IMPACT OF LOGISTICS PERFORMANCE ON COUNTRY'S LIVING STANDARD: WITH SPECIAL REFERENCE TO RELATIONSHIP BETWEEN LPI AND HDI

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Abstract: Logistics is a major tool for smooth Supply Chain Management. It encourages a fluent motion of information and material within the supply chain. Every Country want an efficient supply chian logistics in terms of money and time. There is a major impact of Logistics industry on every country macro and micro economy. The sring of internationalization and globalization is logistics. (2009) is used, both collected from the World Bank and UNDP programme respectively which are LPI and HDI that I have been explored in this paper. The reciprocity relationship between these two has been obtained –. Attempts are made to use a linear regression model offered by SPSS to study this. Data of different countries have been used so far available for the year 2018 in this study and since waiting for LPI index by World Bank after 2018.The calculated regression equation is utilized for forecasting the LPI value of several next years. It has been established by results that the efficiency in logistics cost for any country contributes to bring down final cost of product which eventually makes life affordable for people of country. This is how LPI can impact the HDI level of any country.

Keywords: Logistics efficiency, Trade facilitation, Human welfare, Development level, Relief logistics, Disaster response, LPI, HDI

Introduction

Supply chain logistics refers to the management of activities and coordination among all parties involved so that both materials and information move smoothly throughout the entire chain (Harrison & Van Hoek, 2008). Nations have long pursued ways to reduce both the money and time it takes for supply chain logistics. The logistics sector effects the national economy at both macro and micro scales. At a macroeconomic level, it's good for the gander and jumpstarts the national economy with robust job creation and foreign investment. It is no exaggeration to say that the logistics industry is the heart of globalization and internationalization. The logistics business is competitive which means, at the micro-level, you give more opportunities to market players to compete and offer more competitive prices. A country's Logistic Performance Index (LPI) aims at identifying the bottlenecks and supply chain weaknesses in a country. LPI is computed based on World Bank methodology. The United Nations development program sets the Human Development Index (HDI) to measure human development in a country (UNDP). This study's purpose is to explore whether there might be a relationship between these two measures.

The World Bank provides the interactive benchmarking tool, Logistics Performance Index (LPI). It can be used by countries to rapidly pinpoint unexploited possibilities and root causes of problems in the trade logistics performance. The LPI was last released in 2018, and benchmarked against 160 economies. A worldwide survey of ground operators is conducted and feedback on how easy it is to do business and the level of hospitality in their countries is collated. In addition to this feedback, quantitative information about the nation's logistics system -including performance of key components- is also monitored.

According to this, LPI can be considered a combination of qualitative and quantitative indicators.

INT LPI consists of qualitative assessments by foreign trading partners. The scores are given in six sections: 'customs,' 'infrastructure,' 'ease of scheduling shipments,' 'quality of logistics services,' 'tracking and tracing, ' and 'on time.' DLPI, on the other hand, is a qualitative and quantitative assessment of a country by local logistics professionals in the respective country. LLPI by country of residence does not feature ranking but rather reports logistics processes, logistics environment and institutions of a country,   as well as the challenges to cargo movement in ports, at borders or within countries. It is evaluated in six domains: i) Infrastructure, ii) Services, iii) Border process and time,   iv) Supply chain reliability, etc. (World Bank, 2020).

Though LPI is carefully delineated, there have been cases of methodological inconsistency with LPI-based research. Each nonregulatory response of individual logistics providers will bias their ranking. Moreover, social and economic influences have a large bearing on the performance of LPI. The Human Development Index is a measure of how well human welfare is achieved within a country's major dimensions of human development. Three of these are having a long and healthy life, being knowledgeable and having a decent standard of living, UNDP says. The HDI is the geometric mean of normalised indices for each dimension. The HDI does not tell the full story of social disparities, of poverty or of human insecurity. The Report has been published by the UNDP since 1990. (UNDP, 2021).

