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## IMPACT OF LOGISTICS PERFORMANCE INDEX ON INTERNATIONAL TRADE

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### ABSTRACT

Many articles from previous years have made an effort to evaluate the significant influence of the Logistics Performance Index on international trade. The logistics of national trade. To manage logistics performance successfully in a highly competitive global business environment, performance measurement is crucial. The purpose of this article is to empirically investigate how LPI affects international trade. By using variables such as economic factor i.e. GDP, the distance between importing and exporting countries, the infrastructure of the countries, trade flow, and LPI score of the year 2018 for 150 countries. For the purpose of estimating this relationship among 150 nations, we used the improved gravity model of regression analysis. The findings of our study suggest that trade will rise with trade flow because all of the variables we considered are significant and show the intended indications in line with our hypothesis.

**Keywords:** LPI, GDP, Gravity Model, Trade Flow.

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### I. INTRODUCTION

#### **Logistics Performance Index:**

The national trade logistics Performance measurement in logistics is essential for effectively managing logistics operations in a globally competitive business environment. The pre-requisite for such performance measurement is, determining keyperformance indicators that will have a direct impact on logistics performance in terms of productivity and competitiveness.

The Logistics Performance Index (LPI) is an interactive benchmarking tool created by the World Bank to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance.

The World Bank provides an interactive benchmarking tool called the Logistics Performance Index (LPI). With the help of this tool, countries can easily spot unexploited opportunities and the underlying challenges involved in trade logistics performance. LPI was last released in 2018 comparing 160 countries. A survey of ground operators is conducted worldwide and their feedback on the ease of working and friendliness of the countries they operate in is recorded. Apart from this feedback, quantitative data on the logistics networks in the country emphasizing the performance of key components is also assessed. Therefore, LPI is a combination of both qualitative and quantitative measures

#### **1. Domestic Logistics Performance Index:**

The Domestic LPI looks in detail at the logistics environments in 100 countries. For this measure, surveyed logistics professionals assess the logistics environments in their own countries. This domestic evaluation contains more detailed information on countries' logistics environments, core logistics processes and institutions, and time and distance data. This approach looks at the logistics constraints within countries, not just at the gateways, such as ports or borders. It uses four major determinants of overall logistics performance to measure performance:

- Infrastructure,
- Services,
- Border procedures and time, and

- Supply chain reliability.

The Global Ranking of the World Bank's 2016 Logistics Performance Index shows that India jumped to 35th rank in 2016 from 54th rank in 2014 in terms of overall logistics performance among 160 countries.

Gujarat again ranked 1<sup>st</sup> in the LEADS 2021 Index among 21 states for its 'proactive policies, well-developed infrastructure, and services driven by a responsive government. Gujarat retained its top position in the 3<sup>rd</sup> edition of the national logistics index similar to the previous two rankings in 2018 and 2019.

## **2. International Logistics Performance Index:**

LPI 2018 ranks countries on six dimensions of trade -- including customs performance, infrastructure quality, and timeliness of shipments. The data used in the ranking comes from a survey of logistics professionals who are asked questions about the foreign countries in which they operate.

The components analyzed in the International LPI were chosen based on recent theoretical and empirical research and on the practical experience of logistics professionals involved in international freight forwarding. They are:

- The efficiency of customs and border management clearance ("Customs").
- The quality of trade and transport infrastructure (Infrastructure").
- The ease of arranging competitively priced shipments (Ease of arranging shipments").
- The competence and quality of logistics services—trucking, forwarding, and customs brokerage ("Quality of logistics services").
- The ability to track and trace consignments ("Tracking and tracing").
- The frequency with which shipments reach consignees within scheduled or expected delivery times ("Timeliness").

### **The role of the LPI in promoting trade:**

Political decisions and implemented policies have both direct and indirect effects on the attractiveness of a region or a country in terms of business location decisions and/or foreign direct investment (FDI). Here, the FDI stock in a country is a good indicator of its attractiveness.

Transport system efficiency and industry profitability are closely related. Inventory reduction through high turnover, ability to respond to volatile demand, short lead times and achieving lowest possible transportation costs are essential aspects of a company's competitiveness. For this reason, transportation systems are considered as a production factor and as one of the key determinants of facility location decisions.

Allowing for comparisons across 160 countries, the LPI is used by companies to identify challenges and opportunities related to the receiving country's transport infrastructure, logistics competence, and availability of efficient supply chains. In this context, the LPI is a useful indicator of the host country's trade logistics performance and also a benchmark when choosing locations for various types of operation. This is one of the main reasons why countries tend to focus on their ranking rather than on improvements in actual indicator values of the LPI.

## **II. LITERATURE REVIEW**

Since 2007, LPI findings have become standard reference material in numerous studies and policy papers on trade logistics. The LPI has been adopted by several countries as a key performance indicator in their national transport or logistics strategies. It is also used as a subset of transport or logistics key performance indicators by the European Union, the Association of Southeast Asian Nations, Asia-Pacific Economic Cooperation, and others.

