

To what extent do tax expenditure policies contribute to enhancing investment and employment in Algeria?

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ABSTRACT: This study analyses the impact of tax expenditure policies on investment and employment in Algeria using the ARDL model. The following variables were used in the analysis: Tax expenditures, gross Domestic Product (GDP), corporate tax rate, and deposit interest rate (independent variables), and investment and employment (dependent variables). The results show that tax expenditures negatively affect both investment and employment in the short term but positively enhance them in the long term. Additionally, GDP has a positive impact on both investment and employment, while the corporate tax rate also plays a positive role. On the other hand, the deposit interest rate shows a negative effect on employment in the long run. Based on these findings, the study recommends improving the structure of tax expenditures to target sectors that contribute to job creation and economic and social development, reducing deposit interest rates to encourage private investment, and developing tax policies that better support investments. The study also recommends diversifying the economy to reduce dependence on oil and to promote investment in non-oil sectors, thereby contributing to sustainable and inclusive development.

KEYWORDS: Tax expenditure policies; investment; employment; Algeria

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Introduction

The primary objective of any tax system is to raise the revenue needed to finance public expenditures. Every citizen is required to contribute a proportion of their income, consumption, or wealth to the government to support public goods, social expenditures, and other activities that generate positive economic outcomes for society (Villela et al., 2010).

Fiscal policy represents a powerful economic instrument. Through the revenues collected by the tax system, the government can procure goods and services for its use, provide financial transfers to achieve social objectives, or implement financial incentives to stimulate economic activity (Kefela & Rena, 2011). The manner in which governments collect tax revenues and allocate public expenditures can vary (Ullah, 2016). These can take traditional forms through budgetary spending or, alternatively, through leveraging the tax system via preferential fiscal measures (El-Khoury, 2002).

Imposing high taxes on investment projects often leads to a decline in this sector, reducing new employment opportunities (Kouam & Asongu, 2022). For this reason, many countries choose to alleviate the tax burden on investment activities that support regional and sectoral development. By employing various forms of fiscal expenditure provided by financial authorities, governments aim to create a conducive environment for investment and targeted economic activities, ultimately contributing to economic development.

Tax theory offers an alternative perspective, suggesting that constrained firms may be more likely to claim investment tax incentives because they perceive the additional government funding as highly valuable. Empirical studies, such as those by Zwick and Mahon (2017) and Liu & Mao (2019), support this view by demonstrating that investment tax incentives play a crucial role in easing financial constraints for firms. These incentives not only increase the likelihood of investments in capital-intensive projects but also enable firms to allocate resources more efficiently, thus fostering economic growth and creating employment opportunities (OECD, 2024).

Tax expenditures emerged from the recognition that the tax system could be utilised to achieve objectives similar to those accomplished through public (direct) expenditures. The use of fiscal interventionism has become widespread in both developing and developed countries, particularly among Organisation for Economic Co-operation and Development member states, to promote investment and foster economic growth. Godbout (2006) asserts that preferential fiscal measures have existed as long as taxation itself. However, the awareness of the need to evaluate and assess tax relief policies for economic or social purposes first emerged in the late 1960s in the United States and West Germany (Gilbert, 1995).

Many developed countries have used taxation (tax expenditures) to intervene in the economic sphere. In 1967, the German government published budget reports that included tax subsidy measures (Daniel, 2006). Professor Stanley

Surrey was the first to focus on the concept of “tax expenditure,” introducing it into academic discourse (Fleming & Peroni, 2008). He advocated for full accounting to identify and quantify the revenue losses associated with these tax expenditures.

Around the same time, France, like Great Britain, began to examine this phenomenon by publishing annual reports in the “ways and means” section attached to the finance bill. Through this report, the French government tracks the evolution of tax expenditures, assesses their effectiveness, and analyses the outcomes achieved by this form of subsidy (Godbout, 2006).

Developing countries have also recently recognised the usefulness of tax expenditures in crafting prudent and transparent fiscal policy (Gilbert, 1995), notably the Kingdom of Morocco, which published its first report on tax expenditures in 2005. The strategic use of tax expenditures as a fiscal policy tool enables governments to expand their public finance options, adapt to the dynamics of the modern economy, and effectively intervene to promote growth and achieve national development goals.

Given Algeria’s status as a developing country, investment has been a priority since the early 1960s. Successive economic reforms in Algeria have placed significant emphasis on capital investment as a key driver of economic development, as highlighted by Merghit (2022).

At the domestic level, job creation has remained a primary concern for Algerian authorities (Kpodar, 2007). To address unemployment and stimulate job opportunities, the state implemented a series of strategic measures that relied heavily on tax expenditure policies to achieve its developmental goals. Since 1991, comprehensive tax reforms have been introduced, significantly altering the administrative structure and fiscal framework. These reforms focused on providing tax exemptions, reductions, and financial incentives to investors, particularly in priority sectors, helping create a favourable investment environment for establishing and expanding businesses. Additionally, the state established several institutions to support employment initiatives, including the National Unemployment Insurance Fund (CNAC), established in 1994 to support the unemployed (Executive Decree No. 94-188, July 6, 1994), the National Agency for Youth Employment Support (ANSEJ), created in 1996 to finance youth projects (Executive Decree No. 296/96, September 8, 1996), and the National Agency for Microcredit Management (ANGEM), established in 2004 to support small businesses through tax-subsidized loans (Executive Decree No. 04-16, January 22, 2004). These policies aim to enhance local investment, create job opportunities, and achieve sustainable economic and social development.

