

**Public Expenditure: Algeria's Challenge in Achieving Optimal GDP
-Analytical and econometric study using ARDL model (2000–2024)-**

الانفاق العام: رهان الجزائر في تحقيق الإنتاج المحلي الإجمالي الأمثل
-دراسة تحليلية وقياسية باستخدام نموذج ARDL للفترة (2000–2024)-

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Abstract:

This study aims to analyze and identify the dialectical relationship between public expenditure (both capital and operational expenditures)—and (GDP) in Algeria during the period of (2000–2024). Using the Autoregressive Distributed Lag (ARDL) model in EViews 10, the results showed that total public expenditure in its two components had weak explanatory power for GDP, with a value of $\bar{R}^2$ that did not exceed 37.40%. Despite the government's tendency to expand its operational expenditure, its effect was not statistically significant in the estimated model when compared with capital expenditure. This is due to the orientation of expenditures toward covering the state's administrative needs (wages and expenditures), as well as social grants and subsidies, which are non-productive uses and do not create added value.

Keywords: Public expenditure; Capital expenditures; Operational expenditures; Gross Domestic Product (GDP); ARDL model.

JEL Classification Codes: H50, O4.O47.

ملخص:

تهدف هذه الدراسة لتحليل وتحديد العلاقة الجدلية بين الانفاق الحكومي بقسميه (التجهيز والتسيير) والنتاج المحلي الإجمالي (GDP) في الجزائر خلال فترة (2000–2024). حيث تم التوصل باستخدام نموذج الانحدار الذاتي للإبطاء الموزع $ARDL$ وفق برمجيات *Eviews 10* الى أن الانفاق العام بقسميه يتسم بالضعف في تفسير (GDP) بقيمة $\bar{R}^2$ لم تتجاوز 37,40 %. وبالرغم من توجه الحكومة نحو زيادة نفقات التسيير الا أنها كانت غير معنوية في النموذج مقارنة بنفقات التجهيز. وهذا بسبب توجيه النفقات بشكل عام لتغطية مصالح الدولة من الناحية الإدارية (الأجور و نفقات المعدات) وكذلك المنح والاعانات الاجتماعية والتي هي مصالح غير منتجة ولا تخلق القيمة المضافة.

كلمات مفتاحية: الانفاق العام، نفقات التجهيز، نفقات التسيير، الناتج المحلي الإجمالي، نموذج $ARDL$.

تصنيفات JEL : H50 ، O4 ، O47 .

INTRODUCTION:

Public expenditure has a distinctive feature, reflected in how it determines the size and scope of the state's intervention in economic activity, with the aim of stimulating and boosting economic growth through achieving gross domestic product (GDP). For this reason, public expenditure is considered an important instrument of fiscal policy that can contribute to achieving broad economic and social stability. The relationship between public expenditure and GDP is one of the debated relationships that has generated many differences across theoretical studies, which analyze and discuss ideas from various schools of economic thought. Likewise, empirical studies that have focused on modeling and measuring this relationship have produced widely divergent results.

This variation in empirical findings has led to two groups of studies. The first group argues that excessive expansion in public (government) spending has negative effects, as it distributes financial allocations across economic sectors in a random manner, contributing to the waste of public funds and the spread of economic corruption, which undoubtedly leads to a decline in GDP growth. The second group, by contrast, emphasizes the potentially positive role of government expenditure in supporting economic activity and improving the economy's ability to achieve an optimal level of GDP.

Research problem:

In light of the preceding discussion, this study seeks to identify the nature of the relationship between public expenditure in its two components (capital and operating) and GDP in Algeria during the period 2000–2024, by attempting to answer the following question:

To what extent did capital and operating public expenditures contribute to GDP performance in Algeria during 2000–2024?

Study hypothesis:

The study is based on the assumption that public expenditure, in its two components (capital and operating), may play an important role in generating a statistically significant impact on GDP in Algeria in the short run as well as the long run during the period 2000–2024.

Methodology:

To answer the research question and evaluate the hypothesis, the study employs two complementary approaches. First, it uses an analytical approach to describe and interpret the evolving dynamics of public expenditure—through operating and capital spending—and GDP during 2000–2024. Second, it applies a quantitative econometric approach by estimating an Autoregressive Distributed Lag (ARDL) model using Eviews 10, with the aim of assessing the short- and long-run effects of public expenditure components on GDP in Algeria.

