The impact of the agricultural sector on economic growth in North African countries during the period (2000-2023)

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Abstract:

This study examines the impact of agricultural value added on economic growth, measured by GDP, in Algeria, Tunisia, Egypt, and Libya over the period 2000–2023. Using the Panel ARDL approach, the study includes oil revenues and gross fixed capital formation as control variables. The results show that oil revenues have a positive and statistically significant long-run effect on economic growth. In contrast, agricultural value added and gross fixed capital formation have no statistically significant effect during the study period. These findings suggest that agricultural sector growth has not significantly contributed to overall economic growth in the selected North African countries over the period analyzed.

Keywords: Economic growth; Agricultural value added; North African countries; Panel ARDL.

JEL Classification Codes: O1, O13, C23

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1. INTRODUCTION

The agricultural sector is one of the strategic sectors in the economies of both developed and developing countries. Its importance lies in its role in ensuring food security and preserving national sovereignty. It also provides the industrial sector with plant and animal raw materials for various industries, especially the food industry.

In addition, agriculture can serve as a means of export diversification particularly for countries heavily reliant on oil revenues—thus becoming a source of foreign currency. Through these various functions, the agricultural sector contributes to driving economic growth.

Oil producing countries in North Africa are a living example of states whose economies are tied to oil, although the degree of this dependence varies from country to country. These countries also face a deficit in achieving self sufficiency in food that guarantees food security; they continue to import large amounts of food products of various kinds despite efforts to develop the agricultural sector. Nonetheless, these oil dependent countries are attempting to diversify their exports beyond oil by relying on different sectors, including agriculture. They do this by exporting products in which they have competitive advantages, thus contributing to supporting economic growth outside the oil sector.

1.1 Research Problem

This study seeks to answer the following question:

To what extent does the agricultural sector affect economic growth in North African countries during the period 2000–2023, according to empirical panel data analysis?

- Does agricultural value added (AGR) have a statistically significant effect on economic growth in the four selected North African countries during 2000–2023?
- Do oil revenues (PETR) have a statistically significant effect on economic growth in the selected countries during 2000–2023?
- Does gross fixed capital formation (GFCF) have a statistically significant effect on economic growth in the selected countries during 2000–2023?

1.3 Research Hypotheses

H1: Agricultural value added (AGR) has a statistically significant positive effect on economic growth in the selected North African countries during 2000–2023**.**

H2: Oil revenues (PETR) have a statistically significant positive effect on economic growth in the selected countries during 2000–2023.

H3: Gross fixed capital formation (GFCF) has a statistically significant positive effect on economic growth in the selected countries during 2000–2023.

1.4. Significance of the Study

The importance of this study stems from the critical role of the agricultural sector as a source of economic diversification and from the need to reduce reliance on oil revenue as a primary income source, a reliance that can jeopardize economic stability and affect the rate of economic growth. This study attempts to measure how growth in the agricultural sector, as reflected by its value added, impacts economic growth relative to what oil revenues and other factors contribute in North African countries during the period 2000 2023.

The findings are relevant to several groups: policymakers responsible for agricultural, fiscal, and diversification policies; researchers studying agriculture, natural-resource dependence, and economic growth; and international and regional organizations supporting sustainable development and food-security policies in North Africa.

1.5 Study Boundaries:

The temporal boundary covers 2000–2023; the spatial boundary is limited to Algeria, Tunisia, Egypt, and Libya; and the methodological/data boundary consists of panel analysis based on annual World Bank indicators available for the four countries.

1. 6.Previous Studies

Numerous studies have examined the impact of the agricultural sector on economic growth, employing various indicators to represent the agricultural sector. Some have used the volume of investment in agriculture, while

others have relied on the value of agricultural exports. However, several studies have utilized the indicator of agricultural value added to measure the sector's effect on economic growth, which aligns with the approach adopted in the current study. The following is a review of some of these studies:

a. **Hassoun & Abdelmadjid (2019)**

Title: The Impact of Agricultural Sector on Economic Growth in MENA Countries: A Panel Econometric Approach.

This study examined the relationship between agricultural value added, food production index, and economic growth measured by GDP in eight MENA countries over the period 1975–2014. Using panel econometrics and Granger causality tests, the findings indicated a positive effect of agricultural value added on economic growth. Additionally, a bidirectional causal relationship was found between agricultural value added and GDP at the 10% significance level, while a unidirectional causality from the food production index to GDP was also confirmed. (Hassoun, 2019)

b. Makhloufi (2021–2022)

Title: The Impact of the Agricultural Sector on Economic Growth in Algeria Compared to Selected Arab Countries.

