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The Relationship Between Financial Development and Logistics Performance Index: A Panel ARDL Approach in Emerging Markets

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ABSTRACT

The term "emerging markets" refers to countries that are undergoing economic and financial development. As financial development progresses in these nations, the capital available for international trade and the expansion of logistics infrastructure grows as well. This increased capital enables the financing of international trade activities and facilitates the execution of necessary logistics operations efficiently and effectively. Additionally, with enhanced financial development, it becomes easier to secure the capital required to improve logistics infrastructure and make it more functional. In this study, analyses are conducted using the Panel autoregressive distributed lag method in emerging market countries to evaluate the direct and indirect effects of financial development on logistics performance. The results reveal that increased access to financial institutions and markets positively affects logistics performance in both the short and long term. Among financial variables, the depth of financial institutions exhibits the strongest long-term influence, suggesting that a stable financial system is crucial for logistics efficiency. These insights provide valuable guidance for decision-makers aiming to strengthen logistics infrastructure and trade capabilities. By recognizing the role of financial development in supporting logistics performance, policymakers can craft strategies that support sustainable economic growth through improved logistics processes.

1. Introduction

In the evolving global economy, economic and financial developments are critical in enhancing the competitive strengths of nations and ensuring sustainable growth [1]. Particularly in countries classified as emerging markets (EM), strengthening financial infrastructure offers significant potential for facilitating international trade and improving logistics performance [2]. Financial development plays a key role in promoting both economic growth and logistics performance in these countries [3].

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The efficiency of financial systems is directly related to factors such as guiding investments, enabling capital flows, and providing economic actors with access to finance [4].

The Logistics Performance Index (LPI) is a crucial indicator of a country's trade efficiency and competitiveness. Emerging markets often face challenges in accessing infrastructure investments and financial resources [5]. Therefore, factors such as the depth of financial institutions and accessibility to financial markets are critical in improving logistics performance [6].

Efforts to enhance financial development in emerging markets are of great importance for accelerating international trade and economic growth [1]. Elements such as access to financial institutions, financial depth, accessibility to markets, and market depth can improve a country's logistics capacity, making trade processes more efficient [2]. The effects of financial development on logistics performance are realized through mechanisms such as directing investments and facilitating capital flow [3].

Emerging markets are typically characterized by dynamic and rapidly changing economic structures. Economic growth potential in these countries is often tied to infrastructure investments and financial development. The development of the logistics sector acts as a catalyst for economic growth. Improving logistics performance not only increases the efficiency of trade but also optimizes production and distribution processes, ultimately contributing to greater consumer satisfaction and enhanced competitiveness [7].

Access to financial institutions and financial markets directly affects the capacity of firms and individuals to finance their economic activities. The depth of financial institutions enables more efficient market operations, allowing economic actors to access finance at lower costs. This facilitates both the fulfillment of short-term working capital needs and the financing of long-term investments [4]. Financial development also contributes to reducing economic uncertainties and maintaining market stability.

Logistics performance is a factor that directly influences economic development and growth. A well-developed logistics infrastructure makes production processes more efficient, reduces the cost of trade, and enhances international competitiveness. Therefore, LPI can be seen as an indicator of a country's economic health [7]. Improving logistics performance is of paramount importance for the sustainability of economic growth, particularly in emerging markets.

The effects of financial development on logistics performance occur through various mechanisms. The depth of financial institutions and accessibility to markets facilitate the provision of the capital needed by the logistics sector. Additionally, financial development enables the financing of technological innovations and infrastructure investments required to enhance the efficiency of logistics operations [5]. This increases the capacity of the logistics sector and allows trade processes to become more efficient.

This study aims to analyze the short- and long-term effects of financial development on LPI in emerging markets. Using data from 2013 to 2021, the study employs the Panel autoregressive distributed lag (ARDL) method to analyze LPI and financial development data of 45 emerging market economies. The Panel ARDL method is a powerful econometric technique that allows for modeling short- and long-term relationships simultaneously and works with both stationary and non-stationary data series [8]. The findings of this study are expected to reveal the short- and long-term effects of financial development on logistics performance and provide a strategic guide for decision-makers in developing sustainable logistics infrastructure and increasing financial access opportunities. In particular, the long-term effects of access to financial institutions and market depth on improving logistics performance will guide policymakers in resource allocation and infrastructure investments. In this context, the results of the study will contribute to the shaping of financial development and logistics infrastructure policies to support economic growth.

