



AN ANALYTICAL ECONOMETRIC STUDY OF THE RELATIONSHIP BETWEEN EXPORT DIVERSIFICATION AND ECONOMIC GROWTH IN ALGERIA DURING THE PERIOD (1990–2023)

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Abstract:

The research seeks to assess and study the effects of export diversification on Algeria's economic growth from 1990 to 2023 by applying the Autoregressive Distributed Lag (ARDL) approach. The study also explores statistical trends in exports and economic growth to analyze their development throughout the examined timeframe.

The study confirms a long-run equilibrium relationship among the analyzed variables, demonstrating cointegration between them. Furthermore, the results indicate a one-way causality running from GDP growth to hydrocarbon exports. Additionally, non-hydrocarbon exports contribute positively to economic growth only in the long term, while hydrocarbon exports exhibit a statistically significant and favorable impact in both the short and long run.

Keywords: Economic growth, exports, hydrocarbon sector, ARDL model

JEL classification codes: F43, C21

Introduction:

The world has witnessed several economic transformations, marked by the emergence of a new global economic system based on the principle of regional economic and organizational blocs, founded on strengthening economic cooperation among nations. Resorting to foreign trade has become an essential necessity, regardless of the level of economic development. The impact of exports on economic growth

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has been a subject of study for many economists, highlighting the particular importance of export levels as a key indicator of economic growth rates. A trade surplus, as one of the drivers of growth, enables new investments, which in turn increase national income and raise living standards. This leads to improved economic indicators and social stability, particularly in reducing unemployment to achieve better and more sustainable growth.

Economic growth dynamics have been extensively examined through multiple academic lenses. A notable contribution by (Othmani, 2021) demonstrates that non-hydrocarbon exports exhibit only marginal positive contributions to economic expansion across both immediate and extended time horizons, primarily constrained by their modest share in total exports. In contrast, hydrocarbon exports display favorable short-term growth effects that eventually transition into negative consequences over prolonged periods. The study consequently proposes strategic policy interventions to stimulate non-hydrocarbon export sectors through targeted allocation of petroleum-derived fiscal surpluses, specifically channeling these resources into building industrial capacities with robust global competitiveness.

Similarly, the study by (Ziyoud & Boualchour, 2012) asserts that investment has a significant impact on exports, demonstrating that investment plays a meaningful role in explaining growth in merchandise exports. Increased investment leads to higher production, contributing to economic surpluses and enabling economies of scale. This, in turn, enhances domestic output, improves quality, and strengthens competitiveness in the global market. Consequently, it increases profits from foreign trade, raises gross domestic product (GDP), and ultimately achieves the desired objective: sustained economic growth.

Meanwhile, the study by (Muzaffar & Usman, 2012) concluded that there is a statistically significant positive relationship between exports, government expenditure, and education expenditure on economic growth. An increase of one unit in exports leads to a positive change of 17% in economic growth.

In the broader international context, (Hausmann, Hwang, & Rodrik, 2007) emphasized that the nature of exported products-especially more sophisticated ones-matters significantly in



determining long-run growth prospects. (Hesse, 2008) argued that export diversification is vital for developing countries to reduce vulnerability to external shocks and sustain growth. Likewise, (Olivier , Céline , & Vanessa , 2012) found that diversification initially boosts growth but must be accompanied by structural transformation to avoid stagnation. (IMF, 2014) highlighted that sustained long-term economic growth in resource-rich countries like Algeria requires deliberate efforts to diversify both production and exports. (Elhiraika& Michael , 2014), in a regional African context, underlined that investment in infrastructure and institutional capacity plays a central role in expanding the export base.

Therefore, to further clarify the idea regarding export diversification and its impact on economic growth, we raise the following research question:

What is the impact of export diversification on economic growth in Algeria during the period (1990–2023)?

This main question encompasses the following sub-questions:

- How have exports and economic growth evolved in Algeria during the period (1990–2023)?
- Is there a direct (positive) relationship between exports and economic growth in Algeria?

Before addressing these sub-questions, we formulated the following **hypotheses**, which we deem appropriate:

- The evolution of both exports and economic growth has gone through multiple and fluctuating phases.
- The relationship between exports and economic growth is direct (positive).