This study aimed to measure the impact of the agricultural sector on economic growth in Algeria and to compare it with that of selected Arab countries (Algeria, Saudi Arabia, Egypt, Morocco, Jordan, Qatar, Tunisia, Yemen, and Lebanon) during the period 1990–2018. It analyzed the relationship between agricultural indicators and per capita GDP using both panel data analysis and ARDL models. The results indicated that increases in agricultural sector values had a statistically significant long-term effect on economic growth across the studied countries. (مخلوفي، 2022)

c. Benali (2023)

Title: The Impact of the Added Value of the Agricultural Sector on Economic Growth in Algeria: An Econometric Study for the Period (1993–2022)

This research evaluated the effect of agricultural production on Algeria's GDP using EViews.8 software. The study considered variables such as the value added of agriculture, forestry, and fishing, along with exports and

imports of raw agricultural materials. The findings revealed a positive correlation: a one-unit increase in agricultural value added leads to a 1.10-unit increase in GDP. The study recommends that Algerian authorities implement effective agricultural policies to enhance non-oil revenues. (Benali, 2023)

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e. Gharbi & Bouabdelli (2023)

Title: The Role of Agricultural Investment in Driving Non-Oil Economic Growth in Algeria (1980–2021)

This study aimed to highlight the role of agricultural investment in supporting non-oil economic growth in Algeria as a strategic alternative. Using the ARDL model, the authors found a long-run equilibrium relationship between agricultural investment and agricultural output (independent variables) and economic growth (dependent variable) in Algeria over the period 1980–2021. (ياسين, 2023)

Although numerous studies have examined the relationship between the agricultural sector and economic growth, a review of the existing literature reveals several aspects that remain insufficiently explored. Some studies have focused on a single country, particularly Algeria, such as Beltrèche and Touiti (2018), Boufench (2021), Kerrar and Laouadj (2021), whereas other studies have examined different groups of countries using various econometric approaches. In addition, part of the existing literature has examined the effects of agricultural investment or agricultural value added separately, without incorporating these factors into an analytical framework that explicitly considers the specific characteristics of oil-dependent economies in North Africa.

The main research gap addressed by the present study lies in the absence of a recent comparative study covering Algeria, Tunisia, Egypt, and Libya within a unified econometric framework over an extended period from 2000 to 2023. Such an approach makes it possible to investigate the relationship between the agricultural sector and economic growth across countries that share a relatively high dependence on oil resources but differ in terms of

their agricultural structures, economic conditions, and institutional environments.

The present study also differs from previous research through the use of the Panel ARDL model, which makes it possible to distinguish between the short-run and long-run effects of the explanatory variables on economic growth. The model includes agricultural value added (AGR) as the main explanatory variable, together with oil revenues (PETR) and gross fixed capital formation (GFCF) as control variables. Accordingly, the study does not merely examine whether the agricultural sector affects economic growth; rather, it seeks to determine whether such an effect persists in the long run and how it interacts with dependence on oil revenues and investment in fixed capital.

Therefore, the contribution of the present study is to fill a temporal, geographical, and methodological gap by providing a recent comparative analysis of four North African countries over the period 2000–2023. It examines both the short-run and long-run relationships between the agricultural sector and economic growth, rather than focusing exclusively on a single country or on a simple two-variable relationship.

Table 1. Research Gap

Aspect	Previous Studies	Present Study
Geographical scope	Mainly individual countries, particularly Algeria	Algeria, Tunisia, Egypt, and Libya
Study period	Different periods, often ending before the most recent years	2000–2023
Agricultural indicator	Agricultural sector or agricultural growth in some studies	Agricultural value added (% of GDP)
Control variables	Vary across studies	Oil revenues + Gross Fixed Capital Formation (GFCF)
Econometric approach	Various econometric methods	Panel ARDL
Time horizon	Some studies do not clearly distinguish between short-run and long-run effects	Explicit distinction between short-run and long-run effects
Oil-economy dimension	Limited attention in some studies	Focus on North African oil-dependent economies
Regional comparison	Limited	Four North African countries
Recent period	Limited coverage of recent years	Extends the analysis through 2023

Source: Prepared by the two researchers

2.Theoretical framework:

2.1. Definition of the Agricultural Sector:

"The term agricultural sector refers to crop based agricultural systems and livestock farming systems, including pastures and rangelands, forests, and fisheries (marine fishing and aquaculture). (United Nations Economic and Social Commission for Western Asia) According to the FAO, the agricultural sector includes crop production, livestock production, and agricultural inputs. (Asia, n d)

The agricultural sector is considered part of the economy that is oriented toward producing food, fiber, raw materials, and agricultural products. It encompasses all activities associated with cultivating plants for food and other useful products (Muller, 2025).

