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The Role of Investment Spending in Boosting Non-Hydrocarbon GDP An Econometric Study for the Period 2000/2023

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Abstract:

With its large oil-related budget surpluses, Algeria adopted an expansionary policy to rekindle investment dynamism as part of a broader long-term strategy. The approach would boost Algeria's absorptive efficiency and restore macroeconomic indices.

The aim of this study is to examine the impact of investment spending on non-hydrocarbon GDP during the period 2000-2023, focusing on the short- and long-term relationship using the ARDL model. The findings revealed the existence of equilibrium in both the short and long term, with no evidence of autocorrelation in the model's residuals, indicating the stability of the estimates over time.

Keys words: Public Investment, Non-Hydrocarbon GDP, ARDL model, Algeria.

JEL classification codes: H54, O41, C51, O55.

1-Introduction

Many governments have revised their economic policies to accommodate the new requirements for economic growth, with developing nations being the most vocal in this regard. Among these, Algeria stands out due to its economy's extreme reliance on foreign markets caused by export mono-dependence. Focusing on fundamental industries and the hydrocarbons sector, the Algerian economy aimed to enhance growth rates during the 1970s and 1980s. But Algeria's reliance on hydrocarbon export revenues—whose prices fluctuate for reasons beyond the country's control—and the constraints of state resources were laid bare by the 1986 oil crisis. Government spending was severely constrained as a result of the unpredictability of these revenues. Because of this, in the 1990s, the government had to implement structural adjustment measures.

As the new millennium began and oil prices rose, Algeria vowed to make the most of its economic resources, especially those unrelated to hydrocarbons. That goal was accomplished when Algeria adopted Keynesian policies to raise standards of living in many areas of the economy and society, including but not limited to healthcare, education, leisure, and services. The administration also aimed to encourage exports of goods and services other than hydrocarbons and to restore and reinvigorate state firms. It also lowered unemployment rates and made it easier to attract large amounts of foreign direct investment, both of which increased productivity. Though little in comparison to the massive spending and allocations incorporated into Algeria's economic recovery plans since 2000, these endeavors did produce noticeable results when compared to the 1990s.

This study's overarching goal is to answer the following research question about Algeria's non-hydrocarbon GDP and investment spending (economic recovery programs):

Is there any correlation between investment spending and the growth of Algeria's non-hydrocarbon GDP from 2000 to 2020?

The following hypothesis was developed to meet the research challenge of the study:

Whenever investment spending in Algeria changes, the country's non-hydrocarbon GDP follows suit.

The Goals of the Study:

The following goals are intended to be accomplished by the study:

Draw attention to the non-hydrocarbon industries' impact on Algeria's gross domestic product.

Determine how investment spending in Algeria affects GDP from sectors other than hydrocarbons.

Study Design: This study used a quantitative technique to examine the effect of investment expenditure on Algeria's non-hydrocarbon GDP from 2000 to 2020 in order to answer the research question and cover all the bases. The ARDL model and EViews 12 software were used for analysis in the study.

Research Done Before:

Research by Zouhir Amari and colleagues (2021):

For the years 1980–2019, this research used the ARDL model to analyze how the economic diversification index affected non-hydrocarbon growth in Algeria. The results demonstrated that diversifying the economic base was a short-term strategy with moderate development, marked by decreasing returns, and did not substantially increase non-hydrocarbon growth in the long run. The report suggested using oil profits to fund the creation of long-term industries that do not need oil as a raw material. (Amari, Saadoun, & Boutiara, 2021).

- **A study by Tegreourt Mohamed et al. (2021):**

From 1980 to 2017, this study used the ARDL model to determine how economic diversification affected growth in Algeria's economy. The study found a weak but long-term correlation between economic diversification and growth during the study period, which is understandable given the country's persistent reliance on oil. Without relying on hydrocarbon rents, the report stressed the need of contributing to the actual economy. (Tegreourt, Ramla, & Badrouni, 2021).

- **Study by Ibrahim Carole (2019):**

Over the last four decades, this study used the VAR model to investigate the connection between UAE government spending and non-oil economic growth. Results showed that non-oil economic growth was better in the periods after government spending shocks when expansionary policies were put into place through higher public and investment expenditures. As a result, the UAE economy was able to weather recessions thanks to expansionary government spending.Over the last four decades, this study used the VAR model to investigate the connection between UAE government spending and non-oil economic growth. Results showed that non-oil economic growth was better in the periods after government spending shocks when expansionary policies were put into place through higher public and investment expenditures. As a result, the UAE economy was able to weather recessions thanks to expansionary government spending. (Carole, 2019).

- **Study by Al-Masaeed Abdullah Ali and Tsaregorodtsev Evgeny (2018):**

Inflation, exports, and fiscal policy (government spending, revenue, and internal and external public debt) were the variables studied in this analysis of the factors influencing GDP growth in Jordan from 1990 to 2015. This study used Ordinary Least Squares (OLS) and multiple linear regression to determine that exports, revenues, and government spending all had a positive and substantial effect on GDP growth in Jordan. Meanwhile, inflation had a major detrimental impact. (Al-Masaeed & Tsaregorodtsev, 2018).

- **Study by Symoom Tasnia (2018):**

This study used the Error Correction Model (ECM) and the ARDL model to examine the effect of fiscal policy on economic growth in four South Asian nations from 1980 to 2016. The results showed that in the South Asian nations studied, neither tax income nor government spending had a substantial effect on real GDP growth. (Symoom, 2018).

