HOW LOGISTICS PERFORMANCE RESHAPES THE MOVEMENT OF STOCKS IN THE CONTEXT OF CLIMATE CHANGE?

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Abstract

Supply chains networks are at risk due to the climate change in terms of reputation, functionality, and safety. Increasing regulations, market forces, and stakeholder demands are paving over the decarbonization of supply chains, which has evident consequences for supply chain management. Therefore, the motivation of this research is to use logistics performance indicators to analyse the financial effects on the stock market. A case study of the Seven Leading Industrial Countries was used for this purpose. Autoregressive Distributed Lag (ARDL) model was used. The research sample was selected based on the industrial stock indices for these countries during the time period from the beginning of 2006 to the end of 2022. It is found that the logistics policy regulations indicators account for 26.28% of the impact on the returns of the industrial indicators, while the performance results of logistics services indicators contribute to 38.35% of the impact on the returns of industrial indicators. As originality, the current study succeeded in confirming that the importance of these countries is not only due to the fact that they are described as the Seven Leading Industrial Countries, but rather in how they deal with logistical challenges and developed them during the study period.

This research adds to the literature on climate change's financial effects and sheds light on the intricate linkages between two separate fields which are Finance and Supply chain, and also between logistics performance, supply chains, and stock market returns. Using indirect way to illustrate how the impact of climate change can reach financial markets.

Keywords: Climate Change, Logistics Performance Index, Stock markets

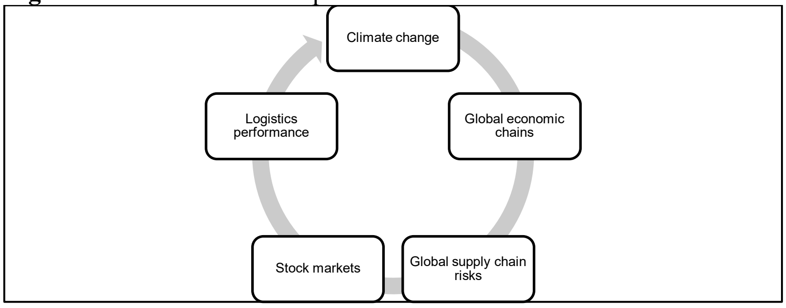
1. INTRODUCTION

Regarding the 2015 Paris Climate Change Agreement, the stock markets of the seven major industrialised nations (Canada, France, Germany, Italy, Japan, United States, and United Kingdom) had to adapt to the climate change considering the industrial sector's global supply chain, which had an impact on their stock prices and returns. This has increased the risks of climate change for companies and attracted the attention of several stakeholders such as institutional investors, banks, accounting firms, government agencies and consumers (Eleftheriadis et al. 2015). In contrast, economic expansion in developing nations has the reverse effect, increasing global emissions and hastening global warming (Hjort, 2016). One of the economic sectors most affected by climate change is the banking system. This is especially true for industrial supply chains that are exposed to the economic effects of climate change and are globally interconnected.

The initial economic effects of climate policy are expected to be below the effects of uncontrolled climate change, in other word climate change and the economic impacts resulting from it or followed that phenomenon are only a small part that has been revealed, but there is other a greater part that has not been revealed yet and is still within unknown of the unknown Risk. This phenomenon also has an impact on logistical performance, which has been addressed through its indicators and needs to be improved, there may be undiscovered effects. Carbon pricing initiatives, which include fees and cap and trade systems, are a key tool for economic experts to reduce emissions and promote technological development (Hjort, 2016). National carbon, energy tariffs, and technology benchmarks are currently in use in several countries**.** If the authorities do not implement regulatory and fiscal measures quickly, this could trigger a disruptive transition to a carbon-neutral society, leading to the obsolescence of certain economic activities and wasted assets (Lagarde, 2020). Businesses must provide comprehensive information about climate risks related to their operations in order to conduct a careful risk analysis. However, the transition to a carbon-neutral economy can offer the financial sector the opportunity to develop into an influential force that delivers greater benefits (Stern, 2022).

Climate change in one place can affect the global economic chains as shown in figure 1, where a global strategy is needed rather than local policies and plans (Levermann, 2014). This is why a global supply chain risk assessment is needed, and capturing accurate information is required about every economic activity within the chains. Country risk analysis has gained importance as businesses work to define the possibility for these risky events as a result of the expansion of global supply networks. The level of logistics risk linked with important suppliers in the global economy was evaluated using the Logistics Performance Index (LPI) data (Lockamy III, 2019).

