

## Investigation into the Relationship between Logistics' Variables and Economic Growth in Algeria

التحقيق في العلاقة بين متغيرات اللوجستيات والنمو الاقتصادي في الجزائر

MAYACHE Nesrine<sup>1</sup>

<sup>1</sup>University of 8 May 1945 Guelma (Algeria), [mayache.nesrine@univ-guelma](mailto:mayache.nesrine@univ-guelma)

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### Abstract:

*The study explores the impact of logistics development on economic growth in Algeria using time series data from 1990 to 2017. To establish the relationship, a set of variables are employed as indicators for logistics sector and economic growth; hence the study involves two stages of analysis: factor analysis and regression analysis.*

*The findings reveal three main factors telecommunications, trade and industry, and services; while the transport factor is not defined. The regression analysis denotes the estimation of the relationship shows that the overall factors are either positive or negative, and statistically significant correlated with the GDP. Consequently, the logistic specificities constitute an important role for reinforcement of economic diversification.*

**Keyword :** Economic Growth ; Logistics ; Factor Analysis ; Regession Analysis.

**Jel Classification Codes :** C51, O40, R40

### ملخص:

تهدف الدراسة إلى تحليل أثر التطور اللوجستي على النمو الاقتصادي في الجزائر باستخدام بيانات من 1990 إلى غاية 2017. ولتحليل هذه العلاقة تم استخدام مجموعة من المؤشرات المعبرة عن المتغيرتين، واعتماد مرحلتين من التحليل: التحليل العاملي ثم تحليل الانحدار.

وقد خلصت نتائج الدراسة إلى تحديد ثلاثة مركبات أساسية: الاتصالات، التجارة والصناعة، وأخيرا الخدمات في حين لم يتم تحديد عامل النقل. كما أسفر تحليل الانحدار عن وجود علاقة بين المركبات والنمو الاقتصادي إما موجبة أو سلبية ومعنوية إحصائيا، هذا ما يدل على أن الخصائص الأساسية اللوجستية لها دور هام في تحفيز استراتيجيه التنويع الاقتصادي.

**كلمات مفتاحية:** النمو الاقتصادي، اللوجستية، التحليل العاملي، تحليل الانحدار.

**تصنيف JEL:** C51, O40, R40.

<sup>1</sup> Corresponding author: Mayache Nesrine, [mayache.n@yahoo.com](mailto:mayache.n@yahoo.com)

## 1. INTRODUCTION

*Transport and logistics services facilitate international trade and play an important role in the growth and development of the local economy. The huge contribution of the logistics to economic development was already approved by the practice in many countries. Recently, the system and intensive of logistics also exhibits the important value of promoting the international trade and accelerating the sustainable development; so the logistics are attracted broadly the attention by decision-makers.*

*Algeria, like other countries, seeks to achieve this advantage especially in the current situation characterized by the decline of oil incomes. Hence, it makes some of implications to overcoming this difficult situation which among them promoting the exports away the hydrocarbons by the diversification of the economy. Based on the above, the following problem has been formulated:*

***Does the logistics development sector enhance the economic growth in Algeria?***

*In the light of the problem posed, the following hypothesis was put forward:*

***There is a significant positive effect of logistics development sector on economic growth in Algeria over the period 1990-2017.***

*Through this study, we seek to achieve a set of goals the most important is to investigate the significant relationship between logistics' variables and economic growth in Algeria; and to suggest a set of implications and policies to reinforce the economic diversification.*

*The study covers both theoretical and applied sides, thus will justify the use of two approaches the factor analysis and regression. It is developed in three sections, the first focused in the theoretical literature studies undertaken the relation between logistics and economic growth. The second section mainly directed by overview of data and methodology. The last covered the empirical study from 1990 to 2017, and discussion of results.*

## 2. LITERATURE REVIEW

Several studies have been provided to explore the relationship between logistics and economic growth. From the perspective of logistics management researchers and development economists, we concentrate briefly on the description of the most important.