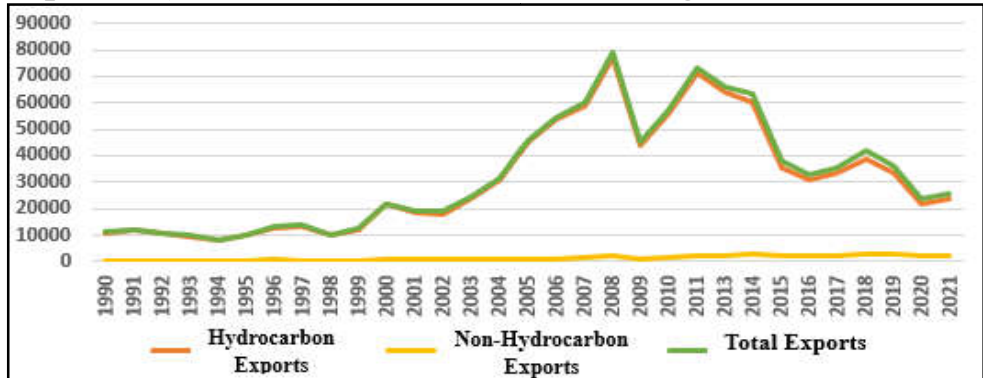
Significance of the Study:

The significance of this research lies in analyzing the effect of exports on economic development and their mutual relationship in Algeria. Additionally, this topic holds significant relevance in restructuring the export sector to diversify non-hydrocarbon exports as a long-term alternative policy. This is particularly crucial given that oil, as a finite primary commodity, is subject to fluctuations in international markets. The significance of this study is further amplified by Algeria's gradual shift toward trade liberalization to strengthen economic relations and foster local economic development.

The Reality of Exports in Algeria During the Period 1990-2021

Evolution of Exports in Algeria (1990-2021)

Figure N° 1: which illustrates the evolution of total exports, hydrocarbon exports, and non-hydrocarbon exports during the period (1990–2020), reveals the following observations:



Source: Compiled by the author using data provided by the National Statistics Office (ONS).

- Total exports in Algeria have shown a continuous increase, rising from 11,304 million USD in 1990 to 23,796.6 million USD in 2020. The peak was recorded in 2008 at 79,298 million USD, primarily due to the sustained rise in oil prices that year, with crude oil prices exceeding \$100 per barrel in early January 2008.
- 2009 witnessed a 43% decline in total exports as a result of falling average crude oil prices, with the price per barrel dropping to \$60.86. Exports rebounded in 2010 but declined again in 2012, 2013, 2014, 2015, 2016, 2019, and 2020. In the last year (2020), total exports fell by 33.75%, mainly due to a 35.20% drop in hydrocarbon exports, which accounted for the largest share at 90.52% of total export value.
- Non-hydrocarbon exports remain below 4.03%, their average contribution to total exports during the period (1990–2000). The year 1996 stands out as the only year when non-oil exports reached 6.58% of total exports (13,375 million USD), a result of Algeria's partial repayment of its external debt (d'Algérie, 2024).

