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Research Article

Logistics Performance and Its Impact on Attracting Foreign Direct Investment: An Empirical Study of a Group of Developing Countries

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ABSTRACT

This study examines the relationship between logistics performance and the attraction of foreign direct investment (FDI) through an econometric analysis involving 20 developing countries over the period 2007–2017. To comprehensively address the research objectives, various economic indicators were employed to represent the independent variable (foreign direct investment) and the dependent variable (logistics performance). The analysis was conducted using EViews 10 software. The findings from the three econometric models tested—pooled regression, fixed effects, and random effects—indicate that the fixed effects model is the most appropriate for this study. Furthermore, the results reveal an inverse relationship between foreign direct investment and logistics performance across all three estimated models.

Keywords: Foreign Direct Investment, Logistics Performance, Developing Countries.

a. Introduction

The global economy has witnessed numerous developments affecting various economic concepts, notably the increasing acceleration of international trade exchanges and the emergence of new forms of financial transactions. One of the most prominent is foreign direct investment (FDI), which has garnered significant attention from countries seeking to attract it as a convenient financing tool. FDI has seen remarkable growth in recent years.

In the late 20th century, the global economy began placing greater emphasis on investments, particularly foreign investments, which have become a powerful and influential phenomenon in international economic relations. These investments play a vital role in international economic transformations, whether from financial, marketing, technological, or informational perspectives.

Given that advanced countries hold the lion's share of scientific and technological advancements and utilize these in their operations, the gap between developed and developing countries has widened. Consequently, developing nations have sought ways to keep pace with developed countries. In recent years, a new concept—logistics services—has emerged, benefiting countries, especially in foreign trade transactions. As a result, activating and modernizing logistics services has become imperative to align with international trade developments. These services are closely linked to their efficiency and performance, which vary from country to country and play a critical role in determining the key factors for attracting foreign direct investment.

This research paper aims to address the following research question:

What is the impact of logistics performance in developing countries on attracting foreign direct investment between 2007 and 2017?

b. Research Hypotheses

1. Logistics performance has a positive impact on improving the investment climate.
2. There is a strong relationship between improved logistics performance and investment.
3. There is a positive or negative relationship between logistics performance and investment.

c. Research Importance

- Gaining proficiency in modern economic tools, particularly econometric methods such as panel data analysis, which are contemporary research topics.
- Assessing the logistics performance sector in developing countries and measuring its impact on investment by utilizing key economic indicators directly related to the research topic based on the latest studies.
- The study derives its importance from applying international indicators to various developing countries.

d. Study Scope

The study focused on measuring the impact of logistics performance on attracting foreign direct investment in a group of developing countries during the period 2007 to 2017.

- **Cross-sectional Limit:** 20 developing countries
- **Time Limit:** 11 years

e. Research Methodology

To examine the research problem, answer the research questions, and test the hypotheses, the study adopted the following methods:

- **Theoretical Aspect:** Descriptive analytical method
- **Empirical Aspect:** Deductive and quantitative methods using panel data models and estimation techniques.

Research Tools:

- Specialized statistical software: **EViews 10**
- Statistical tests for handling panel data models

f. Literature Review

Several previous studies have focused on the relationship between logistics performance and foreign direct investment. Key studies include:

1. Study by Şule Önsel Ekici, Özgür Kabak, and Füsun Ülengin (2019) (1)
This research was presented as a paper titled *Improving Logistics Performance through Reforms in the Pillars of the Global Competitiveness Index (GCI)*. It emphasized that a country's logistics performance is critical for both national and international trade and thus affects economic development. Due to limited resources, policymakers must identify key factors for immediate and significant improvements in logistics services.
The study proposed a methodology for policymakers to develop a roadmap for enhancing their countries' logistics performance. The methodology involved analyzing the impact of GCI pillars on logistics performance, as measured by the Logistics Performance Index (LPI), using a three-stage integrative approach:

- Partial least squares model
- Importance-performance map analysis
- Empirical performance analysis