2- Fiscal Policy in Algeria During 2000–2023

Contrasted with the contractionary fiscal policy that Algeria had from 1990 to 1998, this period saw the adoption of an expansionary fiscal strategy by Algeria. Public investment projects received large sums of money through a number of state-run initiatives, which made this possible. Between the first Growth Support Program (2005–2009) and the 2010–2014 Five-Year Development Program, the investment budget grew from about $7 billion (552 billion dinars) in the 2001–2004 Economic Recovery Program to $55 billion (3,800 billion dinars) and, finally, to $286 billion (21,214 billion dinars) in the latter. Rising oil prices during this period had a favorable effect on hydrocarbon taxes, leading to a notable increase in overall revenues. This allowed Algeria to pay off its foreign loans and expand public investments, especially in infrastructure, which boosted economic growth rates.

Nevertheless, due to the economy's heavy reliance on hydrocarbon earnings, the energy industry maintained its strategic importance. Because of this reliance, research into alternate energy sources, particularly shale gas, has been ongoing.

1-1-Public Revenues (2000–2020)

The total revenues have been steadily increasing, according to the data in Appendix 1. Revenues increased by 651.6 billion dinars during the course of four years, from 1,578.1 billion dinars in 2000 to 2,229.7 billion dinars in 2004. Total sales hit 5,110.1 billion dinars by 2016. In light of this ongoing growth from 2000 to 2020, we must separate hydrocarbon taxes from conventional taxes in order to understand the makeup of total revenues.

Eventually, hydrocarbon taxes were supplanted by regular taxes in Algeria's revenue structure as a result of the country's successful budgetary reforms. After the 2014 oil crisis, the government refocused its tax policy on ordinary taxes, which drained the purchasing power of the population in the face of falling living standards, even though ordinary taxes only accounted for 22% in 2000. In recent years, however, ordinary taxes have surpassed 50%.

1-2-Public Expenditures (2000–2023)

The budget revenues and foreign exchange reserves of Algeria were severely affected by the huge increase in oil prices. In 2000, foreign exchange reserves were $4.4 billion; in 2005, they were $77.78 billion; and in 2007, they reached $110.18 billion. During this time, which ended in 1998, the Algerian government pursued expansionary fiscal policies, as opposed to the contractionary policies that had been in place from 1990 to 1998, which had been characterized by elevated poverty and unemployment rates.

There was no decrease in overall expenditures, as shown in Appendix 1. Government spending increased from 1,178.12 billion dinars in 2000 (or 21% of GDP) to 7,054.35 billion dinars (or 29% of GDP) in 2012. These economic programs, which ran from 2001 to 2004, the Growth Support Program from 2005 to 2009, the Five-Year Development Program from 2010 to 2014, and the Growth Consolidation Program from 2015 to 2019, were the main drivers of the increase in spending from 2000 to 2020 in Algeria.

Spending has risen steadily, topping 8,000 billion dinars since 2018, despite the government's austerity efforts and the oil crisis of 2015.

2-Components of Algeria's Gross Domestic Product (GDP)

2-1- Economic Growth Rates During the Period 2000–2023

The increase in oil export profits for Algeria, spurred by higher oil prices, led to a consistent expansion of the country's gross domestic product (GDP) from 2.2% in 2000 to 7.2% in 2003. In response to this, Algeria was able to plan the Economic Recovery Support Program (PSRE) for 2001–2004 with an initial budget of 525 billion DZD ($7 billion), which increased to around 1,216 billion DZD ($16 billion) in subsequent years. Local development, public service improvement in key areas including irrigation, transportation, and infrastructure, and general population well-being were the primary goals of this initiative. (Kebdani, 2013, p. 251).

But in 2006, growth slowed to 1.7% as a result of non-hydrocarbon industries' declining contribution to GDP, which fell to 5.2%. Despite algiers' best efforts, the Supplemental Program for Economic Growth Support (PCSC) failed

to improve citizens' living conditions, strengthen infrastructure, or revitalise economic sectors between 2005 and 2009, despite a massive budget of 9,680 billion DZD (about $130 billion). The 1,200 km East-West Highway, railway renewal, one million housing units, and health and education sector strengthening were all part of the program's national strategy. There was an allocation of about 40% of the overall budget for economic infrastructure. Despite the fact that this was guaranteed by the stability of increasing oil prices—hydrocarbons contributed an average of 44.03% to GDP—the growth rate was impacted since the agriculture and industrial sectors saw reduced contributions. (Ayyab, 2010, p. 231).

As a result, compared to the substantial investments, the rates of economic growth were very moderate. In spite of algiers' yearly public investment of over 10% of GDP, the country's growth rate was around 5%, indicating inefficiency. An average yearly growth rate of 4.7% was achieved by injecting $155 billion into the national economy from 2001 to 2007. Without the oil and gas industry, which accounted for over 46% of GDP, Algeria's economic growth seems to have stalled. (Shalabi & Bataher, 2010, p. 47). Several industries ground to a halt in 2009 as a result of the worldwide financial crisis and the subsequent decline in oil prices to $62.25 per barrel, causing economic growth to decelerate to 1.6%.

The gross domestic product grew steadily between 2% and 4.09% between 2010 and 2014. Initiated between 2010 and 2014, the Growth Consolidation Program aimed to finish major ongoing projects in the water, railway, and road sectors (9,700 billion DZD, or $130 billion) and start new projects (11,435 billion DZD, or $156 billion) with a total budget of 21,214 billion DZD, or $286 billion. (Ben Semana, 2014, p. 302). Thanks to savings and investments, the economy was able to maintain a steady 3% growth rate in 2015 and 2016, when oil prices fell to $53.1 and $45 per barrel, respectively.