Study structure:

To address both the theoretical and econometric dimensions of the topic, respond to the research question, and test the hypothesis, the study was divided into three parts:

- Theoretical Framework of public expenditure and GDP
- Empirical assessment of Public expenditure and GDP in Algeria (2000-2024)
- The econometric study

Previous studies:

- **Ali Saif Al Mazrouei, (2012):** the authors have examined the impact of public expenditure on GDP in the United Arab Emirates over (1990–2009), and how it affects GDP components. Based on three empirical models, the results indicate a statistically significant and positive effect of public expenditure on overall GDP as well as on each of its main and secondary sources. (Ali Almazouri 2012)
- **Mohamed Abdel Rahman Salih (2012):** This research explores the link between government expenditure and GDP in Sudan during (1970–2010), drawing on Wagner's Law as a theoretical basis and employing econometric techniques. Its main finding was that Wagner's Law can explain the relationship between government expenditure and gross domestic product (GDP) in Sudan through a one-way causal relationship, running from GDP to government expenditure. (Salih 2012)
- **Salim Al-Omrawi and Sarrah Ben Lahrech (2022):** this study investigates the impact of public expenditure on economic growth in Algeria for the period (2000–2020), using Barro's endogenous growth model. The authors report a positive association between fixed capital accumulation and growth, while identifying a negative relationship between economic growth and both public expenditure and employment in Algeria. (Lamraoui et Benlahrch 2022)

1- Theoretical Framework of public expenditure and GDP:

To identify the relationship between public expending—specifically equipment and operational expenditures—and gross domestic product (GDP) in Algeria, it is necessary to begin by reviewing the principal theoretical approaches that explain why public expenditure matters and how it may affect economic growth as captured by GDP. It is also essential to define these variables with sufficient conceptual precision before proceeding to empirical analysis.

1-1 Public expenditure in economic theory

Public expenditure can be viewed as an indicator of the state's level of economic engagement and as a policy lever through which it promotes stability across economic, social, and political fields. For this reason, economists have devoted substantial attention to public expenditure, especially when assessing the consequences of government intervention in the economy.

From a **Keynesian perspective**, public expenditure plays a decisive role in determining a country's macroeconomic direction, since it constitutes a major component of aggregate demand alongside consumption and investment. Thus, an increase in public expenditure is directly accompanied by an increase in aggregate demand, and this increase has a positive effect on productive capacity because aggregate supply is flexible, enabling it to respond to any rise in the volume of demand. According to Keynes, this applies to an economy that has not yet reached full employment. In the opposite case (full employment), the state needs to intervene by reducing public expenditure, which contributes to a decline in aggregate demand, in order to restore balance with aggregate supply and thereby achieve economic stability. (Keynes)

In 1990, Barro (Barro, R. 1990) presented a key concept, which is that public expenditure primarily influences economic growth. Public expenditure facilitates the development of

essential infrastructure—including transportation systems and telecommunications networks—that creates favorable conditions for business operations. This environment enhances the efficiency of private sector companies' productive activities. However, these essential infrastructure have not competitive characteristics, which raises the problem of their financing by the private sector. Considering the high costs of developing these infrastructures, the government turns to tax collection to fund their development. Barro identifies two potential outcomes of public expenditure: (Barro)

- First, a positive outcome emerges when private capital achieves higher productivity levels, particularly during periods of income growth. This prevents the gradual decline toward zero marginal productivity.
- Second, a negative outcome occurs as taxation diminishes private sector productivity by reducing profitability through income deductions from business operations.

Despite this dual-effect dilemma, Barro argues that the positive impact dominates and compounds over time. Specifically, as government expenditure increases progressively, it creates increasingly favorable conditions for economic activity. This enhancement boosts productivity levels and ultimately sustains continuous economic growth rates.

1-2 The concept of Public expenditure and GDP:

1-2-1 Public expenditure:

Public expenditure refers to the financial resources allocated by the state to meet public needs. This expenditure serves as an instrument through which governments accomplish their objectives and execute their developmental initiatives. For this reason, determining the type of these expenditures is what affects economic and social life. Accordingly, public expenditures in the Algerian budget are divided into two basic sections as follows: (Keddi 186-187)

- **Operational expenditures:**
These are expenditures allocated for the ordinary and natural activities of the state. Generally, they are expenditures paid for public and administrative services, meaning their function is to ensure the continuity of state operations from an administrative perspective. Therefore, they include personnel expenses and equipment costs.
- **Capital expenditures:**
These are also called the investment expenses. Consequently, they represent expenditures of an investment nature that generate an increase in Gross Domestic Product (GDP) and subsequently increase the nation's wealth. These expenditures consist of structural economic, social, and administrative investments, which are considered direct productive investments. In general, capital expenditures are allocated to the state's economic sectors (agricultural sector, industrial sector, etc.) to equip them with the means to achieve global development in the country.

1-2-2 Global Domestic Product (GDP):

It is the total value of goods and services produced and marketed within the borders of a state during a specific time period (either quarterly or annually) (IMF). This metric reflects the economic condition of the state. An increase in production indicates the economy's capacity to provide more employment opportunities, and consequently increase individual income, which contributes positively to their consumption, savings, and investments. This leads to another

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increase in production, and vice versa.

