

The Impact of Macroeconomic Determinants (Inflation, Economic Growth, and Trade Openness) on Tax Revenue in Algeria: An Empirical OLS Analysis (2000–2024)

Belaoudja Hassina 

Abstract. Tax revenue plays a central role in ensuring fiscal sustainability, yet empirical evidence on the macroeconomic factors shaping tax revenue performance in Algeria remains limited. This study aims to examine the effects of inflation, economic growth, and trade openness on tax revenue in Algeria over the period 2000–2024. Using annual time-series data, the analysis employs the Ordinary Least Squares (OLS) method to estimate the relationship between these macroeconomic variables and tax revenue measured as a percentage of Gross Domestic Product (GDP). The estimated model is statistically significant and explains approximately 48% of the variation in tax revenue. The findings indicate that inflation has a positive and statistically significant effect on tax revenue, whereas GDP growth is associated with a statistically significant negative effect. By contrast, the estimated effect of trade openness is negative but not statistically significant. The negative association between GDP growth and tax revenue may reflect the structure of the Algerian economy, where economic expansion has been largely driven by the hydrocarbon sector without generating a proportional increase in non-hydrocarbon tax revenues. These results suggest that strengthening tax performance requires more than sustaining economic growth alone. Expanding the effective tax base, improving tax administration through digitalization, and supporting economic diversification are likely to enhance domestic revenue mobilization and reduce dependence on hydrocarbon revenues. The study contributes to the literature by providing updated empirical evidence on the macroeconomic determinants of tax revenue in Algeria and offers practical insights for policymakers seeking to strengthen fiscal sustainability.

Keywords: tax revenue, inflation, economic growth, trade openness, Algeria

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Received: 28 January 2026; Accepted: 11 June 2026; Published online: 28 September 2026

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Əlcəzairdə makroiqtisadi amillərin (inflyasiya, iqtisadi artım və ticarət açıqlığı) vergi gəlirlərinə təsiri: empirik OLS təhlili (2000–2024)

Belaoudja Hassina 

Xülasə. Vergi gəlirləri fiskal dayanıqlığın təmin edilməsində mühüm rol oynayır. Bununla belə, Əlcəzairdə vergi gəlirlərinin formalaşmasına təsir edən makroiqtisadi amillərlə bağlı empirik sübutlar hələ də məhduddur. Bu tədqiqat 2000–2024-cü illər ərzində Əlcəzairdə inflyasiyanın, iqtisadi artımın və ticarət açıqlığının vergi gəlirlərinə təsirini araşdırmağı qarşıya məqsəd qoyur.

İllik zaman sırası məlumatlarından istifadə etməklə, tədqiqat vergi gəlirlərinin ÜDM-ə nisbətə faizi ilə ölçülən göstəricisi ilə qeyd olunan makroiqtisadi dəyişənlər arasındakı əlaqəni qiymətləndirmək üçün Adi Ən Kiçik Kvadratlar (OLS) metodundan istifadə edir. Qiymətləndirilmiş model statistik baxımdan əhəmiyyətli olmuş və vergi gəlirlərindəki dəyişkənliyin təxminən 48%-ni izah etmişdir. Nəticələr göstərir ki, inflyasiya vergi gəlirlərinə müsbət və statistik baxımdan əhəmiyyətli təsir göstərir, halbuki ÜDM artımı vergi gəlirləri ilə statistik baxımdan əhəmiyyətli mənfi əlaqəyə malikdir. Bunun əksinə olaraq, ticarət açıqlığının qiymətləndirilmiş təsiri mənfi olsa da, statistik baxımdan əhəmiyyətli deyil. İqtisadi artım ilə vergi gəlirləri arasındakı mənfi əlaqə Əlcəzair iqtisadiyyatının struktur xüsusiyyətləri ilə izah oluna bilər. Belə ki, iqtisadi genişlənmə, əsasən, karbohidrogen sektorunun hesabına baş vermiş və qeyri-karbohidrogen sahələrindən əldə olunan vergi gəlirlərində mütənasib artım yaratmamışdır. Bu nəticələr göstərir ki, vergi gəlirlərinin səmərəliliyinin artırılması yalnız davamlı iqtisadi artımın təmin edilməsi ilə məhdudlaşmamalıdır. Effektiv vergi bazasının genişləndirilməsi, rəqəmsallaşdırma vasitəsilə vergi inzibətçiliğinin təkmilləşdirilməsi və iqtisadi diversifikasiyanın dəstəklənməsi daxili gəlirlərin səfərbər edilməsini gücləndirə və karbohidrogen gəlirlərindən asılılığı azalda bilər. Tədqiqat Əlcəzairdə vergi gəlirlərinin makroiqtisadi determinantları üzrə yenilənmiş empirik sübutlar təqdim etməklə ədəbiyyata töhfə verir və fiskal dayanıqlığın gücləndirilməsində siyasətçilər üçün praktiki tövsiyələr irəli sürür.

Açar sözlər: vergi gəlirləri, inflyasiya, iqtisadi artım, ticarət açıqlığı, Əlcəzair

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Daxil oldu: 28 Yanvar 2026; Qəbul edildi: 11 İyun 2026; Onlayn dərc edildi: 28 Sentyabr 2026

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Introduction

Tax revenue represents the principal and most sustainable source of public finance, enabling governments to finance public services, infrastructure, social protection, and long-term development programs. Beyond its fiscal role, an effective tax system contributes to macroeconomic stability, supports income redistribution, and strengthens governments' capacity to achieve sustainable development objectives (Organisation for Economic Co-operation and Development (OECD), 2024). Consequently, improving domestic revenue mobilization has become a major policy priority, particularly for developing countries seeking to reduce fiscal vulnerabilities and enhance resilience to external economic shocks (International Monetary Fund (IMF), 2025).

From a theoretical perspective, tax revenue is influenced by a range of macroeconomic factors. Inflation may increase nominal tax receipts by expanding the value of taxable income, consumption, and business transactions, although persistent inflation may weaken economic activity and reduce the real value of government revenues when tax collection is delayed. Economic growth is generally expected to broaden the tax base through higher production, income, and consumption, thereby improving tax performance. Likewise, trade openness can affect tax revenue by influencing trade flows, economic activity, and the composition of government revenues. Nevertheless, the magnitude and direction of these relationships depend on the structure of the economy, the characteristics of the tax system, and the quality of fiscal and institutional governance.

