The Sankalpa: International Journal of Management Decisions
ISSN: 2454-7425

Volume 12, Issue 2 (July - December 2026)

The Impact of Tax Reform on Enhancing the Effectiveness of Fiscal Policy in Algeria (2000–2024)

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Received: 26/02/2026 Accepted: 13/06/2026 Published: 21/08/2026

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Abstract

This study examines the impact of tax reform on the effectiveness of fiscal policy in Algeria, focusing particularly on the Algerian case between 2000 and 2024. The study assesses the effectiveness of the tax reforms adopted by the Algerian government in financing the state treasury and covering public expenditure, as well as their contribution to stabilising the economic and social structure.

The study also conducts an econometric analysis of fiscal and tax policy in Algeria throughout the study period based on indicators including revenues, expenditure, the general budget and ordinary taxation (general tax revenues). The study period is divided into two phases. During the first phase (2000–2010), oil tax revenues outperformed ordinary taxation. During the second phase (2010–2024), however, oil tax revenues declined, while ordinary taxation surpassed them.

Both trends significantly affected the budget deficit despite the tax reforms implemented during the study period. Nevertheless, ordinary taxation did not replace oil taxation. The study concludes that taxation did not fulfil the requirements necessary to strengthen the effectiveness of fiscal policy in Algeria. Finally, it presents proposals and recommendations related to this topic.

Keywords: fiscal policy, taxation, ordinary taxation, direct taxes, indirect taxes, expenditure.

Introduction

Fiscal policy is considered one of the most important tools used by the state to achieve its economic and social goals. This is achieved through the management of public revenues and expenditure, which contribute to economic stability, the financing of public services and the support of economic and social development.

One of the components of fiscal policy is taxation. They occupy a central position as they represent one of the most important sources of financing for the general treasury. Over the course of economic thought development, the view of taxation has evolved, and it has become one of the state's key fiscal policy instruments.

Indeed, taxes play a fundamental role in programmes designed to promote economic reform and address structural imbalances in countries. They influence the allocation of resources, regulate consumption, encourage saving and achieve economic stability. Taxes also affect the government's overall budget deficit and therefore influence fiscal policy.

Algeria is considered one of the developing countries in which the state intervenes in the economy. Facing limited resources and increasing spending pressures, the country's fiscal policy is affected. Consequently, it has become necessary to use taxation as a means of mobilising resources, redistributing wealth and ensuring fiscal stability.

Accordingly, reforming the tax system is one of the country's most important priorities. The intended objectives of such reform are to improve the performance of tax policy by simplifying the tax system and enhancing its fiscal profitability, to ensure the stability of fiscal policy, and to combat tax fraud and evasion.

To address this issue, the study raises the following research question:

To what extent has tax reform in Algeria contributed to enhancing the effectiveness of fiscal policy?

The study seeks to answer this question by proposing the following hypothesis:

Tax reform contributes to enhancing the effectiveness of fiscal policy in Algeria by improving the mobilisation of tax revenues, broadening the tax base and increasing the efficiency of collection, thereby strengthening the state's ability to finance its expenditure and achieving greater fiscal sustainability.

To answer the research question and test the validity of the hypotheses, this study takes a descriptive approach, as well as an econometric/quantitative approach, analysing tables and data relevant to the research question.

The importance of the study stems from the significance of the topic itself. The effectiveness of tax policy is of considerable importance: the more effective the policy, the greater the fiscal profitability of ordinary taxation (general tax revenues), enabling the financing of the general budget and reducing reliance on oil tax revenues. This, in turn, supports fiscal policy stability.

Moreover, the study aims to propose appropriate solutions to address budget deficits. This will contribute to stabilising the general budget, while also taking into account the transformations

that Algeria is undergoing as it adopts a market economy system and integrates with international institutions and organisations, most notably the International Monetary Fund (IMF) and the World Trade Organization (WTO).

First: The Conceptual Framework of Fiscal Policy and Taxation

1. The concept of fiscal policy and its objectives

Fiscal policy originally referred to what is essentially synonymous with public finance and the state budget. In this sense, textbooks on public finance trace the term 'fiscal policy' back to the old French word fisc, meaning a money chest or treasury[1].

Others define fiscal policy as the use of public finance instruments, such as public expenditure programmes and general public revenues, to influence key macroeconomic variables, such as national output, employment, saving and investment, with the aim of achieving the desired effects and avoiding undesired effects at all income and national output levels, as well as at the level of employment and other economic variable[2].

Fiscal policy is therefore the part of government policy concerned with generating state revenues through taxes and other means by determining the level and pattern of spending these revenues[3].

The objectives of fiscal policy include the following:

1.1 Achieving fiscal balance

This refers to the optimal use of state resources. For example, the tax system should be flexible and generate sufficient revenue, while also serving the interests of taxpayers through fair distribution, appropriate tax collection timelines and administrative efficiency, among other considerations. In addition, borrowing should only be used to finance productive investment.

1.2 Achieving economic balance

This balance is achieved when the marginal benefits resulting from the government's economic activities are equal to the marginal costs/benefits foregone by the government through

[1]- Tarek Lahadj (1999). Public Finance. Dar Al-Safa' Publishing and Distribution, Amman, p. 201.
[2]- Mahmoud Hocine Al-Wadi and Zakariya Ahmad Azzam (2000), Public Finance and the Financial System in Islam, Dar Al-Maysara Publishing and Distribution, Amman, p. 182.
[3]- Abd al-Aziz Fahmi Haykal (1980), Encyclopedia of Economic and Statistical Terminology, Dar Al-Nahda Al-'Arabiyya, p. 323.

collecting revenues from individuals. In this context, balance means making the best use of society's resources to reach the optimal level of production[4].

1.3 Achieving Social Balance

This means that society should reach the highest possible level of welfare for individuals within the limits of that society's resources and in accordance with the requirements of social justice. Therefore, fiscal policy should not stop at increasing production; instead, this objective should be pursued by improving the ways in which goods and resources are distributed among individuals.

