RELATIONSHIP BETWEEN DOMESTIC LOGISTICS OPPORTUNITY EFFICIENCY AND INTERNATIONAL LOGISTICS OPPORTUNITY EFFICIENCY BASED ON MARKET POTENTIAL: EMPIRICAL RESEARCH ON DEVELOPING COUNTRIES

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ABSTRACT

Purpose- This research has two main purposes. The first purpose is to determine the domestic and international logistics opportunity efficiency levels based on the market potentials of developing countries. The second purpose is to determine whether the domestic logistics opportunity (DLO) efficiency of developing countries has a significant effect on the international logistics opportunity (ILO) efficiency.
Methodology - Two basic analysis techniques have been applied in this study. In the first analysis, two output-oriented data envelopment analysis (DEA) models have been developed to determine the DLO and ILO efficiency of developing countries. The data of the input variables are taken from the Market Potential Index (MPI) 2021 report. Data for output variables are taken from the Agility Emerging Markets Logistics Index (AEMLI) 2022 report. In the second analysis, simple regression analysis has been applied to determine the relationship between DLO efficiency and ILO efficiency. The sampling consists of 45 developing countries.
Findings- According to the DEA Model-1, the DLO efficiency of 26 developing countries has been determined at the full efficiency level. 19 countries are not at the full efficiency level. According to the DEA Model-2, the ILO efficiency of 31 developing countries has been determined at the full efficiency level. 14 countries are not at the full efficiency level. According to the simple regression analysis findings, DLO efficiency has a positive and significant effect on ILO efficiency.
Conclusion- It has been determined which country should focus on which input variable for the developing countries that are not at the full efficiency level to reach the full efficiency level. It has been determined that the DLO and ILO efficiency of five countries are different. Empirical evidence has been obtained that the steps to be taken to increase the DLO efficiency will also increase the ILO effectiveness.

Keywords: Domestic logistics opportunity, international logistics opportunity, emerging market potential, DEA, linear regression analysis.
JEL Codes: C67, M31, O57

1. INTRODUCTION

The common purpose of the marketing components is to maximize customer satisfaction. Logistics services are among the marketing components that directly affect customer satisfaction (Bienstock et al., 1997). To ensure customer satisfaction and loyalty, the quality of logistics service should be increased (Daugherty et al., 1998). Firms should keep the relationship between logistics activities and marketing activities strong to gain competitive advantage in market conditions (Mentzer and Williams, 2001). Mentzer et al. (2004) draws attention to the necessity of global market segmentation based on logistics service expectations, claiming that cross-border legal regulations in international trade may cause disruption of global logistics activities. Hannah (2008), on the other hand, explained that the domestic market practices of countries differ, and multinational companies face different obstacles in logistics activities. This situation supports the inevitable relationship between the national market and international logistics activities.

Foreign trade stakeholders need information about the logistics capabilities and performances of countries in both export and import processes. To meet this need, various institutions and organizations are developing efforts to determine the logistics

performance of countries. For example, Logistics performance index (LPI) reports are published by Worldbank. In addition, Agility Emerging Markets Logistics Index (AEMLI) reports to identify logistics performance opportunities based on the current capabilities of countries are published by Agility. AEMLI has been reporting the logistics scores of developing countries every year since 2011. In its 2022 report, AEMLI has published the scores of the "Domestics logistics opportunities", "International logistics opportunities", "Business fundamentals" and "Digital readiness" sub-variables, as well as the "overall index scores" of developing countries (AEMLI, 2022). Domestics logistics opportunities measure the potential of domestic logistics services in emerging markets to meet domestic market demands. International logistics opportunities, on the other hand, measures the potential of international logistics services to meet international market demands. Business fundamentals measures the open, sound, fair and robust nature of emerging markets. Digital readiness measures the level of digitalization, sustainability, and innovation orientation of the emerging market.

