

The Impact of Renewable Energy on Economic Growth in Algeria: The Moderating Role of Oil Rent

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Abstract

This study aims to examine the impact of renewable energy consumption on economic growth in Algeria over the period 2000–2023, with particular emphasis on the moderating role played by oil rents in this relationship. Using an Autoregressive Distributed Lag (ARDL) model, the study finds that renewable energy consumption exerts a positive effect on economic growth in the short run, while this effect turns negative over the long run. Oil rents, meanwhile, are found to have a positive impact on economic growth. Furthermore, the results reveal a significant and positive effect of the interaction between renewable energy consumption and oil rents on long-run economic growth. These findings underscore the importance of channeling oil revenues toward investment in renewable energy, thereby supporting Algeria's path toward economic diversification.

Keywords: Renewable energy consumption; Economic growth; Oil rents; Interaction variable; Algeria; ARDL.

JEL Classification : Q42, O47, Q33, C22

Introduction

The world faces pressure to achieve a sustainable energy transition to reduce carbon emissions and combat climate change, making renewable energy a central pillar of modern development policies. Renewable energy is no longer viewed merely as an environmental alternative to traditional energy sources; it is now inextricably linked to energy security, the diversification of production sources, and the achievement of more sustainable economic growth. This transition is of particular importance to developing nations seeking to balance the demands of economic growth with the need to mitigate the environmental impacts of fossil fuel consumption. (Elbadri, Bsikre, Alamari, & Balcilar, 2023)

¹ Received: 10/02/2026 ; Accepted : 20/06/2026 ; Published : 16/08/2026

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This topic is particularly significant for oil-exporting developing countries in general, and for Algeria in particular, where economic performance is heavily tied to the hydrocarbons sector—rendering the economy vulnerable to fluctuations in international oil and gas prices. Furthermore, continued reliance on hydrocarbon resources poses a challenge to diversifying growth sources and developing alternative economic sectors capable of generating sustainable value added. Literature concerning Algeria indicates that economic activity and energy consumption are closely linked to a production structure based on traditional energy sources

(Bouznit, Pablo-Romero, & Sánchez-Braza, 2023). In this context, Algeria has recently moved to strengthen its commitment to developing renewable energy particularly solar power leveraging its vast natural potential in this field. The development of renewable energy sources is viewed as a viable pathway to diversifying the energy mix and alleviating the pressures associated with heavy reliance on hydrocarbons. Expanding investment in renewable energy can also contribute to infrastructure development, stimulate investment, create jobs, and enhance technological capabilities—factors that may positively impact long-term economic performance (Tayeb & Bougueroua, 2021).

Economic studies indicate that the relationship between renewable energy consumption and economic growth is not uniform across different economies; the nature of this relationship varies depending on the level of development, energy structure, volume of investment, and technological capabilities. Regarding the Algerian economy, some studies have identified a long-term relationship between renewable energy and economic growth, though the direction and magnitude of the impact vary according to the time period and econometric methodology employed. While some results show a positive impact of renewable energy on growth, other studies have found a negative or statistically insignificant effect. This lack of consensus underscores the need for further empirical analysis within the Algerian context (Belabiod & Brahimi Benharrath, 2026) (Bouriche & Belarbi, 2026).

In rentier economies, the impact of renewable energy on economic growth may not be independent of available oil resources, as oil rents can play a dual role in the energy transition process. On one hand, oil revenues can provide the financial resources needed to fund investments in renewable energy infrastructure, upgrade electricity grids, and support clean energy innovation and technology. On the other hand, continued reliance on hydrocarbon resources may weaken incentives to diversify the energy mix, particularly when oil revenues and traditional energy sources remain the primary drivers of economic activity (Kahoui & Sahed, 2025).

