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The Determinants of Inclusive Logistics on Foreign Direct Investment: Comparative Evidence from Upper and Lower Middle-Income Countries

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A B S T R A C T
This study investigates the impact of inclusive logistics factors on foreign direct investment (FDI) in two groups middle income countries, upper middle and lower middle. This study was conducted in 24 countries using panel data analysis with FMOLS, DOLS, and dynamic GMM from 2007-2023. Six dimensions of the Logistics Performance are customs, infrastructure, international shipments, logistics competence, tracking & tracing, and timeliness are examined as determinants of foreign direct investments inflows. The results reveal that timeliness significantly drives FDI in UMI countries, while infrastructure is the main determinant in LMI countries. This study highlights heterogeneity in logistics performance related to FDI linkages across countries development stages is consistent with the Investment Development Path theory.

INTRODUCTION

The efficiency of logistics systems has increasingly become a defining element of national competitiveness in the global economy. Efficient logistics infrastructure not only supports international trade but also stimulates productive investment by reducing transaction costs and time delays throughout supply chains. The World Bank Logistics Performance Index (LPI) is widely used to benchmark a country's trade logistics capability through six dimensions—customs efficiency, infrastructure quality, international shipments, logistics competence, tracking and tracing, and timeliness (World Bank, 2023). A country with well-developed logistics services tends to experience lower trade costs and improved integration into global value chains, thereby fostering a more attractive environment for foreign investment.

Foreign direct investment (FDI) is recognized as a primary channel for technology transfer, knowledge spillovers, and long-term capital inflows, particularly in emerging economies. From the perspective of multinational enterprises, logistical performance is a critical component of "location advantages," as articulated in Dunning's Ownership–Location–Internalization (OLI) Paradigm. Locations with efficient logistics systems provide greater reliability in the movement of intermediate goods, improved inventory management, and faster market responsiveness, all of which enhance the profitability of investment operations (Blyde & Molina, 2015). Empirical studies demonstrate that improvements in transport and logistics networks can significantly increase a host country's ability to attract vertically integrated FDI, underscoring the strategic complementarity between logistics and investment flows.

The logistics and FDI nexus is particularly salient for middle-income economies, which often face structural bottlenecks in infrastructure provision, customs processes, and institutional capacity. Such deficiencies contribute to elevated transaction costs that deter potential investors. In these contexts, enhancements in logistics systems have been shown to yield substantial gains in trade facilitation, export diversification, and capital inflows (Nguea, 2021). Nevertheless, the direction of the logistics and FDI relationship appear to vary with each country's development stage and absorptive capacity. For instance, while advanced middle-income countries may attract efficiency-seeking investment motivated by time reliability and service quality, lower-income peers rely more on infrastructure-driven investment sensitive to physical connectivity.

Although the role of logistics in shaping investment attractiveness has gained substantial attention, there remains a limited understanding of how different dimensions of logistics performance operate across income categories. The heterogeneity among upper-middle-income (UMI) and lower-middle-income (LMI) economies suggests that the same logistical determinant may exert divergent effects depending on the maturity of supporting institutions and the sophistication of domestic supply networks. This differentiation aligns with the Investment Development Path (IDP) theory proposed by Dunning (1981), which posits that the determinants and motives of FDI evolve as countries progress from resource-seeking to efficiency-seeking stages of development. Therefore,

exploring how inclusive logistics dimensions affect FDI across UMI and LMI groups offers valuable insights into the development-specific mechanisms of investment attraction.

The present study addresses this gap by empirically examining the influence of six LPI dimensions on FDI inflows in a panel of 24 middle-income countries between 2007 and 2023. It adopts a comparative approach to identify whether logistics determinants differ systematically between UMI and LMI groups. By combining long run estimators (FMOLS and DOLS) with dynamic modeling (GMM), this research provides robust evidence on both the short and long term linkages between inclusive logistics and foreign investment. These findings are expected to enrich the theoretical discussion on location advantage and provide insights that can be applied by policymakers seeking to design suited logistics strategies for country's stage of development in order to attract sustainable foreign direct investment (FDI).