Wen-Jie (2002) analyzed the relationship between economy and logistics by the use of the Regional Economy Theory. The conclusion was: on economic globalization, the regional economic integration, the effort of pursuing profit and core competitive abilities made by in the regional enterprise, and the status of Chinese economic development accelerated the development of modern logistics. In the other hand, the development of modern logistics also changed the growth pattern of regional economy promoting the formation of new industries, and accelerating the formation and development of city centered regional markets (Wen-Jie, 2002).

Huang & al. (2006) performed an analysis of the relationship between logistics development and GDP growth in China. Their research used the traffic turnover volume as the index of logistics scale and GDP as the economic growth index. Their time series data from 1952 to 2004 which was tested by using statistical regression method, then using Granger causality tests. The result shown that there was a reliable co-integration relationship between GDP and logistics volume and it played an important role to GDP growth (Huang & al, 2006).

Chu (2010) studied relation between logistics and economic growth in 30 provinces of China for a period between 1998 and 2007. In this study which was used generalized method of moments approach that is the one of the methods of dynamic panel data analysis, there was a positive significant relationship between investments of logistics sector (transportation, storage, mailing, and telecommunication) and growth. However, the contribution of logistic investments for growth is higher for interior undeveloped provinces in comparison to coastal provinces (Chu, 2010).

Navickas & al (2011), in global economy the activity of logistics systems, its infrastructure usage for the purpose to achieve the growth of economy become a necessity, whereas the scope and aims of logistics systems and its infrastructure use become specific in a reason of the impact of country's economic policy, focused on long-term competitiveness. Main factors of logistics systems impact on country's economic growth could be embodied through development levels of logistics systems and its infrastructure, the impact of business environment, the mobility and effective use of resources, logistic flexibility and receptivity to innovations (Navickas & al, 2011).

Banerjee & al. (2012) studied the access of transportation network's impact on economic growth for various regions of China in a period between 1995 and 2010. The results of analysis demonstrated that the closeness to transportation networks had a moderate, significant, and causative impact on GDP. In the study, it is also found that the GDP per capita and income inequality were at higher levels in regions which were close to historical transportation networks, and also there were more companies in the regions, however, gains of the companies were higher (Banerjee & al, 2012).

Kayode & al. (2013) analyzed relation between investments of transportation infrastructure and economic growth for Nigeria over the period 1990 -2009. The findings demonstrated that the investments of transportation infrastructure had an insignificant role on determination of economic growth (Kayode & al, 2013).

Kuzu & Önder (2014) investigated long run relation between developments in logistics sector and economic growth in the sample of Turkey. In this study which transportation and index of storage turnover were used as a proxy of logistics sector's development, it is found that there was a long-run relationship among variables according to the analysis (Kuzu & Önder, 2014).

Kerbash & Mocan (2015) have been documented globalization expansion one of the most important fundamental services impacting logistic service suppliers. The process of transportation established the effectiveness of moving products. The development in techniques and organization rules improved the moving cargo, delivery speed, service quality, procedure costs, the practice of facilities and energy saving. Transportation took a vital part in the management of logistic. Evaluating the recent condition, a strong system needed an understandable border of logistics and a suitable transport implements and techniques to link the fabricating procedures. The objective of this review to identify the essential factors that affect on the logistics and transport sector through globalization processes happening in the world economy (Kerbash & Mocan, 2015).

Brida & al (2016) examined the effects in the long-run between air transport demand and the economic growth in Mexico. Using quarterly data from 1995 to 2013, the study investigated possible causal relationships between real GDP and number of air passengers in arriving and departing from Mexican airports. Johansen co-integration analysis shown the existence of one co-integrated vector where the corresponding elasticities are positive. The study found that there was positive and bidirectional causality relationship. Additionally, impulse response analysis shown that an increase in the magnitude of air transport expansion in Mexico produced a positive effect on economic growth in the country (Brida & al, 2016).

Sevgi & Tazcan (2017) explored that logistics is one of the tools that play an important role in the change and improvement of economic indicators. The study aimed to investigate how the logistics variables of transportation and communication affected economic growth in 34 OECD countries. The effect of both transportation industry variables and communication industry variables that formed the logistics industry on the increase in per capita income in OECD countries was identified (Sevgi & Tazcan, 2017).