In this context, this research paper aims to analyze the impact of renewable energy consumption on economic growth in Algeria, focusing specifically on the role that oil rents may play in moderating this relationship. The study's primary contribution lies in shifting from an analysis of the direct impact of renewable energy consumption to an examination of the interactive effect between renewable energy consumption and oil rents; this allows for determining whether high levels of oil rents enhance or diminish the contribution of renewable energy to economic growth. Accordingly, the study's research problem centers on the following main question:

What is the impact of renewable energy consumption on economic growth in Algeria, and do oil rents moderate this impact through their interactive role during the 2000–2024 period?

To address the research problem, the following main hypotheses are formulated:

H₁: There is a statistically significant effect between renewable energy consumption and economic growth in Algeria during the period 2000–2024;

H₂: There is a statistically significant effect between oil rents and economic growth in Algeria;

H₃: Oil rents moderate the relationship between renewable energy consumption and economic growth in Algeria during the period 2000–2024.

1- Literature Review

The relationship between renewable energy consumption and economic growth has garnered increasing attention from researchers; however, research findings have varied depending on the nature of the economies studied and the econometric methodologies employed. Most of these studies have found that energy serves as a fundamental input in the production process and that expanding the use of renewable energy sources can support growth by providing a sustainable energy supply, stimulating investment and innovation, and mitigating risks associated with oil price volatility.

This aligns with the study by (Wahyudi & Palupi, 2023), which examined the relationship between renewable energy, investment, and economic growth in ASEAN countries using a Vector Error Correction Model (VECM). They identified a long-term relationship among the variables and concluded that renewable energy consumption contributes positively to economic growth in the long run. This result supports the perspective that renewable energy is an input capable of boosting economic activity, particularly when accompanied by investments in infrastructure and the energy sector.

In another study, (Karacan & al, 2021) analyzed the impact of oil prices on the transition toward renewable energy consumption in Russia between 1990 and 2015, utilizing the Vector Error Correction Model (VECM) and the Canonical Cointegrating Regression (CCR) method. The results indicated that rising oil prices negatively affect renewable energy consumption; this can be attributed to the fact that the complacency resulting from high oil revenues delays the shift toward clean energy sources. The study also demonstrated a positive and significant impact of real per capita income on renewable energy consumption.

In a similar context, (Mukhtarov & al, 2022) examined the impact of rising oil prices, CO₂ emissions, and income on renewable energy consumption in Iran from 1980 to 2019, employing the General-to-Specific (GETS) methodology. The results revealed that both oil prices and CO₂ emissions had a statistically significant negative impact on renewable energy consumption, whereas income showed no significant effect. The researchers attributed this finding to the fact that the satisfaction derived from high oil prices delays the transition from conventional to renewable energy sources—a conclusion consistent with findings from the Russian case. For oil-exporting nations, this relationship holds even greater significance; the shift from conventional to renewable energy sources represents not merely an environmental transition but potentially a component of a broader strategy to diversify the economy and reduce reliance on hydrocarbon resources. In this regard, a study by (Alnsour & Alnsour, 2025) demonstrated that natural resource rents foster economic growth in Gulf Cooperation Council (GCC) countries, thereby supporting Rostow's hypothesis. While renewable energy was also found to positively influence economic growth, the study detected no impact of renewable energy on natural resource rents, suggesting a relative independence between the two trajectories despite their complementary roles in driving growth.

Furthermore, a study by (Agboola, Bekun, & Joshua, 2021) focusing on Saudi Arabia highlights the importance of incorporating oil rents into the analysis of the relationship between energy, growth, and the environment. Research has examined the long-term relationship between economic growth, energy consumption, oil rents, natural resources, and CO₂ emissions, revealing a long-term equilibrium relationship among these variables; this confirms that oil rents cannot be separated from the analysis of growth and energy consumption in oil-based economies.