Figure 1 The research conceptual framework



Source: developed by the authors

The LPI measures logistics efficiency, which is now generally acknowledged as being essential for trade and growth. Access to international freight and logistics networks is necessary for a country's traders to engage in cross-border commerce. While some facets of a country's domestic economy rely on how well its supply chain performs in terms of cost, timeliness, and dependability. Better overall logistical performance and trade facilitation are strongly connected with increased commerce, export diversification, economic growth, and attractiveness to foreign direct investment. According to Narlikar et al. (2012), the six LPI indicators fall into two main categories:

- Policy-regulatory areas that highlight the major supply-chain inputs (customs, infrastructure, and services).
- Supply chain performance results (equivalent to LPI metrics of time, cost, and dependability, timeliness, international shipments, and tracking and tracing).

Hence, this research has addressed the following research question:

How logistics performance reshapes the movement of stocks in context of climate change?

Thereof, the following hypotheses will be investigated in this paper:

H1: There is no statistically significant effect of the logistical performance indicators (Customs, Infrastructure, Logistics competence, Tracking and tracing, international shipments, Timeliness) on the returns of stock market indices in the context of climate change.

H2: There is no statistically significant effect of the areas for policy regulations of logistics represented by the indicators: (Customs, Infrastructure, Logistics competence) on the returns of stock market indices in the in the context of climate change.

H3: There is no statistically significant effect of service delivery performance outcomes of logistics represented in the indicators (Tracking and tracing, international shipments, Timeliness) on the returns of stock market indices in in the context of climate change.

2. LITERATURE REVIEW

The precarious industrial sector is deemed to be one of the prime victims of the daunting financial consequences of climate change (Carney, 2015). The emergence of the Paris Agreement in 2015 has further spurred a growing unease about how the stock markets of major industrial countries would cope with this unfolding disaster. In this section, the related literature of the stock markets' financial impacts in the world's top seven industrial countries has been reviewed.

2.1 Climate Changes and the Financial Impacts

Recent research has identified climate change as a brand-new source of risk for the financial system, raising significant concerns among investors and financial institutions everywhere. The financial sector has not yet created methodologies that allow for an efficient analysis of the threats that climate change poses to financial stability (Battiston, 2021).

Traditional approaches to macroeconomic and financial risk analysis face significant difficulties as a result of the distinctive characteristics of climate risks, including their high degree of uncertainty. Therefore, it is essential to include cutting-edge viewpoints that integrate climate change into macroeconomic and financial analysis in order to achieve a more thorough understanding of the macro financial relevance of climate change (Hallegatte & Rentschler, 2015).

It has come to attention that specific central banks have taken the initiative to conduct an inquiry into the potential impact of climate change and the shift towards low carbon, primarily owing to their responsibility in financial regulation and supervision. Failure to act on climate change may lead to considerable physical and economic losses. This presents a significant matter that demands immediate consideration and critical assessment to avert possible crises (Authority, 2015; Gradwell et al. 2016).

The surge in climate-induced physical hazards like heat waves, floods, and storm surges could potentially trigger a direct impact on insurance providers responsible for covering such risks. In scenarios where such risks remain uninsured, the gradual deterioration of the balance sheets of affected households and corporations may consequently result in losses for their corresponding lending banks. This presents a worrying possibility that demands urgent attention and extensive deliberation, given the potential magnitude of the ensuing financial impacts (Tanaka & O`Neill, 2018).

A shift to a carbon-free economy is ultimately necessary to prevent physical damages and the related financial instability. The risks of economic disruption and stranded assets, however, could increase as a result of the transition itself. For instance, maintaining current oil, gas, and coal reserves underground will likely be necessary to meet the 2 °C temperature threshold (Vogel, 2019; McGlade and Ekins, 2015). At the end, climate change has been identified as a significant source of risk for the financial system, raising concerns among investors and financial institutions globally.

As a result, when making investment choices, insurance firms and other institutional investors must consider the possible financial risks presented by climate change and the transition to a low-carbon economy. Many players in the private sector have pledged to cut deforestation out of their global supply chains.

