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Unraveling the Dynamic Nexus: A Time-Varying Analysis of Government Revenue and Expenditure in Algeria (1980-2022)

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Abstract. This study investigates the evolving causal relationship between government revenue and expenditure in Algeria from 1980 to 2022, a period marked by significant fiscal policy shifts. Unlike previous research assuming a static relationship, we employ a bootstrap rolling window approach and spectral Granger-causality test to capture time-varying causality. These methods illuminate the dynamic nature of fiscal interactions in Algeria's changing economic landscape. Our findings robustly support the tax-spend hypothesis over extended periods, revealing that government revenues significantly influence expenditure patterns. Notably, from 1995 to 2003, we observe a positive effect on spending, coinciding with fiscal contraction and rationalization efforts. Conversely, despite declining tax revenues from 2005 to 2008, an expansionary fiscal policy increased spending, indicative of financial illusion. Interestingly, we also find intermittent short-term evidence supporting both the spend-tax and fiscal synchronization hypotheses, highlighting the complex and multifaceted nature of Algeria's fiscal dynamics. The spectral Granger-causality tests further corroborate these findings, particularly in the medium term. This study contributes to the literature on fiscal policy dynamics in resource-dependent economies and offers valuable insights for policymakers navigating Algeria's complex fiscal landscape. Our results underscore the importance of adaptive fiscal strategies that account for the time-varying nature of revenue-expenditure relationships, particularly in the face of oil price volatility and economic diversification efforts.

Keywords: Algeria, bootstrap rolling window causality Test, Government expenditure, Government revenue, Spectral granger-causality test, Time-varying fiscal dynamics.
JEL Classifications: H20; H72; C32; E62; Q32.

1. INTRODUCTION

In an era of global economic uncertainty and fluctuating oil prices, understanding the dynamic relationship between government revenue and expenditure is crucial, especially for resource- dependent economies like Algeria. This nexus lies at the heart of fiscal policy and has significant implications for economic stability, growth, and sustainability. Recent econometric studies have demonstrated that excessive budget deficits, often resulting from misalignments between revenue and expenditure, can lead to declining economic performance, particularly in African countries (Catão & Terrones, 2005; Ajeigbe et al., 2024). These deficits frequently translate into escalating public debt, which fuels inflation and price instability.

Algeria, as a major hydrocarbon exporter, has long relied on oil and gas revenues to fund government expenditures. However, this dependence has exposed the country to the volatility of global energy markets, leading to significant fluctuations in government revenues and challenging the sustainability of public spending (Omotosho, 2022; Guo et al., 2023). The fall in oil prices over the last decade, particularly since 2014, has led to a serious increase in Algeria's budget deficits and public debt (Chibi et al., 2019; Chellig et al., 2024).

Understanding the direction and dynamics of the revenue-expenditure relationship is vital for preparing rational budgets, avoiding unnecessary deficits, and formulating appropriate fiscal policies (Baharumshah et al., 2016; Afonso & Coelho, 2024). While numerous studies have examined this nexus in various countries (e.g., Tashevska et al., 2020; Magazzino, 2013), research on Algeria and other resource-dependent economies remains limited. Moreover, most existing studies assume a static relationship, overlooking potential time-varying dynamics (Balcilar et al., 2010; Zuo & Luo, 2024).

Recent studies have highlighted the importance of investigating the asymmetric impact of government expenditure on economic growth (Abdelli et al., 2024), the role of renewable energy consumption and environmental quality in sustainable economic growth (Taher, 2024; Yacour et al., 2024), and the diverse impacts of economic policies across countries (Bouyacoub, 2024).

These studies underscore the need for a more comprehensive and nuanced understanding of the revenue-expenditure nexus, particularly in the context of resource-dependent economies.

This study aims to investigate the time-varying causal relationship between government revenue and expenditure in Algeria from 1980 to 2022. We employ a bootstrap rolling window approach and spectral Granger-causality test to capture the evolving nature of this fiscal relationship across different time periods and frequencies. Our approach sheds light on the changing dynamics of fiscal interactions in Algeria's evolving economic landscape.

Our study contributes to literature in several ways. First, it provides a comprehensive analysis of fiscal dynamics in Algeria over a 42-year period, encompassing various economic phases and policy regimes. Second, by

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employing time-varying methodologies, we offer insights into how the revenue-expenditure relationship has evolved in response to changing conditions. Third, we integrate insights from recent studies on asymmetric impacts, environmental sustainability, and economic policy diversity to provide a more holistic understanding of the fiscal dynamics in resource-dependent economies. Finally, our findings have important implications for fiscal policy formulation in Algeria and potentially other resource-dependent economies.

The remainder of this paper is organized as follows: Section 2 reviews the related literature, incorporating recent developments and insights from the new sources. Section 3 describes the data and empirical model. Section 4 presents the results and discussion. Section 5 offers concluding remarks and policy implications.

