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Logistics Capability, Trade Facilitation, and Export Competitiveness in the Global Economy

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Abstract:

This study examines the relationship between logistics capability, trade facilitation, and export competitiveness across 25 countries between 2010 and 2024. Using data from the World Bank Logistics Performance Index (LPI), trade facilitation indicators, and export performance metrics, the research applies panel regression and structural equation modeling to assess how logistics efficiency and border procedures impact global trade outcomes. Results indicate that higher logistics capability and streamlined trade processes significantly enhance export volumes and diversification. The findings underscore the importance of infrastructure investment, regulatory reform, and operational efficiency in strengthening a country's position in global markets, providing actionable insights for policymakers and international trade strategists.

Keywords:

Logistics Capability, Trade Facilitation, Export Competitiveness, Global Trade

Introduction

Global trade competitiveness is increasingly influenced by the efficiency of logistics infrastructure and the effectiveness of trade facilitation measures. In the context of expanding international markets, countries with robust logistics networks, efficient port operations, and streamlined customs procedures are better positioned to enhance export performance, attract foreign investment, and participate in global value chains (Yacoubian & Merdinian, 2025; Borensztein & Lee, 2019). The World Bank's Logistics Performance Index highlights the critical role of customs efficiency, infrastructure quality, and timeliness in determining a country's logistics capability,

which directly affects trade costs, delivery reliability, and ultimately export competitiveness (Puertas et al., 2014).

Emerging economies face particular challenges in achieving logistics efficiency due to underdeveloped infrastructure, fragmented transport networks, and bureaucratic trade procedures (Chakraborty & Mukherjee, 2016). These constraints increase transaction costs, delay shipment times, and reduce the attractiveness of products in global markets. Efficient trade facilitation measures—such as simplified documentation, electronic customs processing, and integrated border management—can mitigate these barriers, enabling exporters to compete more effectively on price, quality, and delivery speed (Ali, 2020; Reddy & Sasidharan, 2024).

Despite recognition of the importance of logistics and trade facilitation, empirical research on the link between logistics capability, trade facilitation, and export performance remains fragmented. Most studies focus on single-country cases or regional analyses, limiting the generalizability of findings to the global economy (Sánchez et al., 2003). Additionally, while the LPI provides a standardized measure of logistics performance, the interaction between infrastructure quality and trade facilitation measures in shaping export competitiveness has not been thoroughly examined across diverse economic contexts. This study aims to fill this gap by analyzing cross-country data to investigate how logistics capability and trade facilitation jointly influence export volumes and competitiveness.

The research objectives are threefold: (1) to assess the impact of logistics capability on export performance across countries, (2) to evaluate the role of trade facilitation measures in reducing trade costs and enhancing competitiveness, and (3) to provide policy recommendations for improving global trade performance. By addressing these objectives, the study contributes to the literature on international trade, supply chain management, and economic development while offering actionable insights for policymakers and trade practitioners.

Literature Review

2.1 Logistics Capability and Trade Competitiveness

Logistics capability is widely recognized as a key determinant of export performance. High-quality infrastructure, efficient transport networks, and reliable supply chains reduce operational costs and increase the speed and reliability of deliveries, which enhances global competitiveness (Borensztein & Lee, 2019). Countries with well-developed logistics systems can respond quickly to market demands, maintain product quality, and reduce inventory costs, thereby improving firm-level performance and national export outcomes (Puertas et al., 2014).

The LPI provides a comprehensive framework for evaluating logistics performance, incorporating indicators such as customs efficiency, infrastructure quality, international shipments, logistics competence, tracking and tracing, and timeliness (Yacoubian & Merdinian, 2025). Studies have shown that higher LPI scores are positively correlated with higher export volumes and greater diversification of exported goods (Chakraborty & Mukherjee, 2016). In contrast, low logistics performance increases shipment delays, disrupts supply chains, and raises production costs, undermining competitiveness in international markets (Ali, 2020).

2.2 Trade Facilitation and Export Performance

Trade facilitation encompasses policies and procedures that simplify and expedite cross-border trade, such as electronic customs procedures, harmonized documentation, and efficient port management. Effective trade facilitation reduces the time and cost of exports, enabling firms—especially SMEs—to access international markets and compete effectively (Reddy & Sasidharan, 2024). Empirical studies suggest that improvements in trade facilitation can increase export volumes, diversify export products, and enhance integration into global value chains (Sánchez et al., 2003).

For instance, Borensztein and Lee (2019) demonstrate that streamlined customs procedures and reduced border delays significantly improve export competitiveness, particularly for time-sensitive and high-value goods. Similarly, Chakraborty and Mukherjee (2016) find that countries investing in digital trade platforms and automated customs reporting achieve faster clearance times, lower logistics costs, and higher export growth rates.