According to the Food and Agriculture Organization (FAO), agriculture has multiple functions, the most important of which are: (Organization., n.d) Ensuring food for all segments of the population

- Managing the environment and mitigating its negative impacts.
- Generating economic output and providing farm related services.
- Supporting rural communities and preserving their cultures.

2.2. Agriculture and Economic Growth:

The capacity of agriculture to stimulate growth in domestic output varies significantly from one country to another. In economies that rely primarily on agriculture, particularly in Africa, the agricultural sector plays an active role in fostering economic growth. In transitional economies, such as those in Asia and North Africa, agriculture contributes to growth to a lesser extent; however, agricultural development has a substantial impact on poverty reduction.

In predominantly industrial economies, such as those of Europe and North America, where poverty is largely of an urban nature, the agricultural sector can play a crucial role in reducing food imports, strengthening food security, and improving human capital in urban areas where households spend a considerable share of their income on food (Kerrar, 2021) .

Agricultural growth is clearly linked to economic development through the

theoretically grounded model of Rostow (1960), known as Rostow's Stages of Economic Growth. Rostow was inspired in his theory by the experiences of the countries that achieved success in their industrial revolution particularly England since around 1780. In his book The Stages of Economic Growth, he considered development to be an inevitable phenomenon through which nations pass in stages, and that the take off is a critical stage within the five stages he proposed. Rostow posits that (Mbotiji, 2023):

In the first stage, known as the Traditional Society, the economy is agricultural and subsistence based, labor is intensive, trade is minimal, and the population lacks a scientific outlook toward the world and technology.

• In the second stage (Preconditions for Take off), societies begin developing industry.

• In the third stage (Take off), there is intensive growth: industries emerge and workers and institutions concentrate around the new industries.

• In the fourth stage (Drive to Maturity), over a prolonged period, living standards rise, the use of technology increases, and the national economy grows and diversifies.

• Finally, the fifth stage (Age of High Mass Consumption) is characterized by mass production and a culture of consumerism.

From Rostow's perspective, one can deduce that agricultural transformation becomes effective in the third stage, and in turn helps to drive the economy toward growth and development through improvements in living standards and welfare during the fourth stage. This implies that agricultural growth reinforces economic development

3 . Applied Study

3.1. Definition of Study Variables

To test the extent to which the agricultural sector acts as an independent variable on economic growth as the dependent variable in North African countries over the period 2000 2023 in other words, to determine whether agricultural growth can be considered a determinant of economic growth in those countries a standard model is adopted. This model includes the

variables shown in the table below, with the understanding that all data for these variables have been retrieved from the World Bank database.

Table 2. Study Variables — Definition & Measurement

Variable	Definition	Measurement in the Study
Gross Domestic Product (GDP)	Represents the total value of all goods and services produced within a country in a given year; this is the main indicator of economic growth.	Measured using the annual GDP, typically in U.S. dollars at current prices (or adjusted for inflation if specified) from the World Bank.
Agricultural Value Added (AGR)	The net output contributed by the agricultural sector (including crop production, livestock, fishing, forestry, etc.) after subtracting intermediate inputs; i.e., the actual contribution of agriculture to the total output of the country.	Measured as a percentage of GDP (% of GDP) over time for the sample countries.
Petroleum Resource Revenues (PETR)	The amount of revenue that a country generates from exploiting its petroleum resources, assumed to have a significant impact on government spending, investment, and economic growth.	Measured as a percentage of GDP (% of GDP).
Gross Fixed Capital Formation (GFCF)	Total investment in fixed assets such as buildings, factories, machinery, infrastructure, etc.; these long-term investments affect the productive capacity and economic structure of the country.	Measured by the annual volume of fixed capital formation, usually as a percentage of GDP.