Nevertheless, the hydrocarbons sector's precipitous fall in 2017 caused a general slowdown in economic activity. Gross domestic product (GDP) growth was1.4%, with non-hydrocarbon growth remaining steady at 2.2% and eventually reaching 4% in 2018. The result was a 2.2% increase in economic growth for that year. (Algeria, 2018, p. 4).

2-2-Analysis of GDP Components in Algeria

From Annex 01, the following points emerge:

Despite consistent development (with a few exceptions), the hydrocarbon sector is very sensitive to fluctuations in oil prices across the world and to Algeria's proportion of total foreign sales, which in turn are affected by decisions made by OPEC. This means that the government's expenditure on this area, which is funded by oil profits, will not have a multiplier effect. This industry's share of GDP was about 20% in the 1990s, but it jumped to about 45% by 2006, thanks to the rising trend in oil prices at the turn of the century. The worldwide economic downturn and subsequent stagnation in hydrocarbon-dependent economies in 2008 led to a decline in oil consumption. As a result of these OPEC decisions, Algeria's oil production decreased, and the hydrocarbons sector's contribution to GDP declined as well. The contribution began to climb again in 2010 after a slow recovery from the crisis. However, it started to collapse in mid-2014 when oil prices fell. As a result, the oil sector's output fell below 4,000 billion DZD, down from over 5,000 billion DZD in 2011–2013.

Variations in growth rates were observed in the agricultural sector, which had a stronger impact on GDP in the 1990s compared to the early 2000s. This industry's contribution dropped from 11.07% in 1999 to 8.39% in 2000 as a result of climatic conditions that caused a slowdown in agricultural activities, mainly drought. Even though the National Agricultural Development Plan and the National Rural Development Plan were implemented between 2001 and 2013, the sector nevertheless faced a period of relative stagnation, with its participation staying below 10% throughout that time. With an increase from 1,771.6 billion DZD in 2014 to 1,936.3 billion DZD in 2015, agricultural output surpassed 2013 and 2014 levels. Nearly 11.6 percent of the total contributed in 2015. Agricultural output surpassed 2,400 billion DZD between 2018 and 2020, driving an improvement in the sector's output and contribution to GDP in recent years.

Trade is the lifeblood of Algeria's economy, and its growth in recent years has been mirrored by the expansion of related industries such as transportation, communications, and services, driving the size of the services sector to new heights. Market and non-market services together accounted for 22.65% of GDP on average over the research period, placing them second only to hydrocarbons in terms of contribution. But the services sector has been the top contributor to GDP since 2014, and by 2020, it will have increased its share to more than 28 percent, with output topping 5,500 billion DZD.

In 1992, the construction and public works sector accounted for 9.5% of the GDP, contributing 102.2 billion DZD. Its contribution % remained constant as it tripled over the subsequent six years, reaching 307.7 billion DZD in 1998. Since then, public investment has kept the sector relatively stable, growing at a rate of 7% to 8% between 2000 and 2008. This was largely due to the Economic Recovery Program and the Supplemental Program, which launched public investment projects to improve infrastructure, construct new schools and hospitals, and expand the transportation network, using funds saved up from earlier eras.

Part of Algeria's poor industrialization status is the fact that the industrial sector's contribution to GDP has been steadily declining. The government's plan to industrialize included helping out SMEs, but many of the loans they gave out didn't even have feasibility assessments, so they weren't doing their jobs.

The analysis reveals that the rise of Algeria's GDP is driven primarily by the hydrocarbons sector. As a result, other parts of the Algerian economy have taken a hit due to the influx of oil money, which has caused Dutch disease. This is especially true following an oil shock, when economic performance drops (even though oil money has gone into areas like construction, public works, and services, it has stifled private sector investment, reduced the industrial and agricultural sectors' contribution to GDP, and limited the possibility for economic diversification).

3-ARDL Modeling of the Relationship Between Investment Spending and Non-Hydrocarbon GDP (2000–2023)

Here, we'll use the ARDL model to determine, for the years 2000–2020, how much of an impact investment spending (economic recovery programs) had on Algeria's GDP growth outside of the oil sector. We shall follow these steps:

3-1-Preliminary Tests

First, we'll talk about the model's overall structure. Then, we'll choose which series to utilize in the model and, lastly, we'll apply delays to the variables in the model based on the AIC criterion.

3-1-1 Model Construction:

Pesaran et al. (1997–2001) suggested the Autoregressive Distributed Lag (ARDL) model, which we employ. To account for the lag time required for the gap to slow down, the ARDL model uses a period-by-period distribution of explanatory variables, which are subsequently integrated into the model through several equally distributed lags. The dependent variable is affected by the studied economic factors, but this effect is gradual and spread out across the short and long term. This allows us to run the ARDL test and formulate the research model in the following way:

$$\Delta LGDPOHYD_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta LGDPOHYD_{t-i} + \sum_{t=0}^{q} \beta_2 \Delta LINVEXP_{t-i} + \alpha_1 LGDPOHYD_{t-1} + \alpha_2 LINVEXP_{t-1} + \varepsilon_t$$

Where:

LGDPOHYD: Logarithm of GDP outside the hydrocarbon sector;

LINVEXP: Logarithm of investment expenditures;

Δ: Indicates first-order differences;

p, q: This refers to the maximum lag length for both the dependent and independent variables in the ARDL model. The selection of these lags is crucial to ensure the model captures the dynamic relationship effectively without overfitting or losing degrees of freedom;

β0-2: These coefficients measure the immediate impact of changes in the independent variables on the dependent variable. They are derived from the error correction representation of the ARDL model and indicate how quickly the system adjusts to deviations from long-run equilibrium);

α1-2: These coefficients represent the equilibrium relationships between the variables in the long run. They show how changes in the independent variables are associated with changes in the dependent variable over time, assuming that the system has fully adjusted.