At the international level, Algeria has undergone a significant transformation in its investment policies since the early 1990s, transitioning from a socialist system reliant solely on the public sector to a market economy. In this context, the state has worked to encourage foreign investment to achieve economic and social development through tax expenditure policies. Several laws have been enacted to enhance the attractiveness of the investment climate, including Law

No. 90-10 of 1990, which laid the foundations for economic liberalization (Law 90-10, April 14, 1990), Law No. 01-03 of 2001, which provided tax and customs incentives to attract investors (Law 01-03, August 20, 2001), and Law No. 22-18 of 2022, which focuses on stabilizing the legal framework and simplifying administrative procedures (Law 22-18, July 24, 2022). These laws aim to create a conducive investment environment, attract foreign capital, and support job creation, thereby boosting the country's economic and social development.

This study contributes to the academic literature by offering an empirical assessment of the effectiveness of tax expenditure policies in a developing country context, specifically Algeria, where this topic remains underexplored. Unlike most existing studies that focus on developed economies, this research extends the literature by applying the ARDL model to distinguish between short-term and long-term effects on both investment and employment. The dual-model approach adopted herein also enables a more nuanced understanding of the mechanisms by which tax expenditures influence different dimensions of economic activity. By integrating Algeria's fiscal reforms and institutional developments into the analysis, this study fills a gap in the literature and provides insights relevant for policymakers in similar economic contexts. Building on reforms in fiscal policy, particularly the tax expenditure policy, this study assesses the impact of these policies on investment and employment opportunities in Algeria from 1995 to 2023, a period marked by significant economic reforms. The study focuses on analysing the impact of these policies in both the short and long terms.

The study is structured as follows. Section 2 presents the literature review, Section 3 outlines the methodology, Section 4 provides the results and discussion, and Section 5 concludes with the findings and policy implications.

Literature review

Tax expenditures, as a mechanism of fiscal policy, have been the subject of many studies regarding their potential impact on investment. These studies have helped to better understand how tax incentives influence investment decisions made by businesses and governments, particularly in strategic sectors such as research and development, innovation, and infrastructure.

Jarkko Harju and Thomas Kosonen examined the impact of tax incentives on the economic activity of small businesses, focusing on reforms that reduced income tax rates for business owners (Harju & Kosonen, 2012). Their findings indicate that lower taxation does not directly increase companies' revenues. However, they emphasised that well-designed tax incentives can play an important role in enhancing economic activity. Similarly, Pierre-Alain Muet and Sanvi Avouyi-Dovi studied the effects of preferential tax measures on corporate investment in France (Muet & Avouyi-Dovi, 1987). Their econometric analysis revealed that these measures led to a significant increase in equipment

investments, with an average cost to the state budget equivalent to 1.5 times their cost. However, they noted that the effectiveness of these measures diminishes over time, leading their budgetary costs to exceed their benefits. Furthermore, Antonella Caiumi focused on tax expenditures aimed at encouraging corporate investment in Italy. Using a methodology comparing companies that benefited from tax incentives with those that did not, she assessed the impact of these measures on investment decisions. Her results indicate that tax subsidies targeted at capital accumulation are not an optimal tool for fostering local development, highlighting the need for a dynamic approach that incorporates structural factors influencing investment decisions (Caiumi, 2011).

Caldeira, Geourjon, and Laporte focused on the challenges of evaluating tax expenditures. Their study highlighted the complexity of assessing the effects of tax incentives on investment, while emphasising the importance of a rigorous approach to measuring the economic and social impacts of these expenditures (Caldeira et al., 2022). The authors stressed the need for precise data to analyse the profitability of tax incentives, particularly in terms of job creation and increased productive investment. Their study demonstrated that while fiscal expenditures can stimulate investment, a thorough evaluation is essential to determine their long-term effectiveness.

Regarding Canada, the study by Chen and Mintz focused on the impact of tax credits for research and development. The results showed that these fiscal incentives led to a substantial increase in R&D spending, thereby stimulating innovation in technological sectors (Chen & Mintz, 2011). This increase in research investment fostered economic growth by encouraging innovation, allowing companies to remain competitive and strengthen their position in international markets. Tax credits for R&D, therefore, played a crucial role in promoting long-term investment in high-value-added sectors. The Platform for Collaboration on Tax (2015) published a report on the use of tax incentives in low-income countries, focusing on the need to adopt more transparent and well-regulated fiscal policies. The report showed that although fiscal expenditures can stimulate investment, their effectiveness remains limited in developing countries, mainly due to poor implementation and the absence of suitable monitoring mechanisms. The authors recommended a more targeted approach to tax incentives to maximise their impact on investment while supporting the economic development of low-income countries.

Several empirical studies have also examined the relationship between tax structure and economic growth, offering valuable insights into the design of growth-oriented fiscal policies. Arnold (2008), using a panel of 21 OECD countries, finds that recurrent taxes on property and consumption taxes are less distortionary and more conducive to economic growth than income taxes, particularly corporate income taxes, which have a significant negative effect on GDP per capita. These findings support shifting the tax burden from income toward consumption and property taxes. In the context of emerging and transition economies, Grdinić and Drezgić (2017) analyse 20 Central and