Source: Prepared by the two researchers

3.2. Data Processing

a. Descriptive Analysis of Study Variables

In this step, various descriptive statistics of the study variables are calculated to provide an initial overview of their development over the study period (2000–2023) for the selected sample, which includes Algeria, Libya, Tunisia, and Egypt, as shown in the table below:

Table3. Descriptive Statistics of the Variable

	GDP	PETR	GFCF	AGR
Mean	3.181056	17.67844	21.81790	8.417247
Median	3.542708	10.78750	20.58746	9.053060
Maximum	86.82675	64.81644	43.38669	15.53808
Minimum	-50.33852	0.916678	8.948526	1.383653
Std. Dev.	12.46209	17.40676	8.205937	3.861299
Skewness	2.216524	1.229083	0.947904	-0.299142
Kurtosis	26.55654	3.443453	3.302213	2.183013
Jarque-Bera	2298.251	24.95692	14.74168	4.101646
Probability	0.000000	0.000004	0.000629	0.128629
Sum	305.3813	1697.130	2094.518	808.0557
Sum Sq. Dev.	14753.85	28784.54	6397.053	1416.415
Observations	96	96	96	96

Source: Eviews output

- Out of 96 observations for the **GDP growth rate** series, the arithmetic mean was **3.54** with a standard deviation of **12.46**. The maximum value recorded was **86.82**, and the minimum was **-50.33**.
- The **oil revenue (PETR)** series had a mean of **10.78** with a standard deviation of **17.4**. The maximum and minimum values were **64.81** and **0.91**, respectively.
- The **gross fixed capital formation (GFCF)** as a percentage of GDP had a mean of **20.58** and a standard deviation of **8.2**. The highest value was **43.38**, and the lowest was **8.94**.

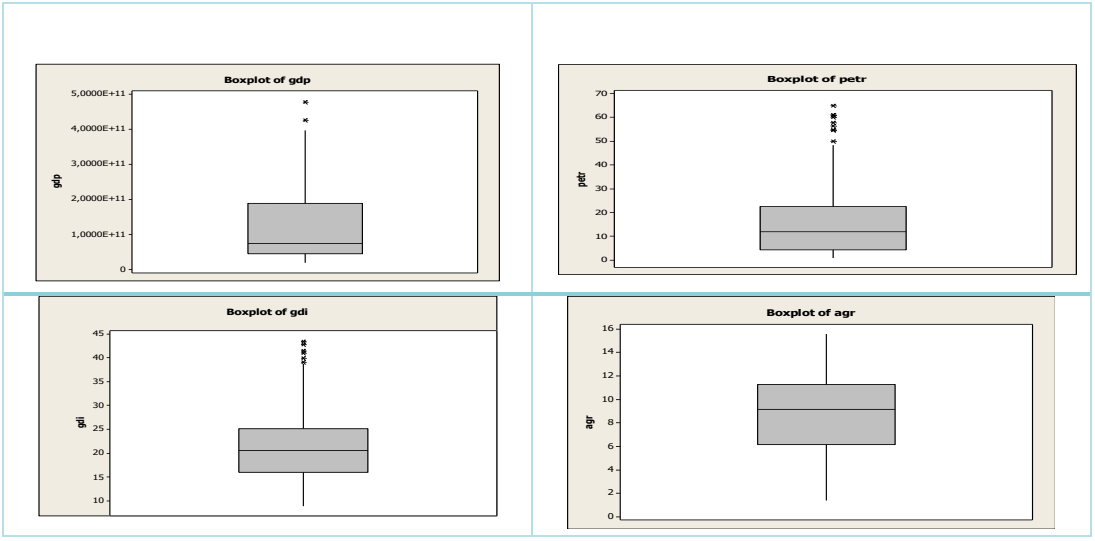
- The **agricultural value added (AGR)** as a percentage of GDP recorded a mean of **9.05** with a standard deviation of **3.86**. The maximum and minimum values were **15.53** and **1.38**, respectively

  Some **outliers or extreme values** appeared in the dataset, likely due to calculation errors or extraordinary events during the study period. To avoid biases in the results, we will perform specialized statistical tests to detect **missing and outlier values**, and propose appropriate corrective measures to address them.

b. Treatment of Outliers

To address outliers or abnormal values in the dataset, we examined the data using **Minitab** software through the **Box Plot** feature. The results obtained are presented in the figure below

Fig.1. Box Plot Representation



Source: Prepared by the researchers using Minitab 15 software.