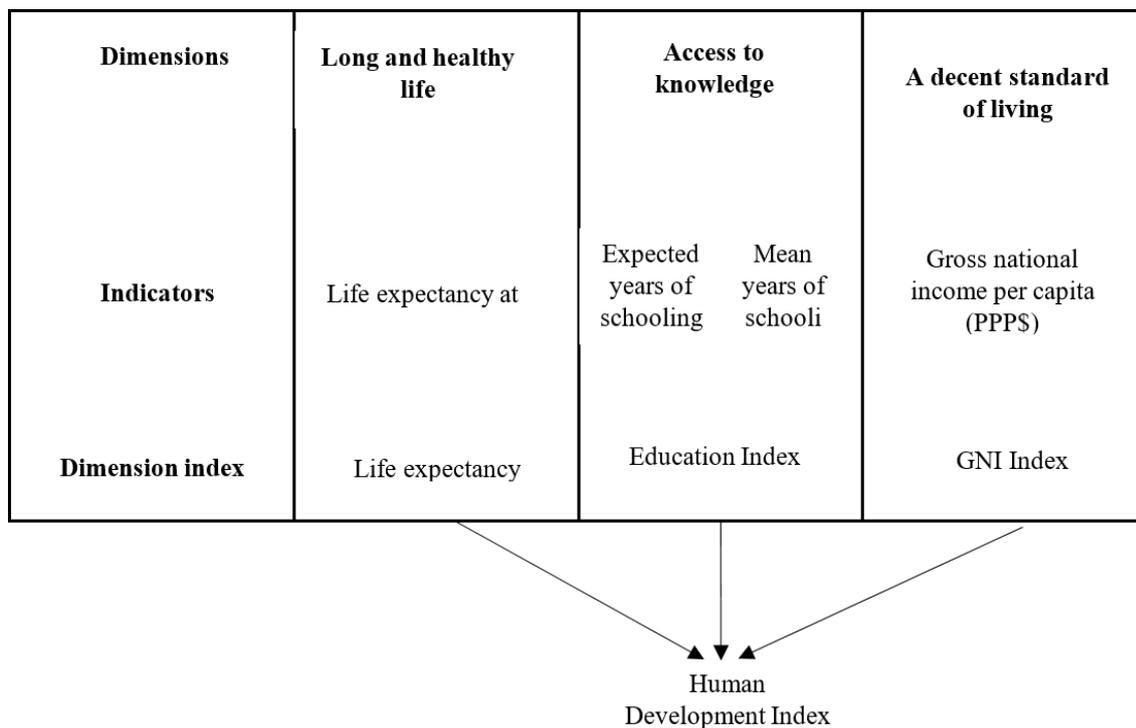The Human Development Index framework is depicted in Figure 1.

Dimensions	Long and healthy life	Access to knowledge		A decent standard of living
Indicators	Life expectancy at	Expected years of schooling	Mean years of schooli	Gross national income per capita (PPP$)
Dimension index	Life expectancy	Education Index		GNI Index

Human Development Index

Figure 1. Human Development Index

Objectives

The drop in India's ranking from 35 in 2016 to 44 in 2018 has prompted to evaluation

the cause due to which it has fallen. This study helps in redefining the HDI factors that are helpful to gain ranking, and us and our economy need to compete in the global economic scenario.

This paper focuses on the association between LPI and HDI of a country. The goals of this study are:

1. To examine whether a relationship between LPI and HDI exists for any country.
2. To investigate if there is any association between the mathematical relation LPI and HDI.

Considering the calculated and forecast for LPI for next year for India can then relationship used to estimate.

Review of Literature

According to Puertas et al. (2014), Tella (2007) says logistics are about information sharing, packaging, warehousing, and systems that cause the same quality promptly with minimum pressure and low cost. It is then under this light that logistics is seen as a determinant of the competitiveness of an economy (Arvis et al., 2007). World Trade and Establishment of Francs. International trade itself must have well-coordinated markets that are fairly priced for a given service in which goods can move freely and efficiently while maintained with accurate books alongside higher levels of productivity to facilitate the growth of such an economy (Puertas et al., 2014). Unfinished infrastructure, frail state-owned enterprises and unrestrained red tape would lead to an increase in trade costs, while the inadequate logistics services could cause friction in goods flow. These signs are common in resource-poor areas (Marti et al., 2014). perceived by the LPI in 2018. The report of 2018 is that they are the top-ranking positions and there's a wide gap between scores with the BRIC economies (Brazil, Russia, India, China.) A Tool for performance evaluation created by the World Bank, known Logistics Performance Index, released in 2007, is also accessible. Unfortunately, the organisation has not made its data available to academia or other organisations and includes scores from both ICL and the MG index that have shown positive comparisons with other metrics. An opportunity to get their act together and grasp the country's logistics woes. It uses 6 distinctive dimensions. These are given in Figure 2 (The World Bank, 2021)

Literature Review

Logistics, as described by Puertas et al. (2014), can be understood as an integrated system that brings together information sharing, container handling, warehousing, and transportation. This system must meet strict requirements in terms of timing, quality, and quantity, all while keeping costs low. Because of this, logistics plays a central role in shaping a country's economic competitiveness (Arvis et al., 2007).

