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RESEARCH ARTICLE

The impact of developing logistic performance on the development of Egyptian total and agricultural exports

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Abstract

The interest and development of logistics services have become the focus of attention of most economies in the world over the past decades. This is what called for Egypt's need to pay attention with the level of its logistical performance and relying on it as an effective solution towards the development of exports within it. Therefore, the study takes its importance by identifying the extent of the reflection of the development of logistical performance on the development of total and agricultural exports through the application to the COMESA agreement using the gravity model. The results showed that the most important factors affecting the total of Egyptian exports to the COMESA countries. It is represented in the gross domestic product of the importing country, the commercial openness to Egypt, the participation in the land borders, the per capita GDP of importing countries, in addition to the adverse effect of the geographical distance. The performance index of logistics services increases in Egypt with an increase in the GDP of Egypt.

Keywords: COMESA; Economic; Gravity Model; Logistics Performance; Trade Openness.

1. Introduction

Logistics chains constituted the pillar of international trade. Effective and efficient logistics systems are important to the global economy, and national economies are greatly affected by the quality of logistics systems. Logistics is also of great importance to economic growth and job creation at the national level. When transportation, logistics, or infrastructure systems are inefficient and ineffective, the country's ability to compete at the global level is compromised. The performance of logistics also affects productivity in all economic sectors, and logistics can be constituted one of the basic sectors for development **(**Economic and Social Commission for Western Asia "ESCWA" 2017).

The World Bank has also clarified that logistics is a network of services that supports the physical movement of goods within and outside borders. It includes many activities, such as transportation, warehousing, and express delivery of goods. It also includes internal and external shipping and reverses shipping. Logistic capabilities are the important enabling factors for the response of supply and supply chains, and often what is characterized by markets is the short product life cycle, the spread of products and services, innovation, and the extraction of everything new, so the use of logistics is of great importance to ensure that this product is the suitable product and is used by end customers to meet their needs and is delivered to them at the suitable time and place, and Logistics services play an effective role in promoting and supporting economic growth within the country, and the degree of efficiency in transporting goods through logistics systems to end of the chain is an essential element

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for providing commercial opportunities for the country.

Therefore, activities and logistics services have become one of the vital topics in the field of integrated business management in terms of its concept, importance, components, and practice in the contemporary business of organizations due to their large size, the multiplicity of their activities and expansion, and multiplicity of production lines and markets, which led to an increase in interest in logistical activities, which have become organizations that aim to serve customers with achieving of the competitive advantage that represents its backbone (Shehata *et al.*, 2021).

The competitive position of the port among other competing ports is one of the most important indicators of judging the efficiency of operating and managing any port. It is possible to determine the competitive position of the port during a certain period by analyzing its strengths and weaknesses of the port. Which is represented in the port's capacity and its commercial reputation and the degree of confidence in the services provided in that port and the total costs of handling goods in the port, the possibilities available in the port for re-shipment of goods, the complementary services provided by the port such as customs services, distribution, ship repair, refueling, banks, shipping lines that frequent Ali El Mina, the port's location in relation to international markets and shipping lines (Al-Baghdadi, 2018).

The research aims mainly to study the impact of developing logistic performance on the development of Egyptian agricultural and total exports. This goal is achieved by identifying the following sub-objectives:

• Getting to know the basic concepts of services and logistical activities in the various departments responsible for them in the country.

• Factors affecting the total of Egyptian exports to the COMESA countries.

• Factors affecting an Egyptian agricultural exports to COMESA countries.

• Factors affecting an efficiency of the performance of Egyptian logistics services with COMESA countries.

2. The basic concepts

2.1. The concept of logistics services

Logistics is defined as an efficiency and effectiveness of planning, executing, and controlling the flow and storage of raw materials, inventory in progress, finished goods, and related information from the starting point to the point of consumption, to satisfy the consumer and achieve his needs (Al Nabulsi, 2017).

As (James. L Haskett) knew in 1977, defined logistics as "all activities through which goods flow and in which there is coordination between supply and demand to achieve a high level of service by providing goods in the suitable place and time at the lowest possible cost." (Median, 2008).

2.2. Performance indicators of logistics services in the Arab Republic of Egypt

The World Bank indicated that the value of the logistics industries amounted to about 4.3 trillion dollars, stressing that logistics services represent the basis of global trade and determine the possibility of countries' participation in the global economy. In addition to identifying the challenges and opportunities, it faces in the field of commercial logistics services to improve its performance. The index measures the level of performance of logistics services through sub-indicators that include infrastructure, customs clearance, international freight, and quality of logistics services, tracking and timing of shipments (The World Bank, 2020).

- The Logistics Performance Index (LPI) is based on six main areas (Arab Planning Institute, p. 44):

1- Efficiency of customs, border management, and clearance.

2- The quality of trade and transport infrastructure (Infrastructure).

