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The Impact of Transport and Logistics Infrastructure on Foreign Economic Activity: A Quantitative Empirical Analysis

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ABSTRACT

The method used in this study is empirical quantitative research which aims to scientifically examine the relationship between the development of transport and logistics infrastructure with foreign economic activity. The primary data was gathered using a structured questionnaire with 5-point Likert scale questions from 350 professionals in logistic, transport, customs, import/export and supply chain management in the industry. The conceptual model is based on four independent variables (transport infrastructure, logistics efficiency, customs procedures and trade facilitation, digital logistics technologies) and one dependent variable (foreign economic activity). The analysis of data was done with SPSS and descriptive statistics, reliability analysis (Cronbach Alpha), Pearson correlation, and multiple regression analysis. The results show that the overall regression model is highly significant (R^2 = 0.628, F = 145.363, $p < 0.001$). Digital logistics technologies have the highest positive effect ($\beta = 0.872$, $p < 0.001$) followed by logistics efficiency ($\beta = 0.125$, $p = 0.029$). The customs procedure has a significant negative effect ($\beta = -0.202$, $p = 0.006$) and transport infrastructure does not show a significant effect ($\beta = 0.019$, $p = 0.753$). H2, H4 and H5 are accepted and H1 and H3 are rejected on the basis of hypothesis testing. The statistics make for solid empirical evidence on the importance of

Hypothesis Testing, SPSS

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digital technologies and logistics efficiency as the two most important factors for foreign economic activity, and not least customs efficiency, still being a big challenge.

Introduction

Transportation and logistics infrastructure has become a key factor in shaping a country's foreign trade, especially in the rapidly globalizing and complex world of international trade, transport and logistics. The efficiency of transport networks and logistics, customs procedures and digital technologies is directly tied to the costs of trade, competitiveness of exports and integration into the global value chain for developing and transition economies, especially landlocked economies. In spite of this, numerous issues are still present in many countries, including insufficient quality of roads and rails, customs clearance delays, delays in logistics, and limited digitalization.

From the theoretical framework and hypotheses of the first part of this research, the following hypotheses are tested empirically in this research:

H1: There is a significant positive relationship between transport infrastructure and foreign economic activity.

H2: Logistics efficiency has a significant positive impact on foreign economic activity.

H3: Customs procedures and trade facilitation have a significant positive effect on foreign economic activity.

H4: Digital logistics technologies have a significant positive relationship with foreign economic activity.

H5: Transport and logistics infrastructure collectively have a significant positive impact on foreign economic activity.

This article presents the research methodology, descriptive and reliability analysis, correlation and regression results, and hypothesis testing conclusions.

Methodology

Research Design and Approach

The study employs quantitative approach descriptive and explanatory research design based on deductive approach. The quantitative approach enables variables to be measured numerically and statistical techniques to be used to investigate the relationships between variables. The descriptive part gives a detailed picture of the situation of the transport and logistics infrastructure and foreign economic activity at present. The explanatory aspect explores the relationship (causes) between independent and dependent variables.

Population and Sampling

The target group are professionals and stakeholders directly and indirectly involved in transport, logistics, supply chain management, import/export activities and foreign economic activities. This involves staff of logistics companies, freight and forwarding companies, transport service providers (road transport, rail transport, air transport, sea transport), customs agents, importers/exporters, business operators involved in international transport, supply chain managers and warehouse managers.

The sampling technique was non probability sampling technique (convenience sampling). The number of responses obtained was 200 - 400 and finally 350 valid responses were obtained which is adequate for correlation and regression analysis.

Data Collection and Questionnaire

Primary data were collected using a structured questionnaire distributed both online (email, Google Forms) and offline. The questionnaire uses a 5-point Likert scale:

The questionnaire consists of six sections: (A) Demographic information, (B) Transport Infrastructure (5 items), (C) Logistics Efficiency (5 items), (D) Customs Procedures and Trade Facilitation (5 items), (E) Digital Logistics Technologies (5 items), and (F) Foreign Economic Activity (5 items). All measurement items were adapted from existing literature (He et al., 2022; Olshanska et al., 2022; Vanoy, 2023; Wanjao, 2022).