2.2 Climate Changes and the Global Supply Chain

Managing risks imposed by a climate change requires firms to coordinate and collaborate with their supply chain partners and stakeholders through three different approaches (Dahlmann and Roehrich, 2019), including information gathering, where firms collect information about any climate change and its consequences; Information processing, that aims to collect and analyse information at product level to understand the impacts of climate changes; and Information transferring, where a feedback is shared with all supply chain partners. To achieve the previous three approaches of collaboration, sustainable supply chain management is needed to manage global supply chains. The related literature clarified that focus on the sustainability dimensions was by (29%), on the environmental and social dimensions jointly was by (27%), where a less focus on environmental and economic dimensions jointly was by (9%) (Koberg and Longoni, 2019).

If global warming rises to 1.5°C, it will inevitably lead to an increase in numerous climatic disasters and multiple threats to ecosystems and people. Numerous terrestrial, freshwater, coastal, and marine habitats will face extremely high risks of biodiversity loss due to near-term warming. As results of climate changes, Pörtner et al. (2022) addressed seven projected global supply chain risks, including ecosystems, food security, water security, health and well-being, migration security, infrastructure security, and economic security.

In a supply chain context, buyer decision-making about supplier openness may aid in reducing risks related to suppliers' greenhouse gas (GHG) emissions (Villena and Dhanorkar, 2020; Blanco, 2021). Pankratz and Schiller (2021) focused on two different weather shock heat waves and floods, to determine whether businesses alter their supply chain networks in response to perceived changes in their suppliers' susceptibility to physical climate risks. They claimed that heat and flooding catastrophes have a detrimental impact on suppliers' financial performance and demonstrate how these shocks' financial repercussions spread to customers via the already-existing supply chain links.

In a globalization context, fast transportation and advanced communication technologies changed the way how companies turned from a classical pattern of operating and competing into a strategic pattern to integrate with their supply chain partners (Kano et al. 2020). This has led to global commodity chains (GCCs), global value chains (GVCs) or global supply chain (GSC), global production networks (GPNs), or global factories. Antràs (2020) defined a GVC as a process that involves a number of steps in the creation of a good or service that is sold to customers, each of which adds value and at least two of which are created in different nations. In addition to being environmentally friendly, Maranesi and Giovanni (2020) claimed that the circular economy (CE) can also offer businesses a viable commercial opportunity and a means of integrating into the industrial supply chain network.

2.3 LPI Drivers Review in Seven Leading Industrial Countries

Climate change poses risks to supply chain networks in terms of safety, functionality, and reputation. The decarbonization of supply chains is being paved over by escalating regulations, market forces, and stakeholder pressures. The effects of climate change on supply chains should be of particular concern to supply chain managers, and researchers should continue to investigate how supply chain operations and design are related to climate change (Dasaklis and Pappis, 2013). These risks impose financial impact on companies, governments, and associations.

The Logistics Performance Index (LPI) data (Lockamy III, 2019) was used to assess the degree of logistical risk associated with significant suppliers in the global economy. LPI has six drivers, including customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing, and timeliness.

- As Customs elucidates, a fresh World Bank investigation espouses the prospect of expediting customs procedures and curbing trade obstacles, to engender a higher rate of economic growth and job creation (Ojala & Celebi, 2015; Ekici et al. 2016).
- Infrastructure is an essential pillar of the Logistics Performance Index (LPI), wields a significant impact on the financial markets of industrial countries (Ehlers, 2014).
- International shipments are a pivotal component of the Logistics Performance Index (LPI), are subject to intricate regulations and procedures.
- Logistics quality and competence cannot be overemphasized in the Logistics Performance Index (LPI) and can trigger a seismic shift in the financial markets of industrial countries (Ekici et al., 2019; Nguyen and Huynh, 2023).
- Tracking and tracing is one of the preeminent pillars of the Logistics Performance Index (LPI) and is believed to have an outsized impact on the financial markets of industrial countries (Yu et al. 2023; Wei et al. 2023; Kafetzopoulos et al. 2023; Naghshbandi, 2023).
- Timeliness is a critical pillar of the Logistics Performance Index (LPI) and can have significant impacts on the financial markets of industrial countries (Qazi, 2022; Azadegan et al., 2021).

3. RESEARCH METHODOLOGY

3.1 Research Variables

In order to study markets' climate change financial impacts in the world's top seven industrialised nations, there was a need to identify the independent and dependent variables that significantly impact the efficiency and effectiveness of supply chains. The independent variables that affect supply chains service delivery are as follows:

- Customs: Customs procedures and regulations can impact the speed and ease of goods moving across borders.