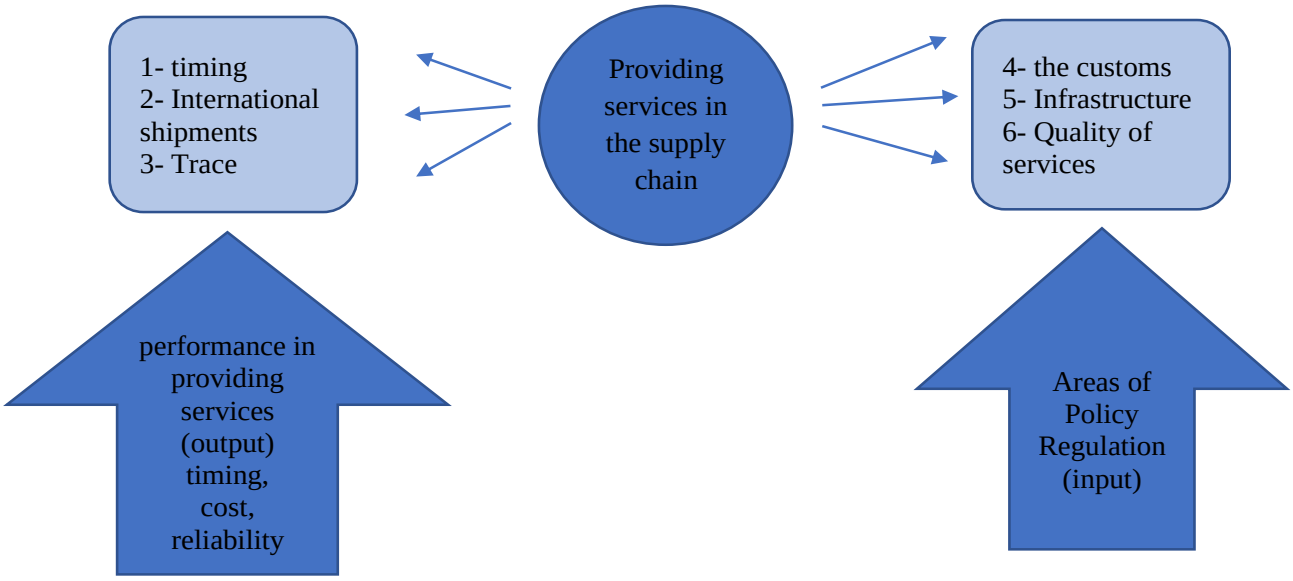
3- Ease of arranging international shipments at competitive prices (International Shipment).
4- The efficiency and quality of logistics services.
5- Timeliness of shipments arriving at the specified time.
6- The ability to track shipments and goods (Tracking and Tracing).

The logistic performance index is graded from the worst (1) to the best (5). The World Bank report revealed for the year (2018) entitled "Interconnectedness to Enhance Competition" revealed a persistent gap in the performance of logistics services between high-income and low-income countries, with high-income countries scoring on average 48% better on the logistics performance index than low-income countries.

Figure No. (1) shows six indicators of the performance of logistics services, divided into two main categories: indicators of inputs and outputs. The first category is the main inputs to the supply chain: customs, infrastructure, and quality of services. The second category is represented in inputs and outputs, which are the timing and cost of international shipments, and the ability to track shipments and goods.

Tariq Henedy, "Vice President of Operations, FedEx Express Middle East and North Africa", explains that the efficient movement of goods through these systems to their final destinations is a key factor in enhancing the opportunities for trade and economic growth for countries. He also clarified the existence of a close link between logistics services and national economic growth represented in facilitating international trade, as the global economic environment witnessed a significant increase in the volume of traded goods during the past three decades.

Figure 1. Input and Output Indicators in the Logistics Performance Index



Source: Economic and Social Commission for Western Asia (ESCWA), 2017, p. 5.3.

3. Methodology

To achieve these objectives, the research relied on two types of data, the first of which is secondary sources and it is represented in reviewing the foreign and Arabic references related to the subject of the study and records issued by several authorities, the most important of which is the database of Logistics Performance Index issued by the World Bank, and various issues of the Doing Business report,

in addition to various issues of the annual bulletin of transportation statistics of the Central Administration of Statistics, and the United Nations Trade and Development Report (UNCTAD). The second type of data is based on primary data by collecting and analyzing the various data issued by the official authorities to shed light on the logistical performance in the Arab Republic of Egypt and its impact on total and agricultural exports, and then its impact on economic growth by estimating the gravity model.

3.1. Data Entry and Analysis

3.1.1. The evolution of the logistic performance index in Egypt

The performance of logistics services is a key factor for the economic growth and competitiveness of each country separately. The inefficiency of logistics services increases the cost of activities and reduces the possibility of integration with global value chains. It also incurs heavy losses for the country when it attempts to compete in the global market. Governments can use the Logistics Performance Index to better understand the correlation between logistics, trade, and growth (Farida, 2018).