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3-1-2- Unit Root Test:

It is possible to use the Phillips-Perron test to find a unit root in one of three scenarios by putting the following assumptions to the test: "The series does not contain a unit root."

A constant-valued unit root being a possible component of the series;

If there is a unit root in the series, it could have a constant and a trend;

A unit root, devoid of both a constant and a trend, may be contained in the series.

Next, we have the alternative hypothesis and the null hypothesis:

$$\begin{cases} \text{Null Hypothesis } (H_0): \begin{cases} |t\text{-stat}| < |t\text{-tab}| \\ \text{Prob} > 0.05 \end{cases} \implies \text{The series contains a unit root} \\ \text{Alternative Hypothesis } (H_1): \begin{cases} |t\text{-stat}| > |t\text{-tab}| \\ \text{Prob} < 0.05 \end{cases} \implies \text{The series does not contain a unit root} \end{cases}$$

All variables in the ARDL model must have an integration degree of zero or one (1). Table 04 displays the results of the Phillips-Perron test, which indicate the degree of stability and integration of the time series being studied. The first degree incorporates the variables.

Table 01: Time Series Stability Test (Phillips-Perron Test)

UNIT ROOT TEST RESULTS TABLE (PP)
Null Hypothesis: the variable has a unit root

		At Level	
		LGDPOHYD	LINVEXP
With Constant	t-Statistic	-2.6577	-5.0680
	Prob.	*0.0987*	*0.0007*
		*	***
With Constant & Trend	t-Statistic	1.5715	0.6097
	Prob.	*0.9999*	*0.9988*
		n0	n0
Without Constant & Trend	t-Statistic	3.2615	2.1516
	Prob.	*0.9991*	*0.9895*
		n0	n0
		At First Difference	
		d(LGDPO	d(LINVEXP)
With Constant	t-Statistic	-3.4271	-3.9367
	Prob.	*0.0229*	*0.0080*
		**	***
With Constant & Trend	t-Statistic	-5.7131	-9.2867
	Prob.	*0.0010*	*0.0000*
		***	***
Without Constant & Trend	t-Statistic	-2.5376	-3.1329
	Prob.	*0.0143*	*0.0035*
		**	***

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

This Result is The Out-Put of Program Has Developed By:
Dr. Imadeddin AlMosabbeh
College of Business and Economics
Qassim University-KSA

Source: EViews 13

3-1-3- Determining the Optimal Lag Lengths for the Model:

When the lag orders of the model's variables are adjusted beyond degree (1), as determined by the Schwarz Information Criterion, the total number of possible alternative models is shown in Figure 01. Using the Akaike Information Criterion, the ARDL (4,4) model emerges as the optimal choice. As depicted in the figure below, the variables LGDPOHYD and LINVEXP are lagged by four periods in this model.

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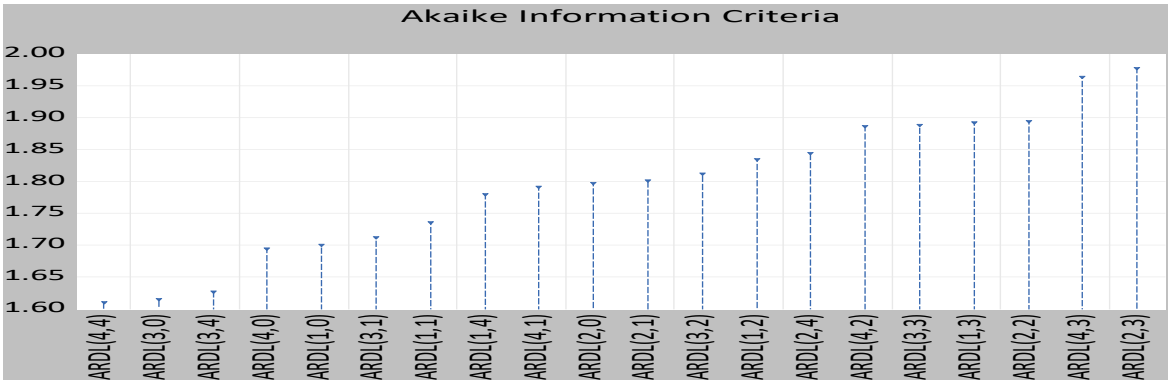
Figure 01: Findings from the Optimal Lag Length Test