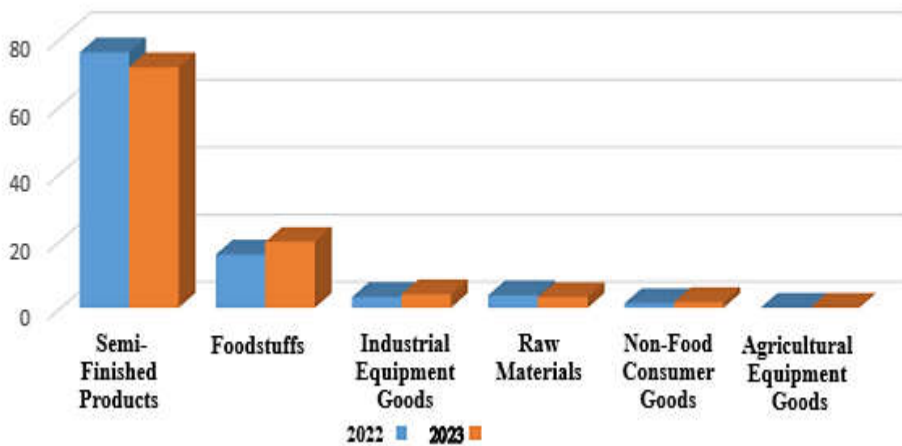


- The share of non-hydrocarbon exports in 2002 and 2003 was estimated at 3.38% and 3.89%, respectively. This weak performance stems from the fragility of the production system and the absence of a diversified and integrated industrial base capable of serving as an alternative to the oil sector. Despite authorities' target of reaching \$4 billion in non-hydrocarbon exports, the period (2000–2015) saw only modest recovery in non-hydrocarbon exports, albeit with low recorded ratios. This limited progress can be attributed to sectoral efforts, along with the implementation of the Economic Recovery Program and the Economic Growth Consolidation Program.
- Non-hydrocarbon exports remain marginal compared to 2018, accounting for just 7.20% of total export value (equivalent to \$2.58 billion in 2019). This represents a decline of 11.80%, followed by a further drop of 9.48% in 2020 (equivalent to \$2.26 billion).
- Non-hydrocarbon exports showed notable relative growth in the first eight months of 2021 compared to 2020, increasing by 1.18% to reach \$2.9 billion, up from \$1.34 billion in the same period of 2020. This positive outcome reflects the new direction of foreign trade policy outlined by the President of the Republic, aimed at diversification and gradual reduction of hydrocarbon dependency. It also underscores the efforts of public authorities in supporting exporters and removing obstacles they face (Douanes, 2020)

Commodity Structure of Algerian Exports:

As previously demonstrated, non-hydrocarbon exports constitute an extremely marginal proportion of total exports. To understand the value of goods exported by Algeria in international markets, we shall examine the commodity structure of exports from 1990 to 2021 through the following figure:

Figure N° 2: Commodity Structure of Non-Hydrocarbon Exports (2022-2023)



Source: Compiled by the author using data provided by the National Statistics Office (ONS).

The above figure (No. 2) illustrates percentage distributions of a group of goods, where semi-finished products dominate the structure of non-hydrocarbon exports, averaging over 50% (Statistique, 2024). This is natural given Algeria's reliance on hydrocarbons. The products within this category consist mainly of iron and electronic goods, plastics and rubber, oils and derivatives, paper, ammonia, and helium. These are followed by the food products group, which primarily includes pasta, sugar, and water, known for their quality. Meanwhile, the remaining four groups—raw materials and agricultural equipment, industrial capital goods, and non-food consumer goods—account for only 5.13% of total non-hydrocarbon exports. Published statistics from the World Bank (2024) indicate an increase in non-hydrocarbon exports to 6.87%. However, this percentage remains low, reflecting Algeria's near-total economic dependence on the hydrocarbon sector. Semi-finished products continue to hold the largest share of non-hydrocarbon exports, followed by food products, industrial capital goods, raw materials, non-food consumer goods, and agricultural equipment.

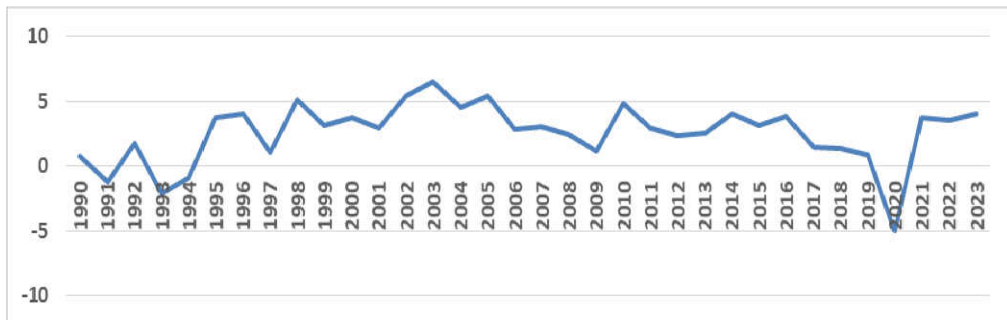


The remaining goods represent marginal or nearly negligible proportions (Ministry of Trade and Export Promotion, 2024)

The Evolution of Algeria's Economic Growth During the Period (1990–2023)

The Algerian economy has undergone several transformations, accompanied by the implementation of extensive economic reforms and measures. These reforms have affected all economic aspects, influencing the trajectory of economic growth rates, as illustrated in the following figure:

Figure N° 3: Evolution of Algeria's Economic Growth Rate During the Period (1990–2023)



Source: Compiled by the author using data provided by the National Statistics Office (ONS).