Algeria offers an appropriate context for examining these relationships. Despite successive fiscal reforms aimed at modernizing tax administration and strengthening domestic revenue mobilization, public finances continue to rely heavily on hydrocarbon revenues, while the contribution of non-

hydrocarbon taxation remains relatively limited. This situation highlights the need to better understand the macroeconomic factors influencing tax revenue and to identify policy measures capable of improving the efficiency and sustainability of the tax system (IMF, 2025).

Although the determinants of tax revenue have been widely examined in the empirical literature, previous studies report mixed findings regarding the effects of inflation, economic growth, and trade openness. These inconsistencies largely reflect differences in economic structures, institutional quality, fiscal systems, and methodological approaches. Consequently, further country-specific evidence remains necessary, particularly for resource-dependent economies such as Algeria, where the determinants of tax revenue may differ from those observed in more diversified economies.

Against this background, the present study investigates the effects of inflation, economic growth, and trade openness on tax revenue in Algeria over the period 2000–2024 using annual time-series data and the Ordinary Least Squares (OLS) estimation technique. The study contributes to the literature by providing recent empirical evidence on the macroeconomic determinants of tax revenue in Algeria and by offering policy-relevant insights that may support efforts to strengthen domestic revenue mobilization and promote long-term fiscal sustainability.

Accordingly, the study addresses the following main research question:

To what extent do inflation, economic growth, and trade openness affect tax revenue in Algeria during the period 2000–2024?

To answer this question, the following sub-questions are examined:

- What is the effect of inflation on tax revenue in Algeria?
- How does economic growth influence tax revenue in Algeria?
- Does trade openness have a statistically significant effect on tax revenue in Algeria?
- To what extent do inflation, economic growth, and trade openness jointly explain variations in tax revenue?

Based on the theoretical framework and the empirical literature, the study tests the following hypotheses:

H1: Inflation has a statistically significant effect on tax revenue in Algeria.

H2: Economic growth has a statistically significant effect on tax revenue in Algeria.

H3: Trade openness has a statistically significant effect on tax revenue in Algeria.

H4: Inflation, economic growth, and trade openness jointly exert a statistically significant effect on tax revenue in Algeria.

Literature Review

1. Theoretical Background

1.1. Tax Revenue

Tax revenue is the cornerstone of public finance and the principal source of domestic government financing. It consists of compulsory payments levied by the state on individuals and businesses without direct compensation, serving not only to generate public revenue but also to allocate resources efficiently, redistribute income, promote macroeconomic stability, and address market failures (Musgrave & Musgrave, 1989). Economically, it reflects a government's capacity to mobilize domestic resources for public expenditure and long-term development; an effective tax system should generate adequate income while preserving equity, efficiency, administrative simplicity, and transparency, limiting economic distortions and providing a stable financial base for education, healthcare, infrastructure, and social protection (Rosen & Gayer, 2023).

Tax revenue is shaped jointly by economic, institutional, and administrative factors. Economic conditions determine the size of the tax base through changes in production, income, consumption, investment, and trade, while institutional quality, governance, and administrative and enforcement efficiency determine how effectively taxable activity is converted into actual revenue (Stiglitz & Rosengard, 2015).

For emerging economies, strengthening domestic revenue mobilization has become a strategic priority to reduce dependence on external funding and natural-resource income while improving fiscal sustainability and resilience to shocks (OECD, 2024). In Algeria, despite successive fiscal reforms, tax performance remains constrained by structural issues—heavy reliance on petroleum income, a large informal economy, and limited administrative capacity. Recent evidence indicates that governance and tax administration reforms, combined with favorable macroeconomic conditions, are critical to improving tax revenue performance (Belaoudja & Hamdani, 2026).

Given this complexity, identifying the macroeconomic drivers of tax revenue is a central concern in public finance research, with inflation, economic growth, and trade openness among the most frequently examined, as each can influence both the size of the tax base and the state's capacity to collect sustainable revenue. The following section examines the theoretical relationship between inflation and tax revenue.

1.2. Inflation and Tax Revenue

Inflation denotes a sustained rise in the general price level, reducing the purchasing power of money. As a key macroeconomic indicator, it affects production prices, household consumption, investment decisions, wage dynamics, and overall fiscal performance. Its relationship with tax revenue is particularly relevant because inflation affects both the nominal value of tax bases and the real value of government revenue, making its net fiscal impact conceptually complex (Mankiw, 2024). Theoretically, moderate inflation may raise tax collection by increasing the nominal value of taxable income, corporate profits, consumption expenditure, and commercial transactions. Under progressive systems, rising nominal incomes can also push taxpayers into higher brackets, generating additional revenue without changes in statutory rates. Inflation can thus expand the tax base and boost nominal revenues, particularly where tax administration is efficient and collection occurs without major delay (Tanzi, 1977). Conversely, chronic or excessive inflation may undermine tax performance through several channels: it erodes purchasing power, discourages private investment, raises production costs, and can impair overall economic activity. Moreover, delays between the taxable event and actual collection allow inflation to erode the real value of tax receipts—the widely recognized *Tanzi Effect*—an outcome particularly pronounced in developing economies where administrative inefficiencies and collection lags further diminish real government income (Tanzi, 1977).

The magnitude and direction of the inflation–tax revenue relationship depend largely on country-specific characteristics, including the structure and composition of the tax system, administrative effectiveness, digitization, institutional quality, and taxpayer compliance. As a result, similar inflation rates can produce markedly different revenue outcomes across countries with different institutional and socioeconomic settings (Abdel Rahman, 2024). For emerging economies such as Algeria, where fiscal performance remains highly sensitive to macroeconomic fluctuations and structural constraints, understanding inflation's effect on tax revenue is particularly relevant, offering evidence for fiscal policies that safeguard domestic revenue mobilization while maintaining macroeconomic stability. This discussion underpins the first empirical hypothesis of the present study.