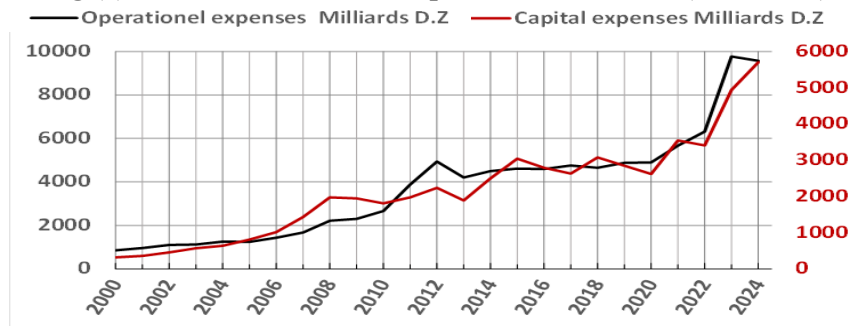
2- Empirical assessment of Public expenditure and GDP in Algeria (2000-2024):

To conduct a descriptive analysis of public expenditure evolution encompassing both (operational / equipment expenditure) and GDP in Algeria, statistical data from the National Office of Statistics, World Bank, and annual financial reports published by the Algerian Bank were used.

Analysis of Fig(1) reveals that public expenditures followed an upward trend, albeit with notable interruptions, rising from 1178.122 million DZD in 2000 to 15275.3 million DZD in 2024. despite the declines occurring during (2016 – 2020) due to the 2014 financial crisis and the 2020 pandemic. Also, GPD experienced growth in its volume, exceeding 4120.02 million DZD in 2000 to reach 35530.6 million DZD in 2024. However, this growth trajectory was similarly interrupted during (2009-2020) due to the same previous reasons, with GDP contracting from 11043.7 million DZD (2008) to 9968.01 million DZD (2009), and from 20501.2 million DZD (2019) to 18380.1 million DZD (2020).

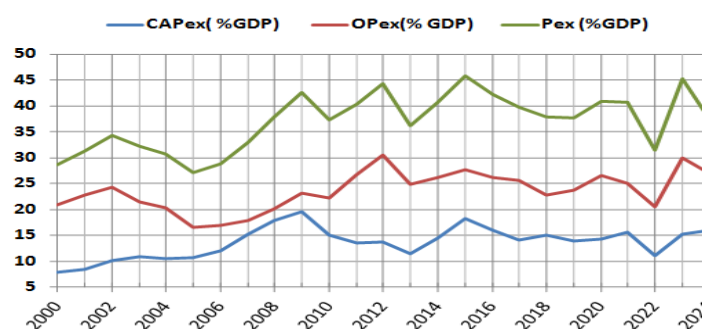
Regarding the relative share of public expenditures to GDP, which is a key indicator of government intervention in economic activity—Fig (2) demonstrates considerable volatility rather than consistent progression. Peak ratios were observed during (2015-2023), registering 45.81% and 45.12% respectively. This corresponds with the increase in public expenditure during these two years due to the government's orientation toward implementing an expansionary expending policy to achieve economic and social development.

Fig (1): Evolution of Public Expenditure and GDP (2000-2024)



Source: The authors based on Data table 1 in annex

Fig (2): Relative Share of Public Expenditure, OPex, & CAPex as a Percentage of GDP (2000-2024)



Source: The authors based on Data table 1 in annex

An analysis of public expenditure divided into its two categories—operational and capital expenditures—reveals through Fig (3) and Fig (4) below that both have generally exhibited a discontinuous upward trajectory, consistent with overall public expenditure trends. However, the share of operational expenses exceeds the share of capital expenditures.

Fig (3): Evolution of Operational Expenditure in Algeria (2000-2024)

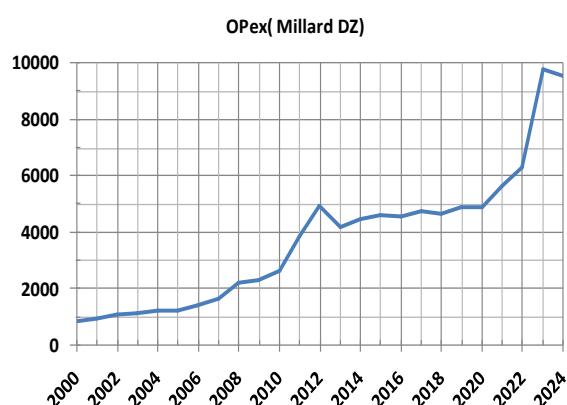
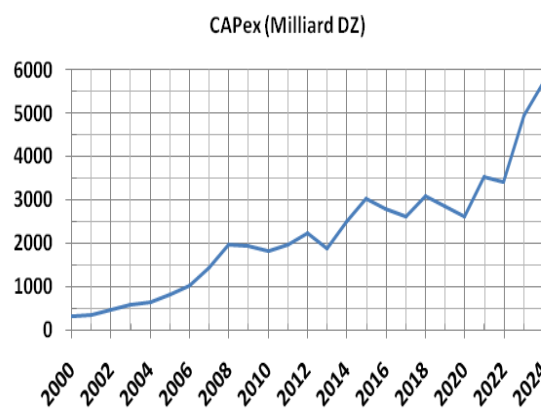


Fig (4): Evolution of Capital Expenditure in Algeria (2000-2024)



Source: The authors based on Data table 1 in annex

In analyzing the evolution of operational and capital expenditures, it is clear that during the period of (2000-2009), which witnessed the implementation of both the « Economic Recovery Program » beginning in 2001, and « the Complementary Program for Growth Support starting » in 2005; public expenditures that began this period with an upward trajectory increased from 1178.122 million DZD in 2000 to 4246.334 million DZD in 2009.