2. Literature Review

The relationship between financial development and logistics performance has been examined from various perspectives by numerous researchers. This section focuses on studies that explore financial development, economic growth, and logistics performance.

Aslan and Korap [9] sought to measure the relationship between financial development and economic growth in Turkey, using Johansen cointegration and Granger causality tests on data from 1987 to 2004. The findings demonstrated a significant long-term relationship between financial development and economic growth. Abu-Bader and Abu-Qarn [10] examined the relationship between financial development and economic growth in Egypt from 1960 to 2001 using a VAR model. The analysis revealed mutual positive causality between financial development and economic growth. Moreover, financial development was found to contribute to economic growth by enhancing investment resources and productivity. Leitão [11] analyzed the relationship between financial development and economic growth using data from 27 European Union countries and BRICS countries between 1980 and 2006. Static and panel data analyses revealed that financial development significantly contributed to economic growth. Chu [12] examined the long-term relationship between logistics investment and economic growth in China using dynamic panel data methods, based on data from 30 provinces between 1998 and 2007. The findings demonstrated that logistics investment had a significant and positive impact on regional economic growth in China.

Khachoo and Khan [13] investigated the factors influencing foreign direct investment (FDI) inflows in 32 developing countries using panel data models, covering the period from 1982 to 2008. The findings indicated that financial development increased FDI inflows. Sánchez et al. [14] stated that logistics performance has a significant impact on economic development and that the improvement of logistics infrastructure plays a strategic role in the transition process of countries to the level of development. In this study, it was revealed that logistics performance is one of the main determinants of economic development. Alper and Oransay [15] analyzed the relationship between financial development and the current account deficit using data from 24 OECD countries from 1995 to 2012. The panel causality test used in this study found that financial development harmed the current account deficit. Civelek et al. [16] used data from 2007 to 2014 to examine the role of LPI in the relationship between the Global Competitiveness Index and gross domestic product (GDP) through hierarchical regression analysis. The results indicated that LPI had a significant effect on the relationship between the Global Competitiveness Index and GDP.

Bağcı [17] aimed to analyze countries' financial statuses and conduct comparisons between them using the financial development index, covering the period from 1980 to 2015. The TOPSIS method was employed to calculate financial development scores for the countries. The results indicated that Japan was the most financially developed country during the 1980-2015 period, with the United States and Switzerland also ranking close to this level. Katrakylidis and Madas [18] employed panel econometric methods to measure the long- and short-term relationships between LPI, international trade, and economic growth, using data from 39 countries between 2007 and 2018. The results showed that both logistics performance and international trade had significant effects on economic growth. Tang and Abosedra [19] investigated whether the export-led growth hypothesis depends on logistics performance, using data from 23 Asian countries between 2010 and 2016. The study concluded that, in all 23 countries, the export-led growth hypothesis was based on logistics performance.

Guo [20] analyzed the need for financial support in the port logistics sector during financial crisis periods and stated that companies can increase their competitiveness by increasing the rate of capital return and reducing costs. This study emphasizes the importance of financial development

for maintaining logistics performance during crisis periods and makes an important contribution to the literature. Tarasenko et al. [21] examined the effects of globalization on financial sustainability and logistics infrastructure in transition economies and found that increased market access as well as infrastructure development improves the quality of financial assets but reduces capital adequacy. These findings indicate that the effects of financial development on logistics infrastructure can be both positive and complex. Kevser and Doğan [22] analyzed the relationship between LPI, financial development, and economic growth using panel causality tests on data from 157 countries between 2010 and 2018. Their results showed a long-term cointegration between LPI and both financial development and economic growth. Nguyen and Le [23] found that financial crises in developing countries have significant negative effects on logistics performance. Stating that different types of financial crises weaken elements such as logistics infrastructure, market size, and innovation, the study shows that the crisis effects are more pronounced, especially in low-income countries.

Most of the studies examining the relationships between financial development, logistics performance, and economic growth in the literature conclude that financial development supports economic growth and logistics performance provides a competitive advantage. There are also studies stating that financial crises directly affect the logistics sector and that logistics performance is one of the driving forces of economic growth. However, it is seen that there are limited studies in the literature directly addressing the impact of financial development on logistics performance. In particular, more research is needed on how financial development supports the logistics infrastructure, strengthens the sector during crisis periods, or its impact on factors such as market access and capital adequacy. This study aims to make a significant contribution to the literature in this context by detailing the relationships between financial development and logistics performance. In addition, the panel ARDL analysis used in the study will examine the relationship between financial development and logistics performance in terms of short-term and long-term effects and provide a new perspective on the existing literature.