LITERATURE REVIEW

Logistic Management

Logistics management is defined as the systematic planning, implementation, and control of the efficient flow and storage of goods, services, and related information from the point of origin to the point of consumption. Over time, it has evolved from a tactical function into a strategic discipline that integrates transportation, warehousing, inventory control, and information systems within a broader supply chain framework. Vacar provides a comprehensive overview of this evolution, highlighting logistics as both an operational necessity and a value-creating function that supports customer satisfaction and competitiveness (Anca, 2019). Complementary research elaborates that logistics efficiency, through coordination of storage, transport, and information flow, enhances cost reduction and service quality within global supply chains (Ding, 2023).

Recent studies emphasize logistics management as a strategic instrument for achieving competitive advantage. Mogaka and Arani argue that logistics strategy significantly influences firm performance when aligned with customer service effectiveness and supply-chain responsiveness (Mogaka & Arani, 2020). Likewise, Islam, Monjur, and Akon stress that the integration of logistics and supply-chain management enhances business agility and resilience in volatile global environments, underscoring the interdependence between logistics coordination, market responsiveness, and business sustainability (Islam et al., 2023). Together, these studies conceptualize logistics management not merely as an operational tool but as a strategic determinant of firm and national competitiveness.

Empirical findings at both the firm and national levels affirm that logistics management practices exert measurable impacts on performance outcomes. Omoush shows that inventory management, warehousing, and transportation practices significantly improve operational performance in road transport companies in Jordan (Omoush, 2022). At a broader scale, efficient logistics systems enhance trade facilitation and investment attractiveness, which is a

mechanism of logistics management that contributes to economic growth and development.

Logistics Performance

The Logistics Performance Index (LPI), introduced by the World Bank, has become one of the most widely referenced metrics for evaluating a country's trade-logistics and transport efficiency. It assesses six dimensions which are customs, infrastructure, international shipments, logistics competence, tracking & tracing, and timeliness to reflect the quality of supply chain services across nations. Ojala & Çelebi emphasize that logistics performance captures underlying institutional and procedural mechanisms of trade facilitation and is strongly associated with global connectivity and economic integration (Ojala & Celebi, 2015). Meanwhile, the 2023 LPI report reiterates that enhancing logistics capabilities significantly lowers trade costs, shortens lead times, and boosts competitiveness, especially in developing and middle-income economies (World Bank, 2023).

Empirical evidence likewise highlights the link between logistics performance and macroeconomic outcomes. For example, the methodological note on LPI explains how logistics inefficiencies, such as inadequate infrastructure and poor customs clearance can translate into higher trade costs and slower growth (Ojala et al., 2018). Likewise, (Varma & Shah, 2021) find that countries with higher LPI scores tend to achieve better export performance and stronger linkage into global value chains, underscoring the role of logistics performance as an economic enabler. These findings collectively suggest that logistics performance is not just an output measurement but a key structural determinant of growth, trade and competitiveness.

Furthermore, scholars have explored the relationship between logistics performance and sustainable development. (Larson, 2021) finds that while high logistics performance drives economic efficiency, it also interacts with environmental dimensions, urging policymakers to balance growth with sustainability. Integrating sustainability principles into logistics practices is therefore essential to ensure long-term competitiveness, particularly for emerging and middle-income economies. Collectively, the literature establishes that improvements in logistics performance not only promote trade and investment but also foster structural transformation towards inclusive and sustainable economic growth.

Foreign Direct Investment

Foreign Direct Investment (FDI) is one of the primary channels of international capital transfer that fosters technology diffusion, industrial development, and economic integration. It involves long term ownership and control in a foreign enterprise aimed at influencing management decisions and production strategies. The *United Nations Conference on Trade and Development (UNCTAD)* highlights that sustainable FDI is essential for achieving inclusive growth, diversification, and global value-chain participation, particularly across emerging and middle-income economies (UNCTAD, 2023). Accordingly, FDI is

viewed as a catalyst for competitiveness, industrial upgrading, and economic resilience.

From a theoretical perspective, Dunning's *Ownership–Location–Internalization (OLI) Paradigm* provides a fundamental framework explaining multinational investment behavior. It argues that firms engage in FDI when they possess proprietary advantages, identify locational benefits, and internalize operations to minimize transaction costs. The *Investment Development Path (IDP)* hypothesis complements this theory, proposing that as countries progress economically, FDI motives shift from resource-seeking to efficiency- and market-seeking patterns (UNCTAD, 2011); (UNCTAD, 2006). These frameworks underscore that the nature, magnitude, and impact of FDI depend on a country's stage of development and institutional maturity.