Among the main concerns of multinational companies in international trade is the decision of which country to enter and which not to enter the market. In addition, information about which country's market potential is higher than others is important for market researchers. "Market Potential Index (MPI)" has been developed by The Michigan State University to determine the market potential of countries. MPI has been published regularly since 1996. In the 2021 report of MPI, 8 dimensions were used to determine the market potentials of the countries. These dimensions and their weighting percentages are "Market Size (25%)", "Market Intensity (15%)", "Market Growth Rate (12.5%)", "Market Consumption Capacity (12.5%)", "Commercial Infrastructure (10%)", "Market Receptivity" (10%)", "Economic Freedom (7.5%)" and "Country Risk (7.5%)" (MPI, 2021).

This research has two main purposes. The first purpose is to determine the domestic and international logistics opportunity efficiency levels based on the market potentials of developing countries. The second purpose is to determine whether the domestic logistics opportunity (DLO) efficiency of developing countries has a significant effect on the international logistics opportunity (ILO) efficiency. To achieve the first objective, DLO and ILO efficiency levels based on market potential should be determined. Data envelopment analysis (DEA) application is aimed to determine the DLO and ILO efficiency levels. Afterwards, it has been planned to conclude the research by determining the relationship between DLO and ILO efficiency levels with simple regression analysis. To realize this plan, three basic research questions have been formed. The research questions are:

- *Research Question 1*: Can DLO efficiency levels based on the market potential of developing countries be obtained by DEA?

- *Research Question 2*: Can ILO efficiency levels based on the market potential of developing countries be obtained by DEA?

- *Research Question 3*: Is there a significant relationship between the DLO efficiency levels and the ILO efficiency levels of developing countries?

To answer the research questions mentioned above, literature review is presented in the second part of the article, research methodology in the third part, the findings in the fourth part, the conclusions in the fifth part, and the implications and suggestions in the sixth part.

2. LITERATURE REVIEW

In the literature review, no study has been found that deals with the relationship between the "market potentials" and "domestic and international logistics opportunities" of developing countries. Since the economic and logistics indicators of the countries are used especially in the determination of the MPI, studies that deal with the logistics performances of the countries and other economic indicators are included in the literature review.

In a study conducted on 10 countries with the best logistics performance according to LPI, it was determined by Fikru (2021) that the country's trade depends on economic size, infrastructure, timelines and landlocked. In addition, the importance of logistics in global trade competition was emphasized. Martí et al. (2017) utilized DEA analysis to determine logistics performance efficiency. In the research, logistics performance sub-criteria were accepted as input and output variables in the DEA models. Logistics performance efficiency of countries have been determined with DEA models applied in different scenarios. In the study, which deals with the relationship between logistics performance and international trade of Balkan countries, Bugarčić et al. (2020) concluded that logistics performance and logistics service quality positively affect international trade.

Göçer et al. (2022) determined 16 logistics actions of countries with content analysis. The effects of the determined logistics actions on LPI variables (Customs, Infrastructure, Ease of arranging shipments, Quality of logistics services, Timeliness, Tracking and tracing) were examined. According to the research findings, cooperation action and environmentalist mindset action have a

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significant effect on customs, ease of arranging shipments, quality of logistics services, timeliness, tracking and tracing variables. Efficiency studies action and use different modes of transportation action have significant effects on the infrastructure variable. Use different modes of port action has significant effect on customs variable. Marketing action, on the other hand, has a significant effect on the ease of arranging shipments variable. Using LPI and Emerging market logistics index data, Maiboroda et al. (2020) examined the domestic distribution network setup. As a result of the research, it has been determined that the establishment of local and regional cooperation is important in the planning of distribution networks. Using data from 41 countries between 2013 and 2019, Demir et al. (2021) examined the effects of imports, gross fixed capital formation, exports, and unemployment rate on AEMLI using Tobit analysis. According to the analysis findings, it has been determined that imports of countries have a negative effect on logistics performance, while other variables have a positive effect.

In the literature, there are studies dealing with the relationship between the logistics performance of countries and their competitiveness levels. Using the ANOVA technique, Sergi et al. (2021) discussed the relationship between logistics performance and global competitiveness. In the research, it has been determined that infrastructure and institutes factors play an important role in the logistics performance of countries. With the regression analysis, Ekici et al. (2019) point out that some factors that make up the competitiveness of countries have critical importance in increasing logistics performance. Kabak et al (2020) proved the significance of the relationship between the competitiveness levels of countries and logistics performance by using the Bayesian net and partial least square method. Erkan (2014), on the other hand, emphasizes that countries should develop the quality of railroad and port infrastructure to increase their logistics performance.