This expansion, driven by rising state financial resources, correspondingly impacted the growth of both operational expenditures and capital expenditures within the total public expenditure framework. However, a closer analysis of the the relative share indicates that capital expenditures have increased int their share, rising from 27.27% in 2000 to 45.83% in 2009. This growth trajectory had a particularly positive impact in 2002, when their share reached 29.20% (Bank of Algeria annual Repport , 2002) while maintaining budgetary balance, thereby enabling authorities to pursue strategic investment initiatives. These initiatives focused on reconstructing infrastructure compromised by the 2003 seismic event and modernizing administrative, social, and healthcare infrastructure to enhance quality of life.

Moreover, the execution of « the Complementary Growth Support Program » amplified capital expenditures by channeling resources toward critical economic sectors: extractive industries and energy, agricultural development and irrigation systems, and economic-administrative infrastructure—representing the principal categories of capital espenses (Bank of Algeria annual report , 2005). Consequently, the continued increase in capital expenditures during this period 2000-2009 corresponded with a proportional increase relative to GDP, escalating from 7.79% (2000) to 19.52% (2009), attributable to intensified investment in economic-administrative infrastructure, residential construction, and municipal development initiatives, particularly during 2004-2007 (Bank Of Algeria Annual Report , 2008)

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Conversely, management expenditures, while constituting a substantial portion of aggregate public spending, exhibited a declining proportional trend, decreasing from 72.67% (2000) to 54.16% (2009). This was reflected in their relative shares of GDP, as shown in Fig (2). Nevertheless, this does not negate their importance within public expenditure, as they contribute to strengthening personnel expenses and equipment costs, thereby playing a pivotal role in ensuring the continued operation of state services and agencies related to both administrative and social aspects, covering expenses for wages, equipment, tools, etc.

During the period of (2010-2019)—which was marked by the implementation of « the Economic Growth Consolidation Program 2010-2014 » and « the Five-Year Development Plan 2015-2019 »— public expenditure maintained an upward trajectory, advancing from 4466.9 million DZD (2010) to 7725.47 million DZD (2019). It should be noted that during 2013 and 2016, a decline in total expenditure was observed, which directly affected both capital expenditures and operational expenses. The 2016 decline, was primarily attributed to reduced financial resources, increased budget deficit, and deterioration of the revenue regulation reserve, leading authorities to implement fiscal consolidation measures through project cancellations and suspensions to optimize resource allocation.

The decline in public expenditure continued until 2018, after when the government pivoted toward expansionary fiscal policy to counteract the economic stagnation experienced during 2016-2017. This led to an increase in public expenditure to 7726.3 million DZD, disproportionately benefiting capital expenditures, which reached 39.83% of total public expenditure and contributed 15.09% to GDP. This expansion aimed to increase capital expenditures to 1143.7 billion DZD for debt settlement purposes, specifically addressing national loan securities and treasury obligations to Sonatrach corporation for fuel import price subsidies and desalination costs (Bank Of Algeria Annual Report , 2018)

In 2019, public expenditure declined to 7725.47 million DZD as part of deficit reduction efforts, resulting in a dual effect: capital expenditures declined proportionally from 39.83% (2018) to 36.84% (2019) of total expenditures, while operational expenditures's share expanded to 63.15%, reflecting continued governmental commitment to enhancing living standards through employment and wage level improvements (Bank of Algeria Annual report , 2020).

With the launch of « the Economic Recovery Plan 2020-2024 », public exhibited a downward trajectory in volume, declining to 7514.10 million DZD in 2020. This reduction precipitated a decrease in capital expenditures to 2620.67 million DZD—representing 34.87% of total public expenditure—attributed to fiscal constraints and COVID-19 pandemic (Bank Of Algeria Annual Report , 2021). Conversely, operational expenditures preserved their proportional allocation at approximately 65.12% of public expenditure, consistent with the government's emphasis on social stability through employment provision, unemployment assistance, housing initiatives, and related social programs.

With the beginning of 2021, public expenditure resumed its expansion trajectory, rising from 9210.51 million DZD to 15275.3 million DZD by 2024. This growth elevated the proportional contributions of both expenditure categories: operational between (61.50% to 66.42%), while equipments ranged from (38.49% to 37.34%) of total government expenditure. Notably, capital

expenditures' GDP contribution intensified from 14.25% (2020) to 16.05% (2024), driven by substantial volumetric increases during 2023 and 2024—reaching 4937.6 million DZD and 5703.94 million DZD respectively. This reflects governmental efforts through investment programs targeting productive economic sectors, particularly agriculture and irrigation infrastructure (Bank Of Algeria Annual Report , 2024)

In light of the previous analysis, it can be said that there has **been an attempt by the government to reach a point of relative equilibrium by reducing operational expenses and increasing capital expenditures** to establish a sustainable expenditure framework. This was clearly evident from the beginning of 2006 until 2009, when capital expenditures reached their maximum proportion of total public expenditure, maintaining a share in the structure of total expenditure ranging between 46.16%, 47.08%, and 45.83% during 2007, 2008, and 2009 respectively. This contrasts with operational expenses, which experienced a decline in their proportion of total public expenditure, recording 58.61% in 2006 and then 53.83%, 52.91%, and 54.16% during 2007, 2008, and 2009 respectively.