Munim (2018) conducted an empirical inquiry into the broader economic contribution of seaborne trade, from a port infrastructure quality and logistics performance perspective for 91 countries. The results reveal that it was vital for developing countries to continuously improve the quality of port infrastructure as it contributed to better logistics performance, leading to higher seaborne trade, yielding higher economic growth (Munim, 2018).

Jiang (2019) pointed on to the correlation between different inner factors of the logistics industry and local economic development and presented relative countermeasures. On account of the statistics from 27 provinces of China from 2005 to 2015, he analyzed the influence of different factors of the logistics industry on regional economy and explored aspects and degrees of their impact by exemplifying and modeling. The research results shown: (1) logistics industry has promoted regional economy in recent years; (2) construction of grade highway played an important role

in economic development; (3) governments' construction of three modes of transport: water freight, airlifts and railway freight has negative effects on the growth of GDP (Jiang, 2019).

From the presentation above, we try in our study to examine whether the logistics sector, especially transportation, can be a booster element for diversification economic. This context is different from previous studies that took places in developing countries especially the Asian's one improving continuously there logistics infrastructure. Additionally, what makes the present research different is the use of statistical tools and the latest data for the case of Algeria. The projection of this study on the Algerian reality is result of the absence of this type of studies; especially they are newly dealt with for the purpose of economic diversification.

### **3. RESEARCH METHOD**

The impact of development of logistic sector on economic growth in Algeria was covered the period from 1990 to 2017. GDP variable expresses the economic growth, while different variables are used as independent indicators.

According to Hayaloglu (2015) study in which selected logarithms of 13 components, such as GDP, total government spending on consumption, population size, enrollment, higher education, employment level (%), total investments in inland transport infrastructure, rail transport (million T-km), road transport (million T-km), air transport, (million T-km), telephone lines (per 100 people), mobile cellular subscription (for 100 people), broadband Internet subscription (for 100 people) and Internet users (per 100 people). In his study, he added also export and import which were employed in the search of Martí & al. (2014).

In addition to the above, we have included as well some variables insight logistics have overall influences like trade, freight turnover, agriculture, industry, production and services. The table below summarizes variables obtained from World Development Indicators database and Global Economy noting that these variables are available and suitable for Algerian case.

**Table 1. Identification of Variables**

Variables	Unit of Measure	Full Name of Variables
<b>GDP</b>	current billion	Gross domestic product
<b>GCF</b>	% of GDP	Gross capital formation
<b>AIR</b>	million ton-km	Air freight services
<b>RAIL</b>	million ton-km	Rail transportation
<b>MCS</b>	per 100 people	Subscriptions to mobile cellular
<b>TEL</b>	per 100 people	Fixed telephone subscription
<b>INTUSER</b>	% of population	Persons using the Internet
<b>IMP</b>	% of GDP	Import of goods and services
<b>EXP</b>	% of GDP	Export of goods and services
<b>EMP</b>	% of population	Employment
<b>GLOBALIZATION</b>	Index	Globalization index
<b>GE</b>	% of GDP	Government expenditure
<b>AGRI</b>	% of GDP	Agriculture, value added
<b>INDUS</b>	% of GDP	Industry, Value Added
<b>SERV</b>	% of GDP	Service, value added
<b>POP</b>	Number	Population

Source: World Development Indicators database and Global Economy.

In this study, we have omitted variable of road since the data does not cover the study period on the one hand; and on the other hand, the recent data from 2011 to 2017 is characterized by a decrease in number of kilometers due to the poor quality of roads in Algeria (the high level of quality index of roads is 7).

**Table 2. Road Kilometers and Quality of Roads (2011-2017)**

year	2011	2012	2013	2014	2015	2016	2017
<b>Roads(km)</b>	4216	4175	3800	3800	3800	3842	4016
<b>Quality index</b>		3,42	3,20	3,13	3,18	3,20	3,60

Source: Global Economy

In order to reveal the influence of the logistics sector on economic growth, we made in first stage a factor analysis of our variable. In second stage, we use the regression analysis; therefore we can formulate the equation (1) as follows:

$$\ln GDP_t = \alpha_0 + \alpha_1 F_1 + \alpha_2 F_2 + \dots + \alpha_i F_i + \eta_t \dots \dots \dots (1)$$

Where  $F_1, F_2, \dots, F_i$  denotes factors derived from factor analysis, and  $\eta_t$  is error term.