In studies dealing with the relationship between logistics performance and trade, it is seen that there is a significant relationship between logistics activities and commercial activities of countries. Wang and Choi (2018) obtained empirical findings supporting that export and import volumes increase as the logistics performance of countries increases. Puertas et al. (2014) presented evidence that logistics activities are important for both exporting and importing countries, but the success of logistics activities in importing countries affects import activities at a higher level. Korinek and Sourdin (2011) determined that low logistics activities create obstacles in the commercial activities of countries.

In general, studies dealing with the relationships between the logistics performance of countries and various variables are also encountered in the literature. Polat et al. (2022) found that there is a significant relationship between the logistics performance of countries and their CO2 emissions. Uca et al. (2016) examined the relationship between corruption perception and logistics performance of countries. Lu et al. (2019) discussed the relationship between green transportation and logistics performance. Liu et al. (2018) examined the relationship between logistics performance and environmental performance of Asian countries. Civelek et al. (2015), on the other hand, determined that there is a significant relationship between logistics performance and gross domestic product. This empirical research aims to bring to the literature by explaining the relationship between the logistics performances of countries and their market potentials.

3. DATA AND METHODOLOGY

3.1. Variables and Sampling

In this empirical research, it is aimed to apply DEA to determine both DLO efficiency and ILO efficiency. Two DEA models have been created in the study. The first DEA model has been used to determine the DLO efficiency, and the second DEA model has been used to determine the ILO efficiency. In both models, the input variables are taken from the Market Potential Index (MPI) report of 2021. Output variables are taken from the Agility Emerging Markets Logistics Index (AEMLI) report of 2022. The reason for taking the input variables from the 2021 reports and the output variables from the 2022 reports is to evaluate the logistics opportunity efficiency of 2022 based on the 2021 market potential of the developing countries.

MPI indicators (Market Size, Market Growth Rate, Market Intensity, Market Consumption Capacity, Commercial Infrastructure, Market Receptivity, Economic Freedom, Country Risk) have been used as input variables in both DEA models. As output variables, the AEMLI sub-indicator "Domestic Logistics Opportunities (DLO)" has been used in the first model, and "International Logistics Opportunities (ILO)" has been used in the second model. Data from 45 developing countries have been used to create the data set of the study. To determine the effect of DLO efficiency level on ILO efficiency level, "DLO Efficient" has been determined as independent variable and "ILO Efficient" has been determined as dependent variable. Information about the variables used in the empirical research and the sample area are presented in Table 1.

Table 1: Variables and Sampling

Models		Variables	Period	Sampling
DEA Model-1	*Inputs*	Market Size (I1), Market Growth Rate (I2), Market Intensity (I3), Market Consumption Capacity (I4), Commercial Infrastructure (I5), Market Receptivity (I6), Economic Freedom (I7), Country Risk (I8)	2021	45 countries
	Outputs	Domestic Logistics Opportunities (O1)	2022	
DEA Model-2	*Inputs*	Market Size (I1), Market Growth Rate (I2), Market Intensity (I3), Market Consumption Capacity (I4), Commercial Infrastructure (I5), Market Receptivity (I6), Economic Freedom (I7), Country Risk (I8)	2021	45 countries
	Outputs	International Logistics Opportunities (O1)	2022	
Linear Regression Model	*Dependent*	ILO Efficient	2022	45 countries
	Independent	DLO Efficient		

3.1. Data Envelopment Analysis (CCR-Output)

While calculating the efficiency values of DLO and ILO with DEA Model-1 and DEA Model-2, adopting an output-oriented approach has been taken as a basis. The reason for choosing this approach is to maximize the DLO and ILO values, that is, the output values. In The Charnes Cooper and Rhodes (CCR) applications, outputs are weighted, and inputs are weighted. Then the weighted outputs are divided by the weighted inputs to obtain the ratio. With the output oriented CCR models, this ratio is maximized by maximizing the output variables (Charnes et al., 1989).