3- The econometric study:

To examine the relationship delineating the influence of public expenditure—encompassing both capital and operational components—on gross domestic product throughout 2000-2024. This study employs the Auto Regressive Distributed Lag (ARDL) modeling framework developed by (Pesaran, Shin et Smith 289-326). This methodological approach facilitates simultaneous examination of both short-run dynamics and long-run equilibrium relationships between independent explanatory variables and the dependent variable.

3-1 Determination of Variables:

A time series comprising 24 observations was used covering the period 2000-2024, as this period is characterized by successive Algerian governments implementing massive development programs through public expenditure. On this basis, the variables were defined as follows:

- **Capital expenditures (CAPEX):** This is an explanatory variable (exogenous) expressed in volume measured in billion DZD, representing all amounts allocated to productive sectors.
- **Operational Expenses (OPEX):** This is an explanatory variable (exogenous) expressed in volume measured in billion DZD, representing all amounts directed toward public and administrative services to ensure the operation of state activities.
- **Gross Domestic Product (GDP):** This is the variable to be explained (endogenous) expressed in volume measured in billion DZD, and it is an indicator that reflects the economic condition of the state.

Based on the above, the relationship can be written as follows:

$$GDP_t = \alpha_0 + \alpha_1 CAPex_t + \alpha_2 OPex_t + \varepsilon_t \quad - 1 -$$

What should be noted is that the ARDL model combines the characteristics of Auto Regressive Models and Distributed Lag Models to estimate cointegration relationships in both the long run

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and short run using a single equation instead of two equations, as illustrated in the equation below:

$$\Delta(GDP)_t = B_0 + \sum_{i=1}^p B_{1i} \Delta(GDP)_{t-i} + \sum_{i=0}^q B_{2i} \Delta(CAPex)_{t-i} + \sum_{i=0}^q B_{3i} \Delta(OPex)_{t-i} + \gamma_1 (GDP)_{t-1} + \gamma_2 (CAPex)_{t-1} + \gamma_3 (OPex)_{t-1} + e_t \quad - 2 -$$

Where: Δ : First difference operator, β_0 : Constant term, $B_1, \dots, B_3$: Short-run regression coefficients, $\gamma_1, \dots, \gamma_3$: Long-run regression coefficients, e_t : Error term.

After determining the lag periods for Equation (2) using the lowest value of the Akaike criterion, the ARDL model with error correction can be estimated according to the following equation:

$$\Delta(GDP)_t = B_0 + \sum_{i=1}^p B_{1i} \Delta(GDP)_{t-i} + \sum_{i=0}^q B_{2i} \Delta(CAPex)_{t-i} + \sum_{i=0}^q B_{3i} \Delta(OPex)_{t-i} + \gamma (ECT)_{t-1} + e_t \quad - 3 -$$

Where: $ECT(\text{cointEq}(-1))$ is the error correction term indicator that determines the speed of adjustment effect of the model toward its long-run equilibrium

3-2 Testing Variable Stability:

The contribution of (Pesaran, Shin et Smith 289-326).regarding the Auto Regressive Distributed Lag (ARDL) model addressed a fundamental econometric challenge in time series analysis related to the approach proposed by (Engle et Granger) and (Johansen), which required that all study variables be integrated (stationary) of the same order. Accordingly, following Pesaran et al, cointegration testing can be applied in studies where variables are integrated of order $I(0)$ or $I(1)$, or a combination of both. It should be noted that this approach cannot be used if any time series is integrated of an order higher than $I(1)$. Table (1) below presents the stationarity test results:

Table (1): Unit Root Test Results for Study Variables Using ADF-TEST at 5% Significance Level

Variable	ADF test (at level) (Intercept)			ADF test (First difference) (Intercept)			Ordre of cointegration
	Critical value 5%	Value calcule	P.Value	Critical value 5%	Value calcule	P.Value	
GDP	-3.6220	-1,569365	0 ,7736	-3.6328	-3,971187	0.0259	I(1)
CAPex	-3.6584	-0,846379	0.9430	-3,6584	-4.920662	0.0044	I(1)
OPex	-3.6220	-1.163821	0.8944	-3.6220	-5.003203	0.0029	I(1)