The research utilized GCI indicators from the World Economic Forum and LPI indicators from the World Bank. Findings suggested that governments should focus on the following areas to improve logistics performance:

- Technological readiness
- Higher education
- Training
- Innovation
- Market size
- Infrastructure

- **Study: *Proposals for Improving the Logistics Performance Index* (2019)** (2)
This study was presented as a research paper titled *Proposals for Improving the Logistics Performance Index*. The aim of the study was to propose ways to improve the current Logistics Performance Index (LPI) by the World Bank. The LPI relies on a global survey of logistics experts, which may be biased due to subjective perspectives on logistics systems in different countries, leading to skewed rankings.
The authors proposed a revised index that provides a quantitative and objective representation of logistics systems and subsystems for 159 countries based on international statistics. This revised index can serve as a reference tool for governments (2019).
- **Study: Hao Phuong Vu, David B. Grant, and David A. Menachof (2019)** (3)
This research was presented as a paper titled *Exploring Logistics Service Quality in Hai Phong, Vietnam*. The

study explored various stakeholders' perceptions of logistics service quality in Hai Phong, one of Vietnam's most important port clusters and largest logistics centers.
Semi-structured interviews were conducted with customers, logistics service providers, and port operators. Fourteen significant variables were identified, with on-time delivery and shipment conditions considered the most critical by all categories. Variables related to human factors were deemed essential by customers but not by logistics providers.
The study contributed to understanding logistics service quality requirements in a developing country like Vietnam with a lower level of logistics maturity. It offered managers insights into factors affecting customers' perceptions and expectations.

- **Study: Azmat Gani (2017)** (4)

This study aimed to test the impact of logistics services on global trade using regression analysis. It included logistics data from 60 countries for the years 2007, 2010, 2012, and 2014, estimating import and export rates. The study focused on examining specific dimensions of logistics performance in global trade and found the following key results:

- Comprehensive logistics services were positively correlated with imports and exports.
- Continuous investment in logistics infrastructure and related services positively impacted global trade.
- Efficient logistics services were crucial for facilitating advanced trade activities.

The study highlighted that logistics achievements in low- and middle-income countries were lower compared to those in high-income countries. Additionally, many basic logistics challenges in developing countries remained due to persistent cost and time constraints affecting the smooth flow of goods.

- **Study: Soufiane Qalloul (2017)** (5)

This research was presented as an article titled *The Attractiveness of Arab Countries for Foreign Direct Investment*. The study examined the determinants of investment among the countries under study by developing a multidimensional index characterized by various features that qualify it as a reference indicator for Arab countries.
The index accounted for the characteristics of Arab countries and adhered to theoretical guidelines. It utilized time series data to measure and track investments in these countries and aimed to clarify the reasons behind the limited share of Arab countries in foreign direct investment flows.
The study also sought to identify why certain countries dominated investment flows and attracted investors while others did not. The findings provided policymakers with insights into enhancing the attractiveness of their countries by leveraging comparative advantages and addressing vulnerabilities to increase foreign investment.

- **Study: *International Transport Forum* (2016)** (6)

This study was presented as an article titled *Developing Logistics Services: Strategies and Performance Measurement*. It emphasized that logistics performance is a strong determinant of national income and results from the efforts of various private and public actors.
The study analyzed the components of logistics performance to improve transport systems' efficiency and trade regulation quality. A roundtable meeting was held to enhance understanding and share experiences in logistics performance measurement and the development of international comparison indicators.
Key discussion points included:

- Examining the applicability of performance measurement in public policy design and implementation, identifying appropriate metrics, and addressing potential misuse of key performance indicators.
- Using the Logistics Performance Index (LPI) developed by the World Bank to drive improvements in trade logistics, with a case study on Turkey.
- Applying supply chain performance measurement in Latin America.
- Developing a performance measurement methodology for multimodal corridors and contributions to port performance regarding public investment in transport infrastructure.

Participants also discussed the establishment of a national freight and logistics observatory in Mexico.