This paper's objective was to investigate the similarity between the two groups of EU nations in terms of logistics performance or study how logistics performance affects the EU15's international bilateral trade CEMS in comparison to the rest of the globe from 2010 to 2018. This paper creates and estimates a Poisson structural gravity model Using the LPI and its subindices as the primary independent variables of interest, a pseudo-maximum probability estimator is used. The findings on bilateral trade, particularly when taking into account trade in various classifications of commodities and various country pair groups. ( Petra Adelajda Zaninović, Vinko Zaninović & Helga Pavlič Skender (2021) The effects of logistics performance on international

trade: EU15 vs CEMS)

This paper has covered both the Human Development Index (HDI) as established by the United Nations Development Program (UNDP) and the Logistics Performance Index (LPI) as defined by the World Bank. It has been investigated how the International LPI and HDI relate. To analyze this association, the authors sought to utilize a linear regression model with SPSS (Statistical Package for the Social Sciences). The information for 154 nations in 2018 has been applied in this research. Regression analysis's presumptions are all met, and the results of SPSS are used to demonstrate this. The LPI value for the year 2019 is predicted using the regression equation that was found. (Soumya Varma and Bhavin Shah Proceedings of the International Conference on Industrial Engineering and Operations Management)

The effect of the Logistic Performance Index (LPI) on global trade between 2007 and 2018 is examined to fulfill the objective. The gravity model approach is used to investigate this relationship, concentrating on the overall LPI and its constituent parts. The study's findings indicate that logistics has a statistically significant positive influence on bilateral trade between CEECs, and logistics justifies the function of a trade mediator. Additionally, the significance of LPI components in enhancing global trade was emphasized. Implications from the research show that enhancing logistics operations and services has a favorable effect on the amount of global trade. (Teorija ir praktika / Business: Theory and Practice)

The Logistics Performance Index (LPI) gauges the effectiveness of supply chains used in commerce or logistics performance. To create a synthetic index of overall logistics performance (DEA-LPI) and compare the logistics performance of the nations with LPI, this study offers a data envelopment analysis (DEA) approach. The suggested method uses DEA as a tool for multiple criterion decision-making to address the six dimensions of LPI (MCDM). The research also examines any potential variations that can be seen when considering various variables, such as income and location. Our research suggests that location and money play a significant role in how well logistics perform. High-income nations are among the top performers, which is heavily influenced by the EU. (Luisa Martí, Juan Carlos Martín & Rosa Puertas (2017) A Dea Logistics Performance Index)

To portray the true state of the logistics environment, this paper compares and ranks the LPI of the Western Balkan nations (Bosnia and Herzegovina, North Macedonia, Albania, Serbia, and Montenegro), as determined by the World Bank for 2018 using an integrated Criteria Importance Through Intercriteria Correlation (CRITIC)-Measurement Alternatives and Ranking according to Compromise Solution (MARCOS) model. To ascertain the six essential characteristics of customs, infrastructure, international transport, logistics capabilities, tracking and tracing of goods, and shipment delivery within scheduled or anticipated times are used to measure the performance of nations and the overall performance of logistics. (Bugarčić, Filip Ž., Viktorija Skvarciany, and Nenad Stanišić. "Logistics performance index in international trade: Case of Central and Eastern European and Western Balkans countries.")

### III. RESEARCH METHODOLOGY

#### 1. Rationale for the study:

Logistics is one of the crucial part of supply chain management. This research will help us analyze the importance of logistics and how its performance affects international trade. This research will also help us in understanding the contribution of logistics performance to economic growth. By using the Logistics Performance index which contains data from different countries over the last few years. Its components have become important for the countries to analyze their performance. We can make a comparative analysis by using the Gravity model which is a type of regression analysis. This gravity model will help us find the bilateral flow of trade.

#### 2. Research Design:

In this paper, Descriptive Research design is being used this paper will help analyze the impact of the Logistics Performance Index on International Trade. This research is based on the research papers and journals that already exist.

#### 3. Research Objectives:

To study the impact of logistics performance index and international trade.

To identify the growth of the logistics performance index and international trade.

To identify the impact of the logistics performance index on economic growth.

To identify how the quality of logistics impacts the performance and international trade.

To identify how operational functions affect logistics performance.

**4. Hypothesis:**

H0: To study if LPI has a positive effect on International Trade

H1: To study if LPI has a negative effect on International Trade

**5. Research Model:**

The gravity Model is one of the types of regression analysis that will be used to analyze the impact of the Logistics Performance Index on International Trade. This model will help to test the hypothesis of the research. The gravity model is a helpful tool for comprehending the connections between two places based on their economic size and distance from one another. To forecast the flow of commodities between two places, it is frequently used in logistics and transportation.