1.4 Achieving general balance

This refers to the balance between total national expenditure (consumption and investment expenditure by individuals, plus government spending) and total national output, measured at constant prices, at a level that allows all available production factors to be fully utilised. The government has numerous and diverse tools at its disposal to achieve this goal, the most important of which include: Taxes, loans, grants/subsidies and exemptions, and participation in project establishment with individuals, among others.

2. The Concept of Taxation and Its Objectives

Tax: Definition

A tax is defined as 'a monetary deduction required of individuals in an obligatory and final manner, without consideration, in order to cover public expenses'. This definition is given by Gastan Jeze[5].

It is also described as an 'enforceable obligation imposed by the state, requiring the taxpayer to pay it without any quid pro quo, so as to enable the state to achieve societal objectives'. This definition is attributed to Professor Abdelhamid Deraz[6].

Objectives of taxation

Through imposing taxes, the state seeks to achieve a set of objectives, including:

2.1 The financial objective of taxation

[4]- Abd al-Matlab Abd al-Hamid (2003), Economic Policies at the Level of the National Economy (A Macroscopic Analysis), 1st edn, Majmu'at al-Nil al-'Arabiyya, Cairo, pp. 44–45.
[5]- Khalashi, R. (2012). The Modern Algerian Tax System. Dar Homa for Printing, Publishing and Distribution, Algeria. Part One, p. 11.
[6]- Abd al-Hamid Daraz, Public Finance, Youth Institution, University of Alexandria, p. 157.

In traditional thought, the role of tax was limited to providing the necessary funds to cover public expenditure. Classical thought emphasised two essential conditions for levying taxes: Tax neutrality and adequacy/sufficiency of tax revenue[7].

In modern thought, the financial objective of taxation has gained increasing importance due to the growing need for public funds as the state expands its activities. Nevertheless, modern perspectives reject the strict requirement of neutrality, since taxes influence economic, social and political developments, and are also used by the state as a means of achieving its broader objectives.

2.2 The Economic Objectives of Taxation

Taxation is a means by which the state can intervene in the economic sphere to produce certain economic effects and achieve the goals of economic policy. This is achieved by making optimal use of economic resources and addressing imbalances that may affect the national economy.

The economic objectives of taxation include:

- promoting economic growth;

- achieving economic stability;

- protecting domestic industry from foreign competition;

- contributing to full employment in advanced capitalist countries.

2.3 Social Objectives of Taxation

Taxation can also fulfil certain social requirements, most notably:

- Reducing the consumption of certain goods and encouraging the consumption of others by imposing high production or excise-like charges on products associated with health harms, such as alcohol and tobacco[8], while applying production charges to essential goods that are widely consumed.

- Reducing tax rates on building materials and/or housing rents, which can alleviate the housing problem to some extent.

Second: the reality of tax reform in Algeria.

[7]- Nasser Mourad (2011), The Effectiveness of the Tax System Between Theory and Practice, Office of University Publications, p. 40.
[8]- Faruq Abd al-Halim al-Ghunduz, 'The extent of our need for taxes under the zakat system', Al-Azhar Scientific Journal of Commerce, Issue Five, June 1982, Cairo, p. 14.

1. Economic policies implemented in Algeria after 2000

Following the reforms carried out by Algeria during the 1990s, positive macroeconomic indicators emerged. However, these measures were insufficient. To achieve high rates of economic growth, the Algerian government adopted a stimulus policy through development programmes, including:

- the Economic Stimulus Support Programme,

- the Supplementary Programme to Support Economic Growth, and

- the Five-Year Development Programme.

1.1 The Economic Stimulus Support Programme (2001–2004)

In April 2001, the Algerian state introduced the Economic Stimulus Support Programme. This programme consisted of financial allocations distributed over the period, with values varying from one phase to another. An initial budget of approximately 525 billion dinars was allocated, equivalent to around 7 billion USD.

Subsequently, the final budget envelope increased to approximately 1,216 billion dinars, i.e. around 16 billion USD. This increase was due to the addition of new projects and the reassessment of projects previously deemed profitabl[9].

The programme was also characterised by its large scale, particularly compared with the foreign exchange reserves recorded before its adoption in 2000, which amounted to approximately 11.9 billion US[10].

Finally, the Economic Stimulus Support Programme comprises four main sub-programmes, which facilitate the effective application of market forces.

1.2 The Supplementary Programme to Support Economic Growth (2005–2009)

The Economic Growth Support Programme is a complementary policy to the Economic Stimulus Support Policy. Its primary objective is to increase domestic and foreign investment to accelerate growth and reduce unemployment by creating jobs in various productive sectors.

[9]- Mohammad Masai (2012), 'Economic Recovery Policy in Algeria and Its Impact on Growth', Al-Bahith Journal, Issue 10, University of Ouargla, Algeria, p. 147.

[10]- Boudekhdakhar, K. (2015). 'The Direction of Economic Policy in Achieving Economic Growth: Stimulating Demand or Developing Supply: A Case Study of Algeria (2001–2014), PhD dissertation submitted for the award of the Doctorate degree, Faculty of Economic, Commercial and Management Sciences, specialising in Money and Finance, unpublished, University of Algiers 3, p. 201.

1.3 Consolidating Economic Growth: The Five-Year Development Programme (2010–2014)

For the Five-Year Development Programme (2010–2014), the government allocated a financial envelope estimated at 21,214 billion Algerian dinars (DZD)—equivalent to approximately 286 billion USD. This is one of the most important long-term strategic development frameworks adopted by Algeria as a developing country, aiming to support economic and social development.

2. Objectives of Tax Reform in Algeria

The tax reform of 1991 was introduced to create a tax system that reflected changes in the global economic environment. It aimed to develop and improve the previous tax system. The most prominent objectives pursued by the legislator are as follows:

2.1 Social objectives:

- Expanding the use of progressive taxation and reducing reliance on proportional taxation, in order to achieve fairness by taking income levels into account.

- Ensuring the fair redistribution of income and wealth among members of society[11].

- Treating natural persons and legal entities differently for tax purposes:

- Taxation of natural persons under Income Tax on Individuals (IRG);

Taxation of legal entities will be under Corporate Tax on Company Profits (IBS).

Expand the tax base by subjecting many goods and services to Value Added Tax (VAT/TVA).

Taking into account taxpayers' ability to pay by using tax exemptions and privileges (tax relief/benefits).

2.2 Economic objectives

Their aim is to stabilise the national economy by easing inflationary pressures that negatively impact consumers' purchasing power and by combatting deflation. They also seek to encourage economic growth by reducing the tax burden and directing savings towards productive investments. Additionally, they intend to achieve external balance by diversifying exports, as petroleum products currently dominate them in an unstable oil market environment[12].

[11]- Nasser Mourad (2011), op. cit., p. 44.
[12]- Hamid Bouzayda (1997), 'Taxation and its implications for the Algerian economy during the period 1988–1996', Department of Economic Sciences, University of Algiers, PhD thesis, p. 70.

2.3 Financial objectives

These include ensuring regular tax collection to generate tax revenues. They also require distinguishing between taxes owed to the state and taxes owed to local authorities so that these authorities can obtain financial resources to drive local development. Finally, they involve allocating regular tax revenues to cover operating expenses, due to fluctuations in oil tax revenues and their dependence on external conditions[13].

Third: an econometric study of how actual tax revenues can enhance the effectiveness of fiscal policy in Algeria.

Among the theories suitable for analysing economic relationships is econometric theory, which uses mathematical methods to estimate and forecast economic variables, with the aim of making informed decisions based on scientific principles.

In this study, we will build econometric models for total public revenues, ordinary revenues, direct taxes and indirect taxes, linking them to the most important influencing variables. This will be achieved by applying several econometric tools, including stationarity tests, causality tests, cointegration tests and error-correction model estimation and analysis, over the period from 2000 to 2024.

The econometric study will focus on identifying the type of variables and testing the stationarity of time series by introducing the hypothesis of a unit root. To determine the long-run relationship between the variables and avoid spurious regression, we will use a cointegration test. This is a necessary step in econometrics because econometric analyses require time-series stationarity — the first condition for cointegration.

In statistical terms, stationarity means that a time series has a constant mean and variance over time[14].

It should be noted that the non-stationarity of time series, which represent real data, depends on the form or pattern of these series. They may follow either a ‘trend-stationary’ or ‘difference-stationary’ pattern, as shown below:

Pattern 1 (TS): This indicates that the time series is non-stationary and exhibits a deterministic trend (defined overall direction) alongside a stable random component whose expected value is zero and whose variance is constant.

[13]- Abd al-Karim Breichi (2007), op. cit., p. 186.
[14]- Mekidish, M. and Abd al-Qadir, S. (2008), 'A comparative/empirical study of oil prices using a GARCH model', Contemporary Economics Journal, Khemis Miliana, Issue 03, p. 175.

Pattern 2 (DS): This means that the time series is non-stationary and has a random trend. It is characterised by the presence of a unit root. To make it stationary, it is tested using the simple Dickey–Fuller test or the Augmented Dickey–Fuller test.

The Augmented Dickey–Fuller (ADF) test (1981)

The ADF test is used to detect the presence of a unit root. It is based on the same principles as the DF test, but converts an AR(1) model into an AR(P) model to eliminate serial correlation in the random error term. Consequently, it is more effective at detecting stationarity and identifying the type of non-stationarity (whether it exhibits TS or DS behaviour).

The Phillips–Perron (PP) test (1988) proposes a non-parametric method to correct for serial correlation, unlike the ADF test, which uses a parametric approach. It tests the null hypothesis of a unit root through several models.

KPSS stationarity test (1992)

The KPSS (Kwiatkowski, Phillips, Schmidt and Shin) test considers cases where the variance of the residuals is not constant over time and where there is more than one unit root. It is based on testing two hypotheses similar to those in the DF test, and then computing the sum of squared residuals. If the calculated LM (Lagrange multiplier) statistic is greater than the critical value, the series is considered stationary; otherwise, it is not stationary.

A cointegration relationship exists when the equation describing the residuals (errors) is stationary, meaning the residual series is integrated of order I(0). In this case, we say that there is cointegration between X_t and Y_t.

To verify cointegration, we perform a unit root test on the residual series, e_t, using stationarity/unit-root tests such as:

- PP

- ADF

- DF

This procedure also requires the time series of the internal (explanatory) variables in the model to be integrated to the same order.

Cointegration analysis is an important econometric tool for studying the long-run relationship between economic variables. It also helps to determine the equilibrium level between stationary and non-stationary data.

Main cointegration tests:

- Engle–Granger test: Also known as the two-step test. It is used in models involving two variables, where one variable is dependent and the other is independent.

- Johansen and Juselius test: Johansen developed a framework that allows maximum likelihood estimation of the possible cointegrating vectors that may exist among a set of variables.

- Error Correction Model (ECM): Once cointegration between two variables has been confirmed, the most suitable model for estimating their relationship is the Error Correction Model (ECM).

When designing the ECM, an error-correction term (representing the lagged residual from the long-run relationship equation) is added to a model of first differences. This lagged residual is introduced with a time delay and corresponds to the model's short-run adjustment equation, often referred to as the short-run (short-term) equation of the long-run adjustment..

1. Description of the study variables

1.1 Descriptive statistical properties of the study variables

The following table presents the descriptive statistical characteristics of the variables:

Table No. 1: Descriptive statistics of the study indicators

Period: 2000–2024

Indicators of descriptive statistics	DEQ (expenditure on preparation/set-up costs):	DTOT (general expenditures).	DG DG(management/operating expenditure).	RP (General Revenues)	IMPTOT (Ordinary tax revenues)	IMPD (direct taxes)
- Arithmetic mean	1643807.	4423373.	2770574.	3106505.	1357561.	523580.4
- Mean	1822595.	4246334.	2300023.	3074644.	1146612.	478430.0
- Maximum value	3078005.	7726291.	4782634.	6313959.	2728450.	1064412.
- Minimum value	221100.0	1178122.	856193.0	1124924.	349502.0	149670.0
- Standard deviation	942048.1	2467276.	1573446.	1589953.	848298.7	296611.3
Skewness (coefficient of skewness)	-0.070277	0.044157	0.144857	0.565174	0.385800	0.451623

- Kurtosis (coefficient of kurtosis)	1.695036	1.399356	1.273113	2.278890	1.630078	1.974125
Sum	31232333	84044078	52640911	59023594	25793665	9948027
Deviation from the sum	1.60E+13	1.10E+14	4.46E+13	4.55E+13	1.30E+13	1.58E+12

Source: prepared by the researcher based on the outputs of the EVIEWS 09 statistical software.

1.2 Stationarity study of time series

A time series is said to be stationary if its arithmetic mean and variance are constant over time.

Several tests are used to determine whether a time series is stationary. The Augmented Dickey–Fuller (ADF) test is the most common and widely used.

1.2.1 Determining the lag length for the study variables

The Schwarz (SC) test is one of the most important tests for determining the appropriate lag length. The software provides several lag-length tests, which can be summarised in the following tables.

Lag length for general expenditure

The results for the lag length of general expenditure are shown in the following table:

Table No. (02): Lag length tests for general expenditure

Delay period	LogL	LR	FPE	AIC	SC	HQ
0	-239.4178	NA	4.89e+12	32.05571	32.10291	32.05520
1	-220.6840	32.47198*	4.60e+11	29.69119	29.78560*	29.69019
2	-220.4783	0.329004	5.14e+11	29.79711	29.93872	29.79560
3	-218.3854	3.069695	4.47e+11*	29.65138*	29.84019	29.64937*
4	-217.6860	0.932481	4.72e+11	29.69147	29.92748	29.68895

Source: EVIEWS 09 software outputs.

The table shows the differences between the various tests used to determine the lag length. We will base our decision on the Schwarz criterion because it is more stringent in selecting the lag length. Therefore, the lag length for general expenditure is one year.

Lag length for general revenues

The results of the lag length test for general revenues are shown in the following table:

Table No. (03): Lag length tests for general revenues

Delay period	LogL	LR	FPE	AIC	SC	HQ
0	-233.8880	NA	2.34e+12	31.31839	31.36560	31.31789
1	-211.3651	39.03965*	1.33e+11*	28.44868*	28.54308*	28.44767*
2	-211.2760	0.142583	1.51e+11	28.57013	28.71174	28.56862
3	-210.6935	0.854323	1.60e+11	28.62580	28.81461	28.62379
4	-210.5518	0.188864	1.82e+11	28.74024	28.97626	28.73773

Source: EVIEWS 09 software outputs.

The table shows that the different tests indicate almost complete agreement that the lag length for general revenues is one year.

Lag length for ordinary tax revenues

The results of the lag length test for ordinary tax revenues are shown in the following table:

Table No. (04): Lag length tests for ordinary tax revenues

Delay period	LogL	LR	FPE	AIC	SC	HQ
0	-270.4807	NA	7.38e+11	30.16452	30.21399	30.17134
1	-236.0781	61.16028*	1.80e+10*	26.45312*	26.55205*	26.46676*
2	-171.5759	0.126367	2.73e+10	26.85783	26.98820	26.83103
3	-169.7176	2.573014	2.42e+10	26.72578	26.89961	26.69005
4	-166.9635	3.389699	1.88e+10	26.45592	26.67320	26.41125

Source: EVIEWS 09 software outputs.

The table shows almost complete agreement among the different tests that the lag length for the variable 'ordinary tax revenues' is one year.

Lag length for the variable 'direct taxes'

The results of the lag length tests for the 'direct taxes' variable are shown in the following table:

Table No. (05): Lag length tests for direct taxes

Delay period	LogL	LR	FPE	AIC	SC	HQ
0	-153.6015	NA	9.45e+10	28.10937	28.14554	28.08657
1	-137.2724	26.72030*	5.84e+09*	25.32226*	25.39461*	25.27666*
2	-136.7022	0.829478	6.38e+09	25.40040	25.50891	25.33199
3	-136.6220	0.102050	7.70e+09	25.56764	25.71232	25.47643
4	-136.3626	0.282991	9.14e+09	25.70229	25.88315	25.58828

Source: EVIEWS 09 software outputs.

The table shows that the different tests agree that the lag length for the variable 'direct taxes' is one year.

1.3 Study of the stationarity of the dependent variables

Stationarity of general expenditure

The results of the stationarity test for the variable 'general expenditure', using the Augmented Dickey–Fuller (ADF) criterion, are shown in the following table:

Table No. (06): Stationarity test models for general expenditure

Decision	First Difference			Level			
I(1)	None	Trend and intercept	Intercept	None	Trend and intercept	Intercept	**DTOT**
	-0.556281	-4.511819	-4.694957	1.956947	-2.484091	-0.453171	Critical value at 5%
	-1.968430	-3.733200	-3.065585	-1.961409	-3.690814	-3.040391	ADF
	0.4578	0.0131	0.0023	0.9838	0.3306	0.8795	SIG

Source: EVIEWS 09 outputs (prepared by the student).

From the previous table, which presents the three models used in the stationarity study, we can see that the critical value in the table is greater than the calculated value in all models at the level (at I(0)). This leads us to conclude that the series is not stationary at this level. This is also confirmed by the fact that the test is not significant in the three models at the level.

As for the three models at the first difference, we observe that the critical value is less than the calculated value, whether the model includes a constant term or a constant and trend term. Even though the results suggest accepting the model, the significance level of the trend is estimated at 0.867, which leads us to reject the model's result.

The model with no constant and no trend is rejected when the calculated value is compared with the critical value; therefore, the series is considered stationary with a constant term.

1.4 Stationarity study of the independent variables

The stationarity results for the independent variables, using the Augmented Dickey–Fuller (ADF) criterion, are shown in the following table:

Test of stationarity for general revenues:

Table No. (07): Stationarity test models for general revenues

Decision	First Difference			Level			
I(1)	None	Trend and intercept	Intercept	None	Trend and intercept	Intercept	**DTOT**
	-2.315494	-4.170374	-3.525535	4.166773	-1.173417	1.329231	Critical value at 5%
	-1.962813	-3.710482	-3.052169	-1.961409	-3.690814	-3.040391	ADF
	0.0238	0.0223	0.0203	0.9999	0.8853	0.9976	SIG

Source: EVIEWS 09 outputs (prepared by the student).

From the previous table, which presents the three models used in the stationarity study, we can see that the critical value in the table is greater than the calculated value in all models at the level (at I(0)). This leads us to conclude that the series is not stationary at this level. This is also confirmed by the fact that the test is not significant in the three models at the level.

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1.4 Stationarity study of the independent variables

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Table No. (07): Stationarity test models for general revenues

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I(1)	None	Trend and intercept	Intercept	None	Trend and intercept	Intercept	**DTOT**
	-2.315494	-4.170374	-3.525535	4.166773	-1.173417	1.329231	Critical value at 5%
	-1.962813	-3.710482	-3.052169	-1.961409	-3.690814	-3.040391	ADF
	0.0238	0.0223	0.0203	0.9999	0.8853	0.9976	SIG

Source: EVIEWS 09 (prepared by the student)

Values shown: 0.0525, 0.0420, 0.0379, 0.9996, 0.5454, 0.9814

From the previous table, which presents the three models used in the stationarity study, we can see that the critical value in the table is greater than the calculated value in all models at the level. This leads us to conclude that the series is not stationary at this level, a conclusion that is also supported by the lack of significance of the test in all three models at this level.

As for the first and second models at the first difference, we observe that the critical value is lower than the calculated value in these two models. This leads us to conclude that the series is stationary at the first difference.

- Test of stationarity for direct taxes:

Decision	First Difference			Level			
I(1)	None	Trend and intercept	Intercept	None	Trend and intercept	Intercept	**DTOT**
	-1.962813	-3.733200	-3.052169	-1.961409	-3.690814	-3.040391	Critical value at 5%
	-1.938199	-3.836518	-3.199848	3.650518	-2.033256	0.495598	ADF
	0.0525	0.0420	0.0379	0.9996	0.5454	0.9814	SIG

Table No. (09): Stationarity test models for direct taxes

Decision	First Difference			Level			
I(1)	None	Trend and intercept	Intercept	None	Trend and intercept	Intercept	**DTOT**
	-1.966270	-3.710482	-3.052169	-1.961409	-3.69081	-3.044039	Critical value at 5%
	-0.500196	-4.087751	-3.981102	3.83250	-2.30725	0.58899	ADF
	0.4823	0.0258	0.0083	0.9991	0.4096	0.9850	SIG

source: prepared by the student based on the outputs of statistical programme EVIEWS 09.

From the previous table, which displays the three stationarity models used in the stability study, we can see that the critical value in the table is greater than the calculated value in all models at the level. This leads us to conclude that the series is not stationary at this level. This is confirmed by the non-significance of the test in all three models at this level.

As for the first and second models at the first difference, we see that the critical value is less than the calculated value in both models. This leads us to conclude that the series is stationary at the first difference.

Test of the stability of indirect taxes: Table No. 10: Stationarity test models for the indirect taxes variable

Decision	Second difference			
I(2)	None	Trend and intercept	Intercept	Statement
	1.970978-	3.791172-	3.098896-	Critical value at 5%
	1.894115-	15.29400-	15.53978-	HD
	0.058	0.0001	0.0000	Significance level

Source: prepared by the student based on the outputs of the statistical programme EVIEWS (09).

From the table, we can see that the critical (table) value is greater than the calculated value in the model without the intercept and without the trend (vector).

For the intercept model and the intercept-and-trend model, the critical value is less than the calculated value, and the significance level is 0.000 and 0.0001 respectively. Since both are less than 0.05, we can conclude that the time series is stationary at the second difference for this variable.

This variable did not achieve stationarity at the level or at the first difference, which is why we exclude it from the cointegration model and only study the causality between it and the dependent variable, which will be included later.

2. Test of cointegration between the variables

2.1 Cointegration model between general revenues and general expenditures:

From the previous tables, we can see that both the independent variable (general revenues) and the dependent variable (general expenditures) are stationary and integrated of the same order at the first difference. This allows us to conduct a cointegration test between the two variables.

- Estimation of the long-run equilibrium model parameters between general revenues and general expenditures:

The mathematical model that links the two variables in the long run is determined by the following equation:

$$DTOT = \alpha + \beta RP + \mu_t$$

Figure No. 11 shows the simple linear regression model between the variables ‘general revenues’ and ‘general expenditures’.

Dependent Variable: DTOT

Method: Least Squares

Date: 03/08/20 Time: 14:28

Sample: 2000 2018

Included observations: 19

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*-117808.2*	*438286.7*	*-0.268792*	*0.7913*
RP	*1.461830*	*0.126284*	*11.57569*	*0.0000*

R-squared	*0.887415*	*Mean dependent var*	*4423373.*
Adjusted R-squared	*0.880792*	*S.D. dependent var*	*2467276.*
S.E. of regression	*851864.5*	*Akaike info criterion*	*30.24754*
Sum squared resid	*1.23E+13*	*Schwarz criterion*	*30.34696*
Log likelihood	*-285.3517*	*Hannan-Quinn criter.*	*30.26437*
F-statistic	*133.9966*	*Durbin-Watson stat*	*0.637018*
Prob(F-statistic)	*0.000000*		

Dependent Variable: DTOT

Method: Least Squares

Date: 03/08/20 Time: 17:21

Sample: 2000 2018

The table above shows the linear regression model linking the two variables.

$$DTOT = -117808.15789 + 1.46182953549*RP$$

In other words, whenever general revenues change by one unit, general expenditures change by 1.46183.

As for stability, we note that it is not statistically significant, which confirms a specification problem in the model and the long-run estimation relationship. To verify this, we conducted a test of the stationarity of the estimated residuals from the simple regression model between the two variables.

2.2 The long-run equilibrium relationship between ordinary tax revenues and general expenditures

One of the conditions for applying this model is that the two series must be stationary at the same order of integration. Since the study variables are stationary at the first difference, we can search for the long-run equilibrium relationship.

Estimation of the model parameters: Table 12 presents the estimation of the model between the variable of ordinary tax revenues and general expenditures.

Method: Least Squares

Date: 03/08/20 Time: 17:21

Sample: 2000 2018

Included observations: 19

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*588807.7*	*267276.4*	*2.202992*	*0.0417*
IMPTOT	*2.824598*	*0.168211*	*16.79197*	*0.0000*

R-squared	*0.943138*	*Mean dependent var*	*4423373.*
Adjusted R-squared	*0.939793*	*S.D. dependent var*	*2467276.*
S.E. of regression	*605396.7*	*Akaike info criterion*	*29.56446*
Sum squared resid	*6.23E+12*	*Schwarz criterion*	*29.66387*
Log likelihood	*-278.8623*	*Hannan-Quinn criter.*	*29.58128*
F-statistic	*281.9702*	*Durbin-Watson stat*	*0.990650*
Prob(F-statistic)	*0.000000*		

The table above shows the linear regression model linking the two variables.

DTOT=588807.7+2.824598 ×IMPTOT

In other words, whenever ordinary tax revenues change by one unit, general expenditures change by 2.824598.

Regarding stability, we note that it is statistically significant, which confirms that the model has an effect and that there are other influencing factors not included in the model. The estimated constant is 588,807.7.

Dickey-Fuller test for the stationarity of the residuals

You can present the test results in the following table:

Table No. 13: Stationarity test models for the residuals

Decision	Level			
I(0)	None	Trend and intercept	Intercept	**Variable** **RP**
	1.961409-	*3.690814-*	*3.040391-*	Critical value at 5%
	2.416999-	*2.205202-*	*2.347621-*	ADF
	0.0189	*0.4589*	*0.1691*	SIG

Source: Prepared by the student based on the programme outputs: EVIEWS (09).

From the table, we can see that the critical value is greater than the calculated value in the two models with the intercept (or constant) and in the model with the intercept and trend vector. This confirms that the time series of the residuals is not stationary in these cases.

However, in the last model, which does not include the intercept or trend, the critical value is less than the calculated value. This confirms the stationarity of the residuals (for the model at this level) and therefore indicates cointegration between the two variables, supporting the possibility of a long-run equilibrium relationship between them.

Having confirmed the stationarity of the residuals in the estimated model, we will now identify the econometric/specification problems in the model. We present the following:

- Econometric problems of the model:

Significance of the overall Fisher (F) test: The previous table (No. 13), which represents the analysis of variance and the significance of the Fisher test, has a value of 0.00. We note that this is less than the chosen significance level of 0.05. Therefore, we can conclude that the

regression trend is different from zero, confirming that the model satisfies the requirement of overall statistical significance for the simple regression model between the two variables.

- Autocorrelation problem: Table No. 14: Autocorrelation

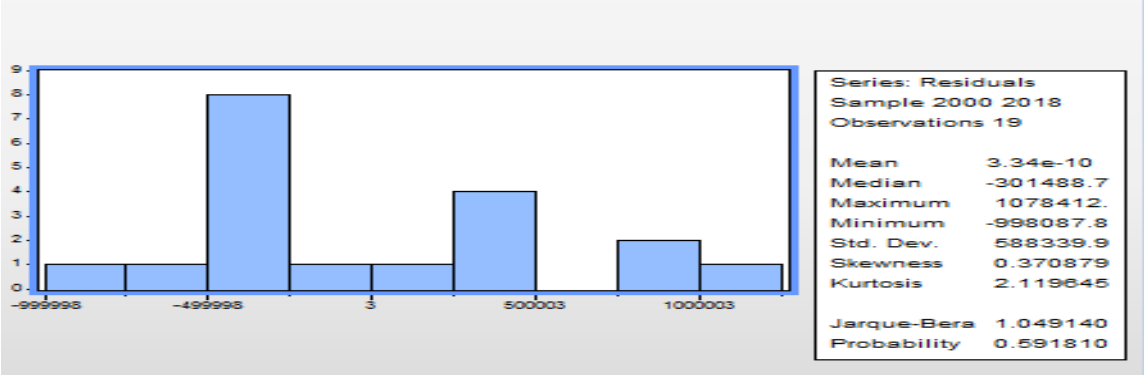
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	*2.454481*	*Prob. F(2,15)*	*0.1196*
*Obs*R-squared*	*4.684839*	*Prob. Chi-Square(2)*	*0.0961*

source: outputs of the statistical program EVIEWS (09).

We note that the results of the Breusch–Godfrey LM test at the chi-square probability level gave a value of 0.0961. This value is greater than the adopted significance level of 0.05. This confirms that the model has no autocorrelation problems.

- Normal distribution of the residuals: The table and the following figure show the results of the normal distribution of the residuals. Table No. 15: Normal distribution of the residuals.



source: outputs of the statistical program EVIEWS (09).

From the table and figure, we can see that the residuals follow a normal distribution because the significance level of the test is 0.591. Since 0.591 is greater than 0.05, the null hypothesis that the residuals of the model are normally distributed can be accepted.

Homoscedasticity (constant variance) of the residuals: The results can be presented in the following table: Table 16: Homoscedasticity (constant variance) of the residuals.

Heteroskedasticity Test: ARCH

F-statistic	*0.343236*	*Prob. F(1,16)*	*0.5661*
*Obs*R-squared*	*0.378031*	*Prob. Chi-Square(1)*	*0.5387*

source: outputs of the statistical program EVIEWS (09).

From the table, we can see that the model does not suffer from heteroscedasticity (non-constant residual variance), as the chi-squared test's probability value is 0.5387, which is greater than 5%. This confirms that the residual variances are constant.

Error Correction Model (ECM): After the residuals reach stationarity, we can estimate the error correction model. This is achieved by using the long-run relationship between the variables (in the first differences for each variable) and adding the lagged residual term (the estimated residuals from the long-run relationship) as an independent variable, delayed by one period.

This can be expressed by the following mathematical equation:

$$\mathrm{d}(DTOT) = \alpha_1 \mathrm{d}(\mathrm{IMPTOT}) + \alpha_2 \mathrm{M}_{2_t}(-1) + \varepsilon_t$$

Table No. (17): Error correction model for ordinary tax revenues and general expenditures

Dependent Variable: DDTOT

Method: Least Squares

Date: 03/08/20 Time: 18:59

Sample (adjusted): 2001 2018

Included observations: 18 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*-60956.97*	*252734.4*	*-0.241190*	*0.8127*
DIMPTOT	*3.416019*	*1.739624*	*1.963654*	*0.0684*
M2(-1)	*-0.605673*	*0.361617*	*-1.674905*	*0.1147*
R-squared	*0.206341*	*Mean dependent var*		*363787.2*

Adjusted R-squared	*0.100520*	*S.D. dependent var*	*581081.5*
S.E. of regression	*551103.0*	*Akaike info criterion*	*29.42824*
Sum squared resid	*4.56E+12*	*Schwarz criterion*	*29.57664*
Log likelihood	*-261.8542*	*Hannan-Quinn criter.*	*29.44870*
F-statistic	*1.949906*	*Durbin-Watson stat*	*1.879861*
Prob(F-statistic)	*0.176707*		

source: outputs of the statistical program EVIEWS (09).

From the above, we can see that the lagged residual term (error-correction term) is not statistically significant and is also negative. This suggests that there is no long-run equilibrium relationship between ordinary tax revenues and general expenditures.

This result can be explained by the short study period, which may not be sufficient to demonstrate a long-term relationship. Additionally, the lack of convergence between the variables in the long run suggests that other factors affect them, particularly oil tax revenues, which remain the main source of financing the state treasury and are directly affected by factors such as the exchange rate, the price of a barrel of crude oil, and international demand for fuel, along with other external factors.

Therefore, it is necessary to develop ordinary tax revenues because they are more stable and less volatile, which helps to achieve fiscal policy stability.

3. Long-run equilibrium relationship model between direct taxes and general expenditure

One of the conditions for applying this model is that the two series must be stationary at the same order of integration. Since the study variables are stationary at the first difference, we can search for the long-run equilibrium relationship.

Indirect taxes have been excluded because they are not stationary in either the level or the first difference.

3.1 Estimation of the model parameters

The mathematical model that links the two variables in the long run is determined by the following equation:

$$DTOT = \alpha + \beta\ IMPD + \mu_t$$

Table No. (18): Model coefficients

Dependent Variable: DTOT

Method: Least Squares

Date: 05/08/20 Time: 13:04

Sample: 2000 2018

Included observations: 19

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*1205044.*	*208878.8*	*5.769104*	*0.0000*
IMPD	*5.860942*	*0.307335*	*19.07020*	*0.0000*
R-squared	*0.955342*	*Mean dependent var*		*4423373.*
Adjusted R-squared	*0.952715*	*S.D. dependent var*		*2467276.*
S.E. of regression	*536510.6*	*Akaike info criterion*		*29.32286*
Sum squared resid	*4.89E+12*	*Schwarz criterion*		*29.42228*
Log likelihood	*-276.5672*	*Hannan-Quinn criter.*		*29.33969*
F-statistic	*363.6725*	*Durbin-Watson stat*		*1.108904*
Prob(F-statistic)	*0.000000*			

source: Outputs from the statistical programme EVIEWS (09).

The table above presents the linear regression model that links the two variables as follows:

*DTOT = 1205043.50043 + 5.86094203434*IMPD*

In other words, whenever direct taxes change by one unit, general expenditures change by 5.86094203434.

The constant term is statistically significant, which confirms that there are other factors affecting the model that were not included in it. The estimated value of the constant is 1,205,043.50043.

Decision	Level			
I(0)	None	Trend and intercept	Intercept	Variable RP
	1.961409-	*3.733200-*	*3.040391-*	Critical value at 5%
	2.674272-	*0.164012-*	*2.601115-*	ADF
	0.0106	*0.9874*	*0.1109*	SIG

Source: prepared by the student based on the outputs of statistical programme 09.

From the table, we can see that the critical value is greater than the calculated value in the two models that include either an intercept (constant) or an intercept and a trend (vector). This confirms that the time series of the residuals is not stationary in these cases.

However, in the final model, which does not include an intercept or a trend, the critical value is less than the calculated value. This confirms the stationarity of the residuals in the model at the level, and therefore indicates the existence of cointegration between the variables, which supports the possibility of a long-run equilibrium relationship between them.

Having confirmed the stationarity of the residuals in the estimated model, we now identify the econometric and specification problems of the model. We present the following:

4. Causality relationship in the short and long run between indirect taxes and general expenditure.

4.1 Causality relationship in the short run between indirect taxes and general expenditure

For direct taxes, the series becomes stationary only at the second difference, while expenditure becomes stationary at the first difference. Therefore, the most commonly used methodology in this case is the Granger causality test between the variables.

The following table was obtained:

Table 20: Granger causality test between the variables in the short run for indirect taxes and general expenditure.

Null Hypothesis:	Obs	F-Statistic	Prob.
DTOT does not Granger Cause IMPIND	17	5.21144	0.0235
IMPIND does not Granger Cause DTOT		3.29875	0.0722

Source: prepared by the student based on the outputs of the statistical programme EVIEWS (09).

From the table, we can see that the causality test in the short term is significant, i.e. less than 0.05. The estimated value is 0.0235, confirming that an increase in public expenditure has a causal relationship with indirect taxes in the short run. However, reverse-direction causality is not valid because the significance level is not significant.

This may be explained by the fact that indirect taxes, measured as a proportion of total ordinary revenue, were volatile. They accounted for a significant proportion of ordinary collection receipts. During the period 2000–2018, indirect taxes contributed an average of 35.96% to ordinary collection. This can be attributed to the significant increase in consumption resulting from the rise in public or private spending, which in turn leads to an increase in the yield of the value-added tax on domestic transactions. This also reflects the increase in Algeria's imports, resulting in higher customs duty proceeds. Additionally, broadening the scope of taxation and strengthening the control exercised by the tax administration over this tax, particularly through monitoring and mandatory invoicing, have contributed to this pattern.

4.2 Long-run causality relationship between indirect taxes and public expenditure

The Dothanamoto methodology (Dota Yamomoto) was adopted. Based on the study of the number of lags, four lags were identified. The indirect taxes variable had the highest stability rank of two (2). The variables were then estimated using six lags, and the following results were obtained:

Table 21: Causality test between the variables in the long run — indirect taxes and public expenditure.

Dependent variable: DTOT

Excluded	Chi-sq	df	Prob.
IMPIND	3.122577	2	0.2099
All	3.122577	2	0.2099

Dependent variable: IMPIND

Excluded	Chi-sq	df	Prob.
DTOT	1.703447	2	0.4267
All	1.703447	2	0.4267

Source: Prepared by the student based on the outputs of the EVIEWS09 statistical program

From the table, we can see that the causality test between the two variables in the long run is not statistically significant, as the significance level reached was 0.4267, which is greater than 0.05. This suggests that an increase in public expenditure does not lead to a long-term causal relationship with indirect taxes.

Furthermore, the causality relationship in the opposite direction is also not significant, as the significance level is 0.2099, which is higher than the adopted significance threshold. Therefore, there is no evidence of a long-run causal relationship from indirect taxes to public expenditure either.

This can be explained by the fact that, beginning in 2010, indirect taxes witnessed a decline in their contribution to financing the state budget overall and ordinary revenues in particular. This decline is due to the increased contribution of direct taxes to budgetary financing, as well as reductions and exemptions in value-added tax (VAT), which were adopted by Algeria in an effort to prepare for joining the World Trade Organization (WTO).

Fourth: Economic interpretation of the estimated model

The econometric study of the impact of ordinary taxation on financing the general budget of Algeria between 2000 and 2018, using the autoregressive distributed lag bounds test (ARDL) 'unrestricted error correction' methodology, begins by describing the econometric model and its variables (study variables) before estimating the model itself.

Accordingly, it was first necessary to examine whether the aforementioned time-series variables were stationary. For this purpose, we relied on the Augmented Dickey–Fuller (ADF) test. These tests establish the nature and characteristics of the time series for the variables under study.

The results show that most of these variables are not stationary at the level. However, they become stationary at the first difference. The exception is the 'indirect taxes' variable, which appears to be stationary only at the second difference. This is why it was excluded from the cointegration framework and why we instead examined the causality between it and the dependent variable.

Subsequently, it became evident that the remaining study variables attained stationarity and integration at the first difference at a 5% significance level. This enabled us to perform a cointegration test on the variables, the results of which are as follows:

Absence of long-run equilibrium relationship

The results show an absence of a long-run equilibrium relationship between general revenues and public expenditure, and between ordinary tax revenues and public expenditure. This can be explained by the fact that the observed changes are the net outcome of developments in both general revenue and public spending.

Throughout the study period, Algeria recorded a budget deficit. This suggests that the causes of the deficit became embedded in the structural composition of the public budget over time. The study period was characterised by the adoption of an expansionary fiscal policy, reflected in continuous increases in public expenditure alongside limited financial resources, resulting in recurring budget imbalances. Under these conditions, establishing a long-run equilibrium relationship between the variables was not possible. Consequently, the public authorities sought to control and rationalise spending in order to maintain economic stability.

In addition, the lack of long-term convergence between ordinary tax revenues and public expenditure suggests that, despite the developments in ordinary taxation during the study period, oil tax revenues remain the main source of financing for the state treasury, even though they are an unstable resource due to their dependence on the national economy's exposure to several external factors. These include the exchange rate, the crude oil barrel price, and international demand for hydrocarbons, among other factors. From this perspective, developing ordinary tax revenues becomes essential because they are generally more stable and less volatile, supporting the achievement of fiscal policy stability.

By contrast, there is a long-run equilibrium relationship between direct taxes and public expenditure. Furthermore, we found that 34.31% of changes in public expenditure are attributable to direct taxes. This finding helps to explain that the key driver of growth in direct taxes is the tax on total income (category: wages and salaries), which has undergone multiple reforms — first in 2003, then in 2008, with the latter representing the most significant reform. This included adjusting the tax schedule for corporate profits. The most recent reform, in 2020, fundamentally revised the tax on total income table by increasing the minimum threshold for tax imposition, lowering the highest marginal rate and reducing the number of tax brackets from five to three.

This evolution driven by reforms helps to explain the persistence of growth in this type of tax due to the reforms implemented.

Conclusion

Through our study, we found that taxation, particularly in terms of its instrumentality, is of great importance and distinguishes it from the other tools of fiscal policy. We also observed the extent to which tax reforms effectively ensure the success of the state's development efforts, with the aim of achieving fiscal policy stability. This is because taxation is an internal variable over which the state has a significant degree of control.

Future research perspectives

Based on these findings, the following avenues for further research can be suggested:

1. Rationalising public expenditure, ensuring its fair distribution, and directing it towards priority sectors.

2. The role of local taxation in achieving local development.

3. The competitiveness of the Algerian tax system as a factor in attracting foreign investment at regional and international levels, with the aim of increasing the yield of ordinary (non-oil) taxation.