Study Methodology

To achieve the study's objectives and measure the impact of institutional quality thresholds on the relationship between the Logistics Performance Index (LPI) and the foreign direct investment (FDI) sector, the following steps were undertaken:

- **Step 1:** Conducted a theoretical and applied literature review on logistics performance indicators and foreign direct investment attraction indicators. The latest measurement methods were examined, followed by a survey of various indicators developed by specialized international organizations.
- **Step 2:** Identified a sample of 20 countries (previously outlined) based on data availability and the economic structure of the countries under study.
- **Step 3:** Tested suitable statistical software for the specificity of the data obtained from reports and websites published by specialized international organizations during the period 2007–2017. The selected software was EViews 10, and the following tests were conducted:

- Lagrange Multiplier Test (LM)
- Hausman Test
- Pesaran CSD Test

Study Model

Sample Selection and Study Community:

Based on the review of previous studies and the sample selection, the study aimed to include as many relevant indicators as possible. The following indicators were chosen:

- **Independent Variables:**

1. Logistics Performance Index (LPI)
2. Gross Domestic Product (GDP)
3. Institutional Quality Index
4. Corporate Tax Rate
5. Infrastructure
6. Labor Market Efficiency Index
7. Technological Readiness

- **Dependent Variable:**
  - Foreign Direct Investment (FDI)

The table below illustrates the source of each indicator according to its issuing organization:

Indicator	Symbol	Source
Foreign Direct Investment	FDI	World Bank
Logistics Performance Index	LPI	World Bank
Gross Domestic Product	GDP	World Bank
Institutional Quality Index	CPI	GCR
Infrastructure	INFRA	GCR
Technological Readiness	TRE	GCR
Labor Market Efficiency Index	LAB	GCR
Corporate Tax Rate	TAX	GCR

Estimation Methods and Statistical Techniques Used in the Study

This section highlights key aspects of the econometric methodology adopted in the analysis. The following software was used:

To measure the impact of the Global Competitiveness Index and Logistics Performance on attracting Foreign Direct Investment (FDI) for a sample of 20 countries during the period 2007–2017, panel data models were estimated using EViews 10. The following models were developed:

- Pooled Model
- Fixed Effects Model
- Random Effects Model

After estimating the three models, the second step involved selecting the appropriate model using the following tests:

1. **Breusch and Pagan Test:** Determines whether random or fixed effects are present. If no effects are detected, the pooled model is used for analysis.
2. **Hausman Test:** Chooses between the random effects and fixed effects models if effects are detected. The analysis relies on the results of the most appropriate model.

Estimation of the Proposed Models (7)

The objective of estimating these models is to construct an experimental model that best fits the study and extracts the true impact on the dependent variable. Five different models were constructed based on different variables. Based on the tests, the fixed effects model was found to be the most suitable.

Summary of Outputs from the Five Models:

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
C Coefficient	-3.04	-2.2	-3.08	-1.27	-1.29
Student Probability (C)	0.11	0.26	0.11	0.0274	0.025
GDP Coefficient	0.26	0.02	0.02	0.025	0.026
Student Probability (GDP)	0.0000***	0.0000***	0.0000***	0.000***	0.0000***
TAX Coefficient	5.94	6.68	5.98	7.89	6.95
Student Probability (TAX)	0.047**	0.02**	0.049**	0.0105**	0.023**

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
LAB Coefficient	-	-5.66	-	-6.27	-
Student Probability (LAB)	-	0.14	-	0.104*	-
TRE Coefficient	-	-	4.11	-	-4.20
Student Probability (TRE)	-	-	0.92	-	0.92
INFRA Coefficient	-6.45	-7.11	-6.86	-6.86	-5.75
Student Probability (INFRA)	0.021**	0.01**	0.19	0.01**	0.28
LPI Coefficient	4.10	4.23	4.12	3.78	3.55
Student Probability (LPI)	0.31	0.29	0.31	0.033**	0.046**
INS Coefficient	5.31	8.77	5.32	3.32	2.78
Student Probability (INS)	0.09*	0.02**	0.09*	0.012**	0.03**
(INS * ILP) = Y Coefficient	-	-	-	-80.1	-7.51
Student Probability (Y)	-	-	-	0.05**	0.07*
R² Coefficient	0.76	0.76	0.76	0.77	0.76
DW Statistic	1.60	1.61	1.60	1.61	1.60
Fisher Probability	0.00000	0.0000	0.0000	0.00000	0.00000