The objective function and constraints of the CCR-O model are shown in Eq.1 and Eq.2, respectively.

$$\min e_k = \sum_{i=1}^{m} v_i x_{ik} \tag{1}$$

$$\sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} u_r y_{rj} \geq 0 \quad j = 1, \dots, n$$

$$\sum_{r=1}^{s} u_r y_{rk} = 0$$

$$u_r, v_i \geq 0; \ r = 1, \dots, s; \ i = 1, \dots, m \tag{2}$$

The dual models of the objective function and constraints of the CCR-O model are shown in Eq.3 and Eq.4, respectively.

$$Max \ Z_k \tag{3}$$

$$\sum_{j=1}^{n} \varphi_{jk} x_{ij} - x_{ik} \leq 0$$

$$z_k y_{rk} - \sum_{r=1}^{s} \varphi_{jk} y_{rj} - x_{ik} \leq 0$$

$$\varphi_{jk} \geq 0; \ r = 1, \dots, s; \ i = 1, \dots, m; j = 1, \dots, n \tag{4}$$

To determine the DLO and ILO efficiency levels, 8 input variables and 1 output variable have been used for both DEA Model-1 and DEA Model-2. There are also 45 DMUs (Developing Countries) in total. The indices and parameters of the study are as follows:

Indices:

i MPI input   *i = 1,…,m (m=8)*

r AEMLI output   *r = 1,…,s (s=1)*

j Developing Countries   *j = 1,2…,n (n=45)*

Parameters:

v_i : "i" weight given to MPI input.

u_r : "r" weight given to financial AEMLI output.

x_{ik} : "k" score of the "i" MPI input of the decision unit.

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y_{rk} : "k" score of the "r" AEMLI output of the decision unit.

$v_i x_{ij}$: "j" Developing countries weighted input score.

$u_r y_{rj}$: "j" Developing countries weighted output score.

4. FINDINGS AND DISCUSSIONS

4.1. Data Envelopment Analysis Findings

OSDEA package program was used to test the DEA models. Output-oriented CCR method was applied in both DEA models. Detailed information about DEA models is presented in Table 2. According to the DEA Model-1 findings, while the DLO activity level of 26 countries is at full efficiency level, the DLO activity level of 19 countries is not at the full efficiency level. DLO efficiency levels of countries are presented in Appendix 1. When Appendix 1 is examined, it is understood that the efficiency levels of 26 countries are "1 (100%)", that is, they are at the full efficiency level. The efficiency levels of the countries that are not at the full efficiency level are as follows: Bangladesh (%85), Chile (%75), Colombia (%76), Ghana (%90), Jordan (%82), Kazakhstan (%92), Kenya (%98), Kuwait (%92), Malaysia (%68), Mexico (%77), Morocco (%85), Paraguay (%95), Peru (%78), Philippines (%64), South Africa (%93), Thailand (%83), Turkey (%82), Uganda (%93), and Vietnam (%83).

According to the DEA Model-2 findings, while 31 countries' ILO efficiency level is at full efficiency level, 14 countries' DLO efficiency level is not at full efficiency level. In Appendix 2, countries' ILO efficiency levels are presented. When Appendix 2 is examined, it is understood that the efficiency levels of 31 countries are "1 (100%)", that is, they are at the full efficiency level. The efficiency levels of the countries that are not at the full efficiency level are as follows: Bangladesh (%81), Chile (%84), Colombia (%86), Ghana (%91), Jordan (%84), Kuwait (%91), Malaysia (%81), Mexico (%87), Morocco (%95), Paraguay (%99), Peru (%92), Philippines (%72), Turkey (%98) and Uganda (%96).

When the findings of both DEA models are compared, 5 countries are not at the full efficiency level in the DLO activity, but at the full efficiency level in the ILO activity. These countries are Kazakhstan, Kenya, South Africa, Thailand, and Vietnam. All other remaining countries are at full efficiency in both the DLO and the ILO.

Table 2: Model Features

|	DEA Model 1	DEA Model 1
Model Name	DLU efficiency analysis of developing countries	ILO efficiency analysis of developing countries
Model Type	CCR-O	
Model Orientation	Output-Oriented	
Model Efficiency Type	Tech	
Model RTS	Constant	
Model Description	The Charnes Cooper and Rhodes Model called CCR.	