Moreover, logistics is closely intertwined with international trade. For trade to support economic growth, it must be carried out in a highly coordinated and harmonised manner, with transparent pricing and fair competitive conditions for producers

(Puertas et al., 2014). When logistics systems are slow or inefficient, trade costs increase and the smooth movement of goods is disrupted, often due to inadequate infrastructure and excessive administrative or bureaucratic barriers, such as cumbersome railway procedures in state institutions. Such challenges are prevalent in many developing countries (Martí et al., 2014). The 2018 Logistics Performance Index (LPI) Report indicates that the highest-ranked positions are predominantly held by high-income economies, which typically have more advanced logistics systems. To help countries identify weaknesses and improve their logistics performance, the World Bank introduced the LPI in 2007. This international benchmarking tool evaluates logistics performance across six key dimensions, providing a basis for comparison and policy improvement (Arvis et al., 2007). These are summarised in Figure 2 below (The World Bank, 2021):

Logistics Performance Index

Customs

International Shipments

Timeliness

Infrastructure

Quality of logistics
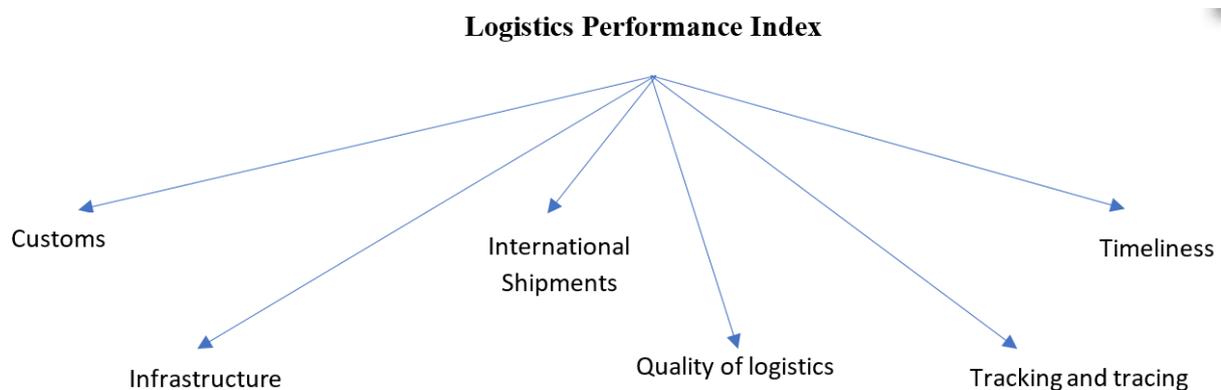
Tracking and tracing

Figure 2. Structure of Logistics Performance Index (Source: World Bank)

❖ **Customs**
Border clearance refers to the procedures carried out at national frontiers to verify the legitimacy and safety of shipments. These checks need to be both fast and reliable, so they do not hold up the movement of goods. When the process is overly complex or filled with unnecessary paperwork, it can seriously disrupt the smooth flow of trade across borders. To support efficient logistics, border clearance systems should be designed to be user-friendly, quick, and consistent, with clear and predictable requirements for all parties involved.

❖ **Infrastructure:**
Low-quality transport and trade facilities will result in late dispatches and low image. Traders generally turn to other, less attractive routes to ship their goods. Therefore, we need to have world-class trade-related infrastructure at ports, railways, IT support, etc., build and maintain as required.

❖ **International shipments**
The ability to transport competitive shipments more conveniently is crucial for the Logistics Performance Index. Cumbersome global shipments would cost less in trade, and so macro-level losses ultimately.

❖ **Quality of logistics**
Quality logistics performance provided by a country is one of the determinant factors that influence how many shipments. There must be high logistics service quality as trucking, forwarding, custom brokerage and etc.

❖ **Tracking and tracing**
An ideal logistic provider has a good knowledge of the job and trusted IT capabilities to make follow-ups on consignments easier.

❖ **Timeliness**

Late shipments can cause massive costs, particularly if goods are perishable. Pilferage, obsolescence may be some of the reasons. In order to prevent this from happening, it should be ensured that anticipated cargo is being delivered where it needs to be, when it needs to be there.