Statistical Tests Results:

Test	Model 1	Model 2	Model 3	Model 4	Model 5
Breusch-Pagan Test	0.000	272.43	0.000	239.17	0.000
Hausman Test	0.016	13.93	0.015	17.41	0.000
Pesaran CSD Test	0.05	-1.95	0.45	-0.828	0.0719

This comprehensive analysis highlights the fixed-effects model as the most suitable, given the statistical tests and variable significance levels. *** denotes high significance at the 1% level, ** at the 5% level, and * at the 10% level.

Source: Prepared by the researcher based on EViews 10 outputs

After conducting diagnostic tests on the five models, it was found that Model 4 is the most suitable for this study. Therefore, a detailed analysis of this model will be conducted.

Study Testing and Analysis: Identifying the Appropriate Model

To determine the appropriate model when using panel data, a specification test is required, as mentioned earlier. There are three primary long models to consider, raising the second research question: **Which model is most suitable for a specific study dataset?**

To answer this question, the following tests are conducted:

1. Comparison Between the Pooled Effects Model and Fixed/Random Effects Models:

- **Breusch-Pagan Lagrange Multiplier (LM) Test** (8)**:**

This test was proposed by Breusch and Pagan (1980). It follows a chi-square distribution with one degree of freedom. The test relies on the Lagrange multiplier associated with errors obtained through the least squares method. The formula for this test is given by:

$$LM = \frac{nT}{2(T-1)} \left[\frac{\sum_{t=1}^{n} [\sum_{t=1}^{T} \hat{u}_{\pi}]^2}{\sum_{t=1}^{n} \sum_{t=1}^{T} \hat{u}\pi^2} - 1 \right]^2 \rightarrow {x_1}^2$$

The hypotheses for the test are as follows:

- **Null Hypothesis (H0):** The pooled regression model is the appropriate model.
- **Alternative Hypothesis (H1):** The fixed and random effects model is the appropriate one.

Decision Criteria:

- If the calculated LM value is greater than the critical chi-square value (with one degree of freedom), the null hypothesis is rejected, and the alternative hypothesis is accepted.
- Additionally, the decision can be made based on the **MacKinnon statistic:** if it is less than the 5% significance level, the null hypothesis is rejected.

2. Comparison Between Fixed and Random Effects:

- **Hausman Test** (9):

This test is used when there is a fundamental difference between fixed and random effects, particularly regarding the extent to which the individual effect correlates with the independent variables.

- **Null Hypothesis:** There is no correlation between the individual effects and the independent variables. In this case, both fixed and random effect estimators are consistent, but the random effects estimator is more efficient.

The test follows a chi-square distribution with **K** degrees of freedom and is defined by the following formula:

$$w = (\hat{b}_{isdv-}\beta_{Gls}) \left[var(\hat{b}_{isdv)-VAR(\hat{\beta}_{GLS})}\right]^{-1} (\hat{b}_{isdv} - \hat{\beta}_{GLS)}$$

Where $(\hat{b}_{isdv-}\beta_{Gls})$represents the difference between the covariance matrix for both fixed and random effect estimators $(\hat{b}_{isdv)-VAR(\hat{\beta}_{GLS})}$. The hypotheses are as follows:

- **Null Hypothesis (H0):** The random effects model is appropriate.
- **Alternative Hypothesis (H1):** The fixed effects model is appropriate.