Figure No. (3) above illustrates that the economic growth rate exhibited very weak levels in the early 1990s, reaching 1.1% in 1990 and -1.2% in 1991, before peaking at 1.8% in 1992. This fluctuation was influenced by the decline in oil prices in 1986 and Algeria's transitional phase toward a market economy. By 1995, the economic growth rate rose to 3.8%, only to decline again to 1.1% in 1997, followed by a surge to 5.1% in 1998 before resuming its downward trend (d'Algérie, 2024)

These volatile growth rates were primarily attributed to the International Monetary Fund's structural adjustment program and the reduction in investment levels in Algeria during the 1990s, given that the country's growth remained heavily dependent on the hydrocarbons sector (Bank, 2024)

With the implementation of the Economic Recovery Support Plan (2001–2004), which aimed, among other objectives, to boost economic growth rates, Algeria witnessed a noticeable improvement in growth during this period, reaching 7.2% in 2003. This recovery was driven by increased growth in the hydrocarbons sector between 2001 and 2003 (with a peak growth rate of 8.1%). However, economic growth declined again to 4.3% in 2004. Overall, the achieved growth rates remained modest compared to previous years.

During the 2005–2009 period, the Complementary Growth Support Program was introduced to sustain the economic expansion initiated by the Economic Recovery Support Plan. Nevertheless, growth rates remained subdued, rarely exceeding 5%, as seen in 2005 (5.91%). By 2009, growth dropped sharply to 1.63% due to the decline in the annual average oil price to \$62 per barrel (down from around \$100 in 2008). This downturn was caused by reduced global demand for oil and gas following the 2007–2008 financial crisis, coupled with Algeria's OPEC-mandated production cuts.

Economic growth began recovering in 2010, rising from 1.63% in 2009 to 3.63%, maintaining this trend until 2014. The hydrocarbons sector continued to significantly influence overall growth, which saw a slight decline due to falling oil prices before improving to 3.76% in 2014. However, growth dipped again in 2016 (3.3%), and economic activity contracted sharply in 2017 (1.6%) due to a significant downturn in hydrocarbons production. In contrast, non-hydrocarbon growth remained relatively stable at 2.2% (Douanes, 2020)

In 2020, economic growth turned negative (-6.4%) due to the repercussions of the COVID-19 pandemic, which disrupted non-oil economic activities amid lockdown measures. The hydrocarbons sector also faced declining output levels, exacerbated by reduced global oil demand and Algeria's compliance with OPEC+ production cuts. Crude oil production fell by 12% in 2020, dropping to 1.023 million barrels per day.



By 2021, however, growth rebounded to around 4.1%, supported by government stimulus measures, particularly in the agriculture and agri-food sectors, which experienced substantial expansion

Econometric Modeling of the Impact of Export Diversification on Economic Growth in Algeria (1990-2021)

Model Specification and Variables Description

To analyze the effect of export diversification on Algeria's economic development from 1990 to 2021, we employed a function with economic growth as the dependent variable and three independent variables: non-hydrocarbon exports, hydrocarbon exports, and trade balance.

The model is specified as follows:

$$LY_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \varepsilon_t \quad t = 1990 - 2023$$

Where:

- **Hydrocarbon Exports (LX₁):** Primarily consisting of energy resources, with a single dominant commodity - hydrocarbons - which accounts for approximately 96% of Algeria's total export value. According to classical economic theory (Othmani, 2021), the relationship between hydrocarbon exports and economic growth is positive: increased hydrocarbon exports lead to higher economic growth rates.

- **Non-Hydrocarbon Exports (LX₂):** Comprising goods and services produced domestically and purchased by foreign residents. These exports are generally qualitative rather than quantitative in nature, encompassing both goods and services. Classical theory (Zahra, 2021) suggests a positive relationship between non-hydrocarbon exports and economic growth: as non-hydrocarbon exports increase, so does economic growth.

- **Trade Balance (LX₃):** Also known as net exports, representing the difference between a country's exports and imports over a given period. This indicator reveals whether a country has a surplus (exports > imports) or deficit (imports > exports). The relationship between trade balance and economic growth is positive: an improved trade balance correlates with higher economic growth.

All variables were transformed into logarithmic form to express variable elasticities and to achieve data homogenization for the time series variables (reducing their variances).

The dataset was sourced from two key references: the World Bank's World Development Indicators (WDI) and Algeria's National Statistical Office (ONS).