3. Methodology

In this study, LPI and financial development indicators of 45 countries, referred to as emerging markets, were analyzed based on data from 2013 to 2021. The dependent variable used in the study is the LPI, while the independent variables are financial institution access (FIA), financial institution depth (FID), financial market access (FMA), and financial market depth (FMD). The LPI data were obtained from annual reports. This index is published annually in a bulletin to measure the proficiency and efficiency of countries in logistics, with values ranging from 0 to 10. Financial development indicators were sourced from the International Monetary Fund (IMF) database, with values ranging between 0 and 1. In both cases, higher values indicate better performance. To enhance the clarity of the analyses, the variables used and their abbreviations are provided below (Table 1).

Table 1
Variables and abbreviations

Data	Abbreviation
EM logistics performance index	LPI
Accessibility to financial institutions	FIA
Depth of financial institutions	FID
Accessibility to financial markets	FMA
Depth of financial markets	FMD

In this study, the Panel ARDL method was used to analyze the short- and long-term relationships between the variables. The Panel ARDL model is known for its ability to work with both stationary and non-stationary data series [8]. Additionally, this method allows for simultaneous modeling of both the long-term equilibrium relationships and the short-term dynamics between variables. The general form of the Panel ARDL model is as follows:

$$\boldsymbol{LPI_{it} = \alpha + \sum_{j=1}^{p} \phi_j LPI_{i,t-j} + \sum_{j=0}^{q} \theta_{1j} FIA_{i,t-j} + \sum_{j=0}^{q} \theta_{2j} FID_{i,t-j} + \sum_{j=0}^{q} \theta_{3j} FMA_{i,t-j} + \sum_{j=0}^{q} \theta_{4j} FMD_{i,t-j} + \varepsilon_{it}} \quad (1)$$

where LPI_{it} represents LPI for cross-section *i* at time *t*, $FIA_{i,t-j}$; $FID_{i,t-j}$, $FMA_{i,t-j}$, and $FMD_{i,t-j}$ and the lagged values of the relevant financial development variables for cross-section *i* at time *t* with a lag of *j*; α is the constant term of the model; ϕ_j is the coefficients of the lagged values of LPI (these coefficients reflect the short-term dynamics); θ_{1j}, θ_{2j}, θ_{3j}, and θ_{4j} are the coefficients of the lagged and current values of the respective independent variables; and ε_{it} is the error term, representing the influence of unobserved factors.

4. Results

In the first step of the analysis, descriptive statistics are provided. The descriptive statistics for the dataset used in this study summarize the basic characteristics and distributions of the variables. Table 2 presents the calculated mean, median, maximum, minimum, standard deviation, skewness, and kurtosis values for the dependent variable, LPI, and the independent variables, FIA, FID, FMA, and FMD.

Table 2
Descriptive statistics

	LPI	FIA	FID	FMA	FMD
Mean	5.056198	0.330588	0.234455	0.284921	0.266815
Median	4.910000	0.351901	0.181651	0.305634	0.201112
Max	8.900000	0.953622	0.832317	1.000000	0.952620
Min	3.310000	0.000001	0.047274	0.000001	0.000002
Std. Dev.	1.041247	0.189822	0.173258	0.244231	0.241858
Skewness	0.758476	0.420952	1.469510	0.393242	0.737310
Kurtosis	3.895240	3.012093	4.691059	2.427074	2.331447
Jarque-Bera	52.356310	11.963520	194.020500	15.977250	44.237220
Probability	0.000000	0.002524	0.000000	0.000339	0.000000
Sum	2047.760	133.888	94.954	115.393	108.060
Sum Sq. Dev.	438.0149	14.5571	12.1274	24.0981	23.6320
Observations	405	405	405	405	405

When examining the descriptive statistics of the variables, it is observed that the mean and median values are close to each other, but the minimum values for some variables are close to zero. For instance, the minimum values for FIA, FMA, and FMD are near zero. This indicates that in some countries, access to and depth of these financial sectors are almost nonexistent. One reason for the minimum values being close to zero is the political and economic instability in these countries. For example, in countries such as Iraq, Bahrain, Uganda, and Cambodia, the tense political climate and

weak economic structures result in low access to financial institutions and markets. Political instability in these countries adversely affects economic development, leading to lower levels of financial development. Factors such as ongoing political unrest in Iraq, internal political conflicts in Bahrain, economic challenges in Uganda, and corruption in Cambodia hinder the development of financial services and market depth in these regions.