4.2. Linear Regression Analysis Findings

The simple regression model has been preferred to determine the relationship between DLO efficiency and ILO efficiency in developing countries. Basically, DLO efficiency is expected to have a significant impact on ILO efficiency. The reason for this can be shown as the fact that internal logistics opportunities play an active role in creating external logistics opportunities. As a finding of DEA models, both DLO efficiency and ILO efficiency levels of 45 developing countries have been determined. The obtained findings constitute the data set of simple regression analysis. DLO and ILO efficiency levels are found in Appendix 1 and Appendix 2. Descriptive statistics of the data set are shown in Table 3. Q-Q plots have been created to observe the normal distribution of the data set (Figure 1). When Figure 1 is examined, it is observed that the data set is far from the normal distribution. However, when we look at the kurtosis and skewness values of the variables, the Skewness and Kurtosis values for DLO_Efficient are "-1.37365" and "0.943142", respectively. For ILO_Efficient, skewness and Kurtosis values are "-2.02743" and "3.487943" respectively. Kline (2011:63) suggested that for the data set to have a normal distribution in social sciences, the kurtosis value should be lower than "3" and the skewness value lower than "10". At this point, it is assumed that the data set has a normal distribution. In addition, when the curve estimation models is calculated, it is determined that the R^2 values of the models are almost the same (approximately 3%). Curve estimation model summaries and parameter estimates are presented in Appendix 3, and graphical representations are presented in Appendix 4. When Appendix 3 is examined, it is seen that all models are significant (p<0.01), the model structure with the highest R^2 value is Cubic and Quadratic models (R^2=0.761), and the R^2 value of the linear model is 0.725. When Appendix 4 is examined, it is seen that the curve lines of the models are very close to each other.

Table 3: Descriptive Statistics

	N	Mean	Std. Dev.	Var.	Skewness		Kurtosis	
	Stat.	*Stat.*	*Stat.*	*Stat.*	*Stat.*	*Std. Err.*	*Stat.*	*Std. Err.*
DLO_Efficient	45	0.933559	0.098123	0.009628	-1.37365	0.353732	0.943142	0.694544
ILO_Efficient	45	0.965552	0.066525	0.004426	-2.02743	0.353732	3.487943	0.694544

Figure 1: Q-Q Plot Charts
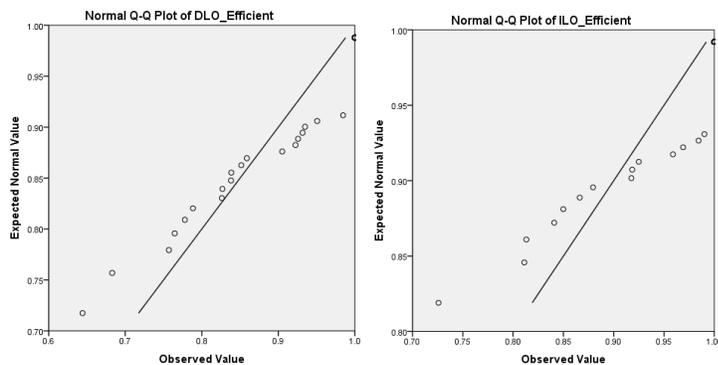
The findings of the Pearson correlation relationship between the variables are presented in Table 4. Newbold (2000) points out that if the correlation between variables is higher than 0.80, there is a very high correlation between the variables. A very high level of correlation has been found between DLO_Efficient and ILO_Efficient variables (r(45)=0.851, $p<0.01$).

Table 4: Correlation Analysis Findings

Variables	Mean	S.D.	DLO_Efficient	ILO_Efficient
DLO_Efficient	0.933559	0.098123	1	
ILO_Efficient	0.965552	0.066525	0.851[*]	1

Notes: [*] $p < 0.01$ (2 tailed)

The high correlation relationship indicates that the effect of DLO_Efficient on ILO_Efficient has a significant effect. Simple regression analysis has been done with SPSS program. Simple regression analysis findings to examine how much DLO_Efficient affects ILO_Efficient in developing countries are as seen in Table 5. Simple regression analysis findings are statistically significant ($F_{(1,43)}$= 113.150077, $p<0.001$). According to the analysis findings, the simple regression analysis model equation is "ILO_Efficient = 0.426766 + 0.577131 (DLO_Efficient)". The adjusted R^2 value of the model is 0.718. According to this value, the 71.8% variance in the international logistics opportunity depends on the domestic logistics opportunity.