Eastern European countries and conclude that most forms of taxation negatively affect growth, with personal income taxes having the most detrimental impact. Notably, consumption taxes were found to be statistically insignificant, highlighting regional differences in tax-growth dynamics. Focusing on EU member states, Kutasi and Marton (2024) employ the Arellano-Bond GMM method and demonstrate that a higher share of indirect taxes, particularly consumption taxes, can foster GDP growth, while excessive reliance on social contributions can hinder income growth. Similarly, Stoilova (2017) and Stoilova (2024) underscore the positive influence of certain tax components (e.g., income and property taxes) on economic growth, while criticising the inefficiencies of excessive public spending and the distortive effects of social security contributions and excise duties. Finally, Ljungqvist and Smolyansky (2018), using U.S. data and a border-discontinuity approach, find that corporate tax increases consistently reduce employment and income, while tax cuts tend to stimulate labour markets only during recessions. This highlights the asymmetric and context-dependent nature of corporate tax policy effects. These studies collectively suggest that the composition of taxation, rather than its level alone, plays a critical role in shaping macroeconomic performance. They provide important theoretical and empirical foundations for evaluating Algeria's tax expenditure policies in relation to growth and employment dynamics.

In Algeria, studies on tax expenditure policy are notably limited, reflecting a significant gap in the literature. Most studies addressing this topic have focused on specific aspects, rather than offering a comprehensive approach. For instance, the study by Yahiaoui and Djelil (2024) focused on the conceptual framework of tax expenditure policy, offering fundamental insights into its role in Algeria's financial system. Meanwhile, the study by Chekrin & Belhadi (2020) examined the subject from a different perspective, highlighting the challenges associated with implementing this policy. On the other hand, Benbia et al. (2021) analysed the impact of tax expenditure policy on revenue collection, emphasising its potential in achieving fiscal sustainability. Additionally, Benmansour's (2023) study explored the relationship between tax expenditure policy and economic growth, offering valuable findings but focusing solely on economic growth rather than its effects on specific economic variables, such as employment or investment.

Furthermore, most studies in Algeria have primarily focused on general tax policy or overall expenditure policy, either on their role in encouraging investment or on their influence on the labour market. However, these studies have largely overlooked the distinct analysis of tax expenditures and their comprehensive impact on key economic variables.

Thus, this study seeks to address this gap by focusing exclusively on tax expenditures and analysing their dual impact on investment and employment. This approach aims to provide a deeper understanding of their role in the Algerian economy and contribute to enriching the literature in this field.

Methodology

The Autoregressive Distributed Lag (ARDL) model was chosen as the primary econometric tool to examine the impact of tax expenditures on investment and employment in Algeria during the period 1995–2023. This model is renowned for its capacity to analyse dynamic relationships between dependent and independent variables, capturing both short-term and long-term effects (Pesaran et al., 2001). The distinction between short-term and long-term effects in the ARDL framework is essential for understanding the dynamic nature of economic relationships. Short-term coefficients capture immediate responses and adjustment processes, whereas long-run coefficients reflect the equilibrium relationship that holds after temporary shocks dissipate (Nkoro & Uko, 2016). It also allows for different lag lengths for each variable, accommodating the inherent complexity of economic data.

Moreover, the ARDL model enables the exploration of dynamic interdependencies by integrating historical values of independent variables, thus providing a clearer understanding of the current state of the dependent variable (Pesaran & Shin, 1999). Its ability to examine intricate interactions and lagged effects makes it particularly suitable for economic studies.

A notable advantage of the ARDL model is its ability to handle variables with mixed integration orders, whether stationary at the level ($I(0)$) or first-differenced ($I(1)$). This feature makes it highly relevant for analysing both stationary and non-stationary time series (Narayan, 2004; Wooldridge, 2010). This attribute is particularly crucial for investigating the impact of tax expenditures, an essential economic variable, on investment and employment, while accounting for other macroeconomic indicators such as GDP, corporate tax rates, and deposit interest rates.

Another critical justification for utilising the ARDL model is its flexibility in dealing with small sample sizes. Studies such as Narayan and Smyth (2005) have demonstrated that ARDL delivers robust and reliable results even with relatively short time series. This is particularly advantageous in contexts with limited data availability, such as the period 1995–2023 in Algeria. Additionally, Kumar and Singh (2019) emphasise the ARDL model's effectiveness in estimating long-term relationships in small samples, further enhancing its applicability to various economic contexts.

This study developed two models to analyse the impact of tax expenditures. The first model examines the relationship between tax expenditures and investment, while the second model focuses on their impact on employment. In both models, the dependent variables are Total Investment (TIN) and Total Labour Force (TLF), respectively. Tax Expenditures (TE) were adopted as the main independent variable in both models, as they directly influence investment and employment decisions by providing incentives to businesses and individuals. Gross Domestic Product (GDP) was included as an independent variable in both models because it reflects overall economic activity, which,

in turn, affects investment and employment levels. The Corporate Tax Rate (CTR) was considered in both models because it affects business profitability, investment decisions, and companies' ability to create jobs. Additionally, the Deposit Interest Rate (DIR) was included as it influences the cost of capital and savings behaviour, with lower interest rates making borrowing cheaper, thus encouraging investment and job creation. The inclusion of these variables enhances the economic analysis by capturing multiple aspects of the national economy and providing a deeper understanding of the interactions between tax expenditures and economic activity. Moreover, selecting these variables ensures the model aligns with recognised economic standards, reducing modelling risks and providing accurate, reliable results. The necessary data for the analysis were sourced from the General Directorate of Taxes under the Ministry of Finance in Algeria and the World Bank database, ensuring the analysis's accuracy and comprehensiveness. The variables are defined in Table 1, along with their descriptive statistics.