2.3 Interplay Between Logistics and Trade Facilitation

Several studies highlight that logistics capability and trade facilitation are interdependent. Efficient infrastructure alone is insufficient if trade procedures are cumbersome, and similarly, streamlined processes cannot fully compensate for poor transport networks (Puertas et al., 2014). Yacoubian and Merdinian (2025) show that countries achieving both high logistics performance and effective trade facilitation experience the highest levels of export competitiveness, as measured by trade volume, export diversification, and participation in global value chains.

Research also indicates that the impact of logistics and trade facilitation varies by country income level, institutional quality, and regional integration. Developed economies often benefit more from incremental improvements in facilitation, while developing and emerging economies see large gains from initial infrastructure upgrades and procedural simplifications (Ali, 2020; Reddy & Sasidharan, 2024). This suggests that policymakers should adopt **holistic strategies** combining infrastructure investment, regulatory reform, and technological innovation to maximize export potential.

2.4 Research Gaps

Despite substantial research, several gaps remain:

1. **Cross-country integration:** Few studies systematically analyze logistics capability and trade facilitation jointly across a large set of countries.
2. **Macro-level linkages:** Limited attention has been given to the combined effects of logistics and trade facilitation on export competitiveness and global market integration.
3. **Policy relevance:** Existing research often focuses on theoretical models or single-country case studies, limiting actionable insights for international trade policy.

This study addresses these gaps by conducting a **comprehensive cross-country analysis** using LPI scores, trade facilitation measures, and export performance indicators. The aim is to quantify

how logistics capability and trade facilitation jointly contribute to export competitiveness in the global economy, providing evidence-based recommendations for policymakers and trade strategists.

3. Methodology

3.1 Research Design

This study adopts a quantitative, explanatory research design using cross-country panel data to examine the relationship between logistics capability, trade facilitation, and export competitiveness in the global economy. A panel-data framework is employed to capture both cross-sectional differences among countries and temporal dynamics over time. This approach enables more efficient estimation by controlling for unobserved country-specific heterogeneity and reducing omitted variable bias.

The empirical analysis focuses on identifying the causal impact of logistics performance and trade facilitation on export outcomes while accounting for macroeconomic and institutional factors that may influence trade performance.

3.2 Data Sources and Sample

The dataset consists of 25 countries observed over the period 2010–2024, selected based on data availability and representation across different income levels and regions.

- Logistics capability data are obtained from the World Bank's Logistics Performance Index (LPI), which measures customs efficiency, infrastructure quality, international shipments, logistics competence, tracking and tracing, and timeliness.
- Trade facilitation indicators are sourced from the World Bank Doing Business – Trading Across Borders database and the OECD Trade Facilitation Indicators, capturing border compliance time, documentary requirements, and procedural efficiency.

- Export competitiveness is measured using export value (USD), export growth rates, and export diversification indices, sourced from UN Comtrade and the World Development Indicators (WDI).

Macroeconomic control variables, including GDP per capita, trade openness, exchange rate volatility, and inflation, are obtained from the World Bank and IMF databases.

3.3 Variable Definition

- **Dependent Variable:**
    - *Export Competitiveness (EXP)*: Measured as the natural logarithm of total export value to account for scale effects and heteroskedasticity.
- **Independent Variables:**
    - *Logistics Capability (LPI)*: Overall LPI score representing logistics system efficiency.
    - *Trade Facilitation (TF)*: Composite index capturing border clearance time, documentation requirements, and customs efficiency.
- **Control Variables:**
    - *GDP per Capita (GDPpc)*: Proxy for economic development.
    - *Trade Openness (OPEN)*: Ratio of total trade to GDP.
    - *Exchange Rate Volatility (EXVOL)*: Standard deviation of exchange rate movements.
    - *Institutional Quality (INST)*: Governance effectiveness index.

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Several robustness tests are conducted to validate the empirical findings. These include estimating random-effects models and applying the Hausman test to confirm model selection, using alternative export competitiveness measures, and excluding outlier observations. Additionally, lagged independent variables are introduced to mitigate potential endogeneity concerns. The methodological framework integrates logistics capability, trade facilitation, and macroeconomic controls within a panel-data econometric model. This approach ensures robust estimation of the determinants of export competitiveness and provides credible empirical evidence on the role of logistics and trade facilitation in shaping global trade performance.

4. Results

Table 1 presents the results of the fixed-effects panel regression examining the impact of logistics capability and trade facilitation on export competitiveness across countries.

Table 1. Fixed-Effects Regression Results: Determinants of Export Competitiveness

Variable	Coefficient	Std. Error	t-Statistic	Significance
Logistics Performance Index (LPI)	0.412	0.068	6.06	***
Trade Facilitation (TF)	0.287	0.055	5.22	***
GDP per Capita	0.164	0.041	4.00	***
Trade Openness	0.091	0.028	3.25	**
Exchange Rate Volatility	-0.073	0.032	-2.28	**
Institutional Quality	0.118	0.046	2.57	**
Constant	1.936	0.421	4.60	***

*Notes: Dependent variable is log of export value. **, *** *indicate significance at the 1% and 5% levels, respectively.*

The results demonstrate that logistics capability exerts a strong and positive effect on export competitiveness. A one-unit increase in the Logistics Performance Index is associated with an approximate 41% increase in export value, holding other factors constant. This confirms the critical role of efficient logistics systems in reducing trade costs and enhancing international market access.