The boxplot analysis revealed the presence of some extreme observations in the variables of oil revenues, gross domestic product (GDP), and gross fixed capital formation (GFCF). A substantial proportion of these extreme observations occurred during the COVID-19 pandemic, which may be attributed to the exceptional economic conditions experienced by the countries in the sample during this period. Therefore, these observations were not necessarily considered data errors and were retained in the dataset to avoid losing potentially meaningful economic information

c. Correlation between Variables

The following table presents the correlation between the study variables:

Table 4. Correlation Matrix of the Variables

	GDP	**PETR**	**GFCF**	**AGR**
GDP	1	0.153301551	-0.031081592	-0.005663800
PETR		1	-0.093270303	-0.774464547
GFCF			1	0.186014982
AGR	-			1

Source: Eviews output

From the table above, it is initially evident that there is a **weak inverse correlation** between the **agricultural value added** and **gross domestic product** (GDP).

Additionally, there is a **positive correlation** between **GDP** and **oil revenues**, and a **strong correlation** between **agricultural value added** and **oil revenues**.

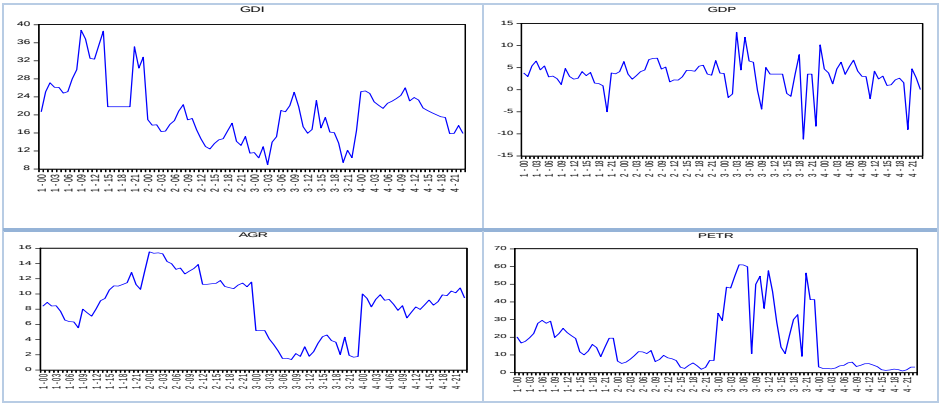
3.3. Stationarity Analysis

Before constructing the model, we begin by examining the **stationarity of the time series** using **unit root tests**, which aim to assess the statistical properties of the time series variables under study. To this end, we employ the **Augmented Dickey-Fuller (ADF)** test.

The first step in the time series analysis process involves plotting the variables under investigation.

a. Time Series Plot

Fig.2. Time Series Representation



Source: Eviews output

From the figure above, it appears that the **GDP** time series is **stationary**, whereas the series for **GFCF (Gross Fixed Capital Formation)**, **AGR (Agricultural Value Added)**, and **PETR (Oil Revenues)** are **non-stationary**. To verify this, a series of statistical tests are applied.

b. Fisher-ADF Test for Time Series Stationarity

To study the stationarity of the time series, the **Fisher-ADF (Augmented Dickey-Fuller)** test was conducted. The results are presented in the table below:

Table5. Fisher-ADF Test for Stationarity at Level and First Difference

Variable	Model Type	ADF (Level)	Prob.	ADF (1st Diff.)	Prob.
GDP (Gross Domestic Product)	**Constant only**	20.3947	0.0089	–	–
	Constant + Trend	22.1460	0.0047	–	–
	None	18.8239	0.0158	–	–
GFCF (Gross Fixed Capital Formation)	**Constant only**	4.89985	0.7682	27.7632	0.0005
	Constant + Trend	11.0611	0.1983	18.5652	0.0174
	None	8.60428	0.3768	45.3331	0.0000
PETR (Oil Revenues)	**Constant only**	10.1771	0.2528	40.9266	0.0000
	Constant + Trend	22.4744	0.0041	28.4646	0.0004
	None	5.86961	0.6618	65.6938	0.0000
AGR (Agricultural Value Added)	Constant only	5.13106	0.7435	40.4308	0.0000
	Constant + Trend	3.92521	0.8638	30.9953	0.0001
	None	7.74874	0.4584	60.2760	0.0000

Source: Prepared by the researchers based on estimation results using Eviews software.

From the results of the three model types, it can be concluded that the time series for **AGR**, **GFCF** , and **PETR** are **non-stationary at level**, as their p-values are greater than 5%, indicating the **rejection of the null hypothesis** of stationarity. Therefore, the test was applied at the **first difference**, which confirmed that these series are stationary after differencing.