When analyzing the distribution of the LPI values, the average is 5.056, and the standard deviation is 1.041. This indicates considerable variability in LPI across countries, with some nations exhibiting very high logistics performance. The maximum value of 8.900 suggests that certain countries have excellent logistics performance, while the minimum value of 3.310 shows that logistics performance is quite low in other countries. The skewness of LPI is 0.758, and the kurtosis is 3.895. These values suggest that the distribution of LPI is right-skewed and more peaked compared to a normal distribution. The Jarque-Bera test result is 52.356 with a probability value of 0.000, indicating that the distribution deviates from normality.

In the next phase, a cross-sectional dependence test was conducted to identify and examine any violations of the assumption of independence between units in panel data models. Cross-sectional dependence is a crucial issue in panel data analysis because most traditional statistical models assume that cross-sectional units (e.g. individuals, companies, or countries) are independent of each other. However, due to economic, social, and environmental factors, there may be links and interactions between units [24]. Cross-sectional dependence analysis is carried out to identify such dependencies and ensure that the models account for them.

In this study, the Breusch-Pagan LM, Pesaran scaled LM, Bias-corrected scaled LM, and Pesaran CD tests were applied to determine cross-sectional dependence. The results of these tests are summarized in Table 3.

Table 3
Cross-sectional dependence test

Variables	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
LPI	0.0000	0.0000	0.0000	0.0000
FIA	0.0000	0.0000	0.0000	0.0000
FID	0.0000	0.0000	0.0000	0.0000
FMA	0.0000	0.0000	0.0000	0.0000
FMD	0.0000	0.0000	0.0000	0.0000
Included periods (*t*): 9				
Included cross-sections (*n*): 45				

When examining the results of the cross-sectional dependence analysis for the data used in the study, cross-sectional dependence was detected for all variables based on the Breusch-Pagan LM, Pesaran scaled LM, Bias-corrected scaled LM, and Pesaran CD tests. The main reason for this dependence is the economic interactions, such as import and export, as well as certain political similarities on a regional basis, which cause countries involved in regional and global integrations to become dependent on each other [25]. In the processes of global and regional integration, economic and political shocks occurring in one country will inevitably spill over to other countries with which they are economically and politically interconnected, thereby developing interdependencies [26].

In general, the detected cross-sectional dependence must be accounted for in the analyses. The presence of cross-sectional dependence necessitates the use of second-generation unit root tests. These tests are advanced methods that consider cross-sectional dependence and heterogeneity in panel datasets [24]. Traditional (first-generation) unit root tests typically assume independence across the panel's cross-sections, which can lead to misleading results if cross-sectional dependence is present. One of the second-generation unit root tests, the Pesaran CIPS test, is designed to

overcome these limitations and provide more reliable statistical inferences [27,28]. The results of this test are presented in Table 4.

Table 4
Second-generation unit root tests

Variables	Statistic	*t*-statistic	*P*-values
LPI	CIPS	-4.23146	<0.01
	Truncated CIPS	-3.92241	<0.01
FIA	CIPS	-6.02828	<0.01
	Truncated CIPS	-5.42378	<0.01
FID	CIPS	-5.72555	<0.01
	Truncated CIPS	-4.96579	<0.01
FMA	CIPS	-5.09884	<0.01
	Truncated CIPS	-4.88008	<0.01
FMD	CIPS	-5.66019	<0.01
	Truncated CIPS	-5.43174	<0.01
Critical values	1%	5%	10%
CIPS	-2.56	-2.33	-2.21
Truncated CIPS	-2.56	-2.33	-2.21

According to the CIPS test results, both the CIPS and Trimmed CIPS test statistics for all variables are lower than the critical values, and the p-values are less than 0.01. These results indicate that the series do not contain unit roots and are stationary. These findings suggest that the variables used in the study are stationary, considering cross-sectional dependence and panel heterogeneity. This satisfies the assumption of stationarity at I(0) and I(1), which is a crucial prerequisite for the correct application of the Panel ARDL model.