A study by (Mahmood & Saqib, 2022) investigated the asymmetric effects of oil rents on CO₂ emissions across 13 OPEC member countries. It demonstrated that the impact of oil rents varies depending on the direction of the shock (increase or decrease) and the specific characteristics of each country, illustrating that the impact of oil resources is not uniform and that the nature of the relationship depends on each country's economic and institutional characteristics. Additionally, a study by (Matallah & al, 2023) on oil-producing countries in the Middle East and North Africa (MENA) region provided significant evidence regarding the varying impact of oil rents on renewable energy development based on the nature of the economy. Covering eight oil-producing nations from 1996 to 2020 and employing cointegration tests, FMOLS, DOLS, and Granger causality analysis, the study found that oil rents had a negative impact on renewable energy generation in non-Gulf countries, whereas the impact was positive and significant in Gulf Cooperation Council (GCC) countries. The study also indicated that combining good governance with oil revenues could accelerate renewable energy development.

Additionally, (Baudino, 2024) examined the relationship between oil rents and renewable energy consumption in OPEC+ countries during the 1999–2019 period. The researcher employed Dynamic Panel Threshold and GMM models, alongside moderated regression analysis, to examine whether the level of financial development alters the impact of oil rents on renewable energy consumption. The results revealed that oil rents negatively affect renewable energy consumption, with this negative impact becoming more pronounced at specific levels of financial development. Furthermore, the study concluded that the findings do not strongly support the hypothesis that oil revenues automatically translate into renewable energy investments, highlighting the significant influence of pressures and vested interests associated with the oil sector.

Additionally, (Solangi & Magazzino, 2025) provided evidence regarding the relationship between effective natural resource management, renewable energy investment, and economic stability in Gulf Cooperation Council (GCC) countries. Their study emphasized that combining prudent management of natural resource revenues with expanded investment in renewable energy can foster long-term economic stability, reinforcing the notion that resource rents are not necessarily a barrier to the energy transition, provided they are accompanied by appropriate institutional policies.

Regarding Algeria, a study by (Amri, 2017) examined the relationship between renewable and non-renewable energy consumption and Gross Domestic Product (GDP) from 1980 to 2012. The results showed no significant long-term impact of renewable energy consumption on economic growth—unlike non-renewable energy and capital, which contributed significantly. However, causality tests revealed a unidirectional relationship running from renewable energy consumption to economic growth, capital, and non-renewable energy in the long run.

In another study, (Elbadri, Bsikre, Alamari, & Balcilar, 2023) re-examined the relationship between renewable energy consumption, economic growth, and CO₂ emissions in Algeria (1990–2018) using the Fourier-Bootstrap ARDL model. The study confirmed a long-term relationship among the variables and demonstrated that the interplay between renewable energy, growth, and the environment in Algeria is influenced by the economy's structural characteristics and transformations within the energy system. This study is particularly significant as it highlights the ongoing lack of consensus regarding the relationship between renewable energy and economic performance in Algeria.

Additionally, a study by (Tayeb & Bougueroua, 2021) investigated the relationship between renewable electricity generation, oil prices, and economic growth in Algeria (1990–2016) using cointegration tests and the Vector Error Correction Model (VECM). The results indicated that oil prices positively influence renewable energy production in both the short and long term, suggesting the potential to utilize revenues from the oil sector to finance renewable energy development. This result provides a significant basis for the idea that the relationship between oil and renewable energy is not necessarily competitive; rather, it can be complementary under certain circumstances.

In a recent study, (Kahoui & Sahed, 2025) examined the relationship between renewable energy use, CO₂ emissions, oil production and prices, and sustainable economic growth in Algeria from 2000 to 2023, employing an ARDL model. The study confirms the enduring pivotal role of conventional energy and oil in explaining Algeria's economic performance, reflecting the difficulty of decoupling the economic growth trajectory from a hydrocarbon-based energy structure.

A review of existing literature reveals that most studies have focused on the bilateral relationship between renewable energy and economic growth, or between hydrocarbon rents and economic growth, without integrating these variables into a unified model; furthermore, they have largely been limited to estimating the direct effects of renewable energy or oil rents. Consequently, this study aims to bridge these gaps by incorporating an interaction term between renewable energy consumption and oil rents to test whether the level of oil rents modifies the impact of renewable energy consumption on economic growth—specifically, whether it enhances that contribution by providing the resources necessary for investment and the energy transition, or weakens it due to continued reliance on the hydrocarbon sector.