1.3. Economic Growth and Tax Revenue

Economic growth, defined as the persistent rise in the real value of goods and services produced, typically measured by real GDP growth, is a fundamental indicator of economic performance and a

key predictor of budgetary capacity. From a public finance perspective, growth expands the tax base by raising household income, corporate profits, consumption, and investment, thereby strengthening the government's revenue-mobilization capacity (Rosen & Gayer, 2023). This relationship is anchored in the concept of tax buoyancy, which holds that tax revenue should rise as economic activity expands: higher output and income generate more taxable transactions, increasing collections from both direct taxes (personal and corporate income) and indirect taxes (VAT, excise duties). Sustained growth is thus generally expected to improve fiscal performance without requiring higher statutory rates (Musgrave & Musgrave, 1989). Despite this theoretical expectation, empirical evidence shows that economic expansion does not always translate proportionally into higher tax revenue. The strength of this link depends on structural factors such as the type of economic activity, the size of the informal sector, the prevalence of tax exemptions, administrative efficiency, and institutional quality. Where growth concentrates in sectors benefiting from preferential tax treatment or compliance remains weak, GDP gains may yield only modest revenue improvements (Stiglitz & Rosengard, 2015).

This issue is especially pronounced in resource-dependent economies, where growth driven mainly by extractive industries may not substantially broaden the domestic tax base beyond that sector—allowing relatively strong GDP growth to coexist with weak domestic tax collection. This divergence underscores the importance of economic diversification and effective tax administration for revenue mobilization (OECD, 2024). Recent empirical research shows that the growth–tax revenue relationship varies considerably across countries and development stages: some studies find a favorable long-run link, while others report weak or negative effects where institutional constraints, policy distortions, or structural factors limit the fiscal gains of growth. These divergent findings highlight the need for country-specific empirical analysis, forming the basis for the study's second hypothesis concerning the relationship between GDP growth and tax revenue.

1.4. Trade Openness and Tax Revenue

Trade openness reflects the extent to which an economy is integrated into global markets, generally measured as the ratio of total exports and imports to GDP. As a key dimension of globalization, it promotes production, investment, technological diffusion, and growth, while also affecting fiscal performance through multiple channels (Krugman et al., 2018). From a public finance standpoint, trade openness influences tax revenue both directly, through customs tariffs and import taxes, and indirectly, since deeper integration into international markets stimulates production, investment, employment, and household income—broadening the domestic tax base and raising revenue from personal income, corporate income, and consumption taxes. Trade openness has thus long been viewed as a driver of domestic revenue mobilization through higher economic activity (Baunsgaard & Keen, 2010). Nonetheless, the theoretical relationship remains ambiguous. Trade liberalization typically reduces tariffs and customs charges, which can sharply lower border tax collections. Whether these losses are offset depends on the government's capacity to strengthen domestic taxation through VAT, corporate, and personal income taxes. Countries with efficient administrations and broad tax bases are better positioned to compensate for tariff losses, whereas developing economies with weaker institutional capacity often experience persistent revenue declines following liberalization (Baunsgaard & Keen, 2010).

The fiscal impact of trade openness is further conditioned by export composition, economic diversification, the size of the informal sector, customs administration efficiency, and fiscal governance quality. In resource-dependent economies, greater trade participation does not necessarily raise domestic tax revenue when exports remain concentrated in sectors with preferential tax treatment or limited fiscal spillovers, so the revenue effects of trade openness vary considerably across countries and stages of development (OECD, 2024).

This ambiguity is mirrored in the empirical literature: while many studies find a positive association between trade openness and tax revenue via its contribution to growth, others report minimal, statistically negligible, or negative effects, largely attributable to tariff reductions and structural constraints. These divergent findings underscore the need for country-specific research. For Algeria, examining trade openness's contribution to tax revenue is particularly relevant given ongoing efforts to diversify the economy and boost domestic revenue mobilization beyond oil resources. Trade openness therefore constitutes the third macroeconomic determinant examined in this study.

1.5. Empirical Literature

Tax revenue determinants have received substantial attention in the empirical public finance literature, especially in developing and emerging economies where strengthening domestic resource mobilisation has become a key fiscal policy objective. While macroeconomic conditions are known to influence tax performance, empirical evidence remains far from unanimous: heterogeneity in the effects of inflation, economic growth, and trade openness on tax revenue is attributed to differences in economic structures, institutional quality, tax policy frameworks, and econometric approaches.

Evidence from developed and transition economies generally agrees that favorable macroeconomic conditions facilitate domestic tax revenue mobilization. In panel data models for European economies, Ristić Cakić et al. (2025) showed that economic growth and trade openness positively affect tax revenue, while inflation exerts a negative impact on fiscal performance. Similarly, Matuiza and Šapkauskienė (2025) found that financial development and trade openness improve tax revenue in post-transition EU countries, though inflation's estimated effect depends on the econometric specification. Together, these findings suggest that diversified economies, prudent macroeconomic management, and efficient fiscal institutions enhance governments' ability to convert economic growth into sustainable tax revenues (Ristić Cakić et al., 2025; Matuiza & Šapkauskienė, 2025).

Conversely, evidence from developing economies reveals a far more heterogeneous relationship between macroeconomic variables and tax revenue. Using an ARDL model for Zambia, Funjika and Gatawa (2025) found that trade openness has a positive long-run impact on tax revenue, whereas inflation and GDP per capita negatively affect fiscal performance. Similarly, Chahib, Bel Mkaddem and Tesse (2026), applying a panel ARDL model to MENA countries, concluded that exports and imports positively affect corporate tax revenue in the long run, while GDP growth does not necessarily raise tax collections. These results indicate that the fiscal implications of macroeconomic performance depend on structural features, institutional quality, tax policy design, and administrative efficiency (Funjika & Gatawa, 2025; Chahib et al., 2026).

Cross-country evidence further confirms the absence of a uniform relationship between macroeconomic variables and tax revenue. Covering 172 countries, Cornevin et al. (2024) found that tax revenue responds positively to economic growth in the long run, while short-run effects remain relatively weak due to differences in tax buoyancy, institutional capacity, and fiscal structures—suggesting that similar macroeconomic conditions can produce markedly different fiscal outcomes depending on each country's economic structure, institutional environment, and tax system.

Empirical studies on tax revenue determinants remain relatively scarce in the Algerian context, with most concentrating on institutional rather than macroeconomic factors. Belaoudja and Hamdani (2026), for instance, examined the impact of e-governance on tax revenue using annual data for 2002–2023 and OLS estimation, finding that the E-Government Development Index (EGDI) has no statistically significant direct effect on tax revenue, while regulatory quality significantly improves fiscal performance. They concluded that digital transformation alone is insufficient for improving domestic revenue mobilisation without accompanying institutional and regulatory reforms (Belaoudja & Hamdani, 2026).

