 0.55, suggesting that better logistics performance aligns reasonably well with export growth. India reflects a weaker but still moderate correlation at 0.43, where gains in LPI contribute to export improvements, though less consistently than in Brazil or Vietnam. By

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contrast, Indonesia records the weakest correlation at 0.16, implying that enhancements in logistics do not necessarily translate into higher export levels, likely due to structural differences in its trade and economic composition.

Table 1: Correlation coefficients between LPI Scores and Exports (India, Indonesia, Brazil, and Vietnam)

Country	Correlation Coefficient
India	0.43
Indonesia	0.16
Brazil	0.55
Vietnam	0.9

As noted in the table, all correlation coefficients from LPI and exports were found to be positive. Within the selected group of countries, Vietnam is a clear case that demonstrates how the "right" logistics systems and structures can influence and drive export growth [30]. Brazil and India, while showing positive correlation with exports, suggest that improvements to logistics alone have limitations and need to align with broader definitional success, coordinating a policy and trade agenda [31]. In the case of India, there may be reasons to seek stronger pathways linking logistics improvements to an export-oriented strategy. Indonesia, with the low correlation, demonstrates improvements to logistics offer no guarantee for increasing exports, but rather have to sit within deeper reforms to the economy and investment, and infrastructure. Therefore, the relative alignment hence comparison presented in this report underscores the significance of logistics but also shows the variation in returns on exports connected with logistics performance relative to the extent of coordination with the economic and trade policies of a country.

The logistic performance-export correlation (0.9) is explained by a coherent development strategy that Vietnam is pursuing for export growth, particularly in the technology, textiles, and shoe sectors [32]. Vietnam has invested considerable resources into logistics infrastructure, customs arrangements, and port systems; these efforts, among others, resulted in substantial benefits to Vietnam's export development [33]. Even better, the research indicates that countries that plan logistics within their overall trade and industrial policy may achieve more direct effects on trade performance [34]. Moreover, Vietnam's spatial proximity to global manufacturing

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centers, in conjunction with trade agreements with fifty-plus countries, facilitated logistics firms' ability to convert improved logistics into export growth [34].

Conversely, India and Brazil have a moderate positive correlation (0.43 and 0.55, respectively), suggesting that while improving logistics contributes to export performance, other structural and economic variables are also important factors [3]. In the case of India, for example, typical complications include delays in implementing policies, different regulatory environments, and infrastructure bottlenecks, which may dilute logistics improvements in the context of exports [35]. Similarly, Brazil's logistics system is often constrained by high costs and overloaded road networks, limiting the responsiveness of exports to improvements in logistics [36]. These complications that affect both countries illustrate that while logistics performance is an important factor, it needs to be complemented by trade policy, institutional reform, and diversification strategies to fully affect export performance in large, complex economies [37]. Indonesia's logistics improvements have minimal impact on exports due to geographic fragmentation, regulatory inefficiency, and other dominant economic factors [38]. Hence, structural challenges prevent logistics from strongly driving export growth, as seen in other countries.

4. Conclusion

The Logistics Performance Index (LPI) is an important benchmark for how effectively countries are able to carry out the movement of goods, and thus plays an important role in the export performance of these countries. This study evaluates the trends in LPI and the relationship between LPI and how countries generate exports, particularly India and its peers. The objectives in this study were: 1) to assess India's LPI trends (2007-2023); 2) comparison of India's performance with Vietnam, Indonesia, and Brazil; and 3) to examine if there is a correlation between LPI and the amount of exports. This study used secondary data from the World Bank LPI and export statistics. The analysis was applied to the data collected across the seven reporting years. From the analysis, the results illustrate that for India in particular, LPI (overall) has improved steadily along with customs and international shippers, which have seen significant improvements, compared to peers such as Vietnam, which rated higher (LPI score). Moreover, the trends in LPI for Indonesia and Brazil seem flatter. Notably, Brazil and Indonesia exhibited contrasting trends in logistics performance over time, yet their scores converged to a similar level by 2023. In addition, the correlation analysis between LPI and exports also showed similar patterns. The correlation coefficient indicates that Vietnam produced the strongest correlation of LPI and exports at 0.9, implying a strong formulaic relationship between the two. However, India and Brazil displayed (and operational) moderate correlations about shipments and logistics overall (0.43 and 0.55) as reported, and - in contrast - Indonesia produced the weakest link measured at 0.16. These results imply that each country differs significantly in how its investments and/or economics of national logistics improvement impact its trade. Conclusively,

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logistics performance does help to support the growth of exports, and it needs to be considered in a qualitative context as it may or may not provide immediate support for exports to increase in volume or value, which should be similar or higher in export volumes and/or values when country logistics improvements occur. In the case of India, aligning the upgrades and logistics improvements with export strategies would be a significant step to maximize trade potential.

5. Limitations and Policy Recommendations

This paper considers a number of limitations that should be noted. First, the LPI scores are available for only a few selected years (i.e., 2007, 2010, 2012, 2014, 2016, 2018, and 2023), which limits our ability to track annual progress and capture the short-term consequences of any particular policy change. Second, the analysis draws correlations as opposed to causation; specifically, while the logistics performance and exports would appear to move together, it is also plausible that other factors, such as global demand changes, geopolitical changes in trade relationships, or trade agreements, may also impact the growth of exports independent of the changes in logistics performance. Finally, the analysis draws primarily on country-level LPI and export data without differentiating between sectors (i.e., agriculture, manufacturing, electronics). A revised analysis based on a sector-specific approach could add more insights, considering logistics bottlenecks, and provide more specific policy suggestions.

Policymakers can utilize this study to make more effective and informed investment decisions on infrastructure to improve logistics areas more strongly associated with trade growth. For example, if customs efficiency or parcel tracking is strongly linked to trade growth, public funds may be best directed to those high payoffs. Additionally, a comparative benchmarking approach offers potential insights, including India's ability to assess logistics relative to peer economies, such as Vietnam, and examine particular successes that might be adapted to bolster India's national logistics plan, for instance, Vietnam's strategic reforms in its logistics sector. Finally, logistics improvements must be aligned with broader trade policy, particularly in the manufacturing and other identified high-export sectors, so it can be ensured that the reforms translate to real export growth and potential long-term growth.

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