Stationarity of Time Series and Cointegration Testing

Before performing cointegration analysis among variables through the bounds testing method, we first verify that no time series is stationary at the second order or higher (integrated of order two or higher), as such results would be spurious. Moreover, the critical values of Pesaran et al. cannot be applied because the ARDL model is built on the assumption that variables are integrated of order $I(0)$ or $I(1)$.

Time Series Stationarity Testing:

This study employs the KPSS test (Kwiatkowski, Phillips, Schmidt, & Shi, 1992) To determine the stationarity of the research's temporal variables. This examination technique is expressly preferred in cases involving restricted observation numbers.

Table (1) displays the condensed outcomes of unit root testing for both level-form time series and first-differenced data.

Table N°1 :Results of Unit Root Tests for Variables Using KPSS Test

Variable	At Level		First Difference		Order of Integration
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	
LY	0.4502	0.109	/	/	$I(0)$
LX1	0.4001	0.11428	/	/	$I(0)$
LX2	0.6990	0.1520	0.1298	0.1028	$I(1)$
LX3	0.1851	0.1816	0.1101	0.0597	$I(1)$

Source: Created by the researcher through EViews version 12
As evidenced in Table (1), the unit root test outcomes demonstrate that the time series for two variables: Gross Domestic Product (LY) and hydrocarbon exports (LX1) are



stationary at level, meaning the time series are integrated of order one $I(0)$. On the other hand, the time series for non-hydrocarbon exports (LX2) and trade balance (LX3) are stationary at level, indicating they are integrated of order zero $I(1)$.

Based on these results, the most appropriate approach for analysis and conducting cointegration tests between the variables is the ARDL model, which accommodates this diversity in the integration orders of the variables.

Cointegration Testing Using the Bounds Testing Approach:

Before conducting bounds testing for cointegration analysis, the optimal lag structure for the Unrestricted VAR model must be established. (Klaus, 2016), multiple selection criteria were employed: the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Hannan-Quinn Criterion (HQ), along with the Adjusted R-squared value. The analysis utilized the Schwarz criterion for bounds testing, incorporating solely an intercept term with a maximum lag length of three periods. Table (2) presents these findings in summary form.

Table N°2 : Results of Cointegration Test Using the Bounds Test Approach

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	6.272669	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: Created by the researcher through EViews version 12.

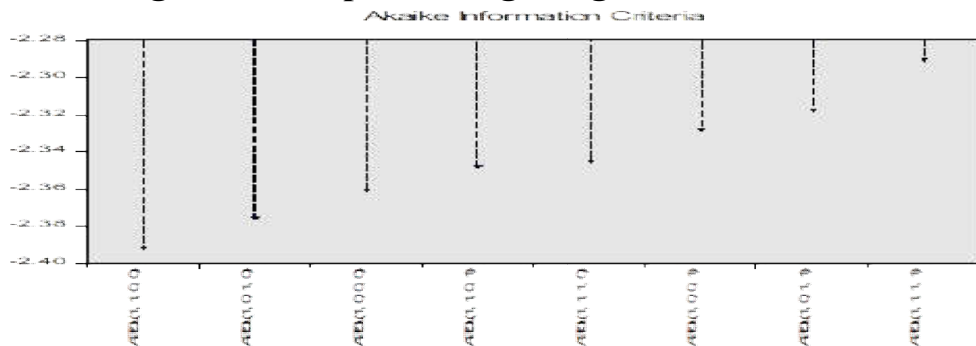
As evident from Table (2) above, the calculated F-statistic (6.27) exceeds the critical values proposed by Pesaran et al. (2001) at the 1% and 5% significance levels. However, these critical values cannot be relied upon in cases of small sample sizes (fewer than 80 observations), as in our study. Instead, we refer to the critical values provided by (Narayan, 2005), which are 3.56 at the 1%

significance level - values lower than our calculated F-statistic. Consequently, The null hypothesis of no cointegration between variables is rejected in favor of the alternative hypothesis, thereby verifying a stable long-run relationship exists among them.