Overall, the existing literature confirms that no single macroeconomic determinant exerts a persistent effect on tax revenue across contexts. Economic growth and trade openness tend to improve fiscal performance, but their effects vary substantially depending on institutional quality, tax policy design, economic diversification, and administrative efficiency. The relationship between inflation and tax revenue remains similarly unclear, with findings ranging from positive to negative depending on the economic environment and estimation methods. These disparate findings underscore the importance of country-specific empirical studies capable of capturing the structural and institutional particularities of individual economies.

To facilitate comparison with the present study, Table 1 summarises the main characteristics of selected recent empirical studies, including geographical coverage, econometric methodology, explanatory variables, main findings and their relevance to the present research.

Table 1

Summary of previous empirical studies

Research Gap / Limitation	Key Findings	Variables Examined	Econometri c Method	Perio d	Country / Sample	Authors
Focuses primarily on the economic growth–tax revenue relationship without jointly examining other key macroeconomic determinants.	Tax revenue follows economic growth in the long run, whereas short-run responses are considerably weaker because of differences in tax buoyancy across countries.	Economic growth, Tax revenue	Dynamic panel estimators	1990 – 2019	172 countries	Cornevin et al. (2024)
Findings are based on developed European economies and may not fully reflect the characteristics of developing and resource-dependent countries.	Economic growth and trade openness positively affect tax revenue, whereas inflation negatively affects fiscal performance.	GDP growth, Inflation, Trade openness	Panel regression	Panel data	European countries	Ristić Cakić et al. (2025)
Focuses on transition economies with institutional and economic characteristics that differ from those of Algeria.	Financial development and trade openness positively influence tax revenue, while inflation produces mixed effects across estimation models.	Financial development, Inflation, Trade openness	Panel estimation	Panel data	Post-transition EU economies	Matuiza & Šapkauskienė (2025)
Findings are	Trade openness	Inflation,	ARDL	Annual	Zambia	Funjika &

country-specific and cannot be generalized to all developing or resource-dependent economies.	positively affects tax revenue, whereas inflation and GDP per capita exert negative long-run effects.	GDP per capita, Trade openness		al data		Gatawa (2025)
Focuses on corporate tax revenue rather than total tax revenue and employs a regional panel framework.	International trade stimulates corporate tax revenue in the long run, whereas GDP growth does not consistently increase tax receipts.	Exports, Imports, GDP growth	Panel ARDL	Panel data	MENA countries	Chahib, Bel Mkaddem, & Tesse (2026)
Examines institutional determinants but does not jointly analyze the effects of inflation, GDP growth, and trade openness on tax revenue.	E-government development has no statistically significant direct effect on tax revenue, whereas regulatory quality significantly improves fiscal performance.	EGDI, Regulatory quality, Control variables	OLS	2002 – 2023	Algeria	Belaoudja & Hamdani (2026)

Source. Compiled by the authors based on the reviewed literature.

As shown in Table 1, numerous empirical studies have examined the determinants of tax revenue, producing a wide range of findings. However, the evidence on the effects of inflation, GDP growth, and trade openness remains inconclusive. In addition, previous studies differ considerably in terms of their research methods, datasets, and country coverage, while empirical evidence for Algeria remains absent. This gap in the literature provides a strong justification for further empirical investigation in the Algerian context.

1.6. Research Gap

Despite the growing body of empirical research on the determinants of tax revenue, several important gaps remain.

First, previous studies report conflicting findings regarding the effects of inflation, economic growth, and trade openness, reflecting differences in economic structures, institutional quality, fiscal systems, and econometric methodologies across countries. Consequently, no clear consensus has yet emerged concerning either the magnitude or the direction of these relationships.

Second, although a substantial number of studies have investigated the determinants of tax revenue in advanced economies and broad cross-country settings, empirical evidence from developing and resource-dependent economies remains relatively limited. This is particularly evident in the case of Algeria, which has received comparatively little attention in the recent empirical literature despite its ongoing efforts to strengthen domestic revenue mobilization and reduce its dependence on hydrocarbon revenues.

Third, the limited empirical studies conducted in Algeria have focused primarily on institutional determinants of tax performance, such as e-government and regulatory quality, while comparatively less attention has been devoted to examining the combined effects of key macroeconomic variables on tax revenue. Furthermore, differences in variable selection, estimation methods, and study periods make direct comparisons across previous studies difficult.

To address these gaps, the present study examines the effects of inflation, GDP growth, and trade openness on tax revenue in Algeria using annual time-series data covering the period 2000–2024 and the Ordinary Least Squares (OLS) estimation technique. By focusing on a resource-dependent developing economy, this study provides updated empirical evidence on the role of key macroeconomic determinants in shaping tax revenue performance. It also contributes to the growing body of literature on domestic revenue mobilization in developing economies while offering policy-relevant insights for enhancing fiscal sustainability.

Methods

1. Research Design

This study adopts a quantitative, explanatory research design to examine the relationship between inflation, economic growth, trade openness, and tax revenue in Algeria over the period 2000–2024. The analysis is based on annual time-series data and employs the Ordinary Least Squares (OLS) estimation technique to estimate the relationship between the selected macroeconomic variables and tax revenue. The study relies on secondary data obtained from internationally recognized databases. This research design is appropriate for examining the historical relationship among the study variables and generating empirical evidence to support fiscal policy in Algeria.

2. Data Sources and Sample

This study examines the effects of selected macroeconomic variables on tax revenue performance in Algeria over the period 2000–2024. The empirical analysis is based on annual time-series data covering 25 years. This period includes several major economic events, including fluctuations in international oil prices, the implementation of fiscal reform programmes, global financial crises, and the economic consequences of the COVID-19 pandemic.

The empirical model includes four variables. Tax revenue, measured as a percentage of Gross Domestic Product (GDP), serves as the dependent variable, while the inflation rate, GDP growth rate, and trade openness (measured as a percentage of GDP) are the explanatory variables. The data were obtained from internationally recognised and reliable sources.

3. Description of Variables

The empirical model consists of one dependent variable and three explanatory variables. Tax revenue, expressed as a percentage of GDP, represents the amount of tax revenue collected relative to the size of the economy. The inflation rate reflects changes in the general price level and may affect tax revenue through its influence on nominal income and consumption. GDP growth indicates the pace of economic expansion and is expected to influence the size of the tax base. Trade openness, measured as the ratio of total trade to GDP, indicates the degree of the country's integration into the global economy and may influence tax revenue through its effects on customs duties, imports, exports, and overall economic activity.