Table 1. Variables and descriptive statistics

Variable	TIN	TLF	TE	GDP	CTR	DIR
Summary statistics						
Mean	34.99628172	10555469.28	390582.941	1.4251E+11	23.13793103	4.254482759
SD	7.58489097	1581243.707	498085.9943	70304095041	5.520896265	4.213974669
Min	22.44697411	7681165	524	41764291672	15	1.8
Max	48.12548797	13425064	1470625.71	2.39899E+11	30	16.58333333
Unit	Billion Algerian dinars	Number of individuals	Billion Algerian dinars	Current value of the dollar	Percentage (%)	Percentage (%) annually
Source	MF	WB	GDT	WB	GDT	MF

Note. MF: Ministry of Finance, WB: World Bank, GDT: General Directorate of Taxes

The functional forms of the models in our study are as follows:

For the first model, which examines the relationship between tax expenditures and investment:

$$TIN = f(TE, GDP, CTR, DIR) \quad \text{Model 1}$$

For the second model, which analyses the impact of tax expenditures on employment:

$$TLF = f(TE, GDP, CTR, DIR) \quad \text{Model 2}$$

Based on the previous methodology, the ARDL versions of our models are specified as follows:

- Modell1:

$$TIN = B_0 + B_1 TIN_{t-1} + B_2 TE_{t-1} + B_3 GDP_{t-1} + B_4 CTR_{t-1} + B_5 DIR_{t-1} + \sum_{i=1}^p y_1 \Delta TIN_{t-p} + \sum_{i=1}^p y_2 \Delta TE_{t-p} + \sum_{i=1}^p y_3 \Delta GDP_{t-p} + \sum_{i=1}^p y_4 \Delta CTR_{t-p} + \sum_{i=1}^p y_5 \Delta DIR_{t-p} + \varepsilon_i$$

- Model 2:

$$TLF = B_0 + B_1 TLF_{t-1} + B_2 TE_{t-1} + B_3 GDP_{t-1} + B_4 CTR_{t-1} + B_5 DIR_{t-1} + \sum_{i=1}^p y_1 \Delta TLF_{t-p} + \sum_{i=1}^p y_2 \Delta TE_{t-p} + \sum_{i=1}^p y_3 \Delta GDP_{t-p} + \sum_{i=1}^p y_4 \Delta CTR_{t-p} + \sum_{i=1}^p y_5 \Delta DIR_{t-p} + \varepsilon_i$$

Here, Δ represents the first-difference operator, and B_1, B_2, B_3, B_4, B_5 are long-run coefficients.

y_1, y_2, y_3, y_4, y_5 are short-run coefficients, and ε_i is the error term.

Results and discussion

Table 2 presents the results of the unit root tests conducted to examine the stability of the time series and determine the degree of their integration. To achieve this, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were employed. These tests evaluate the null hypothesis of a unit root (non-stationarity) against the alternative hypothesis of stationarity. The results indicate that all variables are integrated of order I(1), except for DIR. This satisfies the conditions for using the ARDL model, which allows for variables to be stationary at the level, at the first difference, or a combination of both, but not at the second difference. Therefore, the ARDL model is suitable for this analysis.

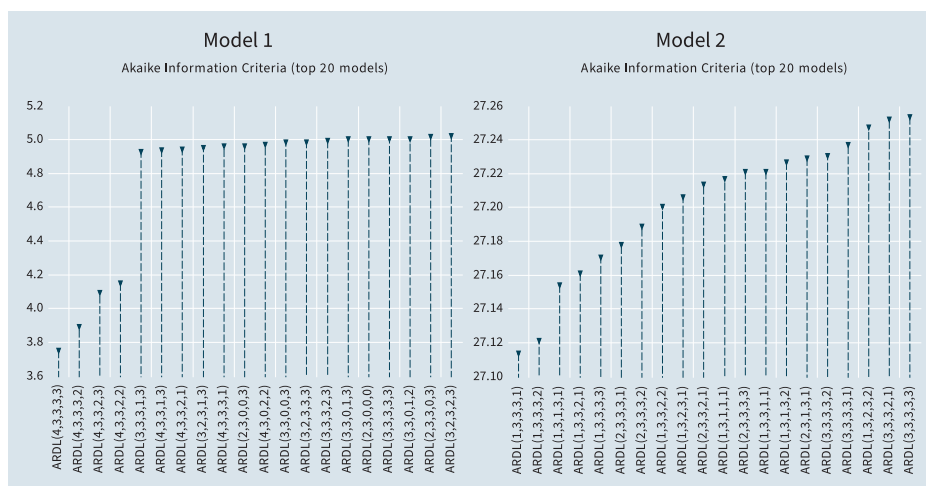
Table 2. Summary of (ADF) and (PP) Test Results

Variable	ADF			PP			Order of Integration
	T-Statistic	P-Value	Critical Value 5%	T-Statistic	P-Value	Critical Value 5%	
TIN	-4.755246	0.0008**	-2.976263	-4.857472	0.0006**	-2.976263	I(1)
TLF	-5.672906	0.0000**	-2.976263	-6.327866	0.0000**	-2.976263	I(1)
TE	-6.618823	0.0000**	-2.976263	-7.611547	0.0000**	-2.976263	I(1)
GDP	-4.641570	0.0010**	-2.976263	-4.619103	0.0011**	-2.976263	I(1)
CTR	-5.024677	0.0004**	-5.024623	-4.641570	0.0004**	-2.976263	I(1)
DIR	-3.515322	0.0513*	-2.971853	-3.579885	0.0000*	-2.971853	I(0)

Note: * at level, ** at first difference

After the unit root test, the next step was selecting the appropriate lag length using the Akaike Information Criterion (AIC). Among 20 models, the results in Figure 1 show that the optimal lag structure for the first model was (4, 3, 3, 3, 3), while for the second model, it was (1, 3, 3, 3, 1).