#### 4. RESULTS AND DISCUSSION

##### 4.1 FACTOR ANALYSIS

We will focus on the following bullet points: Cronbach's Alpha Kaiser-Meyer-Olkin test; own values and cumulative factors; factor template before variation; factor pattern after varimax rotation; and ANOVA (Test for equality of means between series). According to the factor analysis, the following results are derived:

Alpha-Cronbach, equal to 0.8443 this means that the chosen variables are good. Alfa-Cronbach,  $\alpha$ -coefficients there are several scales: for example,  $\alpha \geq 0.9$  - excellent,  $0.9 > \alpha \geq 0.8$  - good,  $0.8 > \alpha \geq 0.7$  - acceptable,  $0.7 > \alpha \geq 0.6$  - doubtful,  $0.6 > \alpha \geq 0.5$  - poor,  $0.5 > \alpha$  - unacceptable (Using and Interpreting Cronbach's Alpha, 2017). The findings are provided in the following table:

**Table 3. Alfa-Cronbach's Coefficient**

GCF	AGRI	AIR	EMP	EXP	GDP	GE	GLO
0.602	0.882	0.887	0.766	0.751	0.883	0.809	0.896
IMP	IND	INT	MCS	POP	RAIL	SER	TEL
0.792	0.916	0.946	0.829	0.966	0.929	0.711	0.944
<b>Alfa-Cronbach's Coefficient = 0.8443</b>							

Source: Outputs, Eviews.10.

Kaiser-Meier-Olkin (KMO) shows an indicator of the adequacy of the sample, if the sample is between 0.90 and 1.00, then this sample is remarkable; if between 0.80 to 0.89 - deserved; between 0.70 and 0.79 is the average; between 0.60 to 0.69 is an intermediary; between 0.50 to 0.59 - satisfactory; between 0.00 to 0.49 is not affected (Sharipbekova, Raimbekov, 2018). KMO is 0.744809 which means the average; the result is shown in table below:

**Table 4. Kaiser's MSA**

GCF	AGRI	AIR	EMP	EXP	GDP	GE	GLO
0.6798	0.708	0.2676	0.3401	0.7785	0.8095	0.6997	0.7494
IMP	IND	INT	MCS	POP	RAIL	SER	TEL
0.7283	0.7132	0.8772	0.8053	0.7609	0.8055	0.6924	0.7496
<b>Kaiser's MSA = 0.7448</b>							

Source: Outputs, Eviews.10.

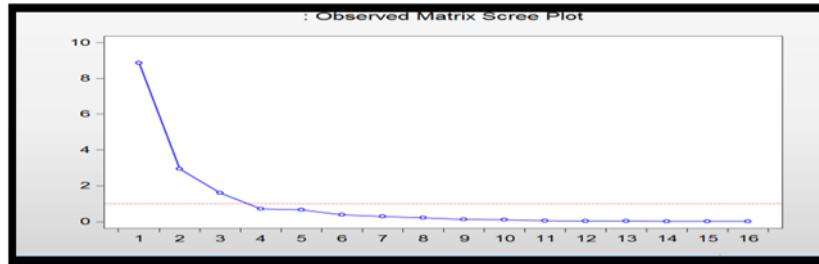
Table (3) shows the eigenvalues obtained from the factor analysis, and as a result, we have 3 factors, out of 16 possible factors (Figure (1)). When performing factor analysis on a correlation matrix, the variables are standardized, which means that each variable has a variance of 1, and we choose coefficient that is greater than 1 scale, i.e., the eigenvalue is greater than 1. Thus, in our case we choose 3 factors that explain proxy 84% of the variability of the original data.

**Table 5. Eigenvalues and Cumulative Factors**

	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>
<b>Eigenvalue</b>	8.869155	2.936204	1.598551
<b>Proportion</b>	0.5543	0.1836	0.0999
<b>Cumulative %</b>	0.5543	0.7380	0.8379

Source: Outputs, Eviews.10.