Table 2 Presents the definitions, measurements, data sources, and expected signs of the variables included in the empirical model.

Table 2

Definition and measurement of the study variables

Expected Effect	Measurement	Symbol	Variable
Dependent variable	Tax revenue as a percentage of GDP	TAX	Tax Revenue (% of GDP)
±	Annual inflation rate	INF	Inflation Rate (%)
+	Annual GDP growth rate	GDP	GDP Growth (%)
±	Total trade as a percentage of GDP	TRADE	Trade Openness (% of GDP)

Source. Prepared by the authors based on EViews output.

4. Model Specification

To examine the relationship between tax revenue and its selected macroeconomic determinants, the following linear econometric model is specified:

$TAX_t = \beta_0 + \beta_1 INF_t + \beta_2 GDP_t + \beta_3 TRADE_t + \epsilon_t$ where:

- TAX_t : denotes tax revenue as a percentage of Gross Domestic Product (GDP);
- INF_t : represents the annual inflation rate
- GDP_t : denotes the annual GDP growth rate
- $TRADE_t$: measures trade openness as a percentage of GDP
- β_0 is the intercept;
- β_1 , β_2 , and β_3 : are the slope coefficients to be estimated
- ϵ_t : is the random error term that captures the effects of omitted factors.

5. Estimation Procedure

The econometric analysis was carried out using EViews. As a preliminary step, the data were subjected to a set of statistical and diagnostic tests to evaluate their characteristics and verify compliance with the assumptions required for Ordinary Least Squares (OLS) estimation. Establishing these conditions before estimating the model enhances the reliability of the coefficient estimates and supports the validity of the subsequent empirical interpretation.

Results and Discussion

1. Descriptive Statistics

Table 3

Descriptive statistics of the study variables

Max	Min	Std. Dev.	Mean	Variable
5.731	2.000	1.345	4.059	Tax Revenue (% of GDP)
9.322	0.339	2.389	4.438	Inflation Rate (%)
6.500	-5.000	2.159	3.052	GDP Growth (%)
71.000	40.100	8.646	56.208	Trade Openness (% of GDP)

Source. Prepared by the authors based on EViews output.

The descriptive statistics presented in Table 3 summarize the main features of the variables over the period 2000–2024. Tax revenue averaged 4.059% of GDP, indicating a moderate contribution of tax receipts to the Algerian economy. The standard deviation of 1.345 suggests that tax revenue exhibited relatively limited fluctuations throughout the sample period.

Inflation averaged 4.438% annually, with values ranging from 0.339% to 9.322%. This variation reflects differences in price dynamics, with some years characterized by relatively stable inflation and others by stronger inflationary pressures. Economic growth recorded an average of 3.052%, while the minimum value of -5.000% confirms that Algeria experienced periods of economic contraction. The relatively high standard deviation also indicates that growth performance was uneven over time.

Trade openness recorded the highest mean value among the explanatory variables, averaging 56.208% of GDP. This highlights the importance of external trade in the Algerian economy, while its relatively large standard deviation indicates that the degree of trade integration varied considerably across the study period.

Taken together, these descriptive results reveal noticeable differences in the behavior of the variables over time. Such variation provides an appropriate basis for investigating the relationship between tax revenue and the selected macroeconomic determinants using econometric techniques.

2. Correlation Analysis

Table 4
Pearson correlation matrix

TRADE	GDP	INF	TAX	Variables
-0.446	-0.521	0.400	1.000	Tax Revenue (TAX)
-0.268	0.045	1.000	0.400	Inflation (INF)
0.343	1.000	0.045	-0.521	GDP Growth (GDP)
1.000	0.343	-0.268	-0.446	Trade Openness (TRADE)

Source. Prepared by the author based on EViews output.

Table 4 reports the Pearson correlation coefficients among the variables included in the empirical analysis. Tax revenue is positively correlated with inflation ($r = 0.400$), indicating that higher inflation rates tend to be associated with higher tax revenue as a share of GDP. A possible explanation is that rising prices increase nominal tax receipts, particularly under a nominal tax system.

By contrast, tax revenue exhibits a moderate negative correlation with GDP growth ($r = -0.521$). This suggests that periods of stronger economic growth were accompanied by relatively lower tax revenue ratios over the sample period. One possible explanation lies in the structure of the Algerian economy, where economic growth has been largely driven by the hydrocarbon sector, limiting the extent to which higher output translates into broader tax revenues.

Trade openness is also moderately and negatively correlated with tax revenue ($r = -0.446$), implying that greater integration into international trade was not associated with higher tax revenue during the period under investigation.

The correlations among the explanatory variables remain relatively low to moderate. The highest coefficient is observed between GDP growth and trade openness ($r = 0.343$), which is well below the threshold commonly associated with multicollinearity concerns. Overall, the correlation matrix

suggests that the explanatory variables can be included simultaneously in the regression model without raising serious multicollinearity issues.

3. Unit Root Test

Table 5

Augmented Dickey–Fuller (ADF) unit root test results

Order of Integration	p-value	ADF at First Difference	p-value	ADF at Level	Variable
I(1)	0.0000	-6.6381	0.3238	-1.9176	Tax Revenue (TAX)
I(0)	0.0000	-4.9174	0.0241	-3.1343	Inflation (INF)
I(0)	0.0000	-9.4108	0.0078	-3.5092	GDP Growth (GDP)
I(1)	0.0003	-4.4245	0.5355	-1.4960	Trade Openness (TRADE)

Source. Prepared by the author based on EViews output.

To examine the time-series properties of the data, the Augmented Dickey–Fuller (ADF) unit root test was conducted before estimating the regression model. This preliminary analysis was intended to identify the order of integration of each variable and to reduce the likelihood of obtaining spurious regression results.

As reported in Table 5, inflation and GDP growth are stationary in levels, with p-values below the 5% significance level, indicating that both variables are integrated of order zero, I(0). Tax revenue and trade openness, however, are non-stationary at level and become stationary after first differencing, classifying them as integrated of order one, I(1).

Taken together, these findings show that the variables are integrated at different orders, consisting of a combination of I(0) and I(1) series, while none is integrated of order two, I(2). This integration pattern provides the foundation for the subsequent stages of the empirical analysis.