- Infrastructure: The quality of infrastructure, such as roads, ports, and airports, can affect the speed and reliability of transportation.
- Logistics quality and competence: The ability of logistics providers to manage the movement of goods efficiently and effectively can impact the speed and reliability of the supply chain.
- International shipments: Shipping goods across international borders involves navigating complex regulations and procedures.
- Timeliness: Timely delivery of goods is essential to keeping the supply chain running smoothly.
- Tracking and tracing: The ability to track and trace shipments throughout the supply chain can improve visibility and transparency, allowing for better inventory management and more efficient resolution of any issues that arise.

While, the dependent variables in this research are the reliable stock exchange indices for measuring industry and energy in the seven major industrial countries. These variables are as follows:

- S&P/TSX Capped Energy Index for Canada: This index tracks the performance of 50 energy companies listed on the Toronto Stock Exchange in Canada.
- CAC 40 for France: This index tracks the performance of the 40 largest companies listed on Euronext Paris, including many industrial and energy companies.
- DAX 30 for Germany: This index tracks the performance of the 30 largest companies listed on the Frankfurt Stock Exchange, including many industrial and energy companies.
- FTSE MIB for Italy: This index tracks the performance of the 40 largest and most actively traded companies listed on the Borsa Italiana in Italy, including many industrial and energy companies.
- Nikkei 225 for Japan: This index tracks the performance of the 225 largest companies listed on the Tokyo Stock Exchange in Japan, including many industrial and energy companies.
- FTSE 100 for the UK: This index tracks the performance of the 100 largest companies listed on the London Stock Exchange, including many industrial and energy companies.
- S&P 500 for the United States: This index tracks the performance of 500 large-cap companies listed on the New York Stock Exchange and NASDAQ in the United States, including many industrial and energy companies.

3.2 Research Sample

The research sample was selected based on the inclusion of the seven largest industrial countries in the world. Industrial stock indices for these countries were determined during the time period from the beginning of 2006 to the end of 2022. The research sample is illustrated in Table 1.

Table 1 The Research Sample

No.	Industrial Countries	Index	Index Components
1	Canada	S&P/TSX Capped Energy	50
2	France	CAC 40	40
3	Germany	DAX 30	30
4	Italy	FTSE MIB Investing	40
5	Japan	Nikkei 225	225
6	United Kingdom	FTSE 100	100
7	United States	S&P 500	500

Source: data obtained from: https://www.investing.com/indices/

In addition, LPI values for the seven leading industrial countries were collected as shown in Table 2.

Table 2 The Values of (LPI) of the Research Sample Countries

No.	Country	2007	2010	2012	2014	2016	2018	2022	Average Periods
1	Canada	3.920	3.870	3.850	3.855	3.931	3.730	3.810	3.852
2	France	3.760	3.840	3.850	3.847	3.901	3.840	3.860	3.843
3	Germany	4.100	4.110	4.030	4.122	4.226	4.200	4.190	4.140
4	Italy	3.580	3.640	3.670	3.691	3.755	3.740	3.730	3.687
5	Japan	4.020	3.970	3.930	3.915	3.970	4.030	3.990	3.975
6	United Kingdom	3.990	3.950	3.900	4.015	4.070	3.990	4.010	3.989
7	United States	3.840	3.860	3.930	3.918	3.992	3.890	3.920	3.907

Source: Sreedevi et al., 2023

The above table shows the average logistics performance index of the seven major industrialised countries during the period from 2007 to 2022. According to the results, Germany ranked first with an average logistics service performance of 4.14, followed by the United Kingdom with a performance rate of 3.989, then Japan with a performance rate of 3.975, and the United States with a performance rate of 3.907. Canada ranked fifth with a performance rate of 3.852, followed by France with a performance rate of 3.843, and finally Italy with an average logistics performance rate of 3.687. These results are important for understanding how the major industrialised countries have tackled logistics challenges and developed logistics services during the mentioned period.

3.3 Research Methodology

In order to study the impact of logistics Performance Indicators on stock indices in Industrial Countries, the Autoregressive Distributed Lag (ARDL) model was used (Pesaran and Shin, 1999; Pesaran et al. 2001), as an alternative to test cointegration of Engel and Granger (1987) and Johansen (1988, 1991).