Determining Optimal Lag Lengths for the Model

Having established the existence of a long-run equilibrium relationship, we now advance to the subsequent stage of ARDL analysis: the estimation of long-term coefficients. This process begins with lag length optimization employing the Akaike Information Criterion (AIC). The accompanying figure displays the selected optimal lags determined by minimizing this criterion. The results demonstrate that the optimal lag lengths according to the AIC are as follows: 1 for LY (GDP per capita), 1 for LX1 (hydrocarbon exports), 0 for LX2 (non-hydrocarbon exports), 0 for LX3 (trade balance). Thus, the selected ARDL model is specified as ARDL(1,1,0,0).

Figure N° 4: Optimal Lag Lengths for the Model



Source: Created by the researcher through EViews version 12.

Estimation of Long-Run and Short-Run Relationships

The results of estimating both long-run and short-run relationships can be summarized in the following tables:



**Table N°3 : Results of Long-Run Relationship Estimation for
the ARDL(1,1,0,0) Model**

Variables	Coefficient	Std.Error	t-Statistic	prob
LX ₁	0.546317	0.094029	5.810112	0.0000
LX ₂	0.211497	0.089013	2.376031	0.0258
LX ₃	0.010734	0.121083	0.088647	0.9301
C	0.918717	0.577817	1.589981	0.1249

Source: Created by the researcher through EViews version 12.

The tabular results demonstrate that both LX1 (log-transformed hydrocarbon exports) and LX2 (log-transformed non-hydrocarbon exports) yield coefficient p-values below the 0.05 threshold. Consequently, we reject H0 in favor of H1, confirming both variables' statistical significance at $\alpha=5\%$.

Furthermore, the analysis reveals that both LX3 (trade balance) and the constant term (C) produce coefficient p-values exceeding 0.05. We consequently maintain the null hypothesis (H0) while rejecting the alternative (H1), demonstrating these parameters' statistical insignificance at the 5% level. Accordingly:

- For the variable LX1: We observe that its sign is positive, indicating a direct relationship between LX1 and the dependent variable LY (GDP). A 1-unit change in hydrocarbon exports leads to a 0.546-unit change in GDP. Since LX1 is significant at 0.05, this means it has a positive long-term effect, contributing 54.63%.
- For the variable LX2: Similarly, its sign is positive, suggesting a direct relationship between LX2 and LY. A 1-unit change in non-hydrocarbon exports results in a 0.211-unit change in GDP. Given that LX2 is significant at 0.05, it also has a positive long-term effect, contributing 21.14%.
- For the variable LX3: Its sign is positive, implying a direct relationship between LX3 and LY. A 1-unit change in the trade balance leads to a 0.01-unit change in GDP. However, since LX3 is not statistically significant, it does not have a long-term effect.

Table N°4 : Results of the short-term relationship estimation for the ARDL(1,1,0,0) model.

Variables	Coefficient	Std.Error	t-Statistic	prob
D(LX1)	0.332680	0.045073	7.380847	0.0000
CointEq(-1)*	-0.389976	0.064469	-6.049014	0.0000

Source: Created by the researcher through EViews version 12.

The error correction model outputs reveal a statistically significant negative coefficient for CointEq(-1) ($p=0.000$), comfortably below the 5% significance threshold. Thus, the two necessary conditions are satisfied. These findings verify a short-run equilibrium relationship between the variables. The error correction coefficient of 0.3899 suggests 38.99% of any deviation is corrected per period, implying a full return to long-term equilibrium takes about 2.5 years ($1/0.3899$). This indicates an adjustment speed of 38.99% toward the steady-state relationship. Additionally, we observe that LX1 has a positive and statistically significant short-term effect, contributing 33.26%.

Granger Causality Test

To examine the causal relationship between GDP per capita (LY) and exports, we conducted the Granger causality test at this level. The findings of this analysis are displayed in the subsequent table:

Table N°5 : Granger Causality Test Results

Prob	F-Statistic	Null Hypothesis (H_0)
0.0009	13.7788	LX1 (Hydrocarbon exports) Granger-causes LY
0.1216	2.55510	LY does not Granger-cause LX1
0.8709	0.02691	LX2 (Non-hydrocarbon exports) does not Granger-cause LY
0.1272	2.47612	LY does not Granger-cause LX2
0.0079	8.23290	LX3 (Trade balance) Granger-causes LY
0.3107	1.06734	LY does not Granger-cause LX3

Source: Created by the researcher through EViews version 12.