**Fig.1. Scatter-Graph of Eigen-values of Factors**



Source: Outputs, Eviews.10.

Non-rotating loads are determined by the method of the Basic factors, where the usual correlation was used. Kaiser Guttman's method and anterior commonness are a square of multiple correlation, and then we use the rotating varimax method, convergence after 17 iterations, we obtain the following results (table 6).

**Table 6. Factor Pattern after Varimax Rotation**

<b>Variables</b>	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>
<b>GCF</b>	0.481569	<b>0.500470</b>	0.291302
<b>AGRI</b>	-0.173726	-0.903189	0.073385
<b>AIR</b>	0.042650	-0.199075	0.172170
<b>EMP</b>	-0.025229	0.287771	0.056058
<b>EXP</b>	0.128594	<b>0.624094</b>	-0.086006
<b>GDP</b>	<b>0.955010</b>	0.204994	-0.214319
<b>GE</b>	<b>0.902741</b>	0.023201	-0.164739
<b>GLO</b>	0.589494	<b>0.657357</b>	0.384985
<b>IMP</b>	<b>0.790588</b>	-0.308191	-0.096144
<b>IND</b>	0.105960	<b>0.976331</b>	0.064923
<b>INTUSER</b>	<b>0.905822</b>	0.342124	0.146921
<b>MCS</b>	<b>0.892963</b>	0.397664	0.069549
<b>POP</b>	<b>0.970340</b>	0.077233	0.196003
<b>RAIL</b>	-0.958466	0.001251	-0.084991
<b>SER</b>	0.284790	0.182230	<b>0.724701</b>
<b>TEL</b>	<b>0.871725</b>	0.410458	0.232415

Source: Outputs, Eviews.10.



Thus, we identify 3 important factors, and we named them as follows: Factor (1): public investment in telecommunications, network, and imports; Factor (2): trade and industry; Factor (3): services. All these factors gathered under the designation of infrastructure of logistics.

**Table 7. ANOVA (Test for Equality of Means between Series)**

	<b>DF</b>	<b>Value</b>	<b>Probability</b>
<b>Anova F test</b>	3	164.4786	0.0000
<b>Welch F-test</b>	3	259.2089	0.0000
<b>Variance</b>	<b>DF</b>	<b>Sum of SQ</b>	<b>Mean SG</b>
<b>Between</b>	3	422.0137	140.6712
<b>Within</b>	108	92.36761	0855256
<b>Total</b>	111	514.3813	4.634066
	<b>Mean</b>	<b>STD.DEV</b>	<b>Std.err of Mean</b>
<b>LnGDP</b>	4.482844	0.606819	0.114678
<b>F1</b>	3.06E-15	1.016727	0.192143
<b>F2</b>	-2.71E-15	1.006875	0.190282
<b>F3</b>	2.13E-15	1.002627	0.189479
<b>ALL</b>	1.120711	2.152688	0.203410

Source: Outputs, Eviews.10.

ANOVA test is single-factor, between subjects, analysis of variance (ANOVA). The basic idea is that if subgroups have the same mean value, the variability between samples means (between groups), should be the same as the variability within any subgroup (within the group). The F-statistic has an F-distribution with numerical degrees of freedom and degrees of freedom of the denominator under the null hypothesis of independent and identical normal distributed data with equal means and variances in each subgroup.

When subgroup variances are heterogeneous, we can use the version of the test statistics of Welch (1951). For tests with only two subgroups, Eviews also reports t-statistics, which is simply the square root of the F-statistics with one degree of freedom of the numerator. Note that for two groups, the Welch test is reduced to the Satterthwaite test (1946). The upper part of the output contains the ANOVA results for testing the equality of means for GDP, classified by the three groups defined in the F1, F2, and F3 series.