This approach allows us to test the long-term relationship using variables that may not be integrated of the same order I (0) or (1). Additionally, the ARDL approach provides unbiased estimates of the long-run relationship (Harris and Sollis, 2003), and it is suitable for small samples (Narayan, 2005). The optimal number of lags for the dependent variable and the independent variable is determined using the Akaike Information Criteria (AIC). The ARDL model equation could be formulated using abbreviated terms for the logistics performance indicators as follows:

Y = Stock index (dependent variable)
C = Customs
I = Infrastructure
LC = Logistics competence
TT = Tracking and tracing
IS = International shipments
T = Timeliness
L = Lag operator

Thus, our ARDL model is given by the following equations:

H1: $Y = \beta 0 + \beta 1C + \beta 2I + \beta 3LC + \beta 4TT + \beta 5IS + \beta 6T + \beta 7C (L) + \beta 8I (L) + \beta 9LC (L) + \beta 10TT (L) + \beta 11IS (L) + \beta 12T (L) + \varepsilon$ (1)
H2: $Y = \beta 0 + \beta 1C + \beta 2I + \beta 3LC + \beta 4C (L) + \beta 5I (L) + \beta 6LC (L) + \varepsilon$ (2)
H3: $Y = \beta 0 + + \beta 1TT + \beta 2IS + \beta 3T + \beta 4TT (L) + \beta 5IS (L) + \beta 6T (L) + \varepsilon$ (3)

where:

β0 is the intercept term.

β1, β2, β3, β4, β5, β6 are the coefficients corresponding to the current values of the logistics performance indicators, representing the short-term impact of each indicator on the stock index.

β7, β8, β9, β10, β11, β12 are the coefficients corresponding to the lagged values of the logistics performance indicators, representing the long-term impact of each indicator on the stock index.

C, I, LC, TT, IS, T are the current values of the abbreviated logistics performance indicators (customs, infrastructure, logistics competence, tracking and tracing, international shipments, timeliness).

C(L), I(L), LC(L), TT(L), IS(L), T(L) are the lagged values of the abbreviated logistics performance indicators up to k lags, representing the long-term impact of each indicator on the stock index.

ε is the error term or residual, capturing the unexplained variation in the stock index that is not accounted for by the logistics performance indicators.

The null of non-existence of the relationship is defined by:

H0: $\beta 1=\beta 2=0$. (Null, i.e., the relationship does not exist).
H1: $\beta 1\neq\beta 2\neq 0$ (Null, i.e., the relationship does exist).

4. FINDINGS AND DISCUSSION

4.1 Descriptive Statistics of Research Variables

Table 3 presents the descriptive statistics of the cumulative returns of the indices of seven industrialized countries in the world, where the returns from the previous year and the current year were collected for the periods of seven issues of logistic performance indicators during the years 2007, 2010, 2012, 2014, 2016, 2018 and 2022. With the aim of analysing and evaluating the performance of the indicators of the markets of industrialised countries over these periods, the table is as follows:

Table 3 Descriptive Statistics Market Indicators

No.	Countries	Index	Years	Mean	Min	Max	Std. Dev.
1	Canada	S&P/TSX	(2006+2007)	16.58%	-41.47%	110.47%	46.43%
2	France	CAC 40	(2009+2010)	14.14%	-1.23%	24.31%	9.50%
3	Germany	DAX 30	(2011+2012)	21.03%	-6.60%	42.40%	16.84%
4	Italy	(invit40) Investing	(2013+2014)	6.80%	-11.91%	20.36%	9.90%
5	Japan	Nikkei 225	(2015+2016)	14.62%	-1.52%	57.38%	18.95%
6	UK	FTSE 100	(2017+2018)	12.48%	-4.80%	32.82%	10.88%
7	USA	S&P 500	(2021+2022)	19.99%	5.97%	38.44%	12.07%

Table 4 includes descriptive data and statistics for six logistical dimensions: customs, Infrastructure, logistics competence, tracking and tracing, international shipments, and timeliness. The data was collected from Panel Data and it includes 49 views of logistic issues data over 7 time periods, including 7 industrialised countries as follows:

Table 4 Descriptive Statistics of Logistic Performance Indicators

Dimensions Independent	Logistic Indicator	Mean	Min	Max	Std. Dev.
Areas For Policy Regulations	Customs	3.726	3.19	4.123	0.208
	Infrastructure	4.051	3.52	4.439	0.187
	Logistics competence	3.936	3.625	4.31	0.163