4. Ordinary Least Squares (OLS) Estimation Results

Table 6

Ordinary least squares (OLS) estimation results

p-value	t-statistic	Std. Error	Coefficient	Variable
0.0024	3.4511	1.6326	5.6344	Constant
0.0353	2.2498	0.0932	0.2096	Inflation Rate
0.0109	-2.7937	0.1058	-0.2956	GDP Growth
0.3096	-1.0412	0.0274	-0.0285	Trade Openness

Source. Author's calculations using EViews.

Table 6 presents the results of the Ordinary Least Squares (OLS) estimation examining the relationship between tax revenue and the selected macroeconomic variables. Inflation has a positive and statistically significant coefficient ($\beta = 0.2096$, $p = 0.0353$), indicating that higher inflation is associated with an increase in tax revenue as a share of GDP. Holding the other variables constant, a one-percentage-point increase in inflation is associated with an estimated 0.21 percentage-point

increase in tax revenue. A plausible explanation is that rising prices increase nominal incomes, consumption expenditure, and taxable transactions, thereby expanding the tax base.

GDP growth, on the other hand, has a negative and statistically significant coefficient ($\beta = -0.2956$, $p = 0.0109$). This finding suggests that periods of stronger economic growth were accompanied by a lower tax revenue-to-GDP ratio during the sample period. One possible explanation is the structure of the Algerian economy, where growth has been largely driven by the hydrocarbon sector, limiting the expansion of non-hydrocarbon tax revenues. The estimated coefficient for trade openness is negative ($\beta = -0.0285$), although it is not statistically significant ($p = 0.3096$). This result indicates that, after controlling for the other explanatory variables, changes in trade openness were not associated with a statistically significant change in tax revenue.

Overall, the estimates suggest that inflation and GDP growth were significant determinants of tax revenue over the study period, whereas trade openness did not have a statistically significant effect within the estimated model.

Table 7

Model summary statistics

Prob. (Jarque–Bera	• Jar que–Bera	• Durbi n–Watson	• Prob. (F-statistic)	• F -statistic	• Adj usted R ²	• R ²	•
0.6408	0.8902	1.2986	0.0030	6.4063	0.4033	0.4779	2

Source. Author's calculations using Eviews

The model summary statistics suggest that the estimated regression provides a satisfactory fit for explaining the relationship between tax revenue and the selected macroeconomic variables. The coefficient of determination ($R^2 = 0.4779$) indicates that inflation, GDP growth, and trade openness jointly explain approximately 47.79% of the variation in tax revenue. After adjusting for the number of explanatory variables, the adjusted R^2 declines to 40.33%, reflecting a moderate but acceptable level of explanatory power for a macroeconomic time-series model.

The overall regression is statistically significant, as indicated by an F-statistic of 6.4063 and a corresponding p-value of 0.0030. This result rejects the null hypothesis that all slope coefficients are jointly equal to zero, confirming that the explanatory variables collectively contribute to explaining variations in tax revenue. The Jarque–Bera statistic is 0.8902, with a p-value of 0.6408, which is well above the 5% significance level. This indicates that the residuals do not depart significantly from a normal distribution, suggesting that the normality assumption of the Ordinary Least Squares (OLS) model is satisfied. The Durbin–Watson statistic is 1.2986, which is below the reference value of 2 and may indicate the presence of positive serial correlation in the residuals. This finding is consistent with the Ljung–Box test reported earlier and suggests that the estimated coefficients should be interpreted with appropriate caution.

5. Diagnostic Tests

Table 8

Diagnostic test results

Decision	p-value	Statistic	Test
No heteroskedasticity	0.8566	0.7703	Breusch–Pagan
No serial correlation at the 5% level	0.0754	3.1619	Ljung–Box (Lag 1)
Serial correlation detected	0.0146	8.4508	Ljung–Box (Lag 2)
Indicates possible positive autocorrelation	—	1.2986	Durbin–Watson

Source. Author's calculations using Eviews.

A series of diagnostic tests was conducted to evaluate the reliability of the estimated regression model.

The Breusch–Pagan test produced a p-value of 0.8566, which is well above the 5% significance level. This result indicates that the null hypothesis of homoskedasticity cannot be rejected, suggesting that the variance of the residuals remains constant across observations. Therefore, there is no evidence of heteroskedasticity in the estimated model.

The Ljung–Box test provides mixed evidence regarding residual serial correlation. At the first lag, the p-value (0.0754) exceeds the 5% significance level, indicating no statistically significant first-order autocorrelation. At the second lag, however, the p-value falls to 0.0146, suggesting the presence of serial correlation in the residuals.

This interpretation is consistent with the Durbin–Watson statistic of 1.2986, which is below the reference value of 2 and may indicate positive serial correlation. Although the Durbin–Watson statistic alone is not sufficient to confirm autocorrelation, it supports the evidence obtained from the Ljung–Box test.

Taken together, the diagnostic tests suggest that the model satisfies the homoskedasticity assumption but shows some evidence of residual serial correlation. The estimated coefficients should therefore be interpreted with appropriate caution. Future studies may address this issue by considering alternative model specifications or applying estimation methods that are more robust to serial correlation.

6. Hypothesis Testing

The research hypotheses were evaluated using the OLS estimation results at the 5% significance level. Decisions regarding each hypothesis were based on the statistical significance of the estimated coefficients.

Hypothesis 1 (H1)

H0: Inflation has no statistically significant effect on tax revenue in Algeria.

H1: Inflation has a statistically significant effect on tax revenue in Algeria.

The estimated coefficient for inflation is 0.2096, with a p-value of 0.0353. Since the p-value is below the 5% significance level, the null hypothesis is rejected. The results indicate that inflation has a positive and statistically significant effect on tax revenue over the study period.

Hypothesis 2 (H2)

H0: GDP growth has no statistically significant effect on tax revenue in Algeria.

H2: GDP growth has a statistically significant effect on tax revenue in Algeria.

GDP growth has an estimated coefficient of -0.2956 and a p-value of 0.0109 . The null hypothesis is therefore rejected, indicating that GDP growth is significantly associated with tax revenue. The estimated coefficient suggests a negative relationship during the study period.

Hypothesis 3 (H3)

H0: Trade openness has no statistically significant effect on tax revenue in Algeria.

H3: Trade openness has a statistically significant effect on tax revenue in Algeria.