Decision Criteria:

- If the calculated value is larger than the critical chi-square value (k), the null hypothesis is rejected, and the alternative hypothesis is accepted.
- Also, the decision can be made based on the **MacKinnon statistic**: if the **P-value** is less than the 5% significance level, the null hypothesis is rejected.

Study Results and Discussion:

After understanding the variables and methods in the previous section, we will now explore the role of institutions as a link between logistics performance and foreign direct investment (FDI) in a group of developing countries. In this study, we will use a model with a set of variables, with foreign direct investment (FDI) as the dependent variable. The independent variables will include logistics performance, GDP, corporate taxes, the labor market, technological readiness, infrastructure, and institutional quality. We will also add a new variable to the model, which involves the interaction term (LPIxINS), and the model will take the following general mathematical form: FDI=f(LPI,GDP,TAX ,LAB ,TRE,INFREA,INS,Y(lpi*ins)

To achieve the goal of the study, we used a combined database with n=20n = 20n=20 cross-sectional units, representing 20 countries. Each unit covers a time period of t=11t = 11t=11 years, making the total number of observations 220.

Estimating the Time-Series Cross-Sectional Models:

After identifying the relationship between the explanatory variable and the dependent variable, estimation is done using the three panel data models: pooled regression, fixed effects model, and random effects model. Based on the EVIEWS10 software, the estimation results can be summarized in the following table:

Table 01-02: Estimation Results for the Static Model of Foreign Direct Investment Determinants

Estimation Models	Pooled Effects	Fixed Effects	Random Effects
C	-8.32	-1.27	-9.23
Student's P-Value	0.0460	0.0274	0.057
GDP	0.023	0.025	0.023
Student's P-Value	***0.0000	0.0000	0.0000
TAX	1.70	7.89	2.03
Student's P-Value	0.011**	0.0105**	0.044**
LAB	4.72	-6.27	1.41
Student's P-Value	0.0332**	0.104*	0.61
INFRA	2.20	-6.86	-3.32
Student's P-Value	0.274	0.01**	0.16
LPI	1.91	3.78	2.55
Student's P-Value	0.128	0.033**	0.88
INS	1.21	3.32	1.97
Student's P-Value	0.19	0.0120**	0.077*
(INS * ILP) = Y	-4.68	-80.1	-5.20
Student's P-Value	0.10	0.05**	0.13
R^2	0.65	0.77	0.37
DW Statistic	1.14	1.61	1.44
Fisher P-Value	0.0000	0.00000	0.0000

Source: Prepared by the researcher based on EVIEWS10 outputs (See Appendix 2, 3, 4).
Note: The asterisk symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.
The table above shows that the p-values for the overall parameters of the model are less than 0.05, indicating that all models are acceptable. However, for the individual parameters, the significance varies from one model to another.

Results of Model Comparison Tests:

After estimating the three studied models, we proceed to use selection methods to compare these models using two approaches: the Breusch-Pagan LM Lagrange multiplier test and Hausman selection.

1. Results of the Comparison between Pooled Regression Model and Fixed and Random Effects Models: To determine the most suitable model for analyzing the data of this study, we used the Lagrange LM test to compare the pooled regression model against the fixed and random effects models. The results are as follows:

Table (01-03): Results of the Lagrange Multiplier LM Test

Test Type	Test Value	P-Value
LM Breusch-Pagan Test	293.177	0.0000

2. Results of Comparison between Fixed Effects and Random Effects Models: After comparing the pooled regression model with the fixed and random effects models, we then used the Hausman test to select between the two. The results are shown in the table below:

Table (02-06): Results of Hausman Test

Correlated Random	Effects- Hausman Test		
Test cross-section	Random Effects		
Test Summary	Chi-Stat	Chi-sq. df	Prob
Cross-section	17.410425	7	0.0149

3. CSD Pesaran Test for Model Suitability: Since it has been determined that the most suitable model is the fixed effects model, we now assess the appropriateness of the model using the Pesaran (2004) test.

Table (2-07): Results of CSD Pesaran Test

Test Type	Test Value	P-Value
CSD	-0.828421	0.4074

Analysis and Discussion of Results

The discussion and analysis of results form the essence of all studies. After addressing the theoretical aspects and performing various calculations, we now arrive at the final stage, which focuses on analysis, discussion, and hypothesis testing.

1. Analysis of Results from Model Comparison

After presenting the results of the model comparison, we observe the following:

Analysis of the Lagrange Test Results

Based on the two hypotheses:

- **Null Hypothesis (H0):** The pooled regression model is the most suitable.
- **Alternative Hypothesis (H1):** The fixed and random effects models are more suitable.

The decision rule for this test is as follows: If the LM value is greater than the Chi-square value (1 degree of freedom), we reject the null hypothesis and accept the alternative hypothesis. The decision can also be made based on the Mackinnon statistic; if the P-value is less than the 5% significance level, we accept the null hypothesis.
The results in the table lead us to reject the null hypothesis (that the pooled regression model is suitable). Therefore, the most suitable model for the studied data is either the fixed effects or random effects model. We observe that the LM test value for the sections reached 293.177 with a near-zero probability. As seen in Table (5.2), the p-values for the Lagrange test were less than 0.05, so we accept the alternative hypothesis that suggests the fixed or random effects model is appropriate for this study (see Appendix No. 07).

Analysis of Hausman Test Results

Based on this test, we differentiate between fixed or random effects.

- **Null Hypothesis (H0):** The random effects model is appropriate.

- **Alternative Hypothesis (H_1):** The fixed effects model is appropriate.

The decision rule for this test is as follows: If the computed value exceeds the Chi-square value (k), we reject the null hypothesis and accept the alternative hypothesis. Also, the decision can be made based on the Mackinnon statistic; if the P-value is less than 5%, we accept the null hypothesis.
According to Table (2-6), the results of this test, which follows a Chi-square distribution, show that the computed value was 17.410425 with a probability of 0.0149. This suggests that, according to the Eviews10 software outputs, the fixed effects model is the most suitable for this study (see Appendix No. 08).

Analysis of CSD Pesaran Test Results for Model Suitability (10):

After determining that the appropriate model is the fixed effects model, we examine the suitability of the model estimated in the previous tests to check for cross-sectional dependence or any autocorrelation in the residuals. Based on the hypotheses:

- **Null Hypothesis (H_0):** There is no correlation between the cross-sections.
- **Alternative Hypothesis (H_1):** There is a correlation between the cross-sections.

The decision rule for this test is as follows: If the P-value is less than 5%, we accept the null hypothesis.
According to Table (2-7), the results of this test, which follow a Chi-square distribution, show a calculated value of -0.8284 with a probability of 0.04074. This means, based on the Eviews10 software outputs, we accept the null hypothesis, indicating no cross-sectional correlation in the estimated values. Therefore, we conclude that this model is suitable for this study.

Analysis of Fixed Effects Model Estimation Results:

Based on the estimation results of this model, we observe that:

- **Overall Significance of the Model:** The EVIEWS10 outputs show that the **prod (f-statistic)** is less than 5%, indicating that the overall model is significant.
- **Intercept (C = -1.27):** The negative value for the intercept suggests that the estimated foreign direct investment (FDI) is zero when logistic performance is absent, and it represents the institutional quality index.
- **Logistics Performance Index (LPI = 3.78):** The positive sign of the coefficient for logistics performance indicates a positive relationship between foreign direct investment and logistics performance, meaning that as logistics performance improves by 1%, FDI inflows increase by 3.78%.
- This suggests that the impact of logistics performance on foreign direct investment depends on the development of institutions.
- **Institutional Quality Index (INS = 3.32):** The positive relationship between FDI and institutional quality indicates that as the quality of institutions improves by 1%, FDI inflows increase by 3.32%. This implies that enhancing institutional quality reinforces the effect of logistics performance on attracting foreign direct investment.
- **Gross Domestic Product (GDP):** The GDP coefficient is significant and positively affects FDI, indicating that a 1% increase in GDP results in a 0.025% increase in FDI inflows. This result aligns with theoretical expectations.
- **Corporate Tax Rate (TAX = 7.89):** The tax rate, which is an indicator of economic stability, shows a positive relationship with FDI in developing countries. This suggests that greater tax stability increases FDI inflows. This result contradicts economic theory, possibly due to the limited impact of corporate taxes on foreign companies, especially in high-return sectors like oil, where taxes do not significantly affect profits.
- **Labor Market (LAB = -6.86):** The labor market is inversely related to FDI, meaning that as labor market efficiency increases by 1%, FDI inflows decrease by 6.86%. This contradicts many empirical studies that find a positive role for the labor market in attracting FDI.
- **Infrastructure (INFRA = -6.86):** The negative relationship between infrastructure and FDI suggests that better infrastructure is associated with a decrease in FDI inflows. This result is inconsistent with several studies that highlight the importance of infrastructure in attracting foreign investment.
- **Coefficient of Determination (R^2 = 0.77):** The independent variables explain 77% of the variation in FDI inflows, which is a reasonable level of explanation.

Discussion and Conclusion

Logistics services are among the critical and growing topics in global economies, playing a vital role in the transformations occurring in international trade patterns and foreign investments. This study aimed to highlight the role of logistics services and their impact on foreign investment in developing countries. Several economists' opinions were reviewed, emphasizing that logistics services are one of the key drivers of investment. As a result, this topic has gained importance in economic studies, with many applied studies adopting various econometric models to estimate the impact of logistics performance on foreign direct investment. These studies vary in their choice of explanatory variables and the type of data used, whether time series or cross-sectional.

A. Hypothesis Testing Results

At the beginning of the research, we proposed a set of hypotheses as initial assumptions and preliminary results, which were tested to answer the research problem. The key findings are as follows:

- **Logistics Performance Impact:** Using econometric models, the results showed a negative and statistically insignificant impact of logistics performance on foreign direct investment in developing countries. This was attributed to their heavy reliance on petroleum-based economies and the fluctuating contribution of oil investments to the total GDP. This highlights the importance of longitudinal data in revealing such differences.
- **Model Selection:** The tests indicated that the random effects model was the most suitable for the panel data, emphasizing the uniqueness of each country's characteristics. However, the results were not always statistically significant, and there was an absence of relationships between variables in the short term.
- **Modeling Approach:** The decision to use a single econometric model rather than multiple models (one for each country's time series) was influenced by the adoption of panel data. This provided a comprehensive analysis by simultaneously using both cross-sectional and time-series data.

B. Study Findings

The study and econometric analysis revealed the following key points:

- **Theoretical Insights:** Developing countries share a dependency on petroleum-based economies, although there are variations in growth drivers and technological advancements.
- **Model Evaluation:** Comparative tests among panel models indicated that the random effects model was the most suitable for this study, given the distinct characteristics of each country.
- **Economic Systems:** There is no universal economic system suitable for all countries at all times. The effectiveness of macroeconomic logistics performance depends on the level of economic development and financial progress of a country.
- **Investment Environment:** Logistics performance can provide an environment conducive to investment in developing countries, offering better opportunities for rapid technological learning, skill acquisition, and access to new markets. Non-oil investments often come from quality control systems and global business standards that surpass those found in developing nations. Through participation in logistics services, companies and individuals in these countries can acquire new competencies and skills.

C. Study Prospects

- Despite following methodological steps during the econometric phases, the findings should be seen as individual conclusions, acknowledging that other specialists in the field have reached different results due to variations in data sources and limitations in econometric methods.
- Future studies could expand the sample to include a mix of developed and developing countries.
- Developing countries should give importance to non-oil investments and provide flexibility in implementing economic policies.
- Building an econometric model with a larger number of explanatory variables to compare their impact on foreign direct investment.
- Using data analysis techniques to divide the population into more homogeneous subgroups.
- Adopting a dynamic econometric model for panel models.

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