From the table we conclude the main results



✓ Causality between GDP per capita (LY) and hydrocarbon exports (LX1):

Since the p-value for the first hypothesis ($LX1 \rightarrow LY$) is 0.000 (< 0.05), we reject H_0 and accept H_1 , concluding that changes in hydrocarbon exports Granger-cause GDP per capita. However, the p-value for the second hypothesis ($LY \rightarrow LX1$) is 0.12 (> 0.05), so we fail to reject H_0 , meaning that GDP per capita does not Granger-cause hydrocarbon exports. Thus, there is unidirectional causality running from LX1 to LY.

✓ Causality between GDP per capita (LY) and non-hydrocarbon exports (LX2):

The p-value for the first hypothesis ($LX2 \rightarrow LY$) is 0.870 (> 0.05), so we fail to reject H_0 , indicating that non-hydrocarbon exports do not Granger-cause GDP per capita. Similarly, the p-value for the second hypothesis ($LY \rightarrow LX2$) is 0.12 (> 0.05), so we fail to reject H_0 , meaning that GDP per capita does not Granger-cause non-hydrocarbon exports. Hence, no causal relationship exists in either direction.

✓ Causality between GDP per capita (LY) and the trade balance (LX3):

The p-value for the first hypothesis ($LX3 \rightarrow LY$) is 0.007 (< 0.05), so we reject H_0 and accept H_1 , concluding that changes in the trade balance Granger-cause GDP per capita. However, the p-value for the second hypothesis ($LY \rightarrow LX3$) is 0.31 (> 0.05), so we fail to reject H_0 , meaning that GDP per capita does not Granger-cause the trade balance. Thus, there is unidirectional causality running from LX3 to LY.

Diagnostic Tests for the Model

To verify the reliability of the model estimates, the following battery of diagnostic examinations should be performed :

3.6.1 Autocorrelation Test for Errors

The Breusch-Godfrey LM test will be implemented to identify potential autocorrelation in the residual series, using the following procedure:

Table N°6 : Results of the Breusch-Godfrey LM Test

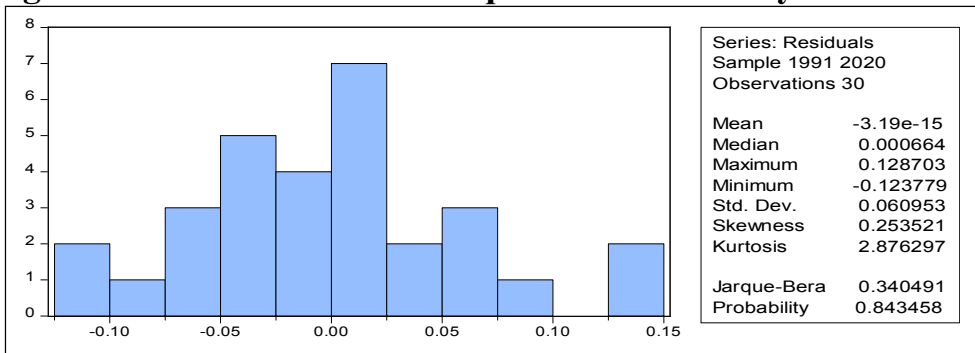
Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.168788	Prob. F(1,23)	0.6850
Obs*R-squared	0.218555	Prob. Chi-Square(1)	0.6401

Source: Created by the researcher through EViews version 12.

The tabulated results show a probability value (0.6850) exceeding the 0.05 significance threshold. We therefore retain the null hypothesis (H_0) while rejecting the alternative (H_1), confirming the absence of residual autocorrelation and validating the model's specification.

Test for Normality of Residuals

The Jarque-Bera test will be utilized to assess the subsequent hypothesis:

Figure N° 5: Results of the Jarque-Bera Normality Test

Source: Created by the researcher through EViews version 12.

The graphical output reveals a probability value (0.8434) surpassing the 5% significance threshold. Consequently, we accept H_0 while rejecting H_1 , confirming normally distributed error terms in our model specification.

Model Specification Test (Ramsey RESET Test)

The Ramsey RESET specification test assesses model formulation correctness by examining the null hypothesis of proper functional form. The tabulated outcomes appear below:



Table N°7 : Ramsey RESET Test Results

Ramsey RESET Test			
Equation: UNTITLED			
Specification: LY LY(-1) LX1 LX1(-1) LX2 LX3 C			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	1.776558	23	0.0889
F-statistic	3.156159	(1, 23)	0.0889

Source: Created by the researcher through EViews version 12. The tabulated results demonstrate that all Ramsey test p-values surpass the 0.05 threshold. Consequently, we retain H_0 while rejecting H_1 , confirming the model's functional form is properly specified.