HDI is a measure of average achievement in the key dimensions of human development. The HDI is a universal scale and has three dimensions: long and healthy life, access to knowledge, and decent standard of living. In addition to being a tool to measure the standard of living, HDI is used by organisations like the World Bank to rank countries or groups into developed or underdeveloped. This model applies to two areas a social and economic development (Kinnunen et al. 2019). The accessibility of knowledge vs Industry 4.0. According to Adeitan et al. (2021),   technology can also lead to the competitiveness of logistics chains via the movement of information in logistics operations. Networks in logistics and supply chains have become more complex over the years. For this to happen, however, information must flow properly in the system so that both the logistics network and terms operate effectively (Dimitrov 2005). It is established that information flow is necessary for the efficacy of feedback logistic channels (Loos & Allweyer, 1998).

Author(s) (Year)	Focus of Study	Tool / Technique Used
Gocer et al. (2021)	**Propose a framework to help countries improve LPI scores through strategic policy recommendations.**	**Policy analysis and strategic recommendations**
Janno et al. (2021)	**Examine subjective elements within the current LPI methodology.**	**Correlation analysis using Principal Component Analysis (PCA)**
Kalpan & Bozyigit (2021)	**Assess how Turkey's logistics performance influences its foreign trade.**	**Regression analysis**
Kesavan & Deif (2021)	**Investigate how social and national culture shapes a country's logistics performance.**	**Hofstede's national culture dimensions**

Park & Cho (2021)	**Study how logistics efficiency affects Korea's agricultural export market.**	**Gravity Model**
Senir (2021)	**Compare Turkey's domestic logistics performance with EU countries.**	**CRITIC method followed by COPRAS ranking**
Sergi et al. (2021)	**Analyse the influence of the Global Competitiveness Index (GCI) on LPI.**	**ANOVA**
Beysenbaev & Dus (2020)	**Propose improvements to the World Bank's current LPI structure.**	**Modified qualitative and quantitative index model**
BUGARČIĆ et al. (2020)	**Examine how logistics performance affects trade volume in CEECs and Western Balkan countries.**	**Gravity Model**
Isik et al. (2020)	**Rank and evaluate logistics performance of 11 Central and Eastern European countries.**	**Statistical Variance (SV) and MABAC**
Mercangoz et al. (2020)	**Provide logistics performance scores for selected countries across a defined time period.**	**COPRAS**
Ulutaş & Karaköy (2019)	**Integrate subjective (SWARA) and objective (CRITIC) weighting methods used in World Bank's LPI calculation.**	**Multi-Criteria Decision Making (MCDM)**
Rezaei et al. (2018)	**Assign weights to LPI's six key components.**	**Best–Worst Method (BWM)**
Mariano et al. (2017)	**Explore the link between low carbon emissions and logistics/transport performance.**	**Data Envelopment Analysis (DEA)**
MARTÍ et al. (2017)	**Develop a synthetic index for overall logistics performance of countries with LPI scores.**	**Data Envelopment Analysis (DEA)**
D'Aleo & Sergi (2016)	**Review and evaluate logistics performance in Balkan countries.**	**Critical analysis**
Nunes et al. (2015)	**Compare Brazil's logistics performance to key international competitors.**	**Cluster analysis and multiple comparison tests**
Martí et al. (2014)	**Examine how different LPI components affect trade in emerging economies.**	**Gravity Model**
Puertas et al. (2014)	**Analyse EU export determinants and changes in logistics performance between 2005–2010.**	**Gravity Model**

Šimanskienė & Kutkaitis (2009)	Study sustainable development through social, economic, and ecological aspects of logistics.	Universal sustainable development model
Ravanos & Karagiannis (2021)	Propose a new model that incorporates external preferences into logistics performance assessment.	Benefit-of-Doubt Model, Value Efficiency Analysis
Shi & Tang (2020)	Investigate sectoral imbalances and regional disparities in China.	Partial differentiation, Coefficient of Variation, variance decomposition
Hanifah & Kiswanto (2017)	Assess how political competition affects HDI.	Multiple regression
Sarkar (2016)	Measure the impact of human development indicators on HDI.	Spearman's correlation
Maria-Lenuţa (2015)	Analyse the influence of three HDI indicators across 37 European countries.	In-depth analysis
Muttneja (2015)	Compare the Human Poverty Index and HDI in the Indian context.	Comparative study
Türe & Türe (2021)	Develop the HDI-EF model which integrates the ecological footprint to assess sustainability.	Mathematical modelling