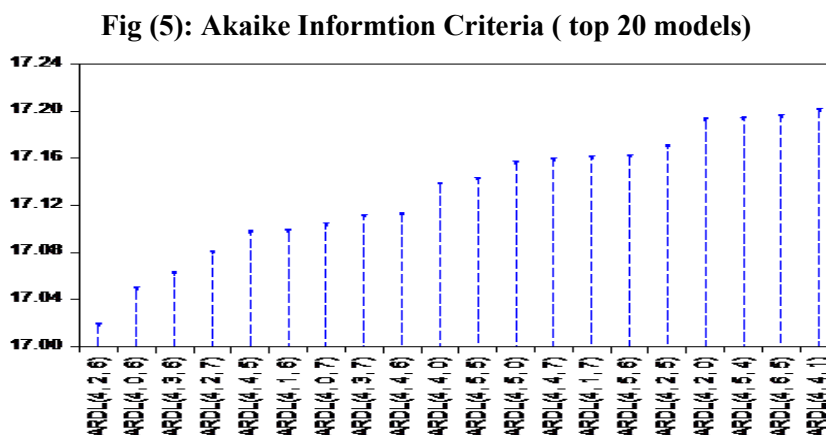
Source: The authors based on Eviews 10 outputs.

Upon examining the table, the Augmented Dickey-Fuller (ADF) test reveals that all study variables are stationary at the first difference, which permits estimation of the model for Relationship (1).

3-3 Estimation of Cointegration According to the ARDL Model

3-3-1 Estimation of the ARDL Model and Determination of Optimal Lag Length ARDL(p,q) :

The number of lags corresponding to the lowest value is tested using the Akaike criterion for each variable. Upon estimating the Auto Regressive Distributed Lag (ARDL) equation, it became evident according to Fig (5) that the appropriate lag periods for all study variables are ARDL(4,2,6), and thus it is considered the best model among 19 other estimated models, as it yields the lowest Akaike criterion value.



Source : Eviews -10 outputs

3-3-2 Diagnostic Tests for the Estimated ARDL(4,2,6) Model

To ensure that the ARDL(4,2,6) model is characterized by quality and free from econometric problems, the following tests must be conducted:

- **Serial Correlation Test:** To detect this problem, the Breusch-Godfrey test (Gujarati) can be used. This test is based on the null hypothesis stating that there is no serial correlation problem between errors. This is verified through the Fisher probability value, estimated at 0.1842 (Table 2 in the Appendix), which is greater than 0.05. Therefore, the null hypothesis is accepted, and the model does not suffer from this problem.
- **Heteroscedasticity Test:** Table 2 in the Appendix shows that the probability value for the Breusch-Pagan-Godfrey test (Gujarati) is greater than 5%, which allows acceptance of the null hypothesis stating homogeneity of error term variance. Consequently, the model is characterized by homoscedastic residuals (constant variance of residuals).
- **Normality Test for Residuals:** The Jarque-Bera test can be used to diagnose the quality of the model in terms of normal distribution of residuals. According to the results shown in Figure 1 in the Appendix, the probability value for J.B., which equals 0.907047, exceeds 5%. Therefore, this result confirms that the model's residuals follow a normal distribution.

3-3-3 ARDL Bounds Test for Cointegration

The bounds testing approach, introduced by (Pesaran, Shin et Smith 289-326)., was utilized to examine whether a long-run equilibrium relationship exists between the variables under

examination. In this analysis, gross domestic product (GDP) serves as the endogenous variable, while operational expenditures (OPEX) and capital expenditures (CAPEX) function as exogenous variables. The methodology evaluates the null hypothesis, which posits the absence of a long-run equilibrium relationship between the study variables, versus the alternative hypothesis, which suggests such a relationship does exist. The evaluation procedure involves comparing the calculated F-statistic value with the critical values of the upper and lower bounds as proposed by (Narayan). The test results are shown in the table below.

Table (2): Results of the cointegration test (Bounds Test)

F-statistic	Significance level	Critical bounds	
		Critical value	
4,0440190		I(0)	I(1)
	1%	4,13	5
	5%	3,1	3,87
	10%	2,63	3,35

Source: The authors based on Eviews 10 outputs.

The findings presented in Table (2) above indicate that the calculated F-statistic value of (4.0440190) surpasses the upper critical values of (3.87 and 3.35) at the 5% and 10% significance levels respectively. These results provide sufficient evidence to reject the null hypothesis in favor of the alternative hypothesis, thereby establishing the presence of a long-run equilibrium relationship between the variables examined in this study.

The confirmation of cointegration between gross domestic product and the two exogenous variables, the analysis now proceeds in two directions. First, we estimate the long-run coefficients. Second, we identify the short-run dynamics

3-3-4 Estimating the Long-Run Relationship

Based on the methodology established by Pesaran, the ARDL(4,2,6) model was used to examine the long-run relationship between the variables. As shown in Table 3 in the appendix, the results yielded the following estimated long-run relationship:

$$EC = D(GDP) - (2.0112 * D(CAPex) + 0.0313 * D(OPex) + 308.4266 - 4 -$$

Equation (4) reveals a positive relationship between the exogenous variables (capital expenditures and operational expenditures) and the endogenous variable, GDP, conforming to established economic theory. Notably, the coefficient associated with capital expenditures demonstrates statistical significance, with a probability value less than 0.05 significance level. The results indicate that each 1% rise in capital expenditures generates a corresponding 2.0112% increase in GDP. Despite this statistically significant effect, it remains weak, making this outcome consistent with existing empirical studies and representative of Algeria's economic conditions.