Service Delivery Performance Outcomes	Tracking and tracing	4.021	3.66	4.265	0.134
	International shipments	3.6	3.21	3.91	0.157
	Timeliness	4.211	3.93	4.48	0.135

Based on the provided data, it appears that the logistics operations are generally performing well in terms of infrastructure, tracking and tracing, and timeliness, as these indicators have relatively higher mean scores (4.051, 4.021, and 4.211, respectively). This suggests that the quality and availability of infrastructure, effectiveness in tracking and tracing shipments, and punctuality in delivering shipments according to schedule are areas of strength in the logistics operations.

However, there may be room for improvement in other areas. The logistics competence indicator has a mean score of 3.936, indicating that there may be some room for enhancement in the competence and expertise in managing logistics processes such as planning, organizing, and coordinating shipments.

The customs indicator has a mean score of 3.726, which suggests that there may be some opportunities to improve the performance and effectiveness in managing customs-related processes in the logistics operations, which may involve customs clearance, documentation, and compliance with international trade regulations.

The international shipments indicator has the lowest mean score of 3.600, indicating that there may be some room for improvement in managing international shipments, which may involve customs clearance, documentation, and compliance with international trade regulations.

Overall, these results highlight both strengths and areas for improvement in the logistics operations, and further analysis and action may be needed to address any identified areas of improvement and enhance overall logistics performance.

4.2. Testing Hypothesis

In order to determine the optimal number of delays for the ARDL models, the Akaike information criterion (AIC) was applied in this research. The data was analysed for hypotheses and the results were discussed in the following part.

4.2.1 Testing the First Hypothesis

To investigate the impact of all dimensions of logistics indicators (customs, infrastructure, logistics competence, tracking and tracing, international shipments, and timeliness) on the industrial sector index in the major industrialised countries, ARDL analysis was performed and provided the following results:

Table 5 Testing the First Hypothesis

VARIABLE	LAG MODEL	COEFFICIENT	T-STATISTIC	PROB.	R^2	DURBIN-WATSON	Prob.
C		0.197	0.142	0.888			
CUSTOMS	1	-0.545	-1.487	0.015			

INFRASTRUCTURE	0	0.587	1.296	0.204	54.29%	1.78	0.005
LOGISTICS COMPETENCE	1	1.251	2.871	0.007			
TRACKING AND TRACING	2	1.244	3.686	0.001			
INTERNATIONAL SHIPMENTS	0	0.325	1.285	0.208			
TIMELINESS	2	-1.053	-3.388	0.002			

According to Table 5, the results indicate a significant effect of changes in the dimensions of logistical indicators on the industrial sector index in major industrial countries, with a coefficient of determination of 54.29%. This suggests that these indicators are able to explain approximately two-thirds of the changes that occur in the industrial index.

It is important to note that the logistical indicators of infrastructure and international shipments did not show a significant effect on the cumulative returns of the industrial sector index in the industrialized countries, as the values of the determination coefficients (t) were lower than the significance level (0.05).

Furthermore, the Durbin-Watson test yielded a value of 1.78, indicating no autocorrelation issue in the model. The significance level of the model was 0.005, which is less than the significance level (0.05), leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis in relation to the first hypothesis.

4.2.2. Testing the Second Hypothesis

To investigate the effect of Areas for Policy Regulations on the logistics services indicators (customs, infrastructure, and logistics competence) on the industrial sector index in the major industrial countries. ARDL analysis was performed and provided the following results:

Table 6 Testing the Second Hypothesis

Dimensions	Lag Model	Coefficient	T-Statistic	Prob.	R2	Durbin-Watson	Prob.
C		-0.850	-0.929	0.359	26.28%	1.67	0.008
Customs	0	-0.057	-0.136	0.049			
Infrastructure	2	1.000	2.777	0.008			
Logistics Competence	1	0.634	1.595	0.119			

Based on Table 6, the results indicate a significant effect of changes in the areas of logistics policy regulations on the cumulative returns of the industrial sector index in major industrial countries, with a determination coefficient of 26.28%. This suggests that these policy regulations can explain a significant portion of the changes in the returns of the industrial index.