Methodology

A good statistical model is supposed to employ a minimum number of mathematical models and be able to describe as simply as possible the real situation (Aczel and Sounder Pandian, 2008). Figure 3. What a good statistical model should look like. This figure explains how we hope a good statistical model would be formed. As seen in Fig. 3, the proposed model well estimates systematically behaving data and disentangles random errors, which are a non-systematic part of the data. One such comparison model is the linear regression model, and this is also used in the current paper. One guy, Sir Francis Galton (Don't Google, is not fun) He's behind the most popular statistical method – Regression. The simple linear regression method describes the relationship between two variables, x — an independent variable y — a dependent variable. As the name suggests, linear regression performs modelling between the variables X and Y to form a best-fit line representing them in terms of a linear equation. Such a model, of course, underwritten by assumptions and mathematical equations, can represent the real world. Even if regression analysis is concerned only with the relationship based among independent and dependent variables but due to the presence of uncertainty in the real world, it cannot be eliminated. These errors could arise due to unknown disturbances, causing the data collected to become skewed. The regression equation, both in general and prediction form, may be expressed as shown in Figure 3(Aczel & Sounderpandian, 2008), where:
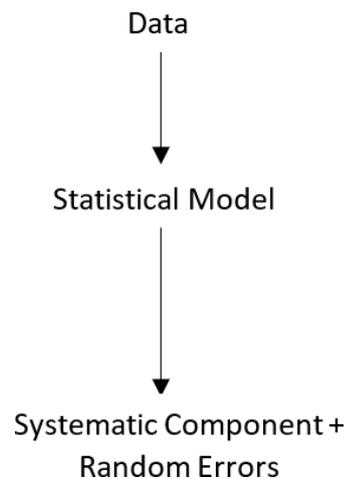
Data

↓

Statistical Model

↓

Systematic Component +
Random Errors

Figure 3. A statistical Model (Adopted from Aczel and Sounderpandian, 2008)

$Y = B0 + BIX E$

Y = dependent variable

B0 = dependent variable

B1 = population slope

The following assumptions are made by a regression model:

1. Variable continuity: For the regression to work, both the independent and dependent variables need to be continuous. That is, the two variables selected can each be at ratio or interval levels of measurement. The regression model cannot be used with nominal/ordinal data.

2. Linearity-There should be a linear relationship between the X and Y variables, that is, there exists an equation of some straight line that can describe their relationship. = mX + C, where C is the Y-intercept; Y stands for the dependent variable (i.e., LPI in the present case), m represents the slope of the line; and X stands for the independent variable (HDI in the current scenario).

3. E is the only random variable: the value of X, the independent variable, is considered to be not random. The only random quantity is the error term, E.

4. Normally distributed and homoscedastic errors: The error terms (or E) are normally distributed across the data. The mean of these errors is taken to be zero, and the variance (sigma square) is   constant over the data.

5. There is no autocorrelation: Autocorrelation is the relationship between a variable's value and that same variable's value lagged one or more periods. The essential idea is that error words that occur in succession should not be affiliated with each other.

Data Collection

Secondary data are used in this research. A regression technique is then applied to the data obtained for HDI from the UNDP site, while LPI scores have been gathered from the World Bank website. The LPI score was available for 160 countries in 2018, while the HDI

score was reported for 189 countries. Countries were selected for which both LPI and HDI data were available. Transfer was performed using the merge method in the Pandas library of Python. This merged binary data of 154 countries was then saved to an Excel spreadsheet, which was imported into the Statistical Package for Social Sciences (SPSS) for analysis. IBM SPSS enables educators and students to quickly and easily perform statistical analysis using intuitive drag-and-drop functionality — you simply select the desired statistic, drag it into place, and run your analysis. It allows different parametric and nonparametric tests to be conducted on the data. The conclusions from the regression analysis are presented in the following section. The value of LPI 2020 has been estimated since the results reveal that LPI is a function of HDI.

Results and Discussions

The findings of the regression analysis are presented in this section using HDI and LPI data of 154 countries. Except for the final regression equation, LPI depends on HDI, and all linear regression assumptions are also demonstrated. The model is verified and gets robust support through the tests presented in Tables 2 and 3. The degree of relationship of HDI with LPI and its consequences is presented in Table 4. Assumption 5 (no autocorrelation within the residuals) is verified in Table 3. Figure 5 indicates that we are not breaking assumption 4 (residuals normality), and Figure 6 says that we also keep assumption 4 (homoscedastic residuals). Ultimately, a linear equation is obtained so that it can predict LPI in forthcoming years.