Table No. (1) the development of the logistics performance index indicates in Egypt. It is noted that the customs and border management efficiency index fluctuated from 2.60 points in 2012 to 2.85 points in 2014, then decreased to 2.75 points in 2016, and then decreased once. Another amounted to 2,60 points in 2018, and this indicates a delay and slowness in customs procedures at the borders. As for the quality of trade and transport

3.1.1.1. Standard form

The method of least squares was used in panel data to determine the factors affecting trade between Egypt and the countries of The COMESA Union, where panel data helps to reach closer and more accurate results where data are integrated from temporal and cross-sectional trends, as well as control of individual heterogeneity. As it assumes that the function data is heterogeneous, while the time series and cross-section data do not control the heterogeneity and therefore the results are more susceptible to bias, as it gives more information about the data, more fluctuations, and less linear values between the variables, and more efficient, while time-series suffer from many linear problems. This study focused on identifying the impact of the logistical performance of Egyptian ports on the flow of trade to The COMESA countries. The following describes the model and estimated equations.

infrastructure index, it decreased from 3.07 points in 2012 to 2.82 points in 2018. As for the index of ease of arranging shipments at competitive prices, it fluctuated between rising and falling until it finally decreased in 2018 to its lowest rate of 2,79 points. The efficiency and quality of the logistics services index also tended to increase first from 2012 to 2016 and then decreased again in 2018 to 2.82 points. The same applies to the index of the ability to track shipments and goods. It was found through the same table that the indicator of the timing of the arrival of shipments on time reached a balance of 3.63 in 2016 and then declined again to 3.19 points in 2018, which is the highest balance compared to other indicators, followed by the quality of trade and transport infrastructure index as shown Figure No. (1).

Based on the foregoing, it is clear to us that the infrastructure index in Egypt decreased in 2018 compared to the rest of the indicators, due to the weak financial capabilities directed towards this indicator and the lack of use of modern digital systems.

Table 1. The evolution of the logistic performance index in Egypt during the period (2012-2018).

Years	Customs and border management efficiency		Quality of trade and infrastructure		Ease of arranging shipments at competitive prices		Efficient and quality logistics		The ability to track shipments and merchandise		Time for shipments to arrive on time	
	Rank	performance rate	Rank	performance rate	Rank	performance rate	Rank	performance rate	Rank	performance rate	Rank	performance rate
2012	69	2.6	45	3.07	51	3	50	2.95	66	2.86	64	3.39
2014	57	2.85	60	2.86	77	2.87	58	2.99	43	3.23	99	2.99
2016	65	2.75	50	3.07	45	3.27	43	3.2	54	3.15	48	3.63
2018	77	2.6	58	2.82	73	2.79	63	2.82	89	2.72	74	3.19

Source: World Bank database, Logistics Performance Index.

3.1.1.2. Gravity model analysis

The gravity model shows in its standard form bilateral trade flows as a function of the market size of trading partners and bilateral barriers to trade. Market size is measured in the gross domestic product, and transportation costs are determined by distance. If the countries share land or coastal borders, they are expressed by a dummy variable. Transportation costs increase with increasing distance, and are higher for landlocked countries, and lower for neighboring countries. Information costs are expressed with a dummy variable for the common official language (Anderson and Wincoop, 2003).

The gravity model can be written as:

Ln Mie = α0 + α1 Ln YI + α2 Ln Ye + α3 Ln YIe + £it (1)

Where Mie is the imports of country (i) from country (e), Y is the GDP both of an exporting and importing country , d is the trade costs between the two countries (the geographic distance between the two countries), £ it is the standard error. The name of gravity is due to Newton's law of gravitation, as exports are directly proportional to the economic mass (Gross Domestic Product) of an exporting and importing countries, and inversely proportional to the distance between them. The method of Ordinary Least Squares (OLS) was used, which is considered the most appropriate measure to clarify the relationship between trade, GDP, and distance. As it is one of the most important properties of least squares that it gives the least sum of the residual squares, provided that the expected (average) value of the error £ it at any level of the variable X, in addition to the absence of a correlation between the explanatory variables and each other. If these conditions are met, it is appropriate to apply the method of least squares.

3.1.1.3. Description of the model used

The natural logarithmic model was used to describe the relationships between the variables, and the equation was written as follows (Matyas, 1997):

Model Description:

LnYTO = α0 + GDPE Ln Y1+ GDPI Ln Y2+ POPE Ln Y3+ POPI Ln Y4+ DS LnY5+ Open LnY6 + tran LnY7 + Lang LnY8

LnYTO = α0 + GDPE Ln Y1+ GDPI Ln Y2+ PGDPE Ln Y3+ PGDPI Ln Y4+ DS LnY5 + Open LnY6 + tran LnY7 + Lang LnY8

LnYAG = α0 + GDPE Ln Y1+ GDPI Ln Y2+ POPE Ln Y3+ POPI Ln Y4+ DS LnY5+ Open LnY6 + tran LnY7 + Lang LnY8

LnYAG = α0 + GDPE Ln Y1+ GDPI Ln Y2+ PGDPE Ln Y3+ PGDPI Ln Y4+ DS LnY5 + Open LnY6 + tran LnY7 + Lang LnY8

LPIe = α0 + GDPE Ln Y1+ GDPI Ln Y2+ POPE Ln Y3+ POPI Ln Y4+ DS LnY5+ Open LnY6 + tran LnY7 + Lang LnY8

LPIe = α0 + GDPE Ln Y1+ GDPI Ln Y2+ PGDPE Ln Y3+ PGDPI Ln Y4+ DS LnY5 + Open LnY6 + tran LnY7 + Lang LnY8

Whereas:

YTO = value of total Egyptian exports to the country i (million dollars)