Finally, the long- and short-term relationships between the variables were examined using the Panel ARDL model. The Panel ARDL model is a useful method for modeling dynamic relationships between variables in both the short and long term. In this analysis, the dependent variable is LPI, and the independent variables are FIA, FID, FMA, and FMD (Table 5).

When examining the long-term coefficients, it is evident that all independent variables have a positive and statistically significant effect on LPI. The FID variable has the highest coefficient, indicating the strongest influence on LPI. This suggests that financial depth plays a critical role in improving logistics performance. FIA and FMA variables also show positive and significant effects on logistics performance.

In the short-term analysis, the error correction term (COINTEQ01) is significant and, as expected, has a negative sign. The coefficient of the error correction term is -0.903460, indicating that approximately 90.3% of the short-term disequilibrium is corrected, returning to the long-term equilibrium. This finding demonstrates that short-term imbalances are quickly adjusted and the system returns to long-term stability.

When analyzing the short-term coefficients, it is observed that FIA has significant effects on LPI in the short term. Specifically, the variable D(FIA(-2)) has a negative and significant coefficient of -0.309319, indicating that a two-period decline in FIA negatively impacts logistics performance. Conversely, the D(FIA(-4)) variable is positive and significant, suggesting that access to financial institutions with a four-period lag enhances logistics performance. FID, on the other hand, has negative and significant effects on LPI in the short term. The variables D(FID) and its lagged values (D(FID(-1)), D(FID(-2)), D(FID(-3)), D(FID(-4))) negatively influence logistics performance, indicating

that financial depth exerts downward pressure on logistics performance in the short term, but this effect becomes positive in the long term.

Table 5
Panel ARDL analyses

Dependent variable: D(LPI)				
Included observations: 360				
Model selection method: Akaike info criterion (AIC)				
Selected Model: ARDL(4, 5, 5, 5, 5)				
Variable	Coefficient	Std. Error	*t*-Statistic	Prob.*
	Long Run Equation			
FIA	1.111489	0.569285	1.952430	0.0525
FID	3.169766	0.449118	7.057763	0.0000
FMA	1.053867	0.423602	2.487868	0.0138
FMD	0.982925	0.474428	2.071812	0.0397
	Short Run Equation			
COINTEQ01	-0.903460	0.056003	-16.13233	0.0000
D(LPI(-1))	0.091081	0.079087	1.151659	0.2510
D(LPI(-2))	0.120666	0.039640	3.044023	0.0027
D(LPI(-3))	0.277198	0.080609	3.438802	0.0007
D(FIA)	0.237542	0.215612	1.101709	0.2721
D(FIA(-1))	-0.029980	0.259663	-0.115458	0.9082
D(FIA(-2))	-0.309319	0.141707	-2.182804	0.0304
D(FIA(-3))	0.006686	0.129743	0.051537	0.9590
D(FIA(-4))	1.560422	0.048254	32.33775	0.0000
D(FID)	-2.468527	0.323155	-7.638833	0.0000
D(FID(-1))	-2.107297	0.114016	-18.48240	0.0000
D(FID(-2))	-2.159253	0.520148	-4.151230	0.0001
D(FID(-3))	-2.267778	0.089880	-25.23104	0.0000
D(FID(-4))	-1.731598	0.384680	-4.501396	0.0000
D(FMA)	0.647090	0.197549	3.275598	0.0013
D(FMA(-1))	0.695166	0.207213	3.354844	0.0010
D(FMA(-2))	0.353614	0.178743	1.978336	0.0495
D(FMA(-3))	0.015661	0.121949	0.128425	0.8980
D(FMA(-4))	0.273392	0.148646	1.839219	0.0676
D(FMD)	1.294672	0.178929	7.235671	0.0000
D(FMD(-1))	0.474084	0.325191	1.457864	0.1467
D(FMD(-2))	-0.191865	0.299641	-0.640317	0.5228
D(FMD(-3))	-0.347297	0.332358	-1.044949	0.2975
D(FMD(-4))	-0.708017	0.183938	-3.849216	0.0002
C	3.090228	0.202391	15.26858	0.0000
Mean dependent var	0.033722	S.D. dependent var		1.526685
S.E. of regression	0.519925	Akaike info criterion		1.826178
Sum squared resid	47.57663	Schwarz criterion		4.090104
Log likelihood	-140.8009	Hannan-Quinn criter.		2.722282

FMA has positive and significant effects on LPI in the short term. The coefficients for D(FMA), D(FMA(-1)), and D(FMA(-2)) are all positive and significant, showing that access to financial markets improves logistics performance in the short term. However, the D(FMA(-3)) variable is not significant, suggesting that a three-period delay in FMA has no noticeable impact on logistics performance.