In contrast, the **GDP** series is **stationary at level**, as indicated by the statistically significant p-values ($p < 0.05$) across all model types.

3.4. Cointegration Test

Table6. Pedroni Residual Cointegration Test

Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	**Prob.**	**Statistic**	**Prob.**
Panel v-Statistic	-0.492776	0.6889	-0.150927	0.5600
Panel rho-Statistic	-3.795241	0.0001	-3.106648	0.0009
Panel PP-Statistic	-8.895926	0.0000	-7.207172	0.0000
Panel ADF-Statistic	-4.098970	0.0000	-3.124720	0.0009
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	-1.883607	0.0298		
Group PP-Statistic	-6.650546	0.0000		
Group ADF-Statistic	-2.542716	0.0055		

Source: Eviews output

- ## Hypothesis Testing

- **Null Hypothesis (H_0):** No cointegration exists (there is no long-term relationship between the variables).
- **Alternative Hypothesis (H_1):** Cointegration exists (there is a long-term relationship between the variables).

In Pedroni's cointegration test, the decision-making process is based on the p-value (Prob.). The criterion for rejection is as follows: if the p-value is less than 0.05, the null hypothesis is rejected.

- As observed in the results, most of the test statistics (Panel rho, Panel PP, Panel ADF, in addition to Group rho, Group PP, and Group ADF) yield p-values below the 0.05 threshold (in many cases, the values are 0.0000 or 0.0001).
- Since these p-values are statistically significant, we reject the null hypothesis. This indicates the presence of a **cointegration relationship** among the variables (GDP, PETR, GFCF , AGR) in the long run

3.5.Estimation of Long-run and Short-run Relationships Using the Panel ARDL Model

Table7. Panel ARDL Model

Dependent Variable: D(GDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long Run Equation				
AGR	-0.170150	0.165503	-1.028081	0.3073
GFCF	0.087415	0.073859	1.183538	0.2404
PETR	0.094483	0.044067	2.144064	0.0354
Short Run Equation				
COINTEQ01	-0.958055	0.207352	-4.620434	0.0000
D(AGR)	-0.308259	0.366875	-0.840229	0.4035
D(GFCF)	0.655943	0.286011	2.293420	0.0247
D(PETR)	0.202444	0.160707	1.259708	0.2118
C	0.380965	1.360223	0.280075	0.7802
Mean dependent var	-0.005495	S.D. dependent var		5.035981
S.E. of regression	3.218929	Akaike info criterion		4.472946
Sum squared resid	756.3898	Schwarz criterion		5.087321
Log likelihood	-191.7014	Hannan-Quinn criter.		4.721287

The source: Eviews output

Based on the table above, the optimal model was selected according

to automatic selection criteria as an ARDL(1, 1, 1, 1) model, indicating the presence of time lags for the dependent variable and the three independent variables (AGR, GFCF , and PETR).

a. Long-Run Equation

This equation illustrates the long-term equilibrium relationship among the variables:

- **AGR:** The coefficient is negative (-0.170150) and statistically insignificant (Prob = 0.3073).
- **GFCF :** The coefficient is positive (0.087415) and statistically insignificant (Prob = 0.2404).
- **PETR:** The coefficient is positive (0.094483) and is the only variable statistically significant at the 5% level (Prob = 0.0354), suggesting a significant positive long-run impact of the PETR variable on the dependent variable.

b. Short-Run Equation

- **Speed of Adjustment (COINTEQ$_{01}$):** The coefficient is -0.958055, which is negative and statistically significant at the 1% level (Prob = 0.0000). This confirms the existence of a cointegration relationship among the variables and indicates that the model has a very strong error correction mechanism toward long-term equilibrium (approximately 95.8% of deviations are corrected in each period).
- **Short-Run Dynamics:**
    - **D(GFCF):** Shows a positive and statistically significant effect (Prob = 0.0247), indicating a significant immediate impact of the GFCF variable in the short run.
    - **D(AGR) and D(PETR):** The results show no statistical significance for the short-run effects of these variables on the dependent variable at conventional significance levels.