The increase in public expenditure (comprising both operational expenditures and capital expenditures) had a limited impact on GDP, which contradicts Barro's 1981 argument that increases in public expenditure should generate positive and productive outcomes through enhanced income generation. Thus, the expansionary fiscal policy implemented by Algerian

government during (2000-2024) had a weak effect on GDP. This weakness is particularly evident in the adjusted R-squared value of merely 37.40% (referenced in Table in appendix), indicating that the explanatory power of the two exogenous variables (operational expenditures and capital expenditures) remains insufficient.

This limited impact undoubtedly reflects the underdeveloped state of the core productive infrastructure across economic sectors and challenges in developing it. One of the primary components of Algeria's GDP heavily depends on the hydrocarbon sector, which experiences vulnerability to external fluctuations (particularly price volatility) while simultaneously serving as the primary revenue source upon which the Algerian government bases its development programming.

3-3-5 Estimating Short-Run Dynamics and Error Correction for the ARDL(4,2,6) Model

Given that the model specified in relationship (1) is characterized by cointegration among the study variables, a key question arises: how quickly does the system adjust back to long-run equilibrium after short-run deviations occur in the endogenous variable? To answer this question, it was necessary to estimate the error correction model (ECM). Table (5) in the appendix indicate that GDP returns to long-run equilibrium, as evidenced by the negative error correction term (ECT) estimated at (-2.140016), which achieves statistical significance at the 5% level. This negative coefficient reveals that roughly 2.140018% of any short-run divergence from the long-run equilibrium level of GDP is corrected within each period. The adjustment speed translates to approximately $(1/2.140018) \times 12$ months, corresponding to 5 months and 15 days for complete correction.

After estimating the error correction model, it is essential to verify the stability of long-run parameters relative to their short-run counterparts using the CUSUM test developed by (Brown et Durbin). As illustrated in Fig (2) of the appendix, no structural break emerges in the data, confirming overall model stability. This stability indicates that long-run parameters align consistently with their short-run equivalents, as the statistical plot remains confined within the 5% critical bounds throughout the sample period, thereby validating the estimated model specification.

Conclusion

Given the importance of public expenditure as one of the state's most effective tools for state to develop its economy, particularly in optimizing gross domestic product, this research examined the complex relationship between public expenditure components (capital and operating expenditures) and gross domestic product in Algeria during the period of (2000-2024). The following results were reached:

- From an econometric perspective, by using the Autoregressive Distributed Lag (ARDL) model, as developed by Pesaran, it was confirmed the presence of cointegration among the variables under study. allowing for the estimation of both short-run and long-run coefficients. Accordingly, econometric analysis revealed that capital expenditures, as an explanatory variable, it has a positive and statistically significant impact on gross domestic product. Conversely, operating expenditures, despite exhibiting a direct relationship, failed to demonstrate statistical significance. Additionally, the explanatory power of the two explanatory variables was weak, estimated at 37.40%.

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- From an economic perspective, it was concluded that operating expenditures experienced substantial inflation in their absolute value, with their share exceeding more than half of total public expenditures, and serving as the principal driver of public expenditure growth. Government spends enormous amounts for procuring essential goods and services while simultaneously funding increases in public sector salaries and social programs (including grants and subsidies). Capital expenditures, despite their direct impact on gross domestic product, their share remains weak relative to total public expenditures. However, the increase witnessed in these expenditures during 2000-2024 in investment, it generated positive effects on gross domestic product, albeit weakly, due to their allocation toward sectors that are largely affected by external changes.

These findings indicate partial inconsistency with the hypothesis proposing that public expenditure across both categories (capital and operational) significantly influences GDP. Overall, the expansion of public spending in Algeria between 2000 and 2024, in its operating and investment components, was marked by inefficiencies in allocation, particularly in investment expenditures, which are typically expected to generate significant effects by directly stimulating aggregate demand and, in turn, increasing total output.

Although a positive relationship was observed between current expenditure and GDP, relationship (4) shows that this effect was not statistically significant, despite the substantial share of current spending in total public expenditures. This can be attributed to the fact that such spending was largely directed toward non-productive uses focused on satisfying social needs, thereby failing to produce the expected positive impact on GDP.