Source: EViews 13

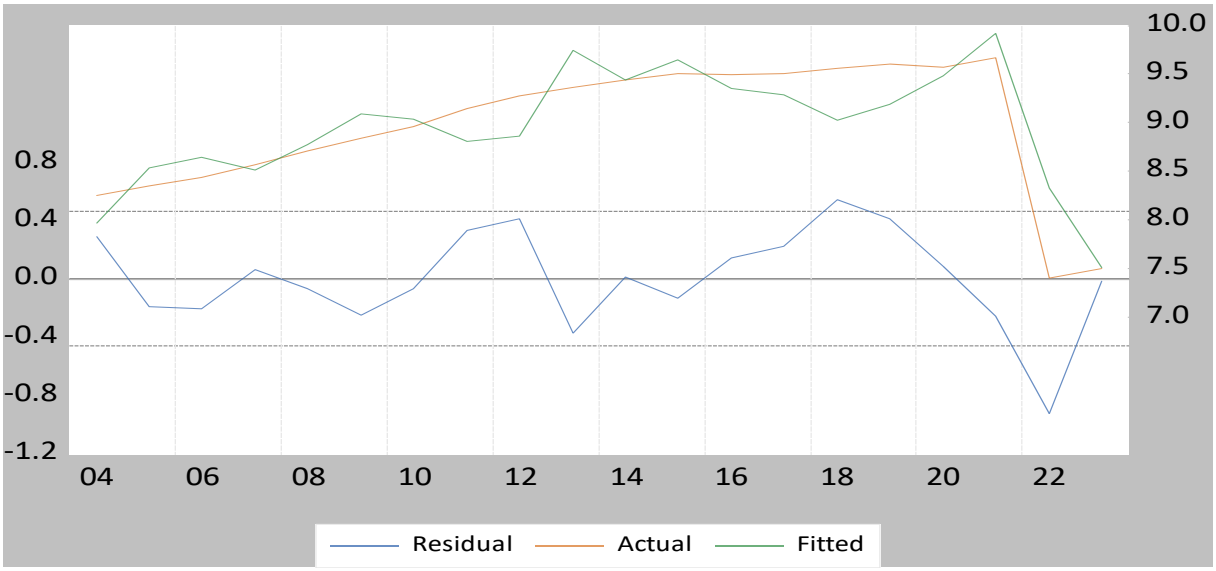
3-2- Model Quality Test (Residual Diagnostics)

Conducting the following tests ensures that the ARDL (4,4) model meets the necessary quality standards for estimating both short- and long-term effects:

3-2-1- Model Quality:

As demonstrated in the picture below, comparing the actual values with the estimated ones is critical for evaluating the model's quality:

Figure 02: Observed vs. Estimated Values and Residual Analysis



Source:EViews 13

Indicative of a high-quality estimated model, the figure shows that the predicted and actual values are very near to one another. Hence, it is trustworthy for results interpretation and analysis.

3-2-2- Assessing Residual Normality:

By testing the null hypothesis that "the residuals are normally distributed," we can gain insights into the distribution of the residuals. This can be done by examining the graph to see if the residuals tend to cluster around the center and diminish as they move toward the tails, or if they fail to cluster altogether. Alternatively, we can compare the chi-square critical value with the Jarque-Bera statistic, which has 2 degrees of freedom and a significance level of 0.05. Below are the null and alternative hypotheses:

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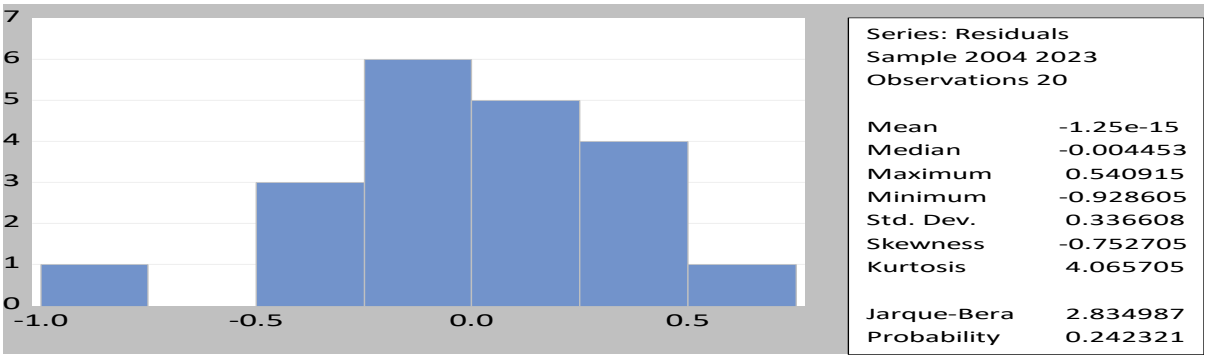
$$\begin{cases} \text{Null Hypothesis } (H_0): \text{Residuals do not follow a normal distribution} & \text{if Jarque-Bera} > \chi^2_{0.05}(2) \\ \text{Alternative Hypothesis } (H_1): \text{Residuals follow a normal distribution} & \text{if Jarque-Bera} < \chi^2_{0.05}(2) \end{cases}$$

Based on the results, it can be concluded that the residuals follow a normal distribution. As shown in Figure 03, the test result was not statistically significant ($\alpha > 0.05$). Additionally, the Jarque-Bera value of 2.83, which is lower than the critical value of $\chi^2 = 5.99$, further supports the conclusion that the residuals are normally distributed, as depicted in the figure:

Figure 03: Normality TestOfResidual.



Source:EViews 13

3-2-3- Test for Autocorrelation of Errors:

To determine if the residuals are autocorrelated, we first test the null hypothesis, "there is no autocorrelation between the residuals." For this, we use a 0.05 significance threshold, 2 degrees of freedom, The LM test involves calculating the Lagrange statistic (R-Squared) and comparing it to the critical value of the Chi-Square distribution. The hypotheses are as follows:

- **Null Hypothesis** (H_0): There is a significant correlation among the residuals.
- **Alternative Hypothesis** (H_1): There is no significant correlation among the residuals.