FMD also exhibits positive and significant effects on LPI in the short term. Both D(FMD) and its lagged value D(FMD(-4)) positively influence logistics performance, indicating that FMD contributes positively to logistics performance in the short term. However, the variables D(FMD(-2)) and D(FMD(-

3)) are not significant, indicating that two- and three-period delays in FMD have no significant impact on logistics performance.

Following the Panel ARDL analysis, a histogram graph (Figure 1) was used to test the validity and reliability of the analysis. The histogram graph is an essential tool for examining the distribution of residuals, allowing both visual and statistical evaluation of how closely the residuals approximate a normal distribution. The normal distribution of residuals indicates that the model's estimates are reliable and valid. This evaluation is crucial for ensuring the accuracy and reliability of the model's results. Below, you will find the histogram graph and the residual statistics.

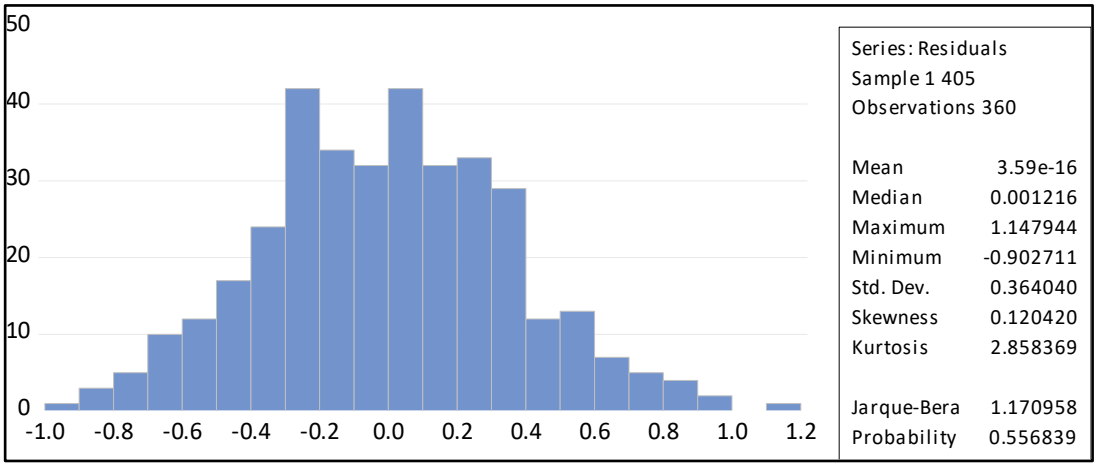

Fig. 1. Histogram graph

Upon examining the histogram graph, it is observed that the distribution of the residuals closely resembles a bell curve (normal distribution). This indicates that the residuals of the model conform to a normal distribution, which is further confirmed by the Jarque-Bera probability value from the residual statistics. The probability value of 0.556839 is greater than the 5% significance level, confirming the presence of a normal distribution as depicted in the graph. Additionally, the mean value being very close to 0 (3.59e-16) suggests that there is almost no difference between the estimated and actual values, meaning that the analysis results are highly accurate. These findings from the histogram graph and residual statistics demonstrate that the model and the estimated values produce highly reliable results.

5. Discussion

In this study, the effects of financial development on logistics performance were examined in the short and long term using panel ARDL analysis. The financial development indicators used in the study include access to financial institutions, FID, access to financial markets, and FMD. These findings offer important implications when examined in the light of the existing literature. The findings of the study reveal that financial development creates complex effects on logistics performance in the short term. In particular, it was observed that access to financial institutions provides a positive effect on logistics performance in the fourth lag value. This situation shows that firms' access to the capital required for their operational activities increases their short-term performance. However, a negative effect was detected in the third lag value; this indicates that in some cases, increased access may create short-term costs and uncertainty for firms. Similarly, it was observed that FID harms logistics performance in the short term. These findings reveal that the effects of financial development have a complex structure in the short term and provide new information in the literature on the relationship between financial access and depth and logistics performance. These results support