Empirical studies confirm that FDI's contribution to growth depends on domestic absorptive capacity. (Alfaro et al., 2010) found that FDI enhances growth in developing economies only when supported by robust macroeconomic institutions, skilled labor, and open markets (PDF). Similarly, (Agosin & Machado, 2005) revealed that while FDI can crowd in domestic investment in countries with strong financial and policy frameworks, it may crowd out local investment in weaker institutional environments. These findings suggest that the developmental impact of FDI is conditional, its benefits materialize only when the host economy exhibits sufficient institutional depth, financial development, and policy coherence.

Logistic Performance and Foreign Direct Investment

The relationship between logistics performance and foreign direct investment (FDI) has gained increasing scholarly attention due to the growing importance of global supply-chain integration. Efficient logistics systems reduce transaction costs, improve trade facilitation, and enhance the attractiveness of a country as an investment destination. According to (Ojala et al., 2018), countries with higher Logistics Performance Index (LPI) scores tend to attract more FDI inflows, as strong logistics capabilities signal reliability and competitiveness to multinational firms. Similarly, (Ojala & Celebi, 2015) highlight that improvements in customs, infrastructure, and timeliness are critical determinants of investment decisions, as they directly influence production efficiency and export potential.

Empirical evidence supports the view that logistics performance plays a significant role in mediating the relationship between trade openness and FDI inflows. Khadaroo and Seetanah demonstrate that transport infrastructure and logistics quality substantially determine multinational firms' location choices, especially in developing and transition economies (Sarma & Pais, 2008). Likewise, Hausman, Lee, and Subramanian (2013) argue that a well-functioning logistics environment enhances supply-chain efficiency and reduces trade costs, thereby increasing a country's competitiveness in attracting FDI. These studies collectively underscore that efficient logistics is a crucial enabler of FDI through its impact on connectivity, reliability, and cost efficiency.

Furthermore, recent analyses extend this relationship to sustainable investment and inclusive economic development. Gani found that logistics efficiency, particularly infrastructure and customs performance, has a positive and statistically significant effect on FDI inflows across developing Asia and the Pacific (Gani, 2017). The findings suggest that countries improving their logistics ecosystems experience stronger integration into global value chains, fostering not only greater foreign investment but also knowledge transfer and technological spillovers. Hence, logistics performance serves as both a catalyst and a transmission mechanism through FDI which promotes economic growth and competitiveness.

Conceptual Framework and Hypothesis

The conceptual framework of this study is based on the argument that logistics performance is a fundamental component of national location advantage that influences foreign direct investment (FDI) decisions. An efficient logistics system—reflected in the quality of customs, infrastructure readiness, international shipping reliability, logistics competence, tracking and tracing capabilities, and timeliness. Those can reduce trade friction and operational costs, thereby increasing a country's attractiveness to multinational companies. Previous studies show that countries with stronger logistics ecosystems tend to receive higher FDI inflows, as logistics reliability signals competitiveness and production efficiency (Ojala et al., 2018). Similarly, improvements in customs and infrastructure are crucial as they facilitate smoother cross-border transactions and reduce uncertainty in supply chain operations (Ojala & Celebi, 2015). Further empirical evidence highlights that transportation infrastructure and logistics quality directly influence the location preferences of multinational companies, especially in developing economies where logistics constraints can be a major barrier (Sarma & Pais, 2008); (Gani, 2017).

Aligned with Dunning's Ownership–Location–Internalization (OLI) paradigm and the Investment Development Path (IDP) theory, this study conceptualizes each dimension of logistics performance as an exogenous determinant affecting inward FDI. Better logistics performance strengthens a country's locational advantages by enabling firms to minimize coordination costs, enhance delivery reliability, and integrate more effectively into global value chains. Other research conducted by Gani has also demonstrated that logistics efficiency, particularly in customs and infrastructure, has positively contributed to FDI inflows across developing regions, supporting deeper participation in international production networks (Gani, 2017). Based on these theoretical and empirical insights, this framework positions all six LPI dimensions as key explanatory factors of FDI inflows, while acknowledging that their relative influence may differ between upper-middle-income (UMI) and lower-middle-income (LMI) countries due to variations in institutional maturity, absorptive capacity, and structural readiness.