Table 5: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.426766	0.050924		8.380463	0.000
DLO_Efficient	0.577131	0.054256	0.851248	10.637203	0.000

Note: Dependent Variable is ILO_Efficient

5. CONCLUSION

In this empirical research, domestic and international logistics opportunity efficiency of developing countries has been determined by DEA analysis. In addition, the linear relationship between DLO_ efficient and ILO_efficient has been investigated by simple regression analysis. Two important conclusions have been obtained based on the DEA analysis findings. The first conclusion is that the DLO_ efficient of 19 developing countries is not at the full efficiency level. The input variables and reference countries that 19 developing countries should focus on to reach the full DLO_Efficient level of efficiency are presented in Appendix 5. According to Appendix 5, for example, for Turkey to increase its domestic logistics opportunity efficiency to full efficiency, it is necessary to

focus only on the commercial infrastructure input variable. In addition, Turkey's reference countries are Algeria, Angola, Argentina, China, Ethiopia, Lebanon, and Pakistan.

The second conclusion is that 14 developing countries do not have full ILO_ efficiency. The input variables and reference countries that 14 developing countries should focus on to reach the full ILO_efficient level are presented in Appendix 6. According to Appendix 6, for example, Chile needs to focus only on the market consumption capacity, commercial infrastructure, economic freedom, and country risk input variable to maximize its international logistics opportunity efficiency. In addition, Chile's reference countries are Angola, Oman, Qatar, and Uruguay.

When the differences between Appendix 5 and Appendix 6 are examined:

- It is seen that Kazakhstan, Kenya, South Africa, Thailand, and Vietnam should focus on DLO_Efficient, on the other hand, ILO_efficient is successful.

- *Bangladesh*: The market consumption capacity input variable should be focused on enabling the DLO, but not in the ILO.

- *Colombia*: The commercial infrastructure input variable should be focused on enabling the ILO, but not in the DLO.

- *Jordan*: The economic freedom input variable should be focused on enabling the ILO, but not in the DLO.

- *Uganda*: The country risk input variable should be focused on enabling the ILO, but not in the DLO.

In the second phase of the research, the effect of the DLO_Efficient level on the ILO_Efficient level has been examined. DLO_Efficient has a statistically positive and significant effect on ILO_Efficient. At this point, it has been concluded that international logistics opportunity efficiency can be increased by increasing the domestic logistics opportunity efficiency of the developing countries. In the DEA analysis findings, the input variables that developing countries should focus on are highly similar in both the DLO and the ILO. At this point, it is concluded that the policies that developing countries will create to develop their market potential will both increase domestic logistics opportunities and increase international logistics opportunities.

5. IMPLICATIONS AND SUGGESTIONS

The implications and suggestions for increasing the DLO and ILO activities of developing countries are as follows:

- Vietnam should increase "Market Intensity" by lowering GNI per capita estimates and private consumption as a percentage of GDP to improve logistics opportunities.

- Kenya should increase the "Market Growth Rate" by increasing the compound annual growth rate of primary energy use and compound annual growth rate of GDP and decreasing it in Philippines, Uganda, and Vietnam to improve logistics opportunities.

- Bangladesh, Chile, Colombia, Mexico, Paraguay, Philippines, South Africa, Uganda, and Vietnam should increase "Market Consumption Capacity" by reducing consumer expenditure, income share of middle-class, median disposable income per household to develop logistics opportunities.

- Ghana, Kuwait, Malaysia, Mexico, Thailand, and Vietnam should increase "Market Receptivity" by reducing per capita imports from US and trade as a percentage of GDP to improve logistics opportunities.

- Chile, Ghana, Kenya, Malaysia, Paraguay, Peru, South Africa, and Thailand should increase "Economic Freedom" by reducing Economic Freedom and Political Freedom to improve logistics opportunities.