Data Analysis Techniques

Data were analyzed using SPSS (Statistical Package for the Social Sciences). The following techniques were employed:

- **Descriptive statistics** (frequencies, means, standard deviations) to summarize data.
- **Reliability analysis** (Cronbach's Alpha) to test internal consistency.
- **Pearson correlation analysis** to examine relationships between variables.
- **Multiple regression analysis** to determine the impact of independent variables on foreign economic activity.

Ethical Considerations

The purpose of the research was fully explained to all the subjects. It was an anonymous and voluntary participation. Not collected any personal identification data. Data were collected and stored securely and only for academic research.

Results

Demographic Profile of Respondents (N = 350)

Gender: Male 283 (80.9%), Female 67 (19.1%).
Age: 20-30 years 91 (26.0%), 31-40 years 74 (21.1%), 41-50 years 162 (46.3%), Above 50 years 23 (6.6%).
Education: Diploma 104 (29.7%), Bachelor's 24 (6.9%), Master's 189 (54.0%), PhD/Doctorate 33 (9.4%).
Professional Experience: Less than 2 years 104 (29.7%), 2-5 years 33 (9.4%), 6-10 years 171 (48.9%), More than 10 years 42 (12.0%).
Sector of Employment: Logistics Company 9 (2.6%), Transport Service Provider 17 (4.9%), Customs/Trade Agency 46 (13.1%), Import/Export Business 116 (33.1%), Supply Chain/Warehousing 126 (36.0%), Other 36 (10.3%).

Descriptive Statistics

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Transport Infrastructure	350	6.00	25.00	19.6943	4.39272
Logistics Efficiency	350	5.00	25.00	19.1143	4.17436
Customs Procedure & Trade Facilitation	350	9.00	20.00	14.4171	2.14188
Digital Logistics Technologies	350	9.00	23.00	17.6029	3.23120
Foreign Economic Activity	350	8.00	25.00	18.7686	4.18424
Valid N (listwise)	350				

Respondents generally have positive perceptions of transport infrastructure (mean = 19.69), logistics efficiency (mean = 19.11), digital technologies (mean = 17.60), and foreign economic activity (mean = 18.77). Customs procedures received a lower mean score (14.42), indicating moderate satisfaction.

Reliability Analysis

Table 2: Reliability Statistics

Cronbach's Alpha	N of Items
.882	25

Cronbach's Alpha of 0.882 exceeds the acceptable threshold of 0.70, indicating high internal consistency and reliability of the questionnaire.

Correlation Analysis

Table 3: Correlations (Pearson)

Variable	TI	LE	CTF	DLT	FEA
Transport Infrastructure (TI)	1	.783**	-.178**	.638**	.565**
Logistics Efficiency (LE)	.783**	1	.086	.484**	.457**
Customs Procedure & Trade Facilitation (CTF)	-.178**	.086	1	-.336**	-.322**
Digital Logistics Technologies (DLT)	.638**	.484**	-.336**	1	.781**
Foreign Economic Activity (FEA)	.565**	.457**	-.322**	.781**	1

**Correlation is significant at the 0.01 level (2-tailed).

Key findings

- Strong positive correlation between DLT and FEA ($r = 0.781$, $p < 0.01$) – the strongest relationship.
- Positive correlations: TI–FEA ($r = 0.565$), LE–FEA ($r = 0.457$).
- Negative correlations: CTF–FEA ($r = -0.322$, $p < 0.01$), CTF–DLT ($r = -0.336$).

Regression Analysis

Table 4: Model Summary

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	.792[a]	.628	.623	2.56814

[a] Predictors: (Constant), Digital_Logistics_Technologies, Customs Procedure & Trade Facilitation, Logistics_Efficiency, Transport Infrastructure

$R^2 = 0.628$ means that 62.8% of the variation in foreign economic activity is explained by the independent variables.

Table 5: ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3834.866	4	958.717	145.363	.000^b^
Residual	2275.388	345	6.595		
Total	6110.254	349			

a Dependent Variable: Foreign Economic Activity

b Predictors: (Constant), DLT, CTF, LE, TI

The overall model is highly significant ($F = 145.363$, $p < 0.001$).