GDPE = Gross Domestic Product of an exporting country Egypt (millions of dollars)

GDPI = Gross Domestic Product of an importing country (millions of dollars)

POPE = Population of an exporting country Egypt (million people)

POPI = Population of an importing country (million people)

DS = Geographical distance between the two countries (km2)

Open= trade openness with Egypt (the percentage of total trade with Egypt in the GDP of country i)

tran = dummy variable for transport costs (inland or coastal shared = 1, not land or coastal bound = 0)

Lang= dummy variable for language (Arabic = 1, other language = 0)

PGDPE= per capita GDP (exporting country Egypt) (dollars)

PGDPI= per capita GDP (imported) (dollars)

YAG = value of Egyptian agricultural exports to the country i (millions of dollars)

LPI_e= Egypt Logistics Performance Index: Efficiency of the customs clearance process (1 = low to 5 = high)

LPI_i= COMESA Logistics Performance Index: Efficiency of the customs clearance process (1 = low to 5 = high)

According to economic theory, the relationship between the variables (signal) is expected to be as follows: Increasing The GDP leads to an increase in trade, as exports are directly proportional to the volume of production (GDP) of exporting and importing countries, and as for the effect of distance on trade, the effect is expected to be negative, as the greater the distance, the higher the transportation costs, and therefore the neighbor decreases, and the neighboring countries that It has a share in the borders and has an integrated network of roads, which reduces transportation costs and reduces the number of shipments, and therefore the value of trade between neighboring countries is large, and with regard to the efficiency of the infrastructure of seaports (logistical performance index), it is expected to have a positive impact on the movement of trade, as the infrastructure Poor port handling capacity may cause long delays in delivery, and poor quality infrastructure is likely to be associated with increased risk of cargo damage and thus higher insurance losses and costs. As for trade openness, it is expected to have a positive impact on trade, as trade openness leads to consumption of more products, as well as per capita GDP, which is expected to have a positive impact, as the higher the per capita income, the more he looks forward to a better standard of living and better products consumption. The increase in the population leads to an increase in consumption and subsequently to an increase in imports, during the period (2016-2020).

Data in table (2) shows the descriptive statistics for all the variables used in the study. We note that the arithmetic mean of GDP and per capita income in the exporting country Egypt is higher than the arithmetic mean of GDP and per capita income in importing countries from COMESA countries, but we note that the difference is low, because most of the countries under study are from the same income group (low middle income and there are some countries from a middle class as in Appendix No. 1). We note that an importing countries are the most volatile in increasing GDP and increasing per capita income, as they have a coefficient of variation is higher than in Egypt, and we note that the presence of seaport infrastructure is higher in Egypt in the arithmetic average, and the arithmetic mean and coefficient of variation of trade openness in importing countries is higher than Egypt.

From the above, it is clear that Egypt is the highest in terms of GDP, per capita income, and infrastructure efficiency of seaports, but importing countries are the most volatile in all variables, and this may be due to the presence of middle- and low-income countries according to the classification of the World Bank in 2020.

3.1.1.4. Standard model results

The standard analysis of variables begins with conducting unit root tests, as the method of least squares can only be applied if all variables are stable at the level, and Table (3) shows the method of least squares.

3.1.1.5. Gravity model estimation

The OLS linear regression equations were estimated for the gravity model, and the results were as in Table (4), we note that the variables' sign is completely consistent with the economic theory.

Table 2. Descriptive analysis of the variables of the gravity model during the period (2016-2020).

Variable	Minimum	Maximum	Mean	Std. Deviation
Y_{TO}	0.86	830.74	121.70	188.691
Y_{AG}	1.91	305.29	69.03	74.185
GDP_E	235733.70	365252.65	297244.39	49115.076
GDP_I	1012.84	1811063.00	42019.26	180637.621
POP_E	94.45	102.33	98.41	2.803
POP_I	0.09	114.96	23.62	28.745
DS	1402.00	6288.00	3680.70	1586.124
Open	0.00	3.23	0.61	0.678
Tran	0.00	1.00	0.25	0.435
LPL_e	2.61	3.82	3.11	0.401
L P I_i	1.00	3.33	2.27	0.552
$PGDP_E$	2444.29	3569.21	3017.92	474.840
$PGDP_I$	228.20	16213.50	2676.15	3712.713

Source: collected only from Appendix No. (1)

Table 3. Unit Root Test for Gravity Model Variables.

Level	Variable	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	Y_{TO}	-7.882**	0.0000
Phillips-Perron test statistic	GDP_E	-10.337**	0.0000
Augmented Dickey-Fuller test statistic	GDP_I	-4.345**	0.0041
Phillips-Perron test statistic	POP_E	-17.491**	0.0000
Augmented Dickey-Fuller test statistic	POP_I	-6.846**	0.0000
Augmented Dickey-Fuller test statistic	(DS)	-9.774**	0.0000
Phillips-Perron test statistic	OPEN	-4.993**	0.0005
Phillips-Perron test statistic	$PGDP_E$	-11.704**	0.0000
Augmented Dickey-Fuller test statistic	$PGDP_I$	-3.497*	0.0452
Augmented Dickey-Fuller test statistic	Y_{AG}	-7.006**	0.0000
Phillips-Perron test statistic	LPL_e	-95.638**	0.0001