Table (8) denotes the estimation of factors scores F1, F2 and F3 as the following:

**Table 8. Factors Scores**

<b>year</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
<b>F1</b>	-1.09	-1.38	-1.12	-0.92	-1.06	-1.04	-0.94	-0.92	-0.624	-0.786
<b>F2</b>	-0.75	-0.22	-0.85	-1.20	-1.02	-0.85	-0.55	-0.25	-1.125	-0.011
<b>F3</b>	-2.82	-1.21	-1.02	-0.80	0.015	0.403	0.223	0.380	0.900	1.171
<b>year</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
<b>F1</b>	-0.85	-0.67	-0.58	-0.38	-0.07	0.011	0.155	0.363	0.546	0.692
<b>F2</b>	1.061	0.554	0.541	0.650	0.818	1.535	1.658	1.554	1.713	0.309
<b>F3</b>	0.941	1.273	1.390	0.978	0.721	0.314	0.089	-0.20	-1.084	-0.052
<b>year</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>		
<b>F1</b>	0.793	1.032	1.232	1.371	1.516	1.525	1.607	1.658		
<b>F2</b>	0.672	0.609	0.337	-0.16	-0.61	-1.38	-1.65	-1.33		
<b>F3</b>	-0.51	-1.20	-0.92	-0.80	-0.74	0.545	0.933	1.117		

Source: Outputs, Eviews.10.

#### 4.2 REGRESSION ANALYSIS

After the determination the principal factors and their scores, we can run the regression analysis. The outcomes of regression analysis are summarized in table (9):

**Table 9. Estimation of Regression Model**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
<b>C</b>	4.484959	0.002036	2204.159	0.0000
<b>F1</b>	0.567635	0.002033	279.1827	0.0000
<b>F2</b>	0.124377	0.002059	60.40819	0.0000
<b>F3</b>	-0.125865	0.002068	-60.86754	0.0000
<b>R-squared</b> 0.999720			<b>AIC</b>	-6.093113
<b>Adjusted R-squared</b> 0.999685			<b>SC</b>	-5.902798
<b>F-statistic</b> 28579.64			<b>Durbin-Watson stat</b>	
<b>Prob (F-statistic)</b> 0.000000			2.219100	

Source: Outputs, Eviews.10.

The findings result in table (8) pointed that the explanatory variable F1, F2, got a positive impact on GDP, and statistically significant at level 1%, 5% and 10%. A 1% increase in the components of F1 (communication, network, and government expenditure) accelerates GDP by 5.67%; whereas a 1% increase in the components of F2 (trade, industry and globalization) led to 1.24% on GDP. So F1 and F2 act as a major booster factor of economic growth in Algeria. The last factor F3 has a negative impact on GDP, but it is significant at level 1%, 5% and 10%. In the meaning that services have negatively affected the economic growth by -1.25%, this makes the total net contribution of logistic on economic growth equalizes 5.66 %.

The diagnostic tests presented in the table (10), these tests are measured for optimum lag=4. The findings show that there is no evidence of diagnostic problem with the model. Measuring the explanatory power of the model by their adjusted R squared achieved 99.9% of the variation in the GDP can be explained. The Breusch -Pagan- Godfrey heteroskedasticity test confirm that the errors are white noise and no serial correlation with p-value upper than 5% respectively 99.90% and 90.58%.

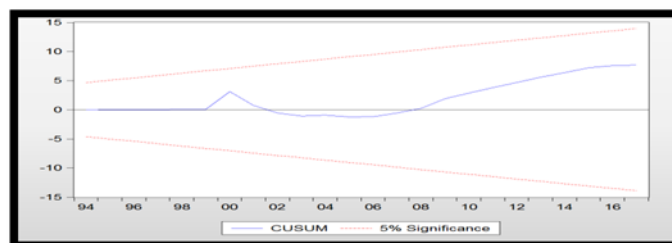
**Table 10. LMT and ARCH Test**

LMT Test			
<b>F-statistic</b>	0.250512	<b>Prob. F(4,20)</b>	0.9059
ARCH Test			
<b>F-statistic</b>	0.021180	<b>Prob. F(4,19)</b>	0.9990

Source: Outputs, Eviews.10.

Furthermore, The Ramsey RESET test indicates that the model is well specified and that there are no omitted variables in the model. The stability of the long-run and short-run model coefficients is checked through the cumulative sum (CUSUM). The results of the CUSUM presented in figure (2) demonstrate that the CUSUM of recursive residuals are within the critical bounds, meaning that all coefficients are stable over the sample period.