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ANNEX

Table N⁰¹ : Evolution of Public expenses and GDP in Algeria during the period 2000-2024

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008
Pex MD*	1178,12	1321,028	1550,646	1690,166	1891,8	2052,037	2453,014	3108,5	4191 ,0
GDP MD*	4120,02	4230,1	4520,01	5250,3	6150,4	7563,6	8514,8	9408,3	11043,74
Years	2009	2010	2011	2012	2013	2014	2015	2016	2017
Pex MD	4246,334	4466,9	5853,6	7169,9	6092,1	6995,7	7656,3	7383,6	7389,3
GDP MD	9968,01	11991,6	14526 ,6	16209,6	16647,9	17228,6	16712,7	17514,6	18575,8
Years	2018	2019	2020	2021	2022	2023	2024		
Pex MD	7726,3	7725,477	7514,109	9210,510	9719,83	14706,9	15275,3		
GDP MD	20390,1	20501,2	18380,1	22690,2	30853	32588,7	35530,6		

Source : the authors based on : - <https://www.bank-of-algeria.dz> seen: 10/09/2024

<https://donnees.banquemondiale.org> consult seen:15/09/2024

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MD*milliars dinars

Table N⁰² : results of hétéroscedasticity and autocorrelation tests

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.638254	Prob. F(14,23)	0.1423
Obs*R-squared	18.97335	Prob. Chi-Square(14)	0.1660
Scaled explained SS	15.94188	Prob. Chi-Square(14)	0.3169

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.942922	Prob. F(2,21)	0.1874
Obs*R-squared	12.16292	Prob. Chi-Square(2)	0.0023

Source : evIEWS10 results

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Table N° 3 : Model Estimation ARDL

ARDL Long Run Form and Bounds Test
Dependent Variable: D(GDP, 2)
Selected Model: ARDL(4, 2, 6)
Case 2: Restricted Constant and No Trend
Date: 06/10/25 Time: 21:25
Sample: 2000S1 2024S2
Included observations: 38

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	660.0387	396.2970	1.665515	0.1094
D(GDP(-1))*	-2.140018	0.537376	-3.982347	0.0006
D(CAPex(-1))	4.304106	1.771332	2.429870	0.0233
D(OPex(-1))	0.066932	4.216924	0.015872	0.9875
D(GDP(-1), 2)	1.020317	0.489413	2.084778	0.0484
D(GDP (-2), 2)	0.851717	0.412192	2.066310	0.0502
D(GDP (-3), 2)	0.782158	0.333194	2.347455	0.0279
D(CAPex, 2)	2.412458	1.189453	2.028207	0.0543
D(CAPex (-1), 2)	-1.357919	1.108697	-1.224789	0.2331
D(OPex , 2)	-0.403262	1.612947	-0.250015	0.8048
D(OPex (-1), 2)	-1.117213	3.438947	-0.324871	0.7482
D(OPex (-2), 2)	0.350994	2.675742	0.131176	0.8968
D(OPex (-3), 2)	0.196745	2.500758	0.078674	0.9380
D(OPex (-4), 2)	-1.183650	2.144254	-0.552010	0.5863
D(OPex (-5), 2)	-2.272780	1.514142	-1.501034	0.1470

* p-value incompatible with t-Bounds distribution.

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CAPex)	2.011247	0.652356	3.083050	0.0053
D(OPex)	0.031277	1.970648	0.015871	0.9875
C	308.4266	173.1586	1.781181	0.0881

EC = D(GDP) - (2.0112*D(CAPex) + 0.0313*D(OPex) + 308.4266)

Source : Eviews10 results

Table N° 4 : results of Adjusted R-squared

R-squared	0.610892	Mean dependent var	674.3158
Adjusted R-squared	0.374044	S.D. dependent var	1662.054
S.E. of regression	1314.974	Akaike info criterion	17.48840
Sum squared resid	39770605	Schwarz criterion	18.13482
Log likelihood	-317.2797	Hannan-Quinn criter.	17.71839
F-statistic	2.579253	Durbin-Watson stat	2.087308
Prob(F-statistic)	0.021254		

Source : Eviews10 results

Table N.^o5 : Error correction model (short-term dynamics)

ARDL Error Correction Regression
 Dependent Variable: D(GDP, 2)
 Selected Model: ARDL(4, 2, 6)
 Case 2: Restricted Constant and No Trend
 Date: 10/06/25 Time: 21:24
 Sample: 2000S1 2024S2
 Included observations: 38

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1), 2)	1.020317	0.453383	2.250453	0.0343
D(GDP (-2), 2)	0.851717	0.379908	2.241904	0.0349
D(GDP (-3), 2)	0.782158	0.299491	2.611620	0.0156
D(CAPex, 2)	2.412458	0.822922	2.931575	0.0075
D(CAPex(-1), 2)	-1.357919	0.980572	-1.384824	0.1794
D(OPex, 2)	-0.403262	1.129029	-0.357175	0.7242
D(OPex(-1), 2)	-1.117213	1.121680	-0.996018	0.3296
D(OPex(-2), 2)	0.350994	1.024001	0.342767	0.7349
D(OPex(-3), 2)	0.196745	1.062977	0.185089	0.8548
D(OPex(-4), 2)	-1.183650	1.394347	-0.848892	0.4047
D(OPex(-5), 2)	-2.272780	1.162035	-1.955862	0.0627
CointEq(-1)*	-2.140018	0.500684	-4.274188	0.0003

Source : EvIEWS10 results