sig.(p) P < 0.01 P < 0.05

3.1.2. Factors affecting the total Egyptian exports to the COMESA countries

a. First Equation

Data in table (4) shows the results of the second model (Stepwise) are the variables most affecting the value of Egyptian exports to the COMESA countries (million dollars), as they indicate that there is a positive direct relationship between the value of Egyptian exports to the COMESA countries (million dollars) YTO and each of the gross domestic product of an importing country (million dollars). GDP_i, Egypt's trade openness (percentage of total trade in GDP) Open dummy variable for transport costs (shared inland or coastal borders = 1, not shared inland or coastal borders = zero) tran, that is, the value of Egyptian

exports to COMESA countries increases by 0.652%, 0.541%, 0.627%, by increasing the gross domestic product of an importing country, by increasing Egypt's commercial openness, and by participating in land borders by 1%.

Table 4. The results of estimating the gravity model of the economic variables affecting the Egyptian total exports to the COMESA countries during the period (2016 - 2020).

First Equation		Unstandardized Coefficients		t	Sig.	Adjusted R Square	F	Sig.
		B	Std. Error					
Full Model	(Constant)	14.872	14.932	.996	.322	0.742	36.562	0.000
	GDP_E	-.294	.577	-.510	.611			
	GDP_I	.651	.120	5.443	.000			
	POP_E	-1.335	3.412	-.391	.697			
	POP_I	-.026	.090	-.288	.774			
	DS	-.904	.340	-2.660	.009			
	Open	.498	.094	5.280	.000			
	Tran	.611	.296	2.064	.042			
	Lang	.453	.392	1.157	.250			
Stepwise	(Constant)	6.060	2.440	2.484	.015	0.745	73.379	0.000
	DS	-1.024	.279	-3.668	.000			
	GDP_I	.652	.067	9.761	.000			
	Open	.541	.086	6.300	.000			
	Tran	.627	.282	2.226	.028			
Second Equation		Unstandardized Coefficients		t	Sig.	Adjusted R Square	F	Sig.
		B	Std. Error					
Full Model	(Constant)	15.737	14.666	1.073	.286	.748	37.757	0.000
	GDP_E	-1.743	3.202	-.544	.587			
	GDP_I	.652	.073	8.968	.000			
	$PGDP_E$	1.488	3.363	.442	.659			
	$PGDP_I$	.152	.099	1.534	.128			
	DS	-1.120	.344	-3.255	.002			
	Open	.498	.092	5.400	.000			
	Tran	.490	.296	1.656	.101			
	Lang	.218	.395	.553	.582			
Stepwise	(Constant)	8.565	1.945	4.404	.000	.750	75.077	0.000
	DS	-1.532	.219	-6.984	.000			
	GDP_I	.669	.066	10.073	.000			
	Open	.506	.086	5.872	.000			
	$PGDP_I$	.217	.084	2.589	.011			

Source: data are collected and estimated from Table No. 1 in the Appendix.

It is also clear from the same model that there is an inverse relationship between the value of the total Egyptian exports to COMESA countries and the geographical distance between the two countries (km2), meaning a decrease in the value of the total Egyptian exports by 1.024% with an increase in the geographical distance by 1%.

The value of the adjusted coefficient of determination, whose value is estimated at approximately 0.745, indicates that the total of the independent variables included in the model, explain about 74.5% of the changes in the value of total Egyptian exports to the COMESA countries, and the statistical significance of the model has been proven at a level of significance of 0.01.

b. Second Equation

The results of the second model (Stepwise) are the variables most affecting the value of Egyptian exports to the COMESA countries (million dollars), as they indicate that there is a positive direct relationship between the value of Egyptian exports to the COMESA countries (million dollars) YTO and each of the gross domestic product of an importing country (million dollars). GDPi, Egypt's trade openness (percentage of total trade in GDP) Open, per capita GDP of importing countries (dollars) PGDPi, meaning that the value of Egyptian exports to COMESA countries increases by 0.669%, 0.506%, 0.217% with an increase in GDP From an importing country, and with an increase in Egypt's commercial openness, the per capita GDP of an importing countries increased by 1%. As shown in Table (4).

The same model also shows that there is an inverse relationship between the value of the total Egyptian exports to the COMESA countries and the geographical distance between the two countries (km2), meaning a decrease in the value of the total Egyptian exports by 1.532% with an increase in the geographical distance by 1%.

The value of the adjusted coefficient of determination, whose value is estimated at approximately 0.748, indicates that the total of independent variables included in the model, explain about 74.8% of the changes in the value of total Egyptian exports to the COMESA countries, and the statistical significance of the model has been proven at a level of significance of 0.01.

3.1.3. Factors affecting Egyptian agricultural exports to COMESA countries

c. Third Equation

Data in table (5) shows the results of the second model (Stepwise) are the variables that most affect the value of Egyptian agricultural exports to the COMESA countries (million dollars), as they indicate that there is a positive direct relationship between the value of Egyptian agricultural exports to the COMESA countries YAG, and a dummy variable for transportation costs (shared inland or coastal borders = 1, not shared inland or coastal borders = zero tran, dummy variable for language (Arabic = 1, other languages = zero) Lang, and the population of importing countries POP_i, meaning that the value of Egyptian agricultural exports to COMESA countries between Egypt and COMESA countries increases by 2.108 %, 2.397%, 0.360% with the countries sharing the land and sea borders of an importing country, and with the countries sharing the Arabic language, and with an increase in the population of an importing countries by 1%.