**6. Sources of Data:**

As this research is fully based on secondary data. The data are sourced from various Research Papers and Journals and also websites of the World Bank WTO, IMF and other national websites.

**7. Data Collection Method:**

The Secondary Data Collection Method is used as the data in this research paper is collected from various journals, and research papers. This study is based on the research papers and also the data collected World bank, IMF, WTO on which the gravity model formula is applied.

**IV. ANALYSIS**

LPI was published every 2 years, we took the LPI score of the year 2018. We also used trade flow, distance, infrastructure, and economic size of the countries. To evaluate the impact of LPI on the economy and also trade flows of the countries. This data is collected for 160 countries in total. The dependent variable in this data is traded flow others are independent variables.

The LPI data was collected by using the WTO website, GDP data was collected by using the World Bank website, Distance through CEPII, and Trade flows through IMF. The following is the results received by using the data collected. This statistical analysis was completed by using Eviews 12 sv.

trade\_flow\_2018\_gdp\_j\_distance\_distij\_infrastructure lpi\_score c

Dependent Variable: TRADE_FLOW				
Method: Least Squares				
Date: 02/27/23 Time: 23:37				
Sample: 1 160				
Included observations: 153				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
_2018__GDP_J_	1.09E-07	5.94E-09	18.29377	0.0000
DISTANCE__DISTIJ_	-2.613911	2.820743	-0.926675	0.3556
INFRASTRUCTURE	90617.25	72035.64	1.257950	0.2104
LPI_SCORE	32312.67	84227.90	0.383634	0.7018
C	-261185.1	75442.33	-3.462050	0.0007
R-squared	0.788009	Mean dependent var		120065.8
Adjusted R-squared	0.782280	S.D. dependent var		301223.1
S.E. of regression	140552.1	Akaike info criterion		26.57668
Sum squared resid	2.92E+12	Schwarz criterion		26.67571
Log likelihood	-2028.116	Hannan-Quinn criter.		26.61691
F-statistic	137.5361	Durbin-Watson stat		1.461096
Prob(F-statistic)	0.000000			

In our research, we first estimated a gravity model to determine whether trade facilitation, as measured by LPI, has an influence on international trade, and the following outcomes are presented. The above is the data collected of GDP for 160 countries, the distance of those countries from India, trade infrastructure of those countries, and LPI score. The data shows the coefficient, standard error, T statistic, and probability. First, more distant countries trade less, demonstrating that physical proximity promotes cross-national trade. Second, the size of the two economies (as determined by the size of their GDPs) has a positive effect on commerce, suggesting that the "bigger" the two economies, the more trade there is between them. The findings demonstrate that the exporting country's LPI coefficient sign is as anticipated, favorable, and statistically significant. All the variables in the above table have a positive effect only distance has a negative effect.

As it was mentioned above the distance as a variable is been negative which shows that if the distance between importing and exporting is huge then the trading cost increases which then reduces trade between these countries. It appears that distance has a greater negative impact on trade in low-income countries. This is due to the fact that low-income nations consume cheaper items and demand less expensive goods from other nations. The LPI coefficient is positive, indicating that the country's LPI score is most influential when it is a middle-income country, while it is most influential when it is a high-income country when importing from that country. The highest LPI-ranked nations also have the best quality of logistics service, the usage of digital technology, the most advanced infrastructure, good regulatory environment, and trade facilitation has the greatest impact on trade in these nations. Moreover, trade growth as a percentage of output tends to be higher in nations with higher GDP growth. The GDP variable is significant and displays a positive sign in all scenarios but the coefficients show that the impact of GDP on trade is greatest when the countries are middle- or high-income. The dummy variables appear to have the most influence when a low-level importer is involved, which is not surprising given that developed nations trade with nations with which they have free trade agreements.

## V. CONCLUSION

The supply chain network, along with trade liberalization and tariff reduction, has led to an increase in the significance of other elements in global commerce. Researchers have collaborated to identify the metrics that most accurately capture trade facilitation, its impact on global trade, and the economy at large. The aim of this research was to find the impact of LPI on international trade through statistical method using the regression analysis gravity model. We applied the augmented gravity model to a sample of 160 nations worldwide in the year 2018 to determine the effect of trade facilitation on international trade. Our gravity equation states that the total amount of trade is influenced by logistical, economic, geographic, and demographic factors. According to the estimation results, all of the variables used are significant and exhibit the predicted signals in line with the initial hypothesis. The GDP of the countries shows a positive which shows that countries with higher economy make more trade as compared to countries with the low economy. The trade flow and the LPI shows a positive coefficient which actually indicates how much it impacts international trade. This research was more focused on the variables that impact trade between the countries as distance has negative coefficient which means longer the distance lesser the trade will take place and other variables as GDP, infrastructure and LPI ha positive coefficients so this shows how all these variables impact trade how traders choose regions to trade on the basis of this data.

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