However, the Logistics competence index did not show a significant effect on the cumulative returns of the industrial sector index in the industrialized countries, as the null hypothesis was rejected, and the alternative hypothesis was accepted in relation to the second hypothesis.

4.2.3 Testing the third hypothesis

To investigate the effect of Service Delivery Performance Outcomes represented by tracking and tracing, international shipments, and timeliness indices on the industrial sector index in the major industrial countries. ARDL analysis was performed and provided the following results:

Table 7 Testing the Third Hypothesis

Dimensions	Lag Model	Coefficient	T-Statistic	Prob.	R^2	Durbin-Watson	Prob.
C		-0.122	-0.105	0.917	38.35 %	1.95	0.011
Tracking And Tracing	2	1.269	3.614	0.001			
International Shipments	0	0.096	0.398	0.693			
Timeliness	2	-1.031	-3.105	0.004			

Based on Table 7, the results indicate a significant effect of changes in the Service Delivery Performance Outcomes on the cumulative returns of the industrial sector index in major industrial countries. The determination coefficient is 38.35%, which suggests that these performance indicators can explain a significant portion of the changes in the returns of the industrial index. However, the international shipments index did not show a significant effect on the cumulative returns of the industrial sector index in the industrialised countries, as the null hypothesis was rejected, and the alternative hypothesis was accepted in relation to the third hypothesis.

4.3. Robustness Check

The ARDL models were assessed for robustness using several diagnostic tests of residuals, including the Breusch-Godfrey serial correlation LM test for autocorrelation, the Breusch Pagan-Godfrey heteroskedasticity test, the Jarque Bera test for normality of residuals, and the CUSUM stability test. Based on the results of these tests, our models were found to be robust, with no evidence of autocorrelation, heteroskedasticity, or departure from normality in the errors. This ensures the validity and reliability of the estimated coefficients and the soundness of our conclusions.

5. CONCLUSION

The results of this study support the hypothesis that logistics performance plays a significant role in influencing the performance of the industrial sector. The findings indicate that the combined effect of various logistics service indicators when considered collectively, can explain up to 54.29% of the changes observed in the cumulative returns of the industrial indicators. Furthermore, the logistics policy regulations indicators account for 26.28% of the impact on the returns of the industrial indicators, while the performance results of logistics services indicators contribute to 38.35% of the impact on the returns of industrial indicators.

These results underscore the significance of logistics services as a critical factor in achieving favourable industrial performance. The aggregated indicators reveal that the interaction among various logistics service indicators can elucidate a substantial proportion of the changes observed in the cumulative returns of the industrial indicators. Furthermore, the specific performance outcomes of logistics service delivery, such as tracking and tracing, international shipments, and timing, also exert a significant impact on industry index returns.

Based on these findings, it can be inferred that logistics services play a pivotal role in industrial performance, as they account for a significant portion of the changes in the cumulative returns of industrial indicators. Enhancements in logistics policy regulations and performance outcomes of logistics services can lead to improved industrial performance.

The results of the study highlight both strengths and areas for improvement in the logistics operations, and further analysis and action may be needed to address any identified areas of improvement and enhance overall logistics performance.

To advance future research, it is advisable to explore additional measures that can potentially enhance the impact on industrial indicators. These measures may include optimizing the organization of shipments, improving the management of timing, streamlining customs procedures, enhancing supply chains, and ensuring the provision of efficient transportation services.

The significant question is how can logistics policy regulations and performance outcomes of logistics services be optimized to maximize their impact on industrial indicators and improve overall industrial performance?

Furthermore, climate change can be used as testable variable by using an event study to investigate the impact of Climate change on both LPI and Financial market indices` returns before and after Paris agreement 2015.

It is claimed that the study provides empirical evidence supporting the hypothesis that logistics performance significantly influences the performance of the industrial sector, as demonstrated by the significant impact of logistics service indicators on the cumulative returns of industrial indicators.

As limitation, the Logistics Performance Index (LPI) serves as a valuable tool for benchmarking logistics performance, but one of the primary limitations of the LPI is its narrow focus on only six dimensions. The LPI neglects various other dimensions that are equally critical for evaluating logistics performance. This narrow scope may lead to an incomplete assessment, failing to capture the holistic complexities of logistics operations. In addition, the LPI's standardized framework might not fully capture the nuances and dynamics of local contexts. Different regions and countries have unique logistical challenges, regulations, and infrastructural constraints that can significantly impact performance.

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