Test for Heteroskedasticity

To detect potential heteroskedasticity in the residual series, we implement the ARCH diagnostic procedure. The test outcomes are displayed in the subsequent table:

Table N°8 :ARCH Test Results

Heteroskedasticity Test: ARCH			
F-statistic	5.623092	Prob. F(1,27)	0.1251
Obs*R-squared	4.998597	Prob. Chi-Square(1)	0.1154

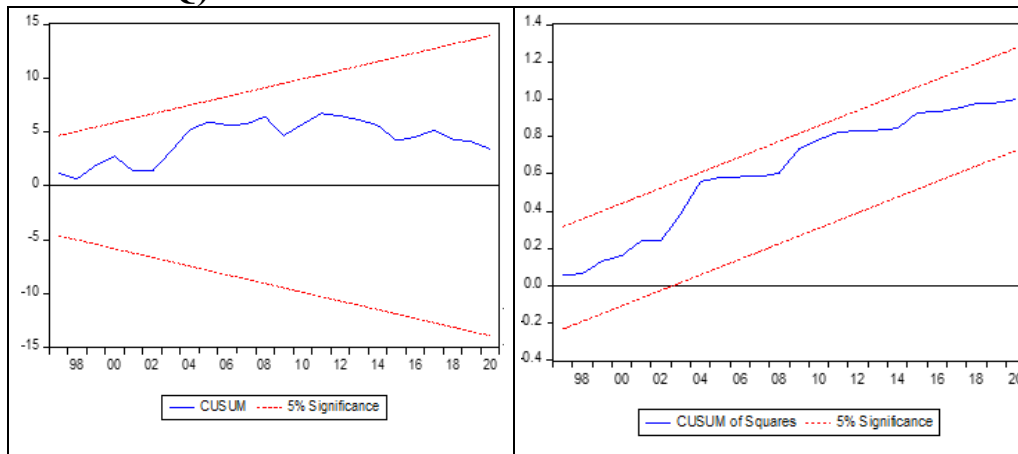
Source: Created by the researcher through EViews version 12. The tabulated results reveal a probability value (0.1251) above the 5% significance level, leading us to accept H_0 and reject H_1 . This statistical evidence confirms the presence of homoskedastic variance in the residual terms.

Model Stability Test

To verify the absence of structural breaks in the dataset employed in this study, Our diagnostic examination incorporates two validation procedures: the CUSUM (Cumulative Sum of Recursive Residuals) test along with its quadratic variant, the CUSUM Q (Cumulative Sum of Squares of Recursive Residuals) test. These tests represent the most robust methodologies for detecting structural instability in time-series data and for

examining the consistency between long-run and short-run parameters. The following figure presents the test outcomes:

Figure N° 6: Model Stability Test Results (CUSUM and CUSUM Q)



Source: Created by the researcher through EViews version 12.

The graphical output demonstrates that both CUSUM and CUSUM Q test statistics remain within their 5% critical boundaries, confirming model stability. This consistency between recursive residual analyses validates the equilibrium relationship between short-term dynamics and long-term equilibrium.

Conclusion

This investigation analyzed Algeria's export-economic growth relationship (1990-2021), incorporating both statistical examination of hydrocarbon and non-hydrocarbon export trends and econometric assessment of export impacts. The research produced these key outcomes:

- The Algerian economy was entirely dependent on oil exports during the study period.
- There are notable results reflecting the Algerian economy's attempts to reduce oil dependency through export diversification, particularly in the last three years.



- The analysis reveals one-directional causality running from hydrocarbon exports (independent variable) to GDP growth (dependent variable).
- The error correction term was found to be negative and statistically significant, fulfilling the two necessary conditions. This indicates a short-term equilibrium relationship among the study variables.
- While non-hydrocarbon exports demonstrate a positive influence on economic growth exclusively in the long-term context, hydrocarbon exports exhibit statistically significant positive effects in both short-term and long-term horizons.
- A positive relationship exists between GDP growth (as the dependent variable) and hydrocarbon exports, non-hydrocarbon exports, and the trade balance (as independent variables).

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