The main objective of this research is to investigate the direct influence of the six dimensions of the Logistics Performance Index (LPI) on foreign direct investment (FDI) in middle-income countries. Unlike mediation-based models,

this study focuses solely on the determinant effects of logistics performance. Each LPI dimension is conceptualized as a key enabling factor that may enhance investment attractiveness by improving trade facilitation, reducing supply-chain frictions, and supporting efficient cross-border operations.

Figure 1. shows the research model that outlines the direct linkages from logistics dimensions to FDI inflows. This framework reflects the assumption that customs efficiency, infrastructure development, shipment reliability, logistics competence, tracking and tracing systems, and timeliness collectively shape the strategic location advantages perceived by multinational enterprises. Given the heterogeneity in logistics development between upper-middle-income and lower-middle-income countries, the estimations are conducted separately for both groups.

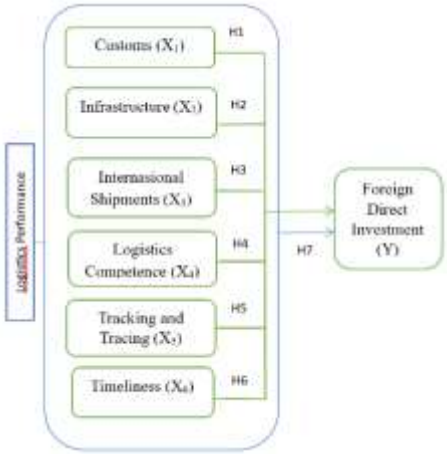

Figure 1: Research Model

The hypotheses of the study are summarized in Table 1, which outlines the expected directional effects of each LPI component on FDI. Model 1 is empirically tested using FMOLS, DOLS, and dynamic system GMM to capture long-run equilibrium relationships, correct endogeneity, and identify short-run dynamics. This methodological approach ensures a comprehensive assessment of how inclusive logistics determinants contribute to FDI inflows across different levels of economic development.

Table 1. Summary of the Hypothesis

H1	FDI is positively influenced by Customs
H2	FDI is positively influenced by Infrastructure
H3	FDI is positively influenced by International Shipping
H4	FDI is positively influenced by Logistics Competence
H5	FDI is positively influenced by Tracking and Tracing
H6	FDI is positively influenced by Timeliness
H7	FDI is positively influenced by Logistics Performance

METHODOLOGY

This study employs a quantitative panel-data approach to examine how six dimensions of the Logistics Performance Index (LPI)—customs, infrastructure, international shipments, logistics competence, tracking & tracing, and timeliness determine foreign direct investment (FDI) in 24 middle-income countries over the period 2007–2023. The sample is divided into upper-middle-income (UMI) and lower-middle-income (LMI) groups to capture structural heterogeneity in logistics development and investment behaviour. All variables are transformed into logarithmic form, while FDI is expressed using the inverse hyperbolic sine transformation (IHS) to correct for skewness and zero-value inflows.

Prior to model estimation, panel unit-root tests (Levin–Lin–Chu and Im–Pesaran–Shin) and cointegration tests (Kao and Pedroni) were conducted to ensure the statistical validity of long-run estimation. The results confirm that most LPI dimensions and FDI are stationary in level or first difference, and that a long-run cointegration relationship exists between logistics performance and FDI in both income groups. Based on this foundation, Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS) are employed to estimate long-run elasticities, correcting for endogeneity, serial correlation, and potential omitted-variable bias common in macro-panel settings.

To complement the long-run analysis and address possible endogeneity as well as FDI persistence, the study also applies a dynamic panel estimator which is Arellano Bond System GMM method. This estimator is suitable for panels with relatively small sample of time series dimensions and allows internal instrumentation of lagged variables. Diagnostic tests, including the Hansen J-test and AR (2), confirm instrument validity and absence of higher-order serial correlation. Together, these methods provide a comprehensive and robust framework to identify the logistics factors most influential in shaping FDI inflows across UMI and LMI economies.