Numerical Results

Table 2. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	.941	.149		6.334	.000	.648	1.235
HDI	2.655	.201	.732	13.238	.000	2.258	3.051

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.416	1	26.416	175.234	.000[b]
	Residual	22.913	152	.151		
	Total	49.329	153			

| a. Dependent Variable: LPI |
| b. Predictors: (Constant), HDI |

The table above can also be used to assess whether the selected model is statistically significant. In this analysis, the Logistics Performance Index (LPI) is considered the dependent variable, while the Human Development Index (HDI) is used as the independent variable. A 5% significance level (α = 0.05) is applied, meaning there is a 5% chance of mistakenly accepting the alternative hypothesis. Following the standard logic of hypothesis testing, the null hypothesis (H_0) is not rejected when the p-value is greater than the alpha level.

According to the results in Table 3, the p-value for HDI is 0.00. Since this is well below 0.05, the null hypothesis is rejected in favor of the alternative hypothesis (H_1). This indicates that HDI has a statistically significant influence on LPI. Therefore, the regression analysis confirms that HDI contributes meaningfully to explaining differences in LPI, suggesting that the model provides a reliable representation of the data.

HDI, as the predictor variable, shows a strong connection with LPI. The correlation coefficient (R) of 0.732 reflects a high positive relationship between the two indicators. In models with multiple predictors, the adjusted R-squared is often preferred because it accounts for model complexity. However, since this model includes only one independent variable, the R-squared and adjusted R-squared values offer essentially the same interpretation.

Table 4 shows an R-square value of 0.535, meaning that HDI explains about 53.5% of the variation in LPI. In social science research, this is typically viewed as a fairly strong model fit. The Durbin–Watson statistic is also used to check for autocorrelation in the residuals. Its values range from 0 to 4, where a score near 2 suggests no autocorrelation. Values lower than 2 indicate increasing positive autocorrelation, while values above 2 imply negative autocorrelation—an idea illustrated in Figure 4.
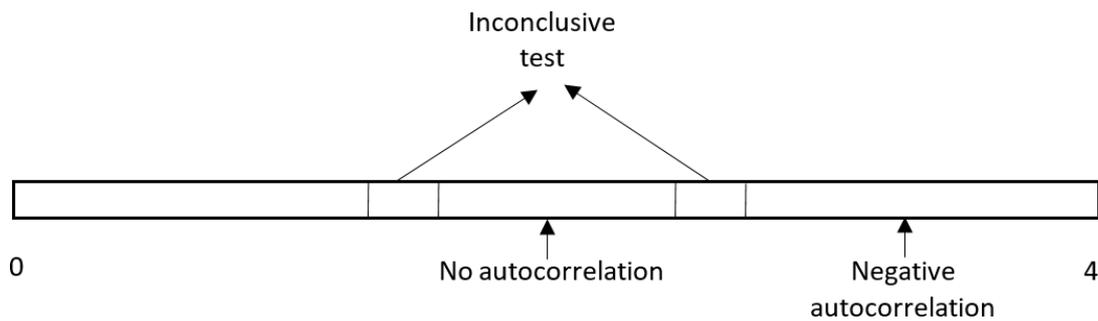
Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.732 a	.535	.532	.388	2.086

a. Predictors: (Constant), HDI

b. Dependent Variable: LPI

Figure 4. Critical regions depicted in Durbin-Watson test (Adopted from Aczel & Sounderpandian, 2008)

In Figure 4, Durbin-Watson static value is 2.086 which indicates no autocorrelation among theresiduals post performance of regression analysis.