The same model also shows that there is an inverse relationship between the value of Egyptian agricultural exports to the COMESA countries and the geographical distance between the two countries (km2), meaning a decrease in the value of Egyptian agricultural exports to the COMESA countries by 6.498%, with an increase in the geographical distance by 1%.

Table 5. The results of estimating the gravity model of an economic variables affecting an Egyptian agricultural exports to COMESA countries during the period (2016-2020).

Third Equation		Unstandardized Coefficients		t	Sig.	Adjusted R Square	F	Sig.
		B	Std. Error					
Full Model	(Constant)	89.696	17.226	5.207	.000	.804	21.006	0.000
	GDP_E	.458	.626	.731	.470			
	GDP_I	.606	.145	4.178	.000			
	POP_E	-5.206	3.705	-1.405	.170			
	POP_I	.102	.123	.831	.412			
	DS	-8.268	.757	-10.921	.000			
	Open	.579	.128	4.528	.000			
	tran	2.547	.418	6.099	.000			
	Lang	4.323	.543	7.962	.000			
Stepwise	(Constant)	62.116	6.740	9.216	.000	.691	22.853	0.000
	DS	-6.498	.821	-7.918	.000			
	tran	2.108	.511	4.124	.000			
	Lang	2.397	.456	5.251	.000			
	POP_I	.360	.127	2.831	.008			
Fourth Equation		Unstandardized Coefficients		t	Sig.	Adjusted R Square	F	Sig.
		B	Std. Error					
Full Model	(Constant)	49.948	8.014	6.233	.000	.955	105.404	0.000
	GDP_E	.897	1.649	.544	.590			
	GDP_I	.649	.057	11.347	.000			
	$PGDP_E$	-1.216	1.728	-.704	.487			
	$PGDP_I$	-.083	.061	-1.366	.182			
	DS	-6.464	.341	-18.934	.000			
	Open	.596	.058	10.347	.000			
	tran	2.291	.183	12.552	.000			
	Lang	2.242	.247	9.070	.000			
Stepwise	(Constant)	51.135	2.616	19.547	.000	.955	167.951	0.000
	Lang	2.287	.245	9.319	.000			
	DS	-6.478	.341	-19.001	.000			
	tran	2.326	.181	12.859	.000			
	GDP_I	.639	.056	11.498	.000			
	Open	.595	.057	10.417	.000			

Source: data are collected and estimated from table No. 1 in the Appendix.

The value of the adjusted coefficient of determination, whose value is estimated at approximately 0.691, indicates that the total of the independent variables included in the model, explain about 69.1% of the changes in the value of Egyptian agricultural exports to the COMESA countries, and the statistical significance of the model has been proven at a level of significance of 0.01.

d. Fourth Equation

As shown in Table (5) the results of the second model (Stepwise) are the variables most affecting the value of Egyptian agricultural exports to the COMESA countries (one million dollars), as they indicate the existence of a positive direct relationship between the value of an Egyptian agricultural exports to the COMESA countries YAG, a dummy variable for the language (Arabic language) = 1, other language = 0 Lang, dummy variable (land or coastal borders = 1, not land or coastal borders = 0) tran, importing country GDP (million dollars) GDPi, trade openness with Egypt (Total trade percentage of GDP) Open, meaning that the value of Egyptian agricultural exports to the COMESA countries between Egypt and the COMESA countries increases by 2.287%, 2.326%, 0.639%, 0.595% with the countries sharing in the Arabic language, with the countries sharing in the land and sea borders From an importing country, by increasing the gross domestic product of importing countries, and by increasing trade openness with Egypt by 1%.

The same model also shows that there is an inverse relationship between the value of Egyptian agricultural exports to the COMESA countries and the geographical distance between the two countries (km2), meaning a decrease in the value of Egyptian agricultural exports to the COMESA countries by 6.478%, with an increase in the geographical distance by 1%.

The value of the adjusted coefficient of determination, whose value is estimated at approximately 0.955, indicates that the total of the independent variables included in the model, explain about 95.5% of the changes in the value of Egyptian agricultural exports to the COMESA countries, and the statistical significance of the model has been proven at a level of significance of 0.01.

3.1.4. Factors affecting the efficiency of the performance of Egyptian logistics services with the COMESA countries

e. Fifth Equation

Data in table (6) shows the results of the second model (Stepwise) are the variables that most affect the performance index of logistics services, as they indicate that there is a positive direct relationship between the performance index of logistics services, and the population of Egypt (million people) POPE, meaning that the performance index of logistics services in Egypt increases by 4.11%, increasing the population of Egypt by 1%.