Regression Equations is as follow:

$$FDI_{it} = \alpha_i + \beta_1 CS_{it} + \beta_2 INF_{it} + \beta_3 IS_{it} + \beta_4 LC_{it} + \beta_5 TT_{it} + \beta_6 TL_{it} + \varepsilon_{it}$$

Variable Definition:

FDI: Foreign Direct Investment
CS: Customs
INF: Infrastructure
IS: International Shipments
LC: Logistic Competence
TT: Tracking and Tracing
TL: Timeliness
ε: Error terms

RESEARCH RESULT

This section reports the empirical findings derived from a structured panel-data estimation procedure. The analysis proceeds in sequential steps, beginning with stationarity diagnostics and cointegration tests to validate the long-run relationship between logistics performance and foreign direct investment (FDI). Long-run coefficients are then estimated using FMOLS and

DOLS, followed by System GMM to assess short-run dynamics and address endogeneity concerns. This integrated approach ensures robust and reliable evidence on the role of logistics performance in shaping FDI inflows across upper-middle-income and lower-middle-income economies.

The stationarity properties of the variables were examined using the Levin–Lin–Chu (LLC) and Im–Pesaran–Shin (IPS) panel unit-root tests. As summarized in Table 2, logistics variables related to customs, infrastructure, international shipments, and logistics competence are stationary at level for both income groups, while the tracking and tracing and timeliness dimensions are stationary only after first differencing. FDI is stationary at level across both groups. These results indicate a combination of I(0) and I(1) processes, supporting the use of panel cointegration and long-run estimators in the subsequent analysis.

Table 2. Stationary Test

Variables	UMI			LMI		
	LLC	IPS	Conclusion	LLC	IPS	Conclusion
Customs	0.0000	0.0000	I(0) – Level	0.0000	0.0000	I(0) – Level
Infrastructure	0.0000	0.0000	I(0) – Level	0.0000	0.0000	I(0) – Level
International Shipments	0.0000	0.0000	I(0) – Level	0.0000	0.0000	I(0) – Level
Logistics Competence	0.0000	0.0000	I(0) – Level	0.0000	0.0000	I(0) – Level
Tracking and Tracing	0.7515 / 0.0000	0.2859 / 0.0000	I(1) – First Diff	0.7211 / 0.0000	0.4218 / 0.0000	I(1) – First Diff
Timeliness	0.1834 / 0.0000	0.0000	I(1) – First Diff	0.2147 / 0.0000	0.0000	I(1) – First Diff
IHS_FDI	0.0000	0.0000	I(0) – Level	0.0000	0.0000	I(0) – Level

Following the stationarity assessment, panel cointegration tests were conducted to determine whether the logistics performance dimensions and foreign direct investment (FDI) move together in the long run. Both the Kao residual test and the Pedroni panel cointegration test were employed to capture convergence under homogeneous and heterogeneous dynamics. As reported in Table 3 and 4, the findings consistently indicate the presence of a statistically significant long-run relationship for both UMI and LMI groups.

Table 3. Kao Residual Cointegration Test

Group	ADF t-Statistic	Probability	Conclusion
UMI	–5.919779	0.0000	Cointegration exists
LMI	–4.965867	0.0000	Cointegration exists

Table 4. Pedroni Panel Cointegration Test

Statistic	Statistic	p-value	Conclusion	Statistic	p-value	Conclusion
Panel v-Statistic	–2.590599	0.9952	Not significant	–2.713838	0.9967	Not significant
Panel ρ-Statistic	3.222927	0.9994	Not significant	3.986265	1.0000	Not significant
Panel PP-Statistic	–3.202654	0.0007	Significant (1%)	0.556272	0.7110	Not significant
Panel ADF-Statistic	–1.524546	0.0637	Marginal (10%)	–0.142868	0.4432	Not significant
Weighted Panel PP	–4.583268	0.0000	Significant (1%)	–1.225662	0.1102	Marginal (10%)
Weighted Panel ADF	–2.830039	0.0023	Significant (1%)	–1.358281	0.0872	Marginal (10%)

The combined evidence from the Kao and Pedroni cointegration tests provides a rigorous confirmation of the long-run equilibrium relationship between logistics performance and foreign direct investment (FDI) within the middle-income country panels. The Kao test unequivocally rejects the null hypothesis of no cointegration for both UMI and LMI groups, indicating that the residuals are stationary and that the underlying relationship among the variables is stable over time. Complementing this, the within-dimension Pedroni statistics yield strong and consistent support for cointegration in UMI economies, with the Panel PP, Weighted Panel PP, and Weighted Panel ADF statistics all significant at the 1% level, reflecting a well-integrated and structurally coherent long-run adjustment mechanism. In contrast, the LMI panel exhibits only marginal significance in selected weighted statistics, suggesting that long-run convergence between logistics performance and FDI is present but remains weaker and less systematic. Taken together, these results substantiate the existence of long-run cointegration across both panels, while highlighting a markedly stronger and more robust equilibrium relationship in UMI countries.