The following table shows the results of autocorrelation tests that were used to confirm that autocorrelation was not present:

Table 02: Findings of the Autocorrelation Test for Errors

Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 4 lags			
F-statistic	2.919563	Prob. F(4,6)	0.1166
Obs*R-squared	3.211995	Prob. Chi-Square(4)	0.1228

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 12/28/24 Time: 02:06
Sample (adjusted): 2004 2023
Included observations: 20 after adjustments
Presample missing value lagged residuals set to zero.

Source:EViews 13

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The Q-Star test shows no statistical significance, with all columns falling within the confidence range. Similarly, the LM test reveals that the Probability Chi-Square value exceeds 0.05. Therefore, we accept the assumption of no autocorrelation.

3-2-4- Heteroskedasticity Test (Variance Consistency over Time):

We employ the Breusch-Pagan-Godfrey test to calculate the R^2 statistic. This value is then compared to the critical value of the Chi-Square distribution with 2 degrees of freedom at a significance level of 0.05. The hypotheses for the test are as follows:

- **Null Hypothesis (H_0)**: The residuals are not homogeneous.
- **Alternative Hypothesis (H_1)**: The residuals are homogeneous.

Table 03: Findings of the Heteroskedasticity Test

Heteroskedasticity Test: ARCH			
F-statistic	0.117302	Prob. F(1,17)	0.7362
Obs*R-squared	0.130204	Prob. Chi-Square(1)	0.7182

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 12/28/24 Time: 02:16
Sample (adjusted): 2005 2023
Included observations: 19 after adjustments

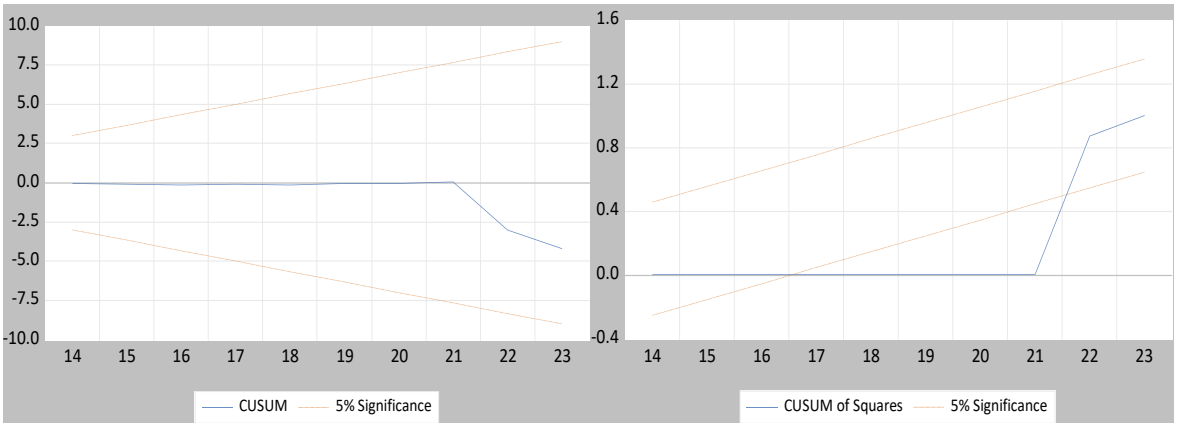
Source:EViews 13

We accept the null hypothesis, which claims that the variance is constant, because this test shows that F is not significant (Prob F > 0.05).

3-2-5- Stability Test:

Visual checks of the model's residuals and squared residuals, as seen in the image below, are used to evaluate the model's stability and guarantee that the data utilized for forecasting is free from any structural changes.

Figure 04: Findings of the Model Stability Test



Source:EViews 13

Since the results of the CUSUM test and the CUSUM of Squares test fall within the critical bounds at the 0.05 significance level, we can conclude that the model is stable.

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3-3- Testing Model Parameters in the Short and Long Run

This section examines the short- and long-term impacts of investment expenditure on economic growth in Algeria, along with the potential for cointegration among the model's variables.

3-3-1- Bounds Test for Cointegration Analysis:

The hypothesis test for cointegration is conducted using the following formula: "There is cointegration among the model variables", which examines the potential existence of a long-run equilibrium relationship:

Null Hypothesis (H_0):

- If F-statistic $< F_{I(0)}$, there is **no cointegration** among the variables.

Indeterminate Zone:

- If $F_{I(0)} < F$-statistic $< F_{I(1)}$, the result is **inconclusive**.

Alternative Hypothesis (H_1):

- If F-statistic $> F_{I(1)}$, there **is cointegration** among the variables.

The table below presents the results of the Bounds Test-based cointegration analysis:

Table 04: Findings of the Bounds Test

Null hypothesis: No levels relationship
Number of cointegrating variables: 1
Trend type: Rest. constant (Case 2)
Sample size: 20

Test Statistic	Value
F-statistic	7.987392

	10%		5%		1%	
Sample Si	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	3.303	3.797	4.090	4.663	6.027	6.760
Asymptotic	3.020	3.510	3.620	4.160	4.940	5.580

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

Source:EViews 13

The calculated F-statistic surpasses both the lower and upper critical values at most significance levels. As a result, we reject the null hypothesis, concluding that the variables are cointegrated. This suggests a long-term equilibrium relationship the investment Expenditures and economic growth.