- Bangladesh, Chile, Colombia, Ghana, Jordan, Kuwait, Malaysia, Mexico, Morocco, Paraguay, Peru, Philippines, South Africa, Thailand, and Vietnam should increase "Economic Freedom" by reducing Economic Freedom and Political Freedom to improve logistics opportunities.

It is generally recommended that the countries that are at the full efficiency level in domestic and international logistics opportunity activity should continue their current market and logistics policies.

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APPENDICIES

Appendix 1: Domestics Logistics Opportunities Efficiency Scores

Country	Efficiency	Country	Efficiency	Country	Efficiency
Algeria	1	India	1	Philippines	0.644138442
Angola	1	Indonesia	1	Qatar	1
Argentina	1	Jordan	0.826943885	Russia	1
Bahrain	1	Kazakhstan	0.925769319	Saudi Arabia	1
Bangladesh	0.858884121	Kenya	0.984534374	South Africa	0.931647135
Bolivia	1	Kuwait	0.922452385	Sri Lanka	1
Brazil	1	Lebanon	1	Tanzania	1
Cambodia	1	Malaysia	0.682907586	Thailand	0.83857977
Chile	0.756990386	Mexico	0.777844133	Tunisia	1
China	1	Morocco	0.851601065	Turkey	0.826160466
Colombia	0.76452627	Nigeria	1	UAE	1
Ecuador	1	Oman	1	Uganda	0.934827933
Egypt	1	Pakistan	1	Ukraine	1
Ethiopia	1	Paraguay	0.950692705	Uruguay	1
Ghana	0.905055198	Peru	0.788403898	Vietnam	0.838192906

Appendix 2: International Logistics Opportunities Efficiency Scores

Country	Efficiency	Country	Efficiency	Country	Efficiency
Algeria	1	India	1	Philippines	0.725841466
Angola	1	Indonesia	1	Qatar	1
Argentina	1	Jordan	0.840873538	Russia	1
Bahrain	1	Kazakhstan	1	Saudi Arabia	1
Bangladesh	0.813116191	Kenya	1	South Africa	1
Bolivia	1	Kuwait	0.918423173	Sri Lanka	1
Brazil	1	Lebanon	1	Tanzania	1
Cambodia	1	Malaysia	0.811113729	Thailand	1
Chile	0.849899553	Mexico	0.879433786	Tunisia	1
China	1	Morocco	0.958912993	Turkey	0.984383163
Colombia	0.866232382	Nigeria	1	UAE	1
Ecuador	1	Oman	1	Uganda	0.969013968
Egypt	1	Pakistan	1	Ukraine	1
Ethiopia	1	Paraguay	0.990121957	Uruguay	1
Ghana	0.917555375	Peru	0.924906523	Vietnam	1

Appendix 3: Model Summary and Parameter Estimates

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	0.725	113.150	1	43	.000	.427	.577		
Logarithmic	0.742	123.575	1	43	.000	1.003	.501		
Inverse	0.755	132.700	1	43	.000	1.429	-.427		
Quadratic	0.761	66.685	2	42	.000	-.581	2.939	-1.359	
Cubic	0.761	66.685	2	42	.000	-.581	2.939	-1.359	.000
Compound	0.717	109.138	1	43	.000	.529	1.899		
Power	0.738	120.928	1	43	.000	1.004	.558		
S	0.755	132.267	1	43	.000	.480	-.477		
Growth	0.717	109.138	1	43	.000	-.637	.642		
Exponential	0.717	109.138	1	43	.000	.529	.642		
Logistic	0.717	109.138	1	43	.000	1.890	.526		

Note: The independent variable is DLO_Efficient. Dependent variable is ILO_Efficient.

Appendix 4: Model Summary and Parameter Estimates Charts
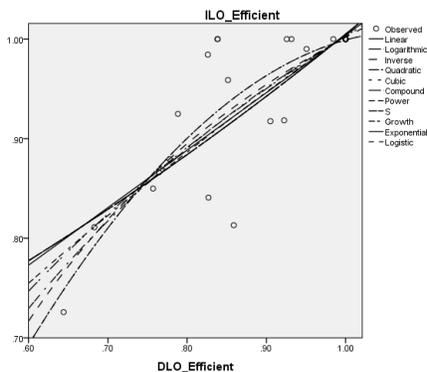
Appendix 5: Input Variables and Reference Countries to Achieve Full Efficiency (DLO_Efficient)