The estimated coefficient for trade openness is -0.0285 , with a p-value of 0.3096 , which exceeds the 5% significance level. The null hypothesis cannot be rejected, indicating that trade openness does not have a statistically significant effect on tax revenue within the estimated model.

Hypothesis 4 (H4)

H0: The explanatory variables are not jointly significant in explaining tax revenue.

H4: The explanatory variables are jointly significant in explaining tax revenue.

The joint significance of the regression model was assessed using the F-test. The estimated F-statistic is 6.4063 , with a corresponding p-value of 0.0030 . Since the p-value is below the 5% significance level, the null hypothesis is rejected. This result confirms that the explanatory variables are jointly significant and that the estimated OLS model provides a statistically significant explanation of variations in tax revenue.

Table 9

Summary of hypothesis testing

Conclusion	Decision	Hypothesis
Inflation has a significant positive effect on tax revenue.	Supported	H1
GDP growth has a significant negative effect on tax revenue.	Supported	H2
Trade openness has no significant effect on tax revenue.	Not Supported	H3
The explanatory variables jointly have a significant effect on tax revenue.	Supported	H4

Source. Author's computation based on EViews regression output.

Table 9 summarizes the results of the hypothesis testing based on the OLS estimation. The empirical findings support three of the four proposed hypotheses. Inflation is found to have a positive and statistically significant effect on tax revenue, suggesting that changes in the general price level are associated with variations in government tax receipts. GDP growth also has a statistically significant effect, although the estimated coefficient is negative. This result may reflect the structural characteristics of the Algerian economy, where economic growth has been largely driven by the hydrocarbon sector without generating a proportional increase in non-hydrocarbon tax revenues.

In contrast, the hypothesis concerning trade openness is not supported. The estimated coefficient is not statistically significant, indicating that changes in trade openness were not associated with significant variations in tax revenue during the study period. The joint significance of the explanatory variables is confirmed by the F-test. The statistically significant F-statistic indicates that the regression model, taken as a whole, explains a significant share of the variation in tax revenue. Overall, the results highlight inflation and GDP growth as significant determinants of tax revenue in

Algeria, while trade openness does not appear to have a statistically significant effect within the estimated model.

Discussion

7.1. Inflation and Tax Revenue

The positive and statistically significant relationship between inflation and tax revenue identified by the OLS estimates can be interpreted in light of the dual role that inflation plays within fiscal systems. According to the Olivera–Tanzi framework, inflation may reduce the real value of tax revenues when delays exist between the time tax liabilities arise and the time they are collected. Under such circumstances, persistent inflation erodes the purchasing power of government revenues before they are received. At the same time, however, inflation may increase nominal tax collections by expanding the value of taxable transactions, particularly in tax systems that rely heavily on indirect taxation and consumption-based taxes.

Previous empirical studies suggest that the relationship between inflation and tax revenue is not uniform across countries. Rather, its direction and magnitude depend on several factors, including the efficiency of tax administration, the structure of the tax system, the speed of tax collection, and the extent to which governments rely on nominal tax bases. While Tanzi emphasized the adverse effect of inflation on real tax revenues in the presence of collection lags, later studies have shown that moderate inflation may increase tax revenues where tax administration remains sufficiently responsive and tax liabilities adjust rapidly to price changes.

The Algerian case appears to be consistent with this latter interpretation. During the study period, indirect taxes and hydrocarbon-related revenues continued to represent important components of public revenues. Consequently, moderate inflation may have expanded the nominal tax base without generating losses large enough to offset the resulting increase in nominal tax receipts. This interpretation provides a plausible explanation for the positive coefficient estimated for inflation in the present study. Nevertheless, this result should not be interpreted as evidence that inflation is inherently beneficial for tax performance. Excessive or persistent inflation would eventually be expected to weaken real tax revenues as collection lags, price distortions, and indexation problems become more pronounced. Accordingly, the findings suggest that the positive relationship observed in Algeria reflects the specific macroeconomic and institutional conditions prevailing during the sample period rather than a universal characteristic of inflation.

7.2. Economic Growth and Tax Revenue

The regression results indicate that economic growth has a negative and statistically significant effect on tax revenue in Algeria. This finding contrasts with the conventional view in public finance, which assumes that higher economic growth expands the tax base and, consequently, increases government tax revenues. In most empirical studies, stronger economic performance is associated with higher tax revenue because rising production, income, and consumption generate additional taxable activities. However, this relationship is not universal and often depends on the structural characteristics of individual economies.

Several cross-country studies have reported a positive association between economic growth and tax revenue. For example, Gupta (2007) found that higher levels of economic development generally contribute to improved tax performance in developing countries by broadening the tax base and strengthening governments' revenue-raising capacity. Similarly, Castro and Camarillo (2014) showed that economic growth is an important determinant of tax revenue in OECD countries, where diversified production structures and efficient tax administrations allow economic expansion to be translated into higher fiscal revenues.

The Algerian experience, however, appears to follow a different pattern. Throughout much of the study period, economic growth was largely driven by the hydrocarbon sector, which remains capital-intensive and highly dependent on fluctuations in international energy prices. Although this sector contributes substantially to national output, its expansion does not necessarily generate proportional increases in taxable income, household consumption, or business activity within the non-hydrocarbon economy. Consequently, periods of higher GDP growth may not be accompanied by a comparable expansion of the domestic tax base.

Another possible explanation relates to the structure of fiscal policy. Hydrocarbon revenues have historically represented an important source of public finance in Algeria, reducing the relative contribution of non-hydrocarbon taxation to total government revenues. As a result, economic growth generated by the oil and gas sector may have had only a limited effect on conventional tax revenues measured as a share of GDP. This structural characteristic provides a plausible explanation for the negative coefficient estimated for economic growth in the present study.

Overall, the findings suggest that economic growth alone is insufficient to improve tax performance unless it is accompanied by broader structural transformation. Diversifying productive activities, strengthening the non-hydrocarbon private sector, and expanding the effective tax base are essential conditions for ensuring that future economic growth translates into sustainable increases in tax revenue. Consequently, the negative relationship identified in this study shovidence contradicting the broader theoretical relationship between growth and taxation.

7.3. Trade Openness and Tax Revenue

The estimated coefficient for trade openness is negative but statistically insignificant, indicating that changes in trade openness did not have a measurable effect on tax revenue in Algeria over the study period. Although the direction of the estimated coefficient is negative, the lack of statistical significance suggests that trade openness was not a key determinant of tax revenue once the effects of inflation and economic growth were taken into account.

This finding differs from much of the empirical literature, which generally identifies trade openness as an important driver of tax revenue, particularly in developing countries that have successfully complemented trade liberalization with comprehensive domestic tax reforms. Gupta (2007), for example, argues that greater trade openness can enhance tax performance by stimulating economic activity and encouraging governments to replace declining trade taxes with more efficient domestic taxes. Likewise, several comparative studies have reported that economies with broader tax bases and stronger fiscal institutions are better positioned to offset revenue losses associated with tariff reductions through improved domestic tax collection.

Nevertheless, the relationship between trade openness and tax revenue is not always positive. Previous research has shown that the fiscal effects of trade liberalization depend largely on the capacity of governments to implement effective tax reforms and strengthen domestic revenue mobilization. In countries where tariff reductions are not accompanied by improvements in tax administration or by the expansion of alternative tax bases, greater trade openness may generate limited fiscal benefits or even reduce government revenue.

The Algerian case appears to reflect these structural constraints. During the study period, external trade remained heavily concentrated in hydrocarbon exports, while the contribution of non-hydrocarbon exports to total trade remained relatively limited. Consequently, fluctuations in trade openness primarily reflected changes in hydrocarbon exports rather than a broad expansion of taxable economic activity across productive sectors. Moreover, the gradual transition from border taxation toward more efficient domestic taxation has progressed at a relatively moderate pace, limiting the extent to which greater trade integration could translate into higher tax revenues.

Taken together, these factors provide a plausible explanation for the negative but statistically insignificant coefficient estimated for trade openness. The findings therefore suggest that trade liberalization, by itself, is unlikely to strengthen tax performance unless it is accompanied by economic diversification, improvements in tax administration, and institutional reforms capable of expanding the domestic tax base. In this respect, the Algerian evidence is consistent with the broader view that the fiscal benefits of trade openness depend not only on increased international integration but also on the quality of domestic fiscal institutions and the structure of the national economy.

7.4. Overall Discussion and Policy Implications

Overall, the findings demonstrate that the relationship between macroeconomic conditions and tax revenue in Algeria differs in several respects from the conventional patterns reported in the international literature. Rather than following a universal relationship, the estimated coefficients appear to reflect the country's specific economic structure, institutional characteristics, and fiscal framework. This observation highlights the importance of interpreting empirical findings within their national context instead of assuming that macroeconomic determinants affect tax revenue uniformly across countries.

The positive effect of inflation suggests that, during the study period, moderate price increases expanded the nominal tax base sufficiently to outweigh the adverse effects commonly associated with inflation. Conversely, the negative coefficient estimated for economic growth indicates that increases in GDP did not necessarily translate into stronger tax revenue performance, largely because economic expansion remained concentrated in the hydrocarbon sector, with limited spillover effects on the broader domestic tax base. Likewise, the insignificant effect of trade openness implies that greater integration into international markets, by itself, was insufficient to improve tax revenue, reflecting the limited diversification of exports and the gradual pace of domestic tax reforms.

These findings reinforce the view that sustainable improvements in tax revenue depend not only on favorable macroeconomic conditions but also on the quality of fiscal institutions and the structure of the economy. Economic growth is unlikely to generate substantial gains in tax revenue unless it is accompanied by broader productive diversification, a stronger non-hydrocarbon private sector, and a more comprehensive tax base. Similarly, the potential fiscal benefits of trade openness can only be fully realized when supported by effective tax administration, efficient domestic tax systems, and coherent fiscal policies.

From a policy perspective, the results underline the importance of accelerating tax administration digitalization, expanding the effective tax base, improving voluntary tax compliance, and reducing the economy's dependence on hydrocarbon revenues. Strengthening institutional capacity and supporting economic diversification would not only enhance domestic revenue mobilization but also improve the resilience of Algeria's public finances to external economic shocks. Consequently, the findings suggest that long-term fiscal sustainability requires a comprehensive reform strategy that combines macroeconomic stability with structural and institutional reforms capable of supporting a broader and more sustainable tax base.

Conclusion

This study examined the relationship between inflation, GDP growth, and trade openness and tax revenue in Algeria over the period 2000–2024 using the Ordinary Least Squares (OLS) method. The estimated model is statistically significant ($F = 6.4063$, $p = 0.0030$) and explains approximately 47.8% of the variation in tax revenue, indicating a moderate but meaningful level of explanatory power. The empirical results show that inflation has a positive and statistically significant effect on tax revenue ($\beta = 0.2096$, $p = 0.0353$). This finding suggests that higher price levels are associated with higher nominal tax receipts, reflecting the sensitivity of tax revenues to inflationary developments. In

contrast, GDP growth exhibits a statistically significant negative coefficient ($\beta = -0.2956$, $p = 0.0109$), indicating that stronger economic growth did not translate into a higher tax revenue-to-GDP ratio during the study period. This outcome may reflect the structure of the Algerian economy, where growth has been largely driven by the hydrocarbon sector, limiting the expansion of non-hydrocarbon tax revenues. Trade openness, although negatively associated with tax revenue, does not have a statistically significant effect ($\beta = -0.0285$, $p = 0.3096$), suggesting that changes in external trade were not accompanied by measurable changes in tax revenue over the sample period.

These findings indicate that improving tax performance requires more than sustaining economic growth alone. Strengthening domestic revenue mobilization depends on expanding the effective tax base, improving tax administration, and increasing the contribution of non-hydrocarbon activities to public revenues. Continued digitalization of tax administration, broader taxpayer compliance, and institutional reforms aimed at enhancing tax collection efficiency could therefore play an important role in reinforcing fiscal sustainability. Likewise, the fiscal benefits of trade liberalization are likely to remain limited unless accompanied by policies that strengthen domestic productive capacity and improve tax administration.

This study is subject to certain limitations. The analysis is based on annual data covering the period 2000–2024 and includes only three macroeconomic explanatory variables. Future research could extend the framework by incorporating institutional and fiscal variables, such as governance quality, tax policy reforms, government expenditure, foreign direct investment, and the shadow economy. Applying alternative econometric techniques that explicitly distinguish between short-run and long-run dynamics, such as the Autoregressive Distributed Lag (ARDL) model, may also provide a more comprehensive understanding of the determinants of tax revenue in Algeria.

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