Figure 1. Optimal Lag Selection for Models 1 and 2



To test for the existence of a long-run relationship in both models in this study, the bounds test was applied. The results, presented in Table 3, indicate that the F-statistic values for both models exceed the critical values at the 1%, 5%, and 10% significance levels, as calculated by Pesaran et al. (2001). For the first model, which examines the relationship between tax expenditures and investment (TIN as the dependent variable, and TE, GDP, CTR, and DIR

as independent variables), the F-statistic value is 5.914255, confirming the presence of a long-run relationship. Similarly, in the second model, which analyses the impact of tax expenditures on employment (TLF as the dependent variable, and the same independent variables as the first model), the F-statistic value is (5.938514), also indicating a long-run relationship.

These findings allow for the estimation of error-correction models to explore the short- and long-term effects of tax expenditures and the adopted explanatory variables on investment and employment.

Table 3. ARDL Bound Test Results for Models 1 and 2

F-Bounds Test (Model 1)						
F-statistic 5.914255						
	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	2.525	3.560	3.058	4.223	4.280	5.840
Asymptotic	2.200	3.090	2.560	3.490	3.290	4.370

F-Bounds Test (Model 2)						
F-statistic 5.938514						
	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	2.525	3.560	3.058	4.223	4.280	5.840
Asymptotic	2.200	3.090	2.560	3.490	3.290	4.370

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

The next step involves estimating an error-correction model (ECM) to analyse the short- and long-run relationships among the variables. The results for both models are presented in Tables 4 and 5.

Based on the results in Table 4, the two studied models show a clear impact of the error correction term (CointEq(-1)) and of the overall statistical quality of the models.

In Model 1, which examines the relationship between total investment (TIN) and the independent variables (TE, GDP, CTR, and DIR), the error correction term shows a value of (-4.5837) with a t-statistic of (-8.935460) and a p-value of (0.0000), indicating strong statistical significance. This demonstrates that the model quickly adjusts to long-run equilibrium when deviations occur. Moreover, the model exhibits high quality, with an R-squared value of 0.9626, indicating that it explains approximately 96.26% of the variation in total investment. After adjusting for the number of independent variables, the Adjusted R-squared remains high at 0.9001, reflecting the model's robustness and strong statistical fitness.

In Model 2, which analyses the relationship between total labour force (TLF) and the same independent variables, the error correction term has a value of -1.3007, with a t-statistic of (-0.065045) and a p-value of (0.0000). Although the coefficient is smaller than in Model 1, it remains highly statistically significant, indicating a reasonably rapid adjustment to long-run equilibrium when deviations occur. Additionally, the R-squared value in this model is 0.8382, meaning that about 83.82% of the variation in the labour force is explained by the model. After adjustment, the Adjusted R-squared value is 0.7304, indicating a satisfactory fit of the model in explaining labour force variation.

In the short-run relationships of the variables in Model 1 (TIN), which examines the impact of tax expenditures on total investment, the results demonstrate that Tax Expenditures (TE) have a statistically significant negative effect on Total Investment (TIN), as indicated by the coefficient of -3.38E-06 and a p-value of 0.0234. This suggests that, in the short run, an increase in tax expenditures reduces investment. Gross Domestic Product (GDP) has a significant positive impact on Total Investment, with a coefficient of 5.66E-11 and a p-value of 0.0018, emphasising the role of economic growth in promoting investment. Similarly, the Corporate Tax Rate (CTR) exhibits a positive, statistically significant relationship with Total Investment, with a coefficient of 1.180184 and a p-value of 0.0004, indicating that higher corporate tax revenues are associated with increased investment. The Deposit Interest Rate (DIR), however, is not explicitly reported in the table, suggesting that its short-run effect on Total Investment was either insignificant or omitted.

In Model 2 (TLF), which examines the impact of tax expenditures on employment, the results indicate that Tax Expenditures (TE) have a statistically significant negative effect on the Total Labour Force (TLF), as reflected by a coefficient of -1.433364 and a p-value of 0.0001. This indicates that higher tax expenditures reduce employment levels in the short term. Gross Domestic Product (GDP) exerts a significant positive influence on the Total Labour Force, with a coefficient of 9.56E-06 and a p-value of 0.0000, confirming the role of economic growth in enhancing employment. For the Corporate Tax Rate (CTR), the coefficient is 22479.54, with a p-value of 0.0714, suggesting a marginally significant and positive short-term relationship with employment. The Deposit Interest Rate (DIR) is reported to be statistically insignificant, suggesting no notable impact on employment in the short run.

These findings from Table 4 highlight the significant influence of Tax Expenditures and GDP on both investment and employment in the short term, while CTR shows varying degrees of impact, and DIR remains largely insignificant.

The long-run results presented in Table 5 analyse the impact of independent variables on Total Investment (TIN) and Total Labour Force (TLF) in Models 1 and 2, respectively.

- ▶ In Model 1 (TIN): The results reveal that tax expenditures (TE) have a positive and statistically significant impact on total investment, with a coefficient of 1.12 at the 1% significance level. This highlights the importance of

tax incentives in fostering long-term investment by improving the investment climate. Similarly, Gross Domestic Product (GDP) has a strong positive impact on investment, with a coefficient of 1.06, also significant at the 1% level, underscoring the role of economic growth in supporting investment activities. The corporate tax rate (CTR) also exhibits a positive and significant impact on investment, with a coefficient of 0.51 at the 1% level, indicating that efficient tax management can encourage investment. On the other hand, the deposit interest rate (DIR) shows a positive coefficient of 1.31, but it is not statistically significant ($p = 0.4969$), suggesting that its long-run influence on total investment is inconclusive.