Table 6: Coefficients[a]

Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
(Constant)	3.572	1.486		2.404	.017
Transport Infrastructure	.019	.059	.019	.315	.753
Logistics Efficiency	.125	.057	.125	2.192	.029
Customs Procedure & Trade Facilitation	-.202	.074	-.104	-2.748	.006
Digital Logistics Technologies	.872	.058	.673	15.034	.000

a Dependent Variable: Foreign Economic Activity

Interpretation:

- **Digital Logistics Technologies** have the largest positive and highly significant effect ($\beta = 0.872$, $p = 0.000$).
- **Logistics Efficiency** has a positive and significant effect ($\beta = 0.125$, $p = 0.029$).
- **Customs Procedures** have a negative and significant effect ($\beta = -0.202$, $p = 0.006$).
- **Transport Infrastructure** is positive but not significant ($\beta = 0.019$, $p = 0.753$).

Hypothesis Testing Results

Table 7: Hypothesis Testing Results

No.	Hypothesis Statement	Beta (β)	t-value	Sig. (p)	Result
H1	There is a significant positive relationship between transport infrastructure and foreign economic activity.	0.019	0.315	0.753	**Rejected**
H2	Logistics efficiency has a significant positive impact on foreign economic activity.	0.125	2.192	0.029	**Accepted**
H3	Customs procedures and trade facilitation have a significant positive effect on foreign economic activity.	-0.104	-2.748	0.006	**Rejected** (negative effect)
H4	Digital logistics technologies have a significant positive relationship with foreign economic activity.	0.673	15.034	0.000	**Accepted**
H5	Transport and logistics infrastructure collectively have a significant positive impact on foreign economic activity.	Model R = 0.792	F = 145.363	0.000	**Accepted**

Discussion of Empirical Findings

Based on the empirical analyses, a number of findings are obtained. Digital logistics technologies, such as electronic customs, real time tracking, automation, are the most promising factor to boost foreign economic activity. This is in line with the recent literature on digitalization of the supply chains (Kazak et al., 2025; Mirzaye & Mohiuddin, 2025). Consistent with the theory of supply chain management and previous empirical studies (Adelajda Zaninović et al., 2021; Shikur, 2022), logistics efficiency has a strong positive impact.

On the other hand, the customs procedures and trade facilitation have a substantial negative impact. This shows that there are still many issues to be addressed when it comes to international trade, such as delays, excessive paperwork, and poor coordination of trade border measures, which are mentioned in the WTO Trade Facilitation Agreement (Hendy & Zaki, 2021; Rbehat & Marafi, 2024).

There is no statistically significant direct effect of transport infrastructure. This indicates that it has an indirect effect – it facilitates logistics efficiency and digital technologies, but doesn't directly spur foreign economic activity. This result is in line with the idea that infrastructure investments need to be accompanied by reforms in the operation and institutions (Badada et al., 2023; Kadyraliev et al., 2022).

The overall model (H5) is highly significant (R^2 = 0.628, F = 145.363, $p < 0.001$), which proves that the importance of the integrated approach can hardly be ignored, which involves transport infrastructure, efficiency in logistics, customs procedures, and digitalization in order to boost foreign economic activity.

Conclusion

This article empirically examined the relationship between transport logistics infrastructure development and foreign economic activity based on primary survey data of respondents which are 350 respondents. The major findings are:

1. Digital logistics technologies are the most important factor, they clearly help to improve transparency, lower rate of errors and improve coordination in international trade.
2. Logistics efficiency is positively linked to foreign economic activity, with a view to decreasing the delivery time and the costs of operations.
3. High customs inefficiencies continue to be a significant constraint, delays, and procedures have a negative impact on trade performance.
4. There is no direct significant effect of transport infrastructure benefits are through logistics and digital systems.

The integrated model is able to account for 62.8% of the variance in foreign economic activity, thus substantiating the need to approach the problem from a comprehensive perspective.

The results are of practical significance: the digitalisation of logistics, the simplification of customs processes, and the boost to logistics efficiency should be the top priorities for policy-making, and transport infrastructure investments should be supported by operational and technological improvements.

Weaknesses and Areas for future studies: The study is based on cross-sectional data of only one country (Uzbekistan). Future studies are recommended to be cross-country, longitudinal and to incorporate other variables (FDI, political stability, green logistics), as well as more sophisticated statistical analysis methods, including structural equation modeling (SEM).

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