2. THEORETICAL AND EMPIRICAL BACKGROUND

2.1. Theoretical Framework

The intertemporal relationship between government spending and revenues has been extensively studied in public finance literature. Payne (2003) characterizes the fiscal budget process between these two aggregates under four testable hypotheses:

Tax-spend hypothesis (H1): Friedman (1978) proposed that tax revenues positively influence government expenditures. An alternative version by Buchanan and Wagner (1978) suggests that, due to fiscal illusion, increased tax revenues may reduce government expenditures.

Spend-tax hypothesis (H2): This hypothesis suggests a positive unidirectional causality from government spending to revenue. Barro (1979) argued that spending is primarily financed by future taxes. Peacock and Wiseman (1979) proposed that temporary increases in expenditure often lead to higher enduring tax revenue.

Fiscal synchronization hypothesis (H3): This hypothesis stipulates a bidirectional relationship between tax revenue and public spending. Musgrave (1966) and Meltzer and Richard (1981) argue that financing spending programs requires simultaneous determination of expected government spending and revenue levels.

Fiscal neutrality hypothesis (H4): Wildavsky and Caiden (1988), Hoover and Sheffrin (1992), and Baghestani and McNown (1994) argue that no causal relationship exists between revenue and expenditure, suggesting an institutional separation between resource allocation and taxation procedures.

2.2. Empirical Approaches and Recent Developments

Recent studies have expanded the scope of analysis, particularly in resource-dependent economies, employing various methodologies such as time-varying analysis, asymmetric causality tests, and autoregressive distributed lag (ARDL) models.

Afonso and Coelho (2024) investigate the key drivers of fiscal sustainability in Portugal, utilizing time-varying analytical approaches. Their findings suggest that Portugal operated under a Ricardian fiscal regime, where the government actively adjusted the primary balance in response to the debt-to-GDP ratio. Factors such as improved external accounts, strengthened European fiscal rules, and extended debt maturities positively influenced fiscal sustainability.

Zuo and Luo (2024) explore the interplay between resource dependency, green growth, and financial resource availability, focusing on the Central Asian and Pacific (EAP) regions. The study supports the resource curse hypothesis in the context of green growth and highlights the role of foreign direct investment (FDI) in mitigating the adverse impacts of resource dependency.

Abdelli et al. (2024) examine the asymmetric impact of government expenditure on economic growth in Tunisia using the Non-linear Autoregressive Distributed Lag (NARDL) model. The findings reveal complex, sector-specific relationships, with government spending on agriculture and health sectors contributing positively to GDP growth, while expenditures in education and the military show a negative impact.

Taher (2024) investigates the relationship between government expenditure, renewable energy consumption, and CO2 emissions in relation to sustainable economic growth in Lebanon using the ARDL approach. The study suggests that renewable energy plays a critical role in Lebanon's sustainable economic growth, while the negative impact of government expenditure on growth calls for a policy shift towards long-term investments in research and development (R&D).

Yacour et al. (2024) explore the nexus between environmental quality, healthcare expenditure, and economic growth in North Africa using panel cointegration analysis. The study identifies

a U-shaped relationship between CO2 emissions and healthcare expenditure, emphasizing the importance of environmental conservation to prevent long-term increases in healthcare costs.

Bouyacoub (2024) conducts an in-depth analysis of the impact of economic policies on the Middle East and North Africa (MENA) region using the ARDL model. The study reveals diverse impacts of economic policies across countries and highlights the critical role of government intervention in promoting growth, maintaining stability, and improving living standards.

Chellig et al. (2024) examine the relationship between government spending and industrial sector performance in Algeria using the ARDL approach. The findings suggest that strategic government spending is essential for long-term industrial growth, while the reliance on oil revenues stresses the need for economic diversification.

Gbadebo et al. (2024) investigate the causal dynamics between defense spending and economic growth in Nigeria using both symmetric and asymmetric causality tests. The results indicate that increased military expenditure stimulates economic growth, particularly in a developing economy like Nigeria.

Ajeigbe et al. (2024) assess the impact of sustainable tax revenue and expenditure on the achievement of Sustainable Development Goals (SDGs) in selected African and developed countries using the Generalized Method of Moments (GMM). The study suggests that efficient tax collection and sustainable government spending can enhance financial stability, support job creation, alleviate poverty, and contribute to the achievement of the SDGs.

Guo et al. (2023) explore the relationship between oil price volatility, financial expenditures in the oil industry, and energy generation intensity in China. The study emphasizes the importance of diversifying revenue sources and transitioning towards sustainable energy sources to mitigate the negative effects of oil price volatility on energy generation.