**Fig.2.Recursive Test**



Source: Outputs, Eviews.10.

### 4.3 DISCUSSION

This study assesses the relationship between logistics development sector and economic growth in Algeria from 1990 to 2017. Therefore, we have performed various estimates and tests to verify this relationship.

The main conclusion that can be drawn from this study is that logistics factors generally have a positive significant effect on economic growth. It conducts to raise the GDP proximately 5.66% in long term. This result is supporting the findings of previous similar studies for wide range of countries; these studies almost resulting nearly changes of 30% of GDP comparing with ours which seems powerless.

Based on the results of factor analysis denotes that infrastructure in logistics and trade contributes mainly in rising economic growth. In the other hand, the lack of services and transport weakens the economic growth. That's what it means enhancing economic growth by the way overcoming difficulties in logistics sector especially transportation that would boost foreign trade. The study also highlights an important aspect of the analysis that the investment programs efficiency has not yet been achieved.

There is another side of analysis depended on the logistic performance index (LPI) which reflect the overall characteristics of logistics in Algeria. It is defined by the World Bank as an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. It measures performance along the logistics supply chain within a country and offers two different perspectives: international and domestic. - International LPI provides qualitative evaluations of a country in six areas by its trading partners—logistics professionals working outside the country. - Domestic LPI provides both qualitative and quantitative assessments of a country by logistics professionals working inside it.

The logistics performance (LPI) is the weighted average of the country scores on six key dimensions:

- The efficiency of the clearance process (i.e.; speed, simplicity and predictability of formalities) by border control agencies, including customs.
- Quality of trade and transport-related infrastructure (e.g., ports, railroads, roads, information technology);
- Ease of arranging competitively priced shipments;
- Competence and quality of logistics services (e.g., transport operators, customs brokers);
- Ability to track and trace consignments;
- Timeliness of shipments in reaching the destination within the scheduled or expected delivery time.

Based on the above, the following table summarized the LPI for Algeria from 2007 to 2018. These values reflect bad performance of logistics, so this led to increase costs of logistics which makes the national product less competitive.

**Table 11. LPI values (2007-2018)**

<b>year</b>	<b>2007</b>	<b>2010</b>	<b>2012</b>	<b>2014</b>	<b>2016</b>	<b>2018</b>
<b>LPI</b>	2,06	2,36	2,41	2,65	2,72	2,45

**Source: World Bank Data**

## 5. CONCLUSION

This study carried out theoretical and empirical evidence about the relationship between logistics development and economic growth. It was also investigated this relation in Algeria for data series from 1990 to 2017 using two stages of analysis: factor analysis and regression.

The results involve three main factors telecommunications, trade and industry, and services; whereas the transportation not defined. Meantime, the regression analysis concluded that there is a positive effect in general.

It is clear from the results, this conducts us to accept null hypothesis in meaning that there is positive impact of logistics on economic growth mainly affected by the public investment in telecommunication and network.

In conclusion, confirmed by our econometric analysis: an effective, implementing of a logistics system is the determining factor of sustainable economic growth, but only the level of income in the country does not explain all the different levels of logistics efficiency. Investment in quality improvement of logistics infrastructure and its contribution to economy are often questioned by politicians, investors and general public.

Although this is an interesting result it might be insightful to further specify the logistics development rate. It is likely that some components contribute to this positive effect, while others do not. For that, it can be considered as the next research intention that will give more insights on these issues.