4. Results and discussion.

- . The study results revealed negative **effect with statistical insignificant** of the agricultural sector on economic growth. Below follows the testing of the study's hypotheses:
- **First Hypothesis:** From Table 7 we find that the regression coefficient for the relationship between AGR (value added in the agricultural sector) and GDP is (-0.170150) with a significance level of 0.3073, which is greater than 0.05. This means there is no statistically significant effect. Accordingly, the third hypothesis that there is a positive effect with statistical significance of value added in agriculture on GDP in the countries under study during 2000 2023 is rejected. This result disagrees with the findings of several studies that examined the effect of the agricultural sector on economic growth, as mentioned in previous studies, such as the study by Benali (2023) which found a positive effect in the short and long term; and the study by Mbotiji (2023). It also disagrees with the study by Sebki (2023), whose results showed that agricultural value added has a strong positive effect on long term economic growth in the MENA countries during 2000 2019.
- **Second Hypothesis:** This examines the relationship between GDP and oil revenues (PETR). From Table 6 we observe that the regression coefficient is 0.094483with a significance level of 0.0354, which is less than 0.05. This means there is a statistically significant positive relationship between oil revenues and GDP. Accordingly, the second hypothesis that there is a positive effect with statistical significance of oil revenue on GDP in the countries under study for the period 2000-2023 — is accepted. Our result aligns with the findings of Belloumi & Almashyakhi (2025), which studied several oil-producing countries in the Middle East and North Africa during 2002-2021, and concluded that natural resource rents have a positive impact on long-term economic growth, provided there is good governance
- **Third Hypothesis**: This hypothesis tests the relationship between fixed capital formation (GFCF) and the GDP. From Table 6 we find that the regression coefficient is 0.087415 with a significance level of 0.2404, which is greater than 0.05. This means there is no statistically significant effect of fixed capital formation on GDP.

Therefore, the first hypothesis, which asserts that "there is a positive effect with statistical significance of fixed capital formation on GDP in the North African countries during the period 2000–2023," is rejected. This result differs from the study by Boufench (2021), which demonstrated a long term direct relationship between gross fixed capital formation growth and growth in GDP per capita in Algeria over 1980 2018; and from another study by Ahamed (2021) conducted across 39 developing countries for the period 1990 2019, which concluded that gross capital formation was among the important explanatory variables of economic growth, along with labor force growth and final government expenditure. On the other hand, it agrees with the study by Beltrèche and Touiti (2018), which did not find strong evidence of a long run relationship between fixed capital formation and growth in Algeria, but found that economic growth causes fixed investment (i.e., growth drives fixed investment, not necessarily the opposite). The lack of significance of fixed capital formation may be due to low quality or inefficiency of investment projects, delays in their execution, or the fact that some investments are directed to sectors that do not yield rapid economic returns or are not highly productive.

5. Conclusion.

- The empirical estimations conducted in this study yielded results that deviate from traditional economic theory, as agricultural investment did not demonstrate a statistically significant impact on the GDP of North African countries throughout the study period. While the agricultural sector remains a strategic pillar of the economy, the absence of a direct, significant impact points to a structural gap between the volume of investment flows and their translation into macroeconomic performance. This lack of significance does not necessarily imply the inefficacy of agricultural investment itself; rather, it suggests the presence of structural bottlenecks that hinder the conversion of investment into tangible value-added. Key factors likely contributing to this outcome include the fragmentation of agricultural value chains, the dominance of the informal sector, and

significant vulnerability to climatic volatility, which disrupts investment return cycles. Consequently, these findings underscore the need for a paradigm shift moving from a mere focus on the quantity of investment to prioritizing the 'quality' and 'strategic targeting' of such investments to better align with the institutional and structural requirements of the region's economies..

- Oil revenues (PETR) also showed a positive, direct relationship with GDP, and this significant effect is expected in oil-rich countries such as Algeria and Libya, where a large part of those revenues is used to finance government expenditure and public investment, which in turn reflect on growth. Meanwhile, Gross Fixed Capital Formation (GFCF) did not show a statistically significant effect on economic growth in this study.

From the above, the following recommendations can be made:

- Focus efforts and policies on supporting agriculture as a core sector for growth through improving production efficiency, which can be achieved by investing in agricultural research, introducing technology in agriculture (smart agriculture).
- Strengthen governance and improve institutional quality to ensure that oil revenues are used in a sustainable manner and are directed toward funding productive sectors such as agriculture, education, and infrastructure.
- Strengthen regional cooperation and the exchange of experiences in the North African countries, especially by sharing best practices in agricultural policy, investment, and enhancing inter-country agricultural trade to reduce barriers to agricultural products.

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