Omotosho (2022) investigates the interactions between monetary and fiscal policies in resource-rich emerging economies using a Dynamic Stochastic General Equilibrium (DSGE) model. The study identifies an "active monetary and passive fiscal policy" framework and underscores the importance of diversifying revenue sources to avoid over-reliance on volatile resource rents.

2.3. Research Gap

Despite the extensive literature, gaps remain in understanding the revenue-expenditure nexus, particularly in resource-dependent economies like Algeria. The recent studies highlight the need for:

- Comprehensive long-term studies that account for various economic phases and policy regimes.
- Application of time-varying methodologies and asymmetric causality tests to capture the evolving fiscal dynamics.
- Integration of fiscal policy analysis with broader economic considerations, such as environmental sustainability, industrial performance, and sustainable development goals.

Our study aims to address these gaps by providing a time-varying analysis of the revenue- expenditure nexus in Algeria over a 42-year period, contributing to a more nuanced understanding of fiscal policy dynamics in resource-dependent economies.

3. METHODOLOGY

3.1. Empirical Framework

Our empirical investigation employs a multi-method approach to examine the dynamic relationship between government revenue and expenditure in Algeria. This section details our methodological framework, which consists of four main components: (1) Bootstrap Full- Sample Causality Test, (2) Parameter Stability Test, (3) Bootstrap Subsample Rolling- Window Causality Test, and (4) Breitung-Candelon Spectral Granger-Causality Test.

We begin with the Bootstrap Full-Sample Causality Test, which addresses the limitations of traditional Granger causality tests by employing a residual-based bootstrap technique (Shukur & Mantalos, 2004). This method improves the causality test, particularly in small samples.

Our bivariate VAR framework is specified as:

$= {}_0 + {}_{1-1} + \ldots + {}_- + \qquad (1)$

$= 1,2, \ldots\ldots,$

Where p is the lag order of the variable and it is selected by Schwarz Information Criteria (SIC), $= ({}_1, {}_2)$ is an independent white-noise process with zero mean and covariance matrix $\sum$ (Liu & Su, 2019):

$$\begin{bmatrix} {}_1 \\ {}_2 \end{bmatrix} = \begin{bmatrix} {}_{10} \\ {}_{20} \end{bmatrix} + \begin{bmatrix} {}_{11}() & {}_{12}() \\ {}_{21}() & {}_{22}() \end{bmatrix} \begin{bmatrix} {}_1 \\ {}_2 \end{bmatrix} + \begin{bmatrix} {}_1 \\ {}_2 \end{bmatrix} \qquad (2)$$

is splited in two vectors: $E\ ({}_1)$ and $PE\ ({}_2)$. Thus, the above equation can be rewritten as follows:

$$\begin{bmatrix} E \\ PE \end{bmatrix} = \begin{bmatrix} {}_{10} \\ {}_{20} \end{bmatrix} + \begin{bmatrix} {}_{11}() & {}_{12}() \\ {}_{21}() & {}_{22}() \end{bmatrix} \begin{bmatrix} E \\ PE \end{bmatrix} + \begin{bmatrix} {}_1 \\ {}_2 \end{bmatrix} \qquad (3)$$

Where, ${}_{i}() = \sum {}_{i,}\ ,\ = 1,2$ and L is the lag operator defined as: $= -$.

From Equation (3), the null hypothesis that government revenue do not Granger cause government expenditure can be tested by ${}_{12,} = 0$ for $= 1,2, \ldots,$. In parallel, the null hypothesis that government expenditure do not Granger cause government revenue can be tested by ${}_{21,} = 0$ for $= 1,2, \ldots,$

Next, we employ the Parameter Stability Test to account for potential structural changes that can lead to parameter instability and unreliable results in full-sample tests. We use multiple stability tests, including the Sup-F test, Mean-F test, Exp-F test (Andrews & Ploberger, 1994), and Lc test (Nyblom, 1989; Hansen, 1992). These tests examine the temporal stability of parameters in the VAR models and evaluate the stability of all parameters

in the comprehensive VAR system.

To further address parameter instability and structural changes, we implement the Bootstrap Subsample Rolling-Window Causality Test (Balcilar et al., 2010). This approach splits the sample into subsamples based on a fixed-size rolling window, applies bootstrap estimation to each subsample, calculates time-varying causality measures, and estimates impact coefficients.

Finally, we complement our analysis with the Breitung-Candelon Spectral Granger-Causality Test, which provides frequency-domain analysis of causal relationships and allows examination of causality at different time horizons: long-run (frequencies from 0 to 1), medium-term (frequencies from 1 to 2), and short-run (frequencies from 2 to 3.14).

3.2. Data Description and Pre-Processing

Our analysis uses annual data for Algeria covering the period 1970-2022, including government revenues (REV) and government expenditures (SPE). Data sources include the National Office of Statistics, Ministry of Finance, International Monetary Fund (IFS), and World Bank.