Having established long-run cointegration through the Kao and Pedroni tests, the analysis proceeds to estimate the long-run coefficients using Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS). These estimators are specifically suited for cointegrated panels, as they correct for endogeneity and serial correlation, thereby providing unbiased and efficient measures of the long-run effects of logistics performance on FDI across UMI and LMI countries. Table 5 and 6 shows FMOLS and DOLS test.

Table 5. FMOLS

Variables	UMI		LMI	
	Coefficients	P-Value	Coefficients	P-Value
Customs	−1.419	(0.199)	+0.502	(0.444)
Infrastructure	+0.560	(0.649)	−0.522	(0.565)
International Shipments	−1.128	(0.202)	+0.757	(0.612)
Logistics Competence	+0.120	(0.915)	−0.122	(0.924)
Tracking and Tracing	−1.621	(0.002)	−0.353	(0.458)
Timeliness	+1.387	(0.012)	−0.048	(0.953)
Adj.R^2	0.229		0.531	

Table 6. DOLS

Variables	UMI		LMI	
	Coefficients	P-Value	Coefficients	P-Value
Customs	−1.231	(0.426)	+0.506	(0.518)
Infrastructure	−1.233	(0.607)	−2.428	(0.144)
International Shipments	−0.967	(0.561)	+2.481	(0.346)
Logistics Competence	−0.160	(0.934)	+1.787	(0.406)
Tracking and Tracing	−1.047	(0.145)	−0.319	(0.636)
Timeliness	+2.559	(0.020)	−1.125	(0.408)
Adj.R^2	0.249		0.549	

The FMOLS and DOLS results show that UMI countries exhibit clear long-run sensitivity of FDI to logistics performance, with Timeliness emerging as a consistently significant positive determinant and Tracking & Tracing showing a significant negative effect under FMOLS. In contrast, none of the logistics indicators are statistically significant in LMI countries, suggesting that logistics systems in this group have not yet reached sufficient structural maturity to shape long-run FDI inflows. Overall, the estimations confirm a robust logistics–FDI nexus in UMI economies but a weak relationship in LMI economies. To validate the short-run dynamics and address potential endogeneity and instrument consistency, the analysis proceeds by estimating the model using the System GMM approach.

Table 7. GMM Estimation and Validity Test

Variables	UMI		LMI	
	Coefficient	P-Value	Coefficient	P-Value
FDI(-1)	0.394	0.145	0.593	0.046
Customs	0.385	0.919	−1.202	0.540
Infrastructure	−1.924	0.633	−0.708	0.857
International Shipments	1.715	0.486	6.336	0.483
Logistics Competence	−1.041	0.836	−3.044	0.630
Tracking and Tracing	−0.636	0.803	−1.140	0.753
Timeliness	1.536	0.430	2.088	0.522

Table 8. Model Validity Test

Test	UMI	LMI	Interpretation
Hansen J-test (p-value)	0.177	0.210	Instruments valid (p > 0.05)
AR(2) (p-value)	0.971	0.847	No second-order autocorrelation
Conclusion	Valid & consistent	Valid & consistent	GMM estimator econometrically sound

The combined GMM results show that lagged FDI is significant only for LMI economies, indicating short-run persistence of investment flows in lower-middle-income contexts, while all logistics indicators remain statistically insignificant in both panels. The Hansen and AR(2) diagnostics for UMI and LMI confirm valid instruments and no second-order serial correlation, ensuring that both GMM specifications are statistically reliable.

DISCUSSION

The empirical findings reveal clear development-dependent heterogeneity in the logistics–FDI relationship, consistent with the Ownership–Location–Internalization (OLI) paradigm and Dunning's Investment Development Path (IDP) framework (Seyoum et al., 2014). In upper-middle-income (UMI) economies, FDI is highly responsive to efficiency-oriented logistics attributes, with Timeliness emerging as a significant positive determinant, reinforcing prior evidence that reliability and speed enhance a country's locational attractiveness (Ojala & Celebi, 2015). Conversely, the negative effect of Tracking & Tracing suggests that excessive or costly digital logistics infrastructure may raise operational burdens, reducing investor appeal, a pattern observed in contexts where logistics modernization outpaces institutional efficiency (Apergis, 2009); (Ojala et al., 2018). These results collectively align with IDP's proposition that countries at more advanced stages attract efficiency-seeking FDI driven by refined logistics capabilities rather than by basic infrastructure.