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## Appendices

### Appendix 1: Data Set (1990-2017)

year	GDP	EXP	IMP	GLO index	GE	RAIL	AIR	MCS	INT user	TEL	POP	AGR	IND	SER	GCF	EMP
1990	62,045	23,44	24,93	23,6	22,3	2680	14,6	0,02	0,01	3,15	25,758	11,96	37,47	4,87	-1,7	44,18
1991	45,715	29,11	23,6	28,81	23,41	2704	24,3	0,018	0,01	3,35	26,4	10,93	42,7	9,46	-14,7	44,44
1992	48,003	25,32	23,86	27,91	25,19	2522	20,2	0,018	0,01	3,56	27,028	12,44	37,46	5,17	2,1	44,52
1993	49,946	21,78	23,13	28	25,4	2296	21,3	0,017	0,01	3,86	27,635	11,5	34,29	5,34	-3,2	44,82
1994	42,543	22,53	26,05	30,6	23,95	2279	24,2	0,005	0,01	3,98	28,213	10,31	35,78	4,96	0,5	45,04
1995	41,764	26,19	28,99	31,65	23,97	1946	21	0,016	0,01	4,09	28,757	10,38	37,94	4,64	3	45
1996	46,941	29,76	23,94	32,62	23,28	2139	16	0,04	0,01	4,37	29,266	11,34	40,26	5,7	3,5	44,94
1997	48,178	30,9	21,33	33,54	24,32	2023	16,8	0,059	0,01	4,71	29,742	9,32	41,78	6,55	0,8	44,57
1998	48,188	22,57	22,51	36,79	24,43	2174	18,8	0,06	0,02	4,89	30,192	12,23	34,9	7,29	3,3	44,21
1999	48,641	28,15	22,77	37,34	24,54	2033	15,4	0,235	0,2	5,22	30,623	11,11	45,36	7,3	2,7	43,98
2000	54,79	42,07	20,78	41,13	24,62	1980	12,65	0,277	0,49	5,67	31,042	8,4	54,37	6,6	6,3	43,57
2001	54,745	36,68	22,01	39,89	25,28	1990	18,35	0,318	0,65	5,98	31,451	9,75	50,1	7,83	5,4	43,31
2002	56,76	35,5	25,63	39,88	26,04	2247	17,89	1,413	1,59	6,12	31,855	9,22	49,18	8,05	8,4	43,08
2003	67,864	38,25	23,87	39,56	26,78	2038	19,09	4,485	2,2	6,45	32,264	9,81	50,83	7,82	4,3	42,87
2004	85,325	10,05	25,64	41,03	26,32	1945	21,44	14,935	4,63	7,61	32,692	9,44	52,3	7,74	8,2	42,69
2005	103,198	47,2	24,07	46,67	25,33	1471	31,62	41,21	5,84	7,76	33,149	7,69	57,33	8,89	8,1	42,54
2006	117,027	48,81	21,91	46,09	26,16	1429	23,69	62,48	7,38	8,45	33,641	7,54	58,89	8,82	6,2	42,01
2007	134,977	47,06	24,87	44,23	26,87	1424	16,57	80,671	9,45	8,98	34,166	7,57	57,68	8,78	10,1	42,29
2008	171,007	47,97	28,71	44,2	30,44	1562	16,99	77,82	10,18	8,84	34,74	6,59	58,62	7,63	12,4	42,19
2009	137,211	35,37	35,95	46,29	30,06	1184	14,32	92,63	11,23	7,29	35,333	9,34	47,2	8,86	8,8	42,12
2010	161,207	38,44	31,42	43,6	33,42	1281	15,91	91,113	12,5	8,12	35,977	8,47	50,49	7,93	7	42,36
2011	200,019	38,78	28,68	41,79	39,87	1248	14,83	97,148	14,9	8,34	36,661	8,11	49,63	7,5	2,9	42,51
2012	209,255	36,89	28,51	41,32	38,73	1253	14,93	100,385	18,2	8,8	38,14	8,77	47,86	7,59	7,2	42,68
2013	209,755	33,21	30,4	41,13	35,58	1254	17,5	103,61	22,5	8,21	38,923	9,85	44,25	9,13	5,6	43,68
2014	213,81	30,21	31,92	38,73	35,24	928	21,66	11,239	29,5	7,96	39,728	10,29	42,31	9,33	6,4	41,52
2015	165,979	27,17	36,52	38,78	34,46	1011	21,9	108,809	38,2	8,22	39,728	11,58	35,73	10,4	5,7	41,46
2016	160,13	20,86	35,03	37,66	32,95	885	21,59	116,004	42,95	8,4	40,551	12,21	34,74	10,67	3,5	41,41
2017	167,555	22,63	33,5	37,29	30,8	1009	24,8	110,707	47,69	9,91	41,389	12,27	37,24	10,97	3,4	41,37

Source: Global Economy