Countrry	I1	I2	I3	I4	I5	I6	I7	I8	Peer Group
Bangladesh				+	+			+	Algeria, Ethiopia, India, Nigeria, Pakistan
Chile				+	+		+	+	Angola, Oman, Qatar, Uruguay
Colombia				+				+	Algeria, Angola, Argentina, Bolivia, Tanzania, Uruguay
Ghana						+	+	+	Algeria, Ethiopia, Lebanon, Oman, Tanzania
Jordan								+	Algeria, Angola, Bolivia, Ethiopia, Lebanon, Oman, Tanzania.
Kazakhstan					+				Algeria, Angola, Bolivia, Lebanon, Oman, Qatar, Uruguay.
Kenya			+		+		+		Argentina, Bolivia, Ethiopia, Tanzania, Uruguay.
Kuwait				+	+			+	Algeria, Angola, Lebanon, Qatar, Ukraine.
Malaysia					+	+		+	Algeria, Angola, Lebanon, Qatar, Tanzania.
Mexico				+		+		+	Angola, China, Lebanon, Saudi Arabia, Ukraine.
Morocco					+			+	Algeria, Angola, Bolivia, Oman, Qatar, Uruguay.
Paraguay				+			+	+	Bolivia, Oman, Qatar, Tanzania, Uruguay.
Peru							+	+	Algeria, Angola, Argentina, Lebanon, Tanzania, Uruguay.
Philippines			+	+				+	Algeria, Angola, Bolivia, Ethiopia, Tanzania.
South Africa				+	+		+	+	Algeria, Angola, Argentina, Brazil.

Country	I1	I2	I3	I4	I5	I6	I7	I8	Peer Group
Thailand					+	+	+	+	Algeria, Angola, China, Ukraine.
Turkey					+				Algeria, Angola, Argentina, China, Ethiopia, Lebanon, Pakistan.
Uganda			+	+	+				Algeria, Argentina, Bolivia, Ethiopia, Tanzania.
Vietnam	+	+	+	+	+			+	Algeria, China.

Notes: Market Size (I1), Market Growth Rate (I2), Market Intensity (I3), Market Consumption Capacity (I4), Commercial Infrastructure (I5), Market Receptivity (I6), Economic Freedom (I7), Country Risk (I8)

Appendix 6: Input Variables and Reference Countries to Achieve Full Efficiency (ILO_Efficient)

Countrry	I1	I2	I3	I4	I5	I6	I7	I8	Peer Group
Bangladesh					+			+	Algeria, Argentina, China, Ethiopia, Nigeria, Pakistan.
Chile				+	+		+	+	Angola, Oman, Qatar, Uruguay.
Colombia				+	+			+	Algeria, Argentina, Bolivia, Ecuador, Tanzania.
Ghana						+	+	+	Algeria, Angola, Ethiopia, Lebanon, Oman.
Jordan							+	+	Algeria, Angola, Bolivia, Ethiopia, Lebanon, Oman.
Kuwait					+	+		+	Angola, Lebanon, Oman, Qatar, Ukraine.
Malaysia						+	+	+	Algeria, Angola, Lebanon, Oman, Ukraine.
Mexico				+		+		+	Angola, China, Russia, Saudi Arabia, Ukraine.
Morocco					+			+	Algeria, Angola, Bolivia, Ecuador, Oman, Ukraine.
Paraguay				+			+	+	Angola, Bolivia, Lebanon, Oman, Uruguay.
Peru							+	+	Algeria, Angola, Argentina, Bolivia, Ethiopia, Ukraine.
Philippines			+	+				+	Algeria, Angola, Argentina, Bolivia, Ethiopia.
Turkey					+				Algeria, Angola, Argentina, China, Ethiopia, Lebanon, Pakistan.
Uganda		+	+					+	Argentina, Bolivia, Ethiopia, Sri Lanka, Tanzania.

Notes: Market Size (I1), Market Growth Rate (I2), Market Intensity (I3), Market Consumption Capacity (I4), Commercial Infrastructure (I5), Market Receptivity (I6), Economic Freedom (I7), Country Risk (I8)