Graphical Outcomes

A normal probability plot (P–P plot) is often used to check whether residuals follow a normal distribution. In Figure 5, the horizontal axis represents the residual values, while the vertical axis shows their corresponding z-scores. If the residuals are normally distributed, the points on the plot will fall closely along a straight reference line. The amount by which the points stray from this line indicates how much the residuals deviate from normality.In this case, the P–P plot shows that the residuals align well with the theoretical straight line, suggesting that they follow a normal distribution and meet the assumptions required for the analysis.
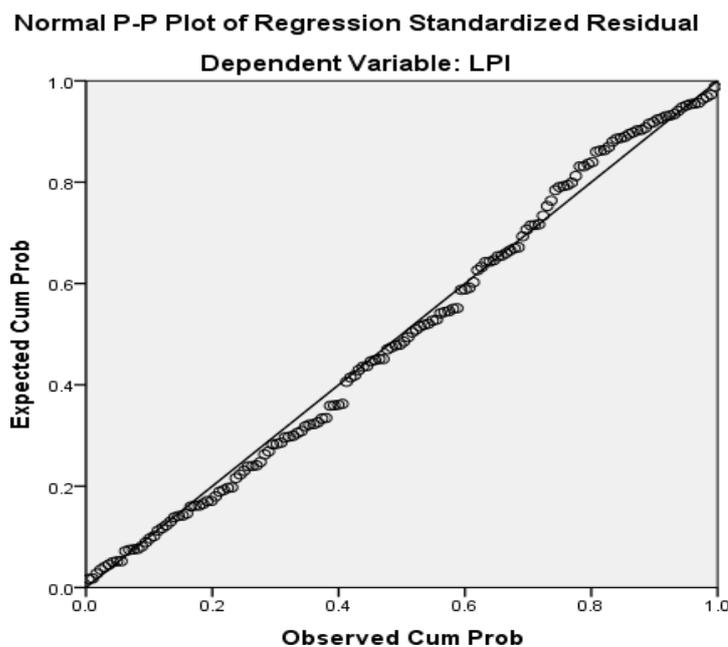
Figure 5. Normal Probability Plot

Scatterplot
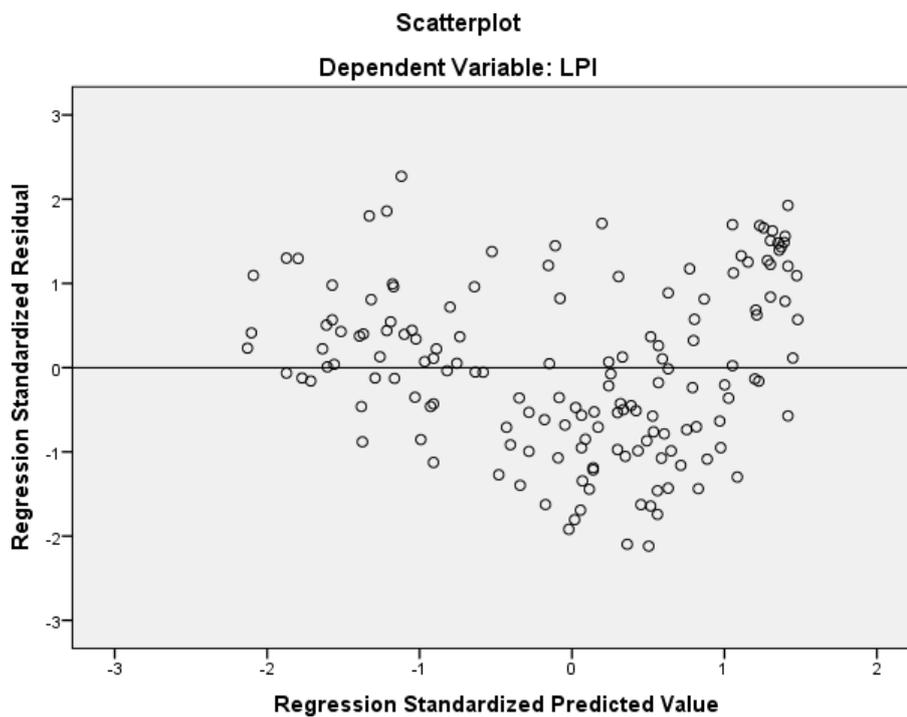**Dependent Variable: LPI**

Figure 6. Scatterplot of residuals

The variance of errors must be constant, according to the requirements of linear regression. A scatter plot, as illustrated in figure 6, can accurately depict the variance of residuals. The variance is described by the change in breadth of the residual scatter plot. If the breadth of the scatter plot changes constantly, the residuals are considered to be heteroscedastic. Simple linear regression may not be useful in the presence of heteroscedasticity. The scatter plot above demonstrates homoscedasticity, which means that the variance of mistakes is constant. According to the assumptions of linear regression, this is acceptable. Because all of the linear regression assumptions are true, the following regression equation can be written.

LPI = 0.941 + 2.655HDI

This regression equation can also be used to forecast LPI values. According to the Human Development Report, 2020 (UNDP, 2021), India's HDI score in 2019 was 0.645. According to the regression equation, India's LPI (2019) is 2.65.