3-3-2- Evaluation and Interpretation of the Short-Term Dynamics:

According to economic theory, investment spending has a positive effect on non-oil GDP in the near term, as shown in Table 05. The coefficient is statistically significant. The low ability of economic recovery initiatives to boost non-oil industries in the short term is demonstrated by the minimal percentage gain of non-oil GDP of 0.79% as investment spending increases by 1%.

The results indicate a dynamic short-term relationship between investment spending and non-oil GDP. The error correction term is estimated at -0.3435 and is statistically significant, suggesting that the dependent variable adjusts at a

rate of 33.01% per period to correct deviations from equilibrium. The negative sign of the error term further confirms the presence of a long-term equilibrium relationship between the variables.

Table 05: Findings of Short-Term Parameter Estimation and the Error Correction Term.

Dependent Variable: D(LGDPOHYD)
Method: ARDL
Date: 12/28/24 Time: 01:38
Sample: 2004 2023
Included observations: 20
Dependent lags: 4 (Automatic)
Automatic-lag linear regressors (4 max. lags): LINVEXP
Deterministics: Restricted constant and no trend (Case 2)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 20
Selected model: ARDL(4,4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.330180	0.068357	-3.738323	0.0058
D(LGDPOHYD(-1))	-1.529218	0.713541	-2.143139	0.0533
D(LGDPOHYD(-2))	10.85366	4.377722	2.479295	0.0290
D(LGDPOHYD(-3))	-6.060486	4.190484	-1.446250	0.1737
D(LINVEXP)	0.793958	0.674049	2.177893	0.0520
D(LINVEXP(-1))	1.319522	0.858705	1.536641	0.1503
D(LINVEXP(-2))	1.385070	0.688787	2.010885	0.0674
D(LINVEXP(-3))	1.909286	0.665570	2.868646	0.0141

R-squared	0.595216	Mean dependent var	-0.031535
Adjusted R-squared	0.359091	S.D. dependent var	0.529069
S.E. of regression	0.423556	Akaike info criterion	1.408912
Sum squared resid	2.152795	Schwarz criterion	1.807205
Log likelihood	-6.089118	Hannan-Quinn criter.	1.486663
F-statistic	2.520773	Durbin-Watson stat	1.416509
Prob(F-statistic)	0.076425		

* p-values are incompatible with t-Bounds distribution.

Source:EViews 13

3-3-3- Evaluation and Interpretation of the long-Term Dynamics:

Table 06 demonstrates that investment spending has a positive and direct impact on non-oil GDP in the long term, at a 5% significance level. This indicates a statistically significant relationship, where a 1% increase in investment spending leads to a 0.64% growth in non-oil GDP. These findings align with economic theory and previous studies that emphasize the importance of economic stimulus programs in promoting growth outside the oil sector.

This positive impact is evident in the substantial increase in the contribution of non-oil sectors to GDP, surpassing 70% since 2015, compared to less than 30% in 2000. Although the oil sector continues to dominate the export structure, making the national economy vulnerable to fluctuations in oil prices, this shift marks a positive step toward achieving economic diversification.

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Table 06: Findings of Long-Term Parameter Estimation.

Dependent Variable: LGDPOHYD
Method: ARDL
Date: 12/28/24 Time: 01:38
Sample: 2004 2023
Included observations: 20
Dependent lags: 4 (Automatic)
Automatic-lag linear regressors (4 max. lags): LINVEXP
Deterministics: Restricted constant and no trend (Case 2)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 20
Selected model: ARDL(4,4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDPOHYD(-1)	1.300962	0.431459	3.015261	0.0130
LGDPOHYD(-2)	12.38288	5.635333	2.197365	0.0527
LGDPOHYD(-3)	-16.91415	10.38783	-1.628267	0.1345
LGDPOHYD(-4)	6.060486	5.436479	1.114781	0.2910
LINVEXP	0.793958	0.927042	0.856442	0.4118
LINVEXP(-1)	-0.545566	1.251657	-0.435875	0.6722
LINVEXP(-2)	0.065549	0.900913	0.072758	0.9434
LINVEXP(-3)	0.524216	0.862913	0.607496	0.5571
LINVEXP(-4)	-1.909286	0.796349	-2.397549	0.0375
C	-9.399677	5.364987	-1.752041	0.1103

R-squared	0.761608	Mean dependent var	8.956030
Adjusted R-squared	0.547054	S.D. dependent var	0.689411
S.E. of regression	0.463982	Akaike info criterion	1.608912
Sum squared resid	2.152795	Schwarz criterion	2.106778
Log likelihood	-6.089118	Hannan-Quinn criter.	1.706101
F-statistic	3.549737	Durbin-Watson stat	1.416509
Prob(F-statistic)	0.030550		

*Note: p-values and any subsequent test results do not account for model selection.

Source:EViews 13

4- Conclusion

The government of Algeria has implemented public investment initiatives since the beginning of the 2000s. Following the challenging 1990s, marked by slow economic growth, worsening population living circumstances, major setbacks in infrastructure development, and a dearth of public services, these measures were essential. Economic and social progress were goals of the government's expansionary fiscal policy, which was achieved through a number of development initiatives.

Using the ARDL model, the applied study looked at how investment spending affected Algeria's non-oil GDP from 2000 to 2020. The findings, which were supported by a robust economic and statistical model, demonstrated that investment expenditure had a strong long-term influence on non-oil GDP but a limited short-term effect. This can be explained by the surplus that has built up in the treasury as a result of higher oil income and the endeavors to channel this surplus into investments that would contribute to economic recovery. Even though the 49-51 rule makes it difficult to attract FDI outside of the oil industry, these programs can nonetheless be deemed effective.