studies conducted in the literature on the relationship between financial development and logistics performance, especially by Nguyen and Le [23]. The positive effects of financial access in the short term are expected as it allows firms to regulate cash flow by meeting their operational capital needs. However, the negative effects of FID on logistics performance in the short term are an uncommon issue in the literature and provide an important finding showing the negative effects of high interest rates or tight credit conditions on logistics firms. In the long term, it has been observed that financial development has more pronounced and positive effects on logistics performance. Access to financial institutions and access to financial markets stand out as the main factors that increase logistics performance in the long term. These findings show that the development of the financial system provides sustainable growth for the logistics sector in the long term and that financial access offers wider investment opportunities over time. The transformation of the short-term negative effects of financial depth into positive in the long term can be explained by firms' adaptation to the financial system and increasing efficiency by integrating into this system. Our study contributes to the literature by showing that FMD promotes sustainable growth in the logistics sector in the long term. The finding that FMD creates financial stability over time and that this situation provides a suitable ground for long-term investments offers a strategic advantage for the logistics sector.

The most important contribution of this study is that it details the relationship between financial development and logistics performance in the short and long term, revealing that this relationship not only creates economic growth or competitive advantage but also provides a structure that supports the sector during crisis periods. While financial development may cause fluctuations in the short term, it plays an important role in terms of economic sustainability by providing a permanent improvement in the sector in the long term. Our study comprehensively addresses the effects of financial development on logistics performance by filling some gaps in the literature. The supporting role of access to financial markets and FID in the logistics sector, especially during crisis periods, is a rarely examined topic in the literature, and our study offers an original contribution in this context.

The findings of the study show that financial infrastructure should be strengthened to increase logistics performance. Increasing financial access and depth will contribute to the improvement of logistics performance and enable companies to meet their short- and long-term capital needs more effectively.

6. Conclusions

In this study, the relationship between financial development and logistics performance was examined with panel ARDL analysis within the framework of short-term and long-term effects. It was revealed how elements such as access to financial institutions, FID, access to financial markets, and FMD affect logistics performance. The results of the study show that financial development may have complex effects on logistics performance in the short term, but it supports sustainable growth in the sector by providing stability in the long term. These findings emphasize that financial development supports not only economic growth but also the development of logistics infrastructure and reveal the importance of regulations to be made in this area. Within the scope of our research questions, it was concluded that short-term results may include some fluctuations and uncertainties, but this effect will turn positive in the long term with the stability of the financial system. As access to financial institutions and markets increases, companies can access more convenient funding sources for short-term and long-term investments, thus conducting their operations more efficiently and supporting infrastructure investments. These results provide important inferences that the performance of the logistics sector can be increased by deepening the financial system and facilitating access to markets. In this context, our study has brought a new perspective to the literature on the relationship between financial development and logistics performance. However, some research questions could not be

fully answered due to limitations. For example, it could not be examined how the effects on logistics performance differ on a sectoral basis (e.g. transportation, storage). A more detailed examination of this issue could make an important contribution to future research.

The findings of this study show that strengthening the financial infrastructure will contribute to improving logistics performance and thus support the development of international trade structures. In this context, the following suggestions can be developed for policymakers and decision-makers:

i. Regulations aimed at increasing financial access and depth will increase the operational flexibility and investment capacity of the logistics sector, ensuring sustainable growth in the sector in the long term.
ii. Strengthening the financial system with special funds and incentives to support the logistics sector during crisis periods will contribute to the sector's ability to maintain its effectiveness in such periods.
iii. By increasing FMD, access to low-cost long-term funds can be provided, and these resources can be directed to logistics infrastructure investments, allowing the sector to promote infrastructure and technological development.

Among the limitations encountered in the study is the inability to examine longer-term effects due to the data covering a certain period. These limitations indicate that different analysis methods should be tried with larger data sets in future studies. In addition, examining the effects of financial development on logistics performance at the sectoral level or considering regional differences will contribute to the development of more in-depth policy recommendations. As a result, this study provides significant contributions to the existing theoretical framework in the field by comprehensively addressing the effect of financial development on logistics performance. The findings provide important information on how the logistics sector can be strengthened with financial development.

In the future, the relationship between financial development and logistics performance can be analyzed in more detail and applications can be investigated to support the sector, especially during crisis periods. In this context, studies targeting the integration of financial and logistics processes are needed, and such studies will contribute to the sustainable support of economic growth and commercial competition.

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Conflicts of Interest
The author declares no conflicts of interest.

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