In lower-middle-income (LMI) economies, *Infrastructure* stands out as the only significant long-run determinant of FDI, reflecting the centrality of physical connectivity and transport capacity at earlier development stages. This pattern is fully coherent with the Solow–Swan model, which identifies capital accumulation, particularly infrastructure investment, as a foundational driver of productivit, and with endogenous-growth theory emphasizing the role of logistical inputs in facilitating technology diffusion and knowledge spillovers (Zhu et al., 2022). The insignificance of advanced logistics dimensions in LMI economies indicates that these countries have not yet developed the institutional strength or absorptive capacity required for efficiency-driven investment responses (Agosin & Machado, 2005). Taken together, the divergence between UMI and LMI mirrors prior empirical findings that logistics development follows a sequential capability-building trajectory (Gani, 2017); (Göçer et al., 2022).

Overall, the findings underscore that logistics operates as a structural determinant of locational competitiveness by influencing trade frictions and supply-chain reliability (World Bank, 2023). The heightened sensitivity of UMI economies to efficiency-based logistics attributes reflects their progression toward more advanced logistical systems, in which investors increasingly evaluate service quality and performance consistency (Göçer et al., 2022). Conversely, the predominant role of infrastructure in LMI economies indicates that basic connectivity remains the principal enabler of foreign investment at earlier stages of development (Saini & Hrušecká, 2021). These patterns collectively affirm that the logistics determinants of FDI adjust progressively with the institutional and structural maturation of national logistics environments.

CONCLUSIONS AND RECOMMENDATIONS

The results imply that logistics and FDI policies must be aligned with each country's development stage. UMI economies should enhance time-sensitive logistics efficiency and optimize digital systems to reduce operational frictions, while LMI economies need to prioritize investments in basic transport infrastructure, port capacity, and customs simplification to strengthen their baseline attractiveness to foreign investors. Across both groups, the growth-enhancing role of FDI underscores the need for complementary reforms that expand absorptive capacity—such as improving institutional quality, upgrading workforce skills, and fostering innovation ecosystems. Practically, policymakers should integrate logistics development with targeted investment facilitation programs, strengthen public–private partnerships in logistics corridors, and implement regulatory harmonization to ensure that FDI spillovers translate into sustained competitiveness gains.

ADVANCED RESEARCH

Future research can explore nonlinear or threshold effects to identify how logistics performance influences FDI at different stages of development, while integrating moderating factors such as institutional quality and logistics digitalization. Using more granular big-data indicators—like real-time shipment

delays or port congestion—may also improve the accuracy of logistics–FDI predictions. Comparative and sector-specific analyses are further needed to determine whether logistics determinants vary across industries and regions.

REFERENCES

Agosin, M. R., & Machado, R. (2005). Foreign investment in developing countries: Does it crowd in domestic investment? *Oxford Development Studies*, *33*(2), 149–162. https://doi.org/10.1080/13600810500137749

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2010). How Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. *Journal of Development Economics*, *91*(2), 242–256. https://doi.org/10.1016/j.jdeveco.2009.09.004

Anca, V. (2019). Logistics and Supply Chain Management: An Overview. *Studies in Business and Economics*, *14*(2), 209–215. https://doi.org/10.2478/sbe-2019-0035

Apergis, N. (2009). Foreign Direct Investment Inward and Outward; Evidence From Panel Data, Developed and Developing Economies, and Open and Closed Economies. *The American Economist*. https://doi.org/10.1177/056943450905400203

Blyde, J., & Molina, D. (2015). Logistic infrastructure and the international location of fragmented production. *Journal of International Economics*, *95*(2), 319–332. https://doi.org/10.1016/j.jinteco.2014.11.010

Ding, H. (2023). History, Issues, and Future Scope of Logistics and Supply Chain. *Journal of Enterprise and Business Intelligence*, *3*(2), 95–105. https://doi.org/10.53759/5181/jebi202303010