Validation

The constructed regression model has been validated by predicting the LPI values of various countries. Table 5 lists the nations where the inaccuracy in forecasted values was less than 5%.

Table 5. Countries with Predicted LPI < 5% error

Country	HDI 2018	Actual LPI 2018	Predicted LPI 2018 (LPI = 0.941 + 2.655HDI)	Percentag eError

Bangladesh	0.625	2.58	2.600	0.790
Brazil	0.762	2.99	2.964	0.866
Bulgaria	0.813	3.03	3.100	2.294
Burundi	0.431	2.06	2.085	1.228
Cambodia	0.585	2.58	2.494	3.327
Chile	0.849	3.32	3.195	3.762
Colombia	0.764	2.94	2.969	1.001
Congo Rep	0.573	2.49	2.462	1.112
Croatia	0.848	3.1	3.192	2.982
Cyprus	0.885	3.15	3.291	4.466
Ecuador	0.762	2.88	2.964	2.920
Egypt	0.701	2.82	2.802	0.633
Eritrea	0.456	2.09	2.152	2.951
Estonia	0.889	3.31	3.301	0.263
Ghana	0.606	2.57	2.550	0.781
Greece	0.881	3.2	3.280	2.502
Guinea	0.473	2.2	2.197	0.145
Honduras	0.633	2.6	2.622	0.831
Ireland	0.951	3.51	3.466	1.256
Israel	0.916	3.31	3.373	1.903
Lesotho	0.522	2.28	2.327	2.057
Liberia	0.48	2.23	2.215	0.655
Madagascar	0.527	2.39	2.340	2.084
Malaysia	0.805	3.22	3.078	4.401
Mauritania	0.542	2.33	2.380	2.146
Mexico	0.776	3.05	3.001	1.597
Nepal	0.596	2.51	2.523	0.533

Niger	0.391	2.07	1.979	4.391
Oman	0.813	3.2	3.100	3.140
Russian Federation	0.823	3.12	3.126	0.194
Sierra Leone	0.447	2.08	2.128	2.297
Slovenia	0.912	3.31	3.362	1.582
Turkey	0.817	3.15	3.110	1.266
Yemen	0.468	2.27	2.184	3.809
Zambia	0.582	2.53	2.486	1.731

Furthermore, 78 countries had projected LPI values that were within 10% of the actual LPI value. As many as 112 out of 154 nations had errors in the range of 15% when compared to the World Bank's real LPI values. This verifies the model and demonstrates that the model's results provide a reasonably accurate prediction of the LPI values of various countries.

Conclusion and Future Directions

Due to the growing competition among nations, it has become increasingly evident that countries must strengthen their logistics capabilities. While most governments focus on improving the six core indicators used by the World Bank's Logistics Performance Index (LPI), an important reality is often overlooked: the LPI is influenced by several broader national conditions that extend beyond these six parameters. One such influential factor is the Human Development Index (HDI). The level of human development within a country tends to shape its logistics environment and cost structure. For example, developing economies often incur logistics costs amounting to nearly a quarter of total delivery expenses, whereas more advanced economies generally face costs of only 8–9% (Roberts, 2003). Lowering logistics costs can reduce the final consumer price of goods, thereby improving affordability and overall living standards, an aspect closely linked to HDI.

Similarly, progress in HDI indicators—such as improved life expectancy, better access to education, and enhanced living conditions—can be supported indirectly through improvements in logistics. Efficient logistics systems can contribute to more competitive markets, more stable prices, and better economic opportunities, all of which help reinforce components of human development. Furthermore, efficient logistics systems have been associated with growth in international trade and higher inflows of foreign direct investment (FDI) (Coto-Millán, 2016). Increased FDI strengthens a country's foreign exchange reserves, enabling governments to meet external obligations, stabilise domestic currency, and maintain investor confidence. Strong reserves also act as a buffer in times of external shocks, natural disasters, or economic disruptions (Mathews & Singh, 2020). Consequently, these macroeconomic improvements can indirectly support enhancements in a nation's HDI.

The present analysis includes only 154 countries for which both LPI and HDI data are available.

Due to the absence of World Bank LPI data for 2020, the study relies on figures up to 2018. Since the LPI is published biennially, the dataset spans six available years, beginning in 2008. Although the values for intermediate years can be estimated, the predictive model used in this study performs reasonably well with the existing dataset. Nonetheless, incorporating additional variables such as GDP or the Ease of Doing Business Index could further refine the model and improve its predictive accuracy.

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