Pre-processing steps involve converting nominal variables to real values using the GDP deflator, transforming variables into natural logarithms, and conducting statistical tests for stationarity and cointegration. This multi-faceted methodological framework allows us to comprehensively examine the dynamic and potentially time-varying relationship between government revenue and expenditure in Algeria, accounting for structural changes and different time horizons.

4. DISCUSSION AND INTERPRETATION OF RESULTS

4.1. Initial Data Analysis

4.1.1. Descriptive Statistics and Correlation Analysis

Our initial analysis of the data is summarized in Table 1:

Table 1: Descriptive statistics and correlation matrix.

	Panel A : Descriptive statistics (53 Observations)						
Variable	**Mean**	**Max.**	**Min.**	**Std. Dev.**	**Skew.**	**Kurt.**	**J-B stats**
LE_t	27.51	29.55	24.84	1.57	−0.35	1.71	3.875 (0.144)
PE_t	27.65	29.79	24.54	1.74	−0.31	1.66	3.876 (0.143)
	Panel B : Correlation matrix						
	E_t		PE_t				
E_t	1		–––				
PE_t	0.994* (0.000)		1				

Note: *, *, and *** represent significance at 1%, 5%, and 10% levels, respectively.

The descriptive statistics reveal several important characteristics:

- Both series are normally distributed (Jarque-Bera $p > 0.05$)
- Strong positive correlation ($r = 0.994$, $p < 0.01$) between revenues and expenditures
- Platykurtic distribution (kurtosis < 3) indicating fewer outliers
- Left-skewed data suggesting majority of observations on the right

4.1.2. Integration Properties

The results of our unit root tests are presented in Tables 2 and 3:

Table 2: ADF and PP test results.

Series	**ADF**			**PP**			**I (...)**
	I	II	III	I	II	III	
E_t	4.79	−1.42	−0.97	4.36	−1.35	−1.18	I (1)
E_t	−3.78*	−4.99*	−4.20**	−3.79*	−4.94*	−4.86*	
PE_t	2.87	−2.42	0.12	4.75	−2.05	−0.3	I (1)
PE_t	−1.61***	−4.31*	−4.06**	−2.50**	−4.24*	−4.72*	

Note: *, *, *** indicate significance at 1%, 5%, and 10% levels. I: None, II: Intercept only, III: Include both intercept and trend.

Table 3: MZα Unit root test results – Ng and Perron.

	Level		**First Differences**		
Series	**M**	**M**	**M**	**M**	**I(..)**
E_t	0.8	−7.86	−17.66*	−19.13**	I(1)
PE_t	−0.32	−4.95	−17.33*	−19.07**	I(1)

Note: ** indicate significance at 1% and 5% levels.

[A] A constant is added in the test equation; one-sided test of the null hypothesis that a unit root exists; 1%, 5% and 10% significance critical value equals −13.800, −8.100, −5.700, respectively.

[B] A constant and a linear trend are added in the test equation; one-sided test of the null hypothesis that a unit root exists; 1, 5 and 10% critical values equal −23.800, −17.300,

−14.200, respectively.

Using ADF and PP tests, the results show that all variables are non-stationary at level and stationary at the first difference I (1). The NG-Perron Unit Root Test (MZα) supports these findings, indicating that the variables are stationary at the first difference but non-stationary at the level.

After determining the order of integration, we build a bivariate vector autoregressive model with REV and SPE as endogenous variables to estimate the full sample causal relation. The optimal lag order chosen for the bivariate causality test is two.

4.2. Causality Analysis

4.2.1. Full Sample Causality Results

The first step to find the direction of causality between government revenues (REV) and government expenditures (SPE) is to perform a bootstrap full-sample Granger causality test under the assumption that all parameters are stable over the full sample period, and it exists just one type of causality (either positive or negative causality). The critical values were obtained from 10000 replications.

To test the null hypothesis that the government revenues does not Granger cause and government expenditure or government expenditure does not Granger cause government revenues, we estimate the full sample bootstrap LR statistics, and their corresponding p- values based on the bivariate VAR of government revenues and government expenditure with lag-length equal to 2, decided based on the Schwarz information criteria (SIC). We can reject the null hypothesis if p-value falls below 0.05.

Table 4: Full sample Granger causality tests between LREV and LSPE: Bootstrap LR test.

	H₀ : LREV does not Granger cause LSPE		**H₀ : LSPE does not Granger cause LREV**	
Test	**LR-Statistics**	**Bootstrap P-value**	**LR-Statistics**	**Bootstrap P-value**
Bootstrap LR test for Algeria	5.62**	0.057	5.61	0.13

Note: *, ** and *** indicate "significant" at the 1% level, the 