- ▶ In Model 2 (TLF): The results demonstrate that tax expenditures (TE) have a positive and statistically significant effect on the total labour force, with a coefficient of 1.49 at the 1% significance level. This indicates the role of tax incentives in promoting labour market growth and creating long-term employment opportunities. Additionally, Gross Domestic Product (GDP) has a significant positive impact on employment, with a coefficient of 1.55, indicating a strong relationship between economic growth and employment. The corporate tax rate (CTR) shows a positive and statistically significant impact on employment, with a coefficient of 79001.05 at the 1% level, suggesting that tax revenues can be utilised to support employment policies. In contrast, the deposit interest rate (DIR) has a negative and statistically significant effect on the total labour force, with a coefficient of -106073.5 at the 1% significance level. This indicates that higher interest rates discourage investment activities that create job opportunities, ultimately negatively affecting employment.

Table 4. ECM and Short-Run Regression Results for Models 1 and 2

ECM Regression, short-run (Model 1 "TIN")				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TE)	-3.38E-06	1.24E-06	-2.724536	0.0234
D(GDP)	5.66E-11	1.30E-11	4.356061	0.0018
D(CTR)	1.180184	0.217327	5.430452	0.0004
D(DIR)	10.50846	1.116195.	9.414544	0.0000
CoIntEq(-1)*	-4.583683	0.512977	-8.935460	0.0000
R-squared	0.962554	Mean dependent var	0.471980	
Adjusted R-squared	0.900144	S.D. dependent var	3.596210	
S.E. of regression	1.136401	Akaike info criterion	3.351959	
Sum squared resid	11.62267	Schwarz criterion	4.132040	
Log likelihood	-25.89949	Hannan-Quinn criterion.	3.568320	
Durbin-Watson stat	2.615277			

ECM Regression, short-run (Model 2 "TLF")				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TE)	-1.433364	0.283914	-5.048590	0.0001
D(GDP)	9.56E-06	1.47E-06	6.491052	0.0000
D(CTR)	22479.54	11587.28	1.940019	0.0714
D(DIR)	-2111.096.	32455.96	1.531765	0.9490
CointEq(-1)*	-1.300748	0.177923	-0.065045	0.0000
R-squared	0.838220	Mean dependent var	199694.2	
Adjusted R-squared	0.730366	S.D. dependent var	256022.3	
S.E. of regression	132942.8	Akaike info criterion	26.72933	
Sum squared resid	2.65E+11	Schwarz criterion	27.26160	
Log likelihood	-336.4813	Hannan-Quinn criterion.	26.88261	
Durbin-Watson stat	2.699180			

Note: *p-values are incompatible with t-Bounds distribution

Table 5. Long-Run Regression Results for Models 1 and 2

Long-run relationships (Model 1 "TIN")				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TE	1.12E-05	4.87E-07	23.00298	0.0000
GDP	1.06E-10	7.17E-12	14.73004	0.0000
CTR	0.519514	0.091417	5.682896	0.0000
DIR	0.863053	0.188227	4.585165	0.0002
C	1.316868	2.650040	0.496924	0.6247
CE = TIN - (1.12*TE + 1.06*GDP + 0.51* CTR + 0.86*DIR + 1.31)				
Long-run relationships (Model 2 "TLF")				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TE	1.493776	0.129740	11.51363	0.0000
GDP	1.55E-05	2.13E-06	7.303648	0.0000
CTR	79001.05	23006.46	3.433864	0.0025
DIR	-106073.5	29812.50	-3.558022	0.0019
C	6575376	752801.9	8.734536	0.0000
CE = TLF - (1.49*TE+ 1.55*GDP +79001.05*CTR - 106073.5*DIR+ 6575376)				

Note: * Coefficients derived from the CEC regression

To evaluate the validity of the two models in estimating long-term elasticities, we conducted standard diagnostic tests, including the ARCH test for heteroskedasticity, the Serial Correlation LM test for residual autocorrelation, and the normality test for error distribution. The results are summarised in Table 6 and Figure 2. To assess the structural stability of parameters in both short- and long-term relationships, we used the CUSUM and CUSUM SQ tests, with results shown in Figure 3.

Based on the results in Table 6, the ARCH test for Model 1 indicates no evidence of heteroscedasticity, as the F-statistic is 0.080 with a probability of 0.7798, which exceeds the 5% significance level. This allows us to accept the null hypothesis of stable error variance. Similarly, for Model 2, the ARCH test confirms the absence of heteroscedasticity, with an F-statistic of 0.506 and a probability of 0.4837, also above the 5% threshold.

Regarding autocorrelation, the Breusch-Godfrey Serial Correlation LM test for Model 1 shows no significant sequential autocorrelation, as the F-statistic is 0.689 with a probability of 0.5918 (greater than 5%). For Model 2, the test also suggests no autocorrelation, with an F-statistic of 2.687 and a probability of 0.1280, which exceeds the 5% level.

As shown in Figure 2, the residuals of both models are normally distributed. The Jarque-Bera test for each model yields p-values greater than 5%, indicating that the null of normality cannot be rejected.

The results of the tests in Figure 3 demonstrate the model's stability and consistency in both the short and long run. This indicates the absence of any structural changes in the data over the study period, as the CUSUM and CUSUM of Squares tests remain within the critical bounds at the 5% significance level.

Table 6. ARCH and Serial Correlation LM Test Results for Models 1 and 2

Model 1			
Heteroskedasticity Test: ARCH			
F-statistic	0.080110	Prob. F(1,22)	0.7798
Obs*R-squared	0.087076	Prob. Chi-Square(1)	0.7679
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.689786	Prob. F(2;2)	0.5918
Obs*R-squared	10.20522	Prob. Chi-Square(2)	0.0061
Model 2			
Heteroskedasticity Test: ARCH			
F-statistic	0.506804	Prob. F(1,23)	0.4837
Obs*R-squared	0.538997	Prob. Chi-Square(1)	0.4628
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	2.687201	Prob. F(2,8)	0.1280
Obs*R-squared	10.44790	Prob. Chi-Square(2)	0.0064

Figure 2. Normal distribution test for random errors for Models 1 and 2

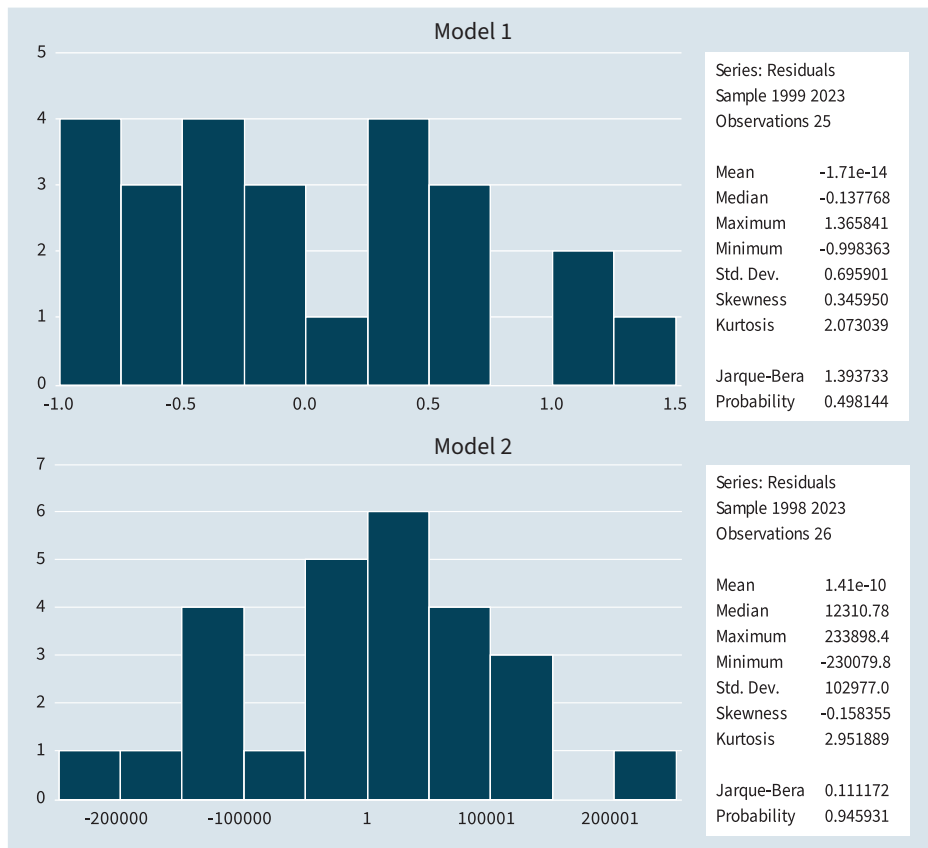
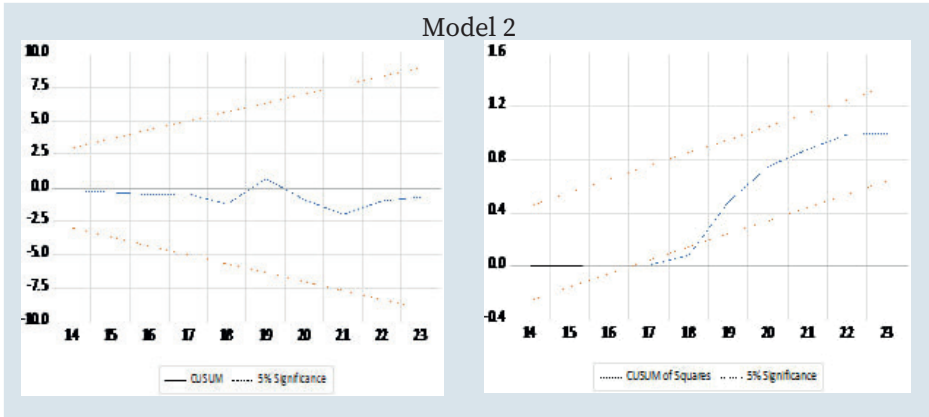


Figure 3. Results of the (CUSUM) and (CUSUM SQ) tests for Models 1 and 2





The empirical findings of this study confirm and expand upon the existing literature regarding the economic effects of tax expenditures. In the short term, the observed negative impact of tax expenditures on both investment and employment in Algeria partially aligns with previous concerns raised in the literature. For instance, Caiumi (2011) emphasised that tax subsidies are not always effective tools for promoting regional development, particularly in the presence of structural weaknesses. Similarly, Muet and Avouyi-Dovi (1987) highlighted the potential inefficiencies of prolonged and poorly targeted tax incentives, which resonates with the adverse short-run effects identified in this study.

In contrast, the long-run results reveal a positive and statistically significant relationship between tax expenditures and both investment and employment. This supports the findings of Harju and Kosonen (2012), who demonstrated that well-designed tax reductions can stimulate economic activity. It is also consistent with the study by Chen and Mintz (2011), which showed that fiscal incentives targeting research and development led to increased investment in Canada.

Additionally, the strong positive effect of gross domestic product (GDP) on investment and employment in both the short and long run aligns with the conclusions of Stoilova (2017, 2024), Kutasi and Marton (2024), and Arnold (2008), who emphasised the importance of fiscal structures in supporting economic growth.

An important and somewhat unexpected finding of this study is the positive and significant impact of the corporate tax rate (CTR) on investment and employment. While this may seem counterintuitive, it can be interpreted in the Algerian context where increased tax revenues, when effectively managed, may be reinvested to support public infrastructure and productive spending. This result contrasts with the conclusions of Ljungqvist and Smolyansky (2018), who found that corporate tax increases in the United States typically reduce employment and income. However, they also noted that tax cuts tend to be more effective during economic downturns, a dynamic that may reflect the Algerian economic context between 2014 and 2017.

Furthermore, the findings regarding the deposit interest rate (DIR), which either lack statistical significance or show a negative impact, support the argument that high interest rates discourage investment and reduce job creation. This observation is consistent with the theoretical insights of Caldeira et al (2022), who stressed the need to assess tax incentives within the broader context of monetary and fiscal conditions.

In sum, this study addresses a significant gap in the Algerian literature by examining the dual impact of tax expenditures on investment and employment through an empirical ARDL model. It confirms several established international findings while providing new evidence from a developing-country context. The results underscore that tax expenditures, if carefully targeted and monitored, can become effective instruments for promoting long-term economic development.

Conclusion and policy implications

This study is grounded in public finance theory, particularly the role of tax policy as a fiscal instrument to influence macroeconomic variables such as investment and employment. It builds on the theoretical framework that views tax expenditures as indirect government spending intended to incentivise specific economic behaviours.

Unlike most existing studies that focused on developed countries, this paper provides empirical evidence from Algeria, a developing economy with unique fiscal constraints. The study contributes to the literature by offering a dual assessment of the short- and long-term effects of tax expenditures using ARDL modelling, an underexplored approach in the Algerian context.

This study analyses the impact of tax expenditure policies on investment and employment in Algeria. Using ARDL modelling, the findings indicate that tax expenditures have complex effects on these two variables. In the short term, the results show that an increase in tax expenditures reduces both investment and employment, consistent with economic expectations, suggesting that lenient tax policies may be ineffective in stimulating the economy in the short run. However, in the long term, tax expenditures play a positive role in boosting both investment and employment, helping create a more stable environment that attracts investment.

Tax expenditures, which form a core part of Algeria's fiscal policy, are a strategic tool that can significantly impact investment decisions and employment. Algeria, facing various economic challenges, including dependence on oil revenues and regional disparities in development levels, views tax expenditures as a key element in government efforts to stimulate economic activity. Although tax expenditures may reduce government revenues in the short run, their long-term impact on investment and employment can contribute to sustainable economic growth.

Gross Domestic Product (GDP) had a significant positive impact on both investment and employment, highlighting the importance of overall economic growth in driving economic activity. This factor is crucial for Algeria, which is undergoing continuous economic transformation, as sustainable economic growth increases labour demand and encourages businesses to invest more. On the other hand, the Corporate Tax Rate (CTR) also has a positive and significant impact on investment and employment, reflecting the importance of competitive tax policies in encouraging companies to invest and create jobs.

The impact of tax expenditures on the Algerian economy extends beyond providing financial incentives for investors; it also includes stimulating the private sector and directing investments to underfunded sectors, such as local industry, technology, and services. Tax expenditures are an essential tool for economic reform, as they can be allocated to support small and medium-sized enterprises, thereby enhancing job creation in areas that most need it.

However, the study found that the Deposit Interest Rate (DIR) negatively affects employment in the long run. Higher interest rates reduce investment in job-creating projects, negatively affecting employment. This shows the need for Algeria to improve its interest rate policies to encourage investment in projects that generate new jobs. These findings are consistent with the economic challenges Algeria currently faces, including limited economic diversification and heavy reliance on oil revenues. Despite the government's efforts to improve the business environment and encourage investment, current tax and monetary policies require further reforms to create a more stable, conducive environment for sustainable growth.

While the results are specific to Algeria, they may be generalised to other oil-dependent developing countries facing similar structural and fiscal challenges, particularly in North Africa and the MENA region.

Based on these findings, the study recommends several policies to enhance the effectiveness of tax expenditures in Algeria, such as improving the structure of tax expenditures to target sectors that contribute to job creation, reducing deposit interest rates to encourage private investment, and developing tax policies that better align with the needs of both local and foreign businesses. Moreover, the Algerian government should aim to diversify its economy away from oil dependence by promoting investment in non-oil sectors such as industry, services, and technology.

Despite its contributions, this study has limitations. The analysis relies on aggregate national data, which may obscure regional disparities. Additionally, treating tax expenditures as a single aggregated variable does not allow for disaggregating effects by sector or tax type.

Future research could explore disaggregated tax expenditure data by sector or investigate the regional effects of tax incentives across Algeria. Moreover, comparative studies with other developing economies could enrich the understanding of fiscal effectiveness in varied policy contexts. ■

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