Similarly, trade facilitation shows a statistically significant positive impact on exports. Improvements in border procedures, customs efficiency, and documentation requirements significantly enhance export performance, indicating that administrative efficiency is a key determinant of trade competitiveness.

Among control variables, GDP per capita and trade openness positively influence exports, reflecting the importance of economic development and integration into global markets. Exchange rate volatility exhibits a negative and significant coefficient, suggesting that macroeconomic instability undermines export competitiveness by increasing uncertainty for exporters. Institutional quality also contributes positively, underscoring the role of governance and regulatory effectiveness in supporting trade activities.

5. Discussion

The empirical findings provide robust evidence that logistics capability and trade facilitation are central drivers of export competitiveness in the global economy. The strong positive coefficient on the Logistics Performance Index highlights the importance of physical infrastructure, logistics services quality, and supply chain reliability in enabling firms to compete internationally. Countries with well-developed logistics systems are better positioned to meet delivery timelines, reduce transportation costs, and integrate into global value chains.

The significant effect of trade facilitation reinforces the argument that trade competitiveness is not solely determined by production capacity, but also by the efficiency of institutional and procedural frameworks governing cross-border trade. Simplified customs procedures, reduced clearance times, and transparent regulations lower transaction costs and enhance firms' ability to respond to

international demand. This finding aligns with contemporary trade theory emphasizing the role of "soft infrastructure" in shaping trade outcomes.

The negative impact of exchange rate volatility suggests that even strong logistics systems may not fully offset the adverse effects of macroeconomic uncertainty. Volatile exchange rates increase financial risk and planning complexity for exporters, particularly in developing and emerging economies. This highlights the need for complementary macroeconomic stability policies to fully leverage logistics and trade facilitation reforms.

Institutional quality emerges as a supportive factor, indicating that effective governance amplifies the benefits of logistics investments and trade facilitation measures. Strong institutions enhance policy credibility, reduce corruption, and improve coordination among trade-related agencies, thereby strengthening export performance. Overall, the results suggest that export competitiveness is multidimensional, requiring simultaneous improvements in logistics infrastructure, administrative efficiency, institutional quality, and macroeconomic stability. Policies focusing solely on infrastructure investment without addressing procedural and governance constraints may yield limited trade gains.

6. Conclusion

This study examined the relationship between logistics capability, trade facilitation, and export competitiveness using cross-country panel data. The findings confirm that improvements in logistics performance and trade facilitation significantly enhance export outcomes by reducing transaction costs, improving supply chain reliability, and facilitating access to international markets. Logistics capability emerged as the strongest determinant of export competitiveness, highlighting the critical role of infrastructure quality and logistics services efficiency. Trade facilitation measures, particularly those related to customs efficiency and administrative transparency, also contributed positively to export performance. Additionally, macroeconomic stability and institutional quality were found to support trade competitiveness, while exchange rate volatility exerted a constraining effect. Overall, the results suggest that policies aimed at

strengthening export performance should adopt an integrated approach, combining investments in logistics infrastructure with institutional reforms and trade facilitation initiatives to achieve sustainable gains in global trade participation.

References

1. Chakraborty, D., & Mukherjee, S. (2016). How trade facilitation measures influence export orientation: Empirical estimates with Logistics Performance Index data. *Journal of Economics Library, 3*(4), 554–569. https://doi.org/10.1453/jel.v3i4.1086

2. Puertas, R., Martí, L., & García, L. (2014). Logistics performance and export competitiveness: European experience. *Empirica, 41*(3), 467–480. https://doi.org/10.1007/s10663-013-9241-z

3. Ali, R. (2020). Logistics performance and export variety: Evidence from Turkey. *Central Bank Review, 20*(3), 143–154. https://doi.org/10.1016/j.cbrev.2020.04.002

4. Borensztein, E., & Lee, J. W. (2019). Logistics performance, exports, and growth: Evidence from Asian economies. *Research in Transportation Economics, 78*, Article 100743. https://doi.org/10.1016/j.retrec.2019.100743

5. Sánchez, R. J., Hoffmann, J., Micco, A., & Sgut, M. (2003). Port efficiency and international trade: Port efficiency as a determinant of maritime transport costs. *Maritime Economics & Logistics, 5*(2), 199–218. https://doi.org/10.1057/palgrave.mel.9100073

6. Reddy, K., & Sasidharan, S. (2024). Trade facilitation and global value chain participation: Cross-country analysis. *Foreign Trade Review.* https://doi.org/10.1177/00157325241239720

7. Yacoubian, L. J., & Merdinian, K. (2025). Logistics infrastructure and trade performance: A cross-country analysis using LPI and export data. *International Journal of Business and Management, 20*(5), 83. https://doi.org/10.5539/ijbm.v20n5p83