2- Methodology and Tools

2-1-Study Methodology and Variables

This study employs an econometric approach to examine the relationship between renewable energy consumption and economic growth, as well as the interactive determinant illustrating the moderating role of oil rents in this relationship within Algeria. This is achieved by applying the ARDL methodology through a series of tests and analyses, following these steps (Pesaran, Shin, & Smith, 2001) :

- Testing time-series stationarity;
- Testing for cointegration using the Bounds Test approach;
- Estimating the long-run model using the ARDL framework.

The model variables were selected based on economic theory and insights from prior studies on the subject. The dependent variable is GDP per capita (denoted as GDP), reflecting the level of economic activity. The explanatory variables include: renewable energy consumption as a percentage of total final energy consumption (denoted as REC), measuring the economy's reliance on renewable energy sources; oil rents as a percentage of GDP (denoted as OILR), reflecting the significance of oil revenues to the Algerian economy data sourced from (worldbank, 2026) and finally, an interaction term between renewable energy and oil rents (denoted as REC_OILR) to determine whether oil rents alter the strength or direction of the impact of renewable energy on economic growth.

2-2-Correlation Analysis of Explanatory Variables

We conducted the Variance Inflation Factor (VIF) test; the following table presents the results:

Table (01): Multicollinearity Test

Variables	VIF	1/VIF
REC	1.772	0.5643304
OILR	1.728	0.5787037
REC_OILR	1.036	0.9652509

Source: Prepared by the researchers based on outputs from the Gretl software.

The VIF test results for all variables show values not exceeding 10, indicating that the model does not suffer from multicollinearity (i.e., there is no multicollinearity issue among the variables); consequently, no variable will be excluded.

2-3-Time Series Stationarity Test

Examining the stationarity of the study variables is a fundamental prerequisite for proceeding with the analysis, as it allows for determining the order of integration for each variable using the Augmented Dickey-Fuller (ADF) test. Table (02) presents the test results and model specifications; the variables must be integrated of order I(0), I(1), or a mixture of both.

Table (02): Augmented Dickey-Fuller (ADF) test results for the time series under study.

Serie	Level			1stdifference			
	ADF Calculated	ADF Tabulated	Proba	ADF Calculated	ADF Tabulated	Proba	
GDP	-3.0609	-2.9918	0.0434	-3.2247	-2.9980	0.0314	I(0)
REC	-2.7156	-3.6121	0.2394	-7.1481	-3.6220	0.0000	I(1)
OILR	-2.1153	-3.6121	0.5119	-4.7799	-3.6220	0.0046	I(1)
REC_OILR	-2.6930	-3.6121	0.2476	-5.4685	-3.6220	0.0010	I(1)

Source: Prepared by the researchers using EViews 13 software.

The table above presents the results of the unit root test using the Augmented Dickey-Fuller (ADF) test. The results indicate that the GDP time series is stationary at the level, as evidenced by a p-value (0.0434) less than 0.05 and a calculated value ($T_{cal} = -3.0609$) exceeding the critical value in absolute terms ($T_{tab} = -2.9918$). Consequently, the null hypothesis (H_0) positing the existence of a unit root is rejected, and the alternative hypothesis (H_1) positing stationarity at level I (0) is accepted.

In contrast, the REC, OILR, and REC_OILR time series were found to be non-stationary at the level; their p-values exceeded 0.05 (0.2394, 0.5119, and 0.2476, respectively), and their calculated values were lower than