Gani, A. (2017). The Logistics Performance Effect in International Trade. *Asian Journal of Shipping and Logistics*, *33*(4), 279–288. https://doi.org/10.1016/j.ajsl.2017.12.012

Göçer, A., Özpeynirci, Ö., & Semiz, M. (2022). Logistics performance index-driven policy development: An application to Turkey. *Transport Policy*, *124*(February), 20–32. https://doi.org/10.1016/j.tranpol.2021.03.007

Islam, M. R., Monjur, M. E. I., & Akon, T. (2023). Supply Chain Management and Logistics: How Important Interconnection Is for Business Success. *Open Journal of Business and Management*, *11*(05), 2505–2524. https://doi.org/10.4236/ojbm.2023.115139

Larson, P. D. (2021). Relationships between logistics performance and aspects of sustainability: A cross-country analysis. *Sustainability (Switzerland)*, *13*(2), 1–13. https://doi.org/10.3390/su13020623

Mogaka, C. O., & Arani, W. (2020). Logistics strategy as a competitive tool for firm performance: The moderating effect of customer service

effectiveness. *Journal of Sustainable Development of Transport and Logistics*, *5*(1), 56–65. https://doi.org/10.14254/jsdtl.2020.5-1.6

Nguea, S. M. (2021). The Impact of Infrastructure development on Foreign Direct Investment in Cameroon. *Economics Bulletin*, *41*(3), 1113–1124.

Ojala, L., Arvis, J.-F., Shepherd, B., Wiederer, C., Raj, A., Dairabayeva, K., & Kiiski, T. (2018). Connecting to Compete 2018. *Connecting to Compete 2018*, *July*. https://doi.org/10.1596/29971

Ojala, L., & Celebi, D. (2015). The World Bank 's Logistics Performance Index (LPI) and Drivers of Logistics Performance. *Logistics Development Strategies and Their Performance Measurements*, *March*, 1–30.

Omoush, M. M. (2022). the Impact of the Practices of Logistic Management on Operational Performance: a Field Study of Road Transport Companies. *Journal of Governance and Regulation*, *11*(4 Special Issue), 237–245. https://doi.org/10.22495/jgrv11i4siart4

Saini, M., & Hrušecká, D. (2021). COMPARATIVE IMPACT OF LOGISTICS PERFORMANCE INDEX, EASE OF DOING BUSINESS AND LOGISTICS COST ON ECONOMIC DEVELOPMENT: A FUZZY QCA ANALYSIS. *Journal of Business Economics and Management*, *22*(6), 1577–1592. https://doi.org/10.3846/jbem.2021.15586

Sarma, M., & Pais, J. (2008). Financial Inclusion and Development: A Cross Country Analysis. *In Annual Conference of the Human Development and Capability Association, New Delhi*, *168*(10–13), 1–30. https://doi.org/10.1002/jid

Seyoum, M., Wu, R., & Lin, J. (2014). Foreign Direct Investment and Trade Openness in Sub-Saharan Economies: A Panel Data Granger Causality Analysis. *South African Journal of Economics*, *82*(3), 402–421. https://doi.org/10.1111/saje.12022

UNCTAD. (2006). World Investment Report 2006: FDI from Developing and Transition Economies: Implications for Development. In *World Investment Report 2006*. https://doi.org/10.4324/9780203078624-15

UNCTAD. (2011). *World Investment Report 2011: Non Equity Modes of International Production and Development*.

UNCTAD. (2023). *World Investment Report 2023: Investing in Sustainable Energy for All*. https://doi.org/10.18356/9789210027847c010

Varma, S., & Shah, B. (2021). A Study of the Relationship between Logistics Performance and Human Development. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 833–845. https://doi.org/10.46254/in01.20210244

World Bank. (2023). *Connecting to Compete 2023: Trade Logistics in the Global Economy- The Logistics Performance Index and Its Indicators*. 1–90.

https://lpi.worldbank.org/sites/default/files/2023-04/LPI_2023_report_with_layout.pdf

Zhu, Y., Bashir, S., & Marie, M. (2022). Assessing the Relationship between Poverty and Economic Growth: Does Sustainable Development Goal Can be Achieved? *Environmental Science and Pollution Research International*, *29*(19), 27613–27623. https://doi.org/10.1007/s11356-021-18240-5