The value of the adjusted coefficient of determination, whose value is estimated at approximately 0.201, indicates that the total of an independent variables included in the model, explain about 20.1% of the changes in the logistics performance index, and the statistical significance of the model has been proven at a level of significance of 0.01.

f. Sixth Equation

As shown in Table (6) the results of the second model (Stepwise) are the most influential variables on the LPIE performance efficiency index, which indicates that there is a positive direct relationship between the logistics performance index, Egypt's GDPE, and the per capita GDP in Egypt PGDPE, that is, the performance index of Logistics services in Egypt increase by 4.213%, 4.306% that is an increase in Egypt's GDPE, and an increase in GDP per capita in Egypt PGDPE by 1%.

The value of the adjusted coefficient of determination, whose value is estimated at approximately 0.204, indicates that the total of an independent variables included in the model, explain about 20.4% of the changes in the logistics performance index, and the statistical significance of the model has been proven at a level of significance of 0.01.

Table 6. The results of estimating the gravity model of the economic variables affecting the efficiency of the performance of logistics services during the period (2016 - 2020).

Fifth Equation		Unstandardized Coefficients		t	Sig.	Adjusted R Square	F	Sig.
		B	Std. Error					
Full Model	(Constant)	-17.171	4.052	-4.238	.000	.204	2.919	0.006
	GDP_E	-.093	.157	-.595	.553			
	GDP_I	.001	.032	.021	.983			
	POP_E	4.306	.926	4.650	.000			
	POP_I	.000	.025	-.018	.986			
	DS	-.001	.092	-.013	.990			
	Open	-.001	.026	-.022	.983			
	Tran	-.005	.080	-.006	.996			
	Lang	-.003	.106	-.003	.997			
Stepwise	(Constant)	-17.452	3.797	-4.596	.000	.201	24.670	.000[b]
	POP_E	4.110	.828	4.967	.000			
Sixth Equation		Unstandardized Coefficients		t	Sig.	Adjusted R Square	F	Sig.
		B	Std. Error					
Full Model	(Constant)	-17.205	4.028	-4.271	.000	.204	2.921	0.006
	GDP_E	4.217	.880	4.794	.000			
	GDP_I	.000	.020	-.015	.988			
	$PGDP_E$	4.311	.924	4.667	.000			
	$PGDP_I$	-.003	.027	-.101	.919			
	DS	.004	.094	.045	.964			
	Open	-.001	.025	-.027	.978			
	tran	.003	.081	.032	.974			
	Lang	.006	.108	.052	.959			
Stepwise	(Constant)	-17.180	3.835	-4.479	.000	.204	12.445	.000
	GDP_E	4.213	.847	4.975	.000			
	$PGDP_E$	4.306	.889	4.842	.000			

Source: data are collected and estimated from table No. 1 in the Appendix.

From the above, it is clear from the analysis of the models that

The most important factors affecting the total Egyptian exports to the COMESA countries are represented in the gross domestic product of the importing country, the trade openness to Egypt, the participation in the land borders, the per capita GDP of the importing countries, meaning that the value of Egyptian exports to The COMESA countries increases by 0.652%, 0.541%, 0.627%, 0.217% with an increase in the previous variables by 1%.

In addition to the adverse effect of geographical distance, the value of total Egyptian exports decreases by 1.024%, with an increase in geographical distance by 1%.

While it was found that the most important factors affecting the Egyptian agricultural exports to the COMESA countries are the participation in the land borders of the an importing country, as well as the participation in the Arabic language, in addition to an increase in the population of an importing countries, meaning that the value of Egyptian exports to COMESA countries

increases by 2.108%, 2.397%, 0.360% with an increase of the previous variables by 1%.

In addition to the adverse effect of geographical distance, the value of Egyptian agricultural exports to COMESA countries decreases by 6.498%, with an increase in geographical distance by 1%.

By studying the factors affecting the efficiency of the performance of Egyptian logistics services with the COMESA countries, it was found that the performance index of logistics services in Egypt increases by 4.11%, with an increase in the population of Egypt by 1%. This may be due to the increase in individual consumer demand due to an increase in the population, which leads to an increase in the volume of total imports and exports. The performance index of logistics services in Egypt increases by 4.213%, 4.306%, that is, an increase in Egypt's GDPE, and an increase in the per capita GDP in Egypt PGDPE by 1%.

4. Recommendations

1. The necessity of establishing collection and marketing centers for Egyptian goods in some African countries to facilitate the circulation of goods for the rest of the countries that do not share land or sea borders with Egypt.
2. Working on the application of the unified customs tariff while working on removing non-tariff restrictions in front of the intra-trade movement of the countries of the COMESA Union, allowing the creation of a market for all commercial goods and services.
3. Establishing a joint fund to finance the trade flow between Egypt and the COMESA countries, to facilitate the flow of trade between the countries of the Union.
4. The COMESA countries should be concerned with providing good logistical performance by providing good infrastructure for transportation of all kinds, in addition to paying attention to the efficiency of the clearance process and trying to provide an efficient system to monitor and track transported shipments, in addition to paying attention to the time factor that is related to on-time delivery, which is one of the logistics goals.
5. The necessity of issuing legislations that attract investment in the maritime transport sector to build a navy capable of absorbing the requirements of transferring foreign trade from Egypt to the COMESA countries in line with modern technology.
6. The Egyptian ports must be converted from traditional ports to integrated logistic ports.
7. Paying attention to the degree of customer satisfaction from importing countries and trying to raise that degree and improve it continuously.