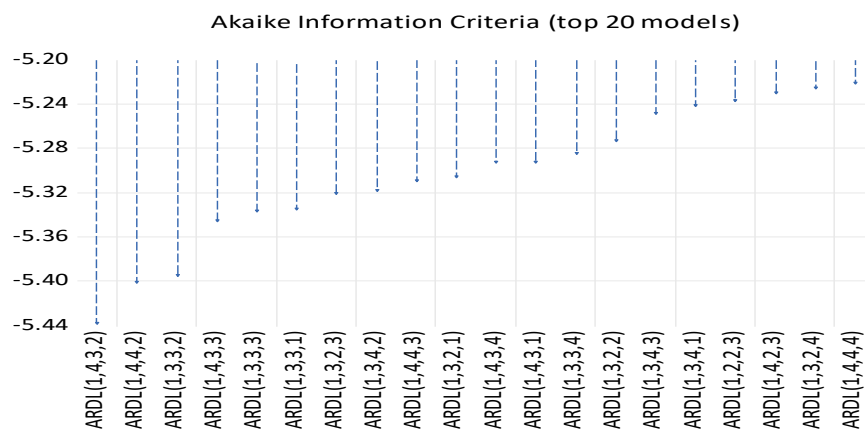
the critical values in absolute terms, meaning the null hypothesis could not be rejected at the level. However, after taking the first difference, all three series became stationary: p-values fell below 0.05 (0.0000, 0.0046, and 0.0010, respectively), and calculated values exceeded critical values in absolute terms. This leads to the rejection of the null hypothesis and the acceptance of the alternative hypothesis, confirming that these series are stationary at the first difference, I (1).

Given that the test results reveal varying degrees of integration—specifically I(0) and I(1) with no series integrated of order two, I(2), the use of the ARDL Bounds Testing approach for cointegration is justified, thereby enabling us to proceed with the ARDL model analysis.

• Selection of Optimal ARDL (p,q) Lag Lengths

The Akaike Information Criterion (AIC) was used to determine the lag lengths. It was found that the optimal lag structure for the model is ARDL (1,4,4,4) specifically, a lag of 1 for the dependent variable (GDP). The following figure illustrates this:

Figure (01): Optimal Lag Length Test



Source: EViews 13 program outputs

2-4 Cointegration test using the Bounds Test approach

After determining the appropriate model specification, the long-run cointegration relationship is examined using the Wald test, as presented below:

Table (03): (Bounds Test)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.328458	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: EViews 13 program outputs

The bounds test results indicated that the F-statistic (3.328458) falls between the lower and upper bounds at the 10% and 5% significance levels, rendering the result inconclusive on its own. However, the error correction term (ECM) was negative and statistically significant (0.0014), supporting the existence of a long-run equilibrium relationship among the variables. Furthermore, we estimated the long-run coefficients, yielding the following results:

Table (04): Long-run cointegration coefficient estimates

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
REC	-0.561408	0.063113	-8.895231	0.0000
OILR	0.008956	0.001595	5.614935	0.0008
REC_OILR	0.017040	0.005525	3.083917	0.0177
C	8.379290	0.016828	497.9458	0.0000
EC = GDP - (-0.5614*REC + 0.0090*OILR + 0.0170*REC_OILR + 8.3793)				

Source: EViews 13 program outputs

Table (05): Short-run cointegration coefficient estimates

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REC)	0.128759	0.051866	2.482515	0.0421
D(REC(-1))	0.749082	0.182095	4.113684	0.0045
D(REC(-2))	0.412559	0.127980	3.223632	0.0146
D(REC(-3))	0.109691	0.071744	1.528925	0.1701
D(OILR)	0.003765	0.001015	3.708095	0.0076
D(OILR(-1))	-0.005087	0.001366	-3.724578	0.0074
D(OILR(-2))	-0.002652	0.001073	-2.472053	0.0427
D(REC_OILR)	0.004239	0.003785	1.119877	0.2997
D(REC_OILR(-1))	-0.009611	0.004903	-1.960337	0.0908
CointEq(-1)*	-1.254885	0.245386	-5.113919	0.0014

Source: EViews 13 program outputs

From the two tables above, we observe that the probability values for both the constant and the stationary variables exceed 0.05. Consequently, the coefficients are statistically significant, supporting the earlier finding of cointegration among the variables under study. The results also indicate a short-run dynamic relationship between the variables; the estimated error correction term is negative and statistically significant (CointEq(-1) = -1.2548), with a p-value of 0.0014 (below the 5% threshold). This term measures the proportion of disequilibrium in the dependent variable corrected from one period to the next specifically 125.4% implying that if a deviation from equilibrium occurs, a return to the long-run equilibrium level takes approximately six months.

2-5- Model Diagnostic Tests

Several tests were conducted to verify the performance quality of the selected model, as follows:

- **Error Autocorrelation Test (LM Test):**

To ensure the absence of autocorrelation, we employed the Breusch-Godfrey serial correlation LM test; the results are presented in the following table:

Table (06): Results of the Error Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.192568	Prob. F(1,6)	0.3167
Obs*R-squared	3.481917	Prob. Chi-Square(1)	0.0620

Source: EViews 13 program outputs

From this table, we observe that the Prob(F-stat) is 0.3167 (greater than 0.05) and the Prob (Chi-Square (1)) is 0.0620 (greater than 5%). Therefore, we accept the null hypothesis of no residual autocorrelation and reject the alternative hypothesis; consequently, there is no autocorrelation problem.

- **Test for Error Variance Stability:**

To detect heteroskedasticity, we use the ARCH Heteroskedasticity Test; the results are shown in the following table:

Table (07): Results of the heteroskedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.465232	Prob. F(13,7)	0.8892
Obs*R-squared	9.733920	Prob. Chi-Square(13)	0.7155
Scaled explained SS	0.783200	Prob. Chi-Square(13)	1.0000

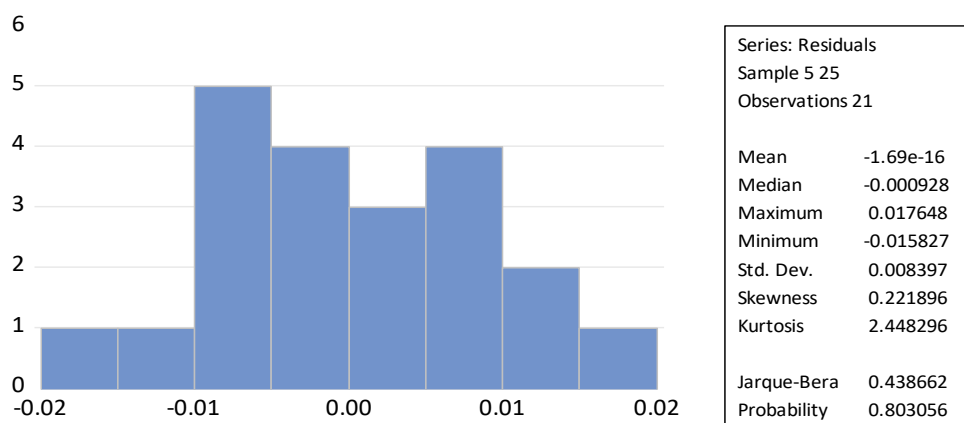
Source: EViews 13 program outputs

From the table above, we observe that the p-value for the F-statistic is 0.8892, which is greater than 5%. Consequently, the null hypothesis is accepted and the alternative hypothesis is rejected; this indicates the absence of heteroscedasticity (non-constant error variance) in the model.

- **Normal distribution of residuals:**

The Jarque-Bera test is used to verify the normality assumption. The test result was non-significant ($\alpha > 0.05$), confirming that the residuals follow a normal distribution. Specifically, the Jarque-Bera statistic is 0.4386 with a p-value of 0.8030 (which exceeds 0.05); thus, the null hypothesis is accepted, confirming that the model's residuals are normally distributed, as illustrated in the following figure.

Figure (02): Normal distribution of residuals



Source: EViews 13 program outputs

- **Test for Functional Form Specification:**

The validity of the estimated model's specification and design (functional form validity) is tested using the Ramsey test. The null hypothesis states that the functional form is correctly specified.

Table (08): Ramsey Test Results

	Value	df	Probability
t-statistic	1.506655	6	0.1826
F-statistic	2.270010	(1, 6)	0.1826

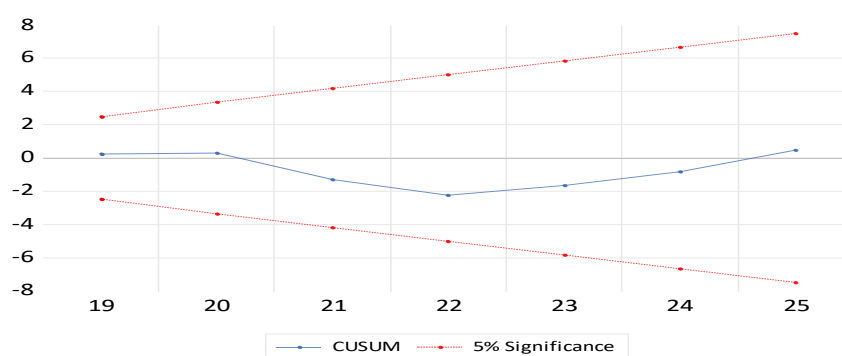
Source: EViews 13 program outputs

The table shows that the Ramsey test (Fisher) probability value (prob = 0.1826) is greater than 5%; therefore, we accept the null hypothesis, indicating the validity of the model's functional form.

- **Structural Stability Test for Model Parameters (CUSUM and CUSUM of Squares):**

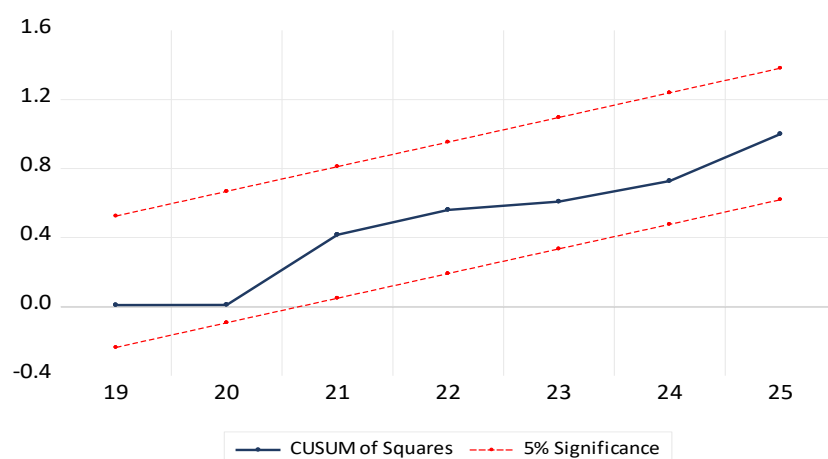
The model is observed to be stable, as the plots for both the CUSUM test and the CUSUM of Squares test remain within the critical bounds at the 0.05 significance level.

Figure (03) : CUSUM Test



Source: EViews 13 program outputs

Figure (04): (CUSUM of Squares) Test



Source: EViews 13 program outputs

Discussion of Results

An analysis of the results reveals that the impact of renewable energy consumption and oil rents on economic growth differs between the short and long terms. This reflects the specific structure of the Algerian economy

which relies heavily on the hydrocarbons sector as well as the limited contribution of renewable energy to economic activity during the study period.

In the long term, the results indicate a statistically significant coefficient of -0.561408 for renewable energy consumption; specifically, a 1% increase in renewable energy consumption leads to a 0.5614% decrease in GDP, suggesting a negative impact on economic growth. This result can be attributed to the specific nature of Algeria's energy transition phase: renewable energy projects often require high initial investments, specialized technology, and specific infrastructure, yet their contribution to production and economic activity remains limited compared to the hydrocarbons sector. Furthermore, the result may reflect the fact that transitioning from a model primarily reliant on fossil fuels to one more dependent on renewable energy does not necessarily generate immediate positive economic effects in the long run unless accompanied by the development of local production capacities and value chains associated with renewable energy. Conversely, in the short term, there is a positive and statistically significant impact of renewable energy consumption on economic growth, with an impact coefficient of 0.128759; this positive and significant effect persists regarding changes lagged by one and two years. This can be explained by the fact that expanding renewable energy use may stimulate economic activity through investment in energy infrastructure, the development of solar projects, and the creation of demand for equipment, services, and labor associated with the sector. Furthermore, the delayed manifestation of the impact may reflect the gradual nature of renewable energy projects, which require time to reach the operational stage and for their effects on economic activity to materialize. As for oil rents, they demonstrated a positive and significant long-term impact with a marginal coefficient of 0.0089 meaning a 1% increase in oil rents leads to a 0.0089% increase in GDP. Consequently, rising oil rents provide financial resources that can fund public spending, investment, and infrastructure, thereby driving economic growth and confirming that oil rents remain the primary engine of Algerian economic activity. In the short term, the impact of oil rents was also positive and significant (coefficient of 0.0037), whereas the coefficients for lagged oil rents turned negative and significant. This result may reflect the nature of the Algerian economy, which benefits from immediate increases in oil revenues through government spending and investment, while subsequently experiencing effects linked to revenue volatility and heavy reliance on the hydrocarbons sector. Thus, the immediate positive impact of oil rents does not necessarily imply that continued reliance on them constitutes a sustainable growth path, particularly given the need to diversify the productive base. It is also observed that the interaction variable between renewable energy consumption and oil rents with a coefficient of 0.01704 was positive and statistically significant (p -value = 0.0177, which is below the 5% significance level). Consequently, a one-unit increase in oil rents leads to a 0.017040 increase in the marginal effect of renewable energy consumption (REC) on GDP. This indicates that oil rents play a moderating role in the relationship between renewable energy consumption and economic growth. This result offers a significant explanation for the nature of this relationship within the Algerian economy, as resources derived from the oil sector can provide the necessary funding to develop renewable energy projects, improve infrastructure, and import technology and equipment, thereby allowing a portion of oil revenues to be channeled into clean energy investments. From this perspective, oil rents appear in the model not merely as a direct source of growth, but as a factor capable of altering the relationship between renewable energy and economic activity. In the short run, however, the lack of statistical significance for the interaction term suggests that the moderating role of oil rents does not manifest with the same strength; rather, time is required for oil resources to translate into investments and projects linked to renewable energy.

Finally, the error correction coefficient $CointEq(-1)$ was found to be -1.254885 with a p -value of 0.0014, indicating that it is both negative and statistically significant. This result points to the existence of an adjustment mechanism for deviations from the equilibrium path within the model, characterized by a high speed of adjustment. However, the fact that the absolute value of the coefficient exceeds unity suggests the possibility of an overshoot of the equilibrium path before stability is reached.

Conclusion

This research paper analyzed the impact of renewable energy consumption and the moderating effect of oil rents on Algeria's economic growth from 2000 to 2023, incorporating an interaction variable. Augmented Dickey-Fuller (ADF) test results indicated that the time series for the variables were stationary at both the

level and first difference, thereby allowing for the application of the ARDL cointegration model. A long-run equilibrium relationship was identified among the variables, confirmed by the statistical significance and negative sign of the error correction term. Renewable energy consumption had a positive and significant impact in the short run, whereas its impact was negative and significant in the long run. Oil rents were found to be positively associated with economic growth, and the interaction term between oil rents and renewable energy consumption showed a positive and significant long-run effect, highlighting the importance of oil rent levels in shaping the relationship between renewable energy and economic growth a finding that reflects the persistent rentier nature of the Algerian economy.

Consequently, enhancing the contribution of renewable energy to economic growth requires leveraging oil resources to finance productive and sustainable investments, while simultaneously developing a more diversified economic base that is less dependent on hydrocarbons. Based on these findings, we propose several recommendations, including: directing a portion of oil revenues toward financing renewable energy projects particularly solar energy initiatives; encouraging investment in the infrastructure and technological capabilities associated with renewable energy production and utilization; fostering economic diversification to gradually reduce reliance on the hydrocarbons sector; channeling oil revenues into productive, sustainable investments that enhance the renewable energy sector's contribution to economic activity; and promoting public-private partnerships for the financing and implementation of renewable energy projects.

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