Thus, in order for Algeria to reap the benefits of trade liberalization, the country needs to reorganize its economy and accept FDI without red tape and obstacles.

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5-Appendices:

Appendix 01: Development of Fiscal Policy Components in Algeria

investment Expenditures	Expenditures	Revenues	Non-Hydrocarbons	Import Duties	Services	Construction and Public Works	Industry	Agriculture	Hydrocarbons	GDP	Growth Rate	Years
47.7	136.5	160.2	429.2	43.5	111	57.18	66.92	62.72	125.19	554.39	0.8	1990
58.3	212.1	272.4	516.35	72.8	170	78.53	99.54	87.31	236.24	752.59	-1.2	1991
144	420.131	316.8	824.3	80	218	102.15	127.16	128.42	250.4	1074.7	1.8	1992
185.21	476.627	320.1	979.1	85.7	325.2	121.5	130.9	131.1	247.4	1189.8	-2.2	1993
235.926	566.329	477.2	1142.5	119.3	351.6	151.8	161.7	145.6	327.4	1487.5	0.2	1994
285.923	759.617	611.7	1468.1	174.8	459.6	191.2	193.9	187.4	503.4	1993.5	3.8	1995
174.013	724.582	825.2	1803.6	212.3	560.3	217.7	222.3	277.8	733.1	2564.7	3.7	1996
201.641	845.196	926.7	1941.2	217.3	633.7	276.6	223.2	242.7	839	2780.2	1.1	1997
211.884	875.739	774.5	2192.2	226.9	696.7	300.9	256.8	324.8	638.2	2830.5	3.2	1998
186.987	961.682	950.5	2357.4	226.3	770.3	307.7	280.4	359.7	890.9	3248.2	3.2	1999
321.929	1178.122	1578.1	2507.1	250.1	842.6	334.9	290.7	346.1	1616.3	4123.5	3.8	2000
357.395	1321.028	1505.5	2783.1	284.4	921.7	358.8	315.2	412.1	1443.9	4227.1	3	2001
452.93	1550.646	1603.2	3045.7	290.3	1004.1	409.9	337.5	417.2	1477.03	4522.7	5.6	2002
516.504	1639.265	1966.6	3383.4	317	1112.2	445.2	355.3	515.2	1868.8	5252.3	7.2	2003
638.036	1888.93	2229.7	3829.2	446.2	1303.1	507.9	388.1	580.5	2319.8	6149.1	4.3	2004
806.905	2052.037	3082.6	4209.1	494	1518.9	564.4	418.2	581.6	3352.8	7561.9	5.9	2005
1015.144	2453.014	3639.8	4619.4	491.5	1684.8	674.3	449.5	641.2	3882.2	8501.6	1.7	2006
1434.638	3108.669	3687.8	5263.5	532.5	1919.5	825.08	479.7	708.07	4089.3	9352.8	3.4	2007
1973.278	4191.053	5190.5	6046.1	653.9	2113.6	956.7	519.6	727.4	4997.5	11044	2	2008
1946.371	4246.394	3676	6858.9	715.8	2349.05	1094.8	570.6	931.3	3109.07	9968	1.7	2009
1807.862	4466.94	4392.9	7811.2	747.7	2586.3	1257.4	617.4	1015.2	4180.3	11992	3.6	2010
1934.5	5731.752	5703.4	9346.02	854.6	2933.2	1333.2	663.7	1183.2	5242.5	14589	2.6	2011
2363.01	7054.35	6339.3	10672.3	1077.5	3305.1	1491.2	728.6	1421.6	5536.3	16209	2.7	2012
2479.26	6635.62	5957.5	11682.1	1242.2	3849.5	1627.4	771.7	1640	4968.01	16650	2.8	2013
2519	6995.7	5738.4	12584.7	1242.1	4198.2	1793.9	838.5	1771.4	4657.8	17243	3.6	2014
3154.289	7746.214	5103.1	13457.6	1363.7	4549.8	1908.1	900.8	1936.3	3134.2	16702	3.1	2015
2792.2	7383.6	5110.1	13193.3	1336.1	4837.8	2069.3	975.7	2140.3	3638.8	17409	3.4	2016
2291.4	6883.2	6182.8	13478.2	1466.8	4867.1	2202.8	1062	2281.9	3880	18684	3.1	2017
4043.5	8628	6342.98	14213.2	1498	5305.3	2346.5	1127	2427	4547.8	22684	2.3	2018
3602.68	8557.16	6507.91	14807.1	1567	5577.8	2481.4	1198.5	2429.4	3910.1	23090	2.6	2019
2929.77	7823.21	6289.72	14332.1	1476.6	4823	2398.1	1153.5	2598.5	2575.1	20902	2.6	2020
2798.52	8113.03	5328.18	15708.6	1578.6	5380.3	2713.5	1272.5	2688.3	4734.4	25158	3.1	2021
3546.9	9858.43	5683.22	1626.4	1462.3	5062.8	3441.5	1282.3	2778.1	4546.6	22968	3.6	2022
4708.86	13604.7	7901.92	1800.7	1626.5	4964.7	3843.6	1319.6	2867.9	5076.8	23638	3.6	2023

Source: This report was compiled by the researchers using data collected from the Bank of Algeria's statistical bulletins and financial laws (www.banque-of-algeria.dz).

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