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Ethics Approval and Consent to Participate

This research is not applied to living animals.

Consent for Publication

Not applicable.

Conflicts of Interest

The authors declare that they don't have any conflict of interest

Appendix:

Annex (1)- Descriptive analysis of the variables of the gravity model for the countries of The COMESA federation

First equation	The value of Egyptian exports to the country I (million dollars) Y_{TO}	The gross domestic product of the importing country Egypt (millions of dollars) GDP_I	Population of the importing country (million people) POP_I	Geographical distance kilometers DS	Economic openness (percentage of total trade to GDP) Open	GDP per capita (imported) (dollars) $PGDP_I$	The value of Egyptian agricultural exports to the country (million dollars) YAG
Uganda	67.22	33165.78	42.71	3205.00	0.22	774.92	–
Ethiopia	123.79	88778.88	109.25	2493.00	0.16	809.84	–
Eritrea	97.37	6064.00	5.86	1852.00	0.13	1033.60	69.04
Eswatini	4.11	4270.56	1.14	6288.00	0.09	3757.14	–
Sudan	479.36	32472.65	41.82	1566.00	2.15	783.86	79.44
Somalia	84.81	6086.30	15.02	3198.00	1.22	404.36	56.45
D.R.C	8.68	44283.56	84.12	3711.00	0.16	524.78	–
Burundi	9.58	2724.54	11.18	1633.00	0.37	244.08	–
Tunisia	421.84	42503.99	11.56	2137.00	0.92	3677.88	25.57
Comoros	1.38	1141.41	0.83	4909.00	0.16	1369.48	–
Djibouti	40.65	3015.36	0.96	2392.00	1.54	3139.78	12.74
Rwanda	24.99	9654.77	12.31	3566.00	0.26	783.74	
Zambia	11.37	381503.05	17.36	4943.00	0.70	1324.50	2.37
Zimbabwe	14.44	18716.91	14.44	5456.00	0.19	1297.12	–
Seychelles	3.72	1429.06	0.10	4647.00	0.27	14797.32	–
Kenya	326.11	90124.62	51.40	3308.00	0.66	1748.80	85.72
Libya	616.27	38839.67	6.68	1402.00	1.99	5810.84	220.89
Malawi	5.46	9492.99	18.16	4825.00	0.36	519.02	–
Madagascar	63.96	13189.14	26.28	5815.00	0.49	501.94	–
Mauritius	28.79	12928.04	1.26	6268.00	0.23	10219.96	–
Total	2433.90	840385.29	472.46	73614.00	12.28	53522.96	552.21
Average period	121.70	42019.26	23.62	3680.70	0.61	2676.15	69.03
Minimum	1.38	1141.41	0.10	1402.00	0.09	244.08	2.37
Maximum	616.27	381503.05	109.25	6288.00	2.15	14797.32	220.89

Source: World Bank (2020), World development indicators database.

5. References

Al-boghdady, H. (2019). 'The Effect of the Efficiency of Transportation, Loading and Unloading Operations Performance on the Expected Economic Performance of East Port Said Port', *Zagazig Journal of Agricultural Sciences,* (46), pp. 1.

Al-Nabulsi, Jabr (2017). *'Logistics of Port Management (Multimodal Transport)',* Dar Al-Jinan for Publishing and Distribution, the Hashemite Kingdom of Jordan, first edition, pp. 122.

Anderson, J.E., Wincoop, E.V. (2003). 'Gravity with Gravitas: a solution to the Border Puzzle', *American Economic Review,* (93), March 2003, pp. 170-192.

Central Agency for Public Mobilization and Statistics, www.capmas.gov.eg

FAO, IFAD, et WFP. (2018). 'The State of Food Insecurity in the World' 2018 – Rome, FAO.

Farida, H. (2018). 'An Analytical Study of the Logistics Performance Index in Algeria', Faculty of Economics, Commercial Sciences and Facilitation Sciences, Zian Ashour University in Djelfa (Algeria), *Journal of Law and Human Sciences, Economic Issue,* pp. 304.

Matyas, L. (1997), 'Proper Econometric Specification of the Gravity Model', *The World Economy,* (20), pp. 363-368.

Median, P., Gratacap, A. (2008). *'La logistique et supply chain management',* Dunod, (Paris: Dunod), pp.11

Shaker, S. (2017), 'The Impact of Logistics Expenditures on Entry of Egyptian Exports to the Nile Basin Countries', Arab Planning Institute, *Journal of Development and Economic Policies,* Volume (19), pp. 90.

Shehata, G., et al. (2021). 'The Future of Logistical Services for Egyptian Ports and its Economic Importance', *International Journal of Social Sciences Arts & Humanities,* (8), pp 64.

The Arab Planning Institute in Kuwait, 'Guide to International Development Indicators, Databases and Credit Rating Agencies', pp. 44.

United Nations, (2017 December 20-21), *'Logistics Performance Index in the Arab Region',* Economic and Social Commission for Western Asia (ESCWA), Transport and Logistics Committee, Session (18).

World Bank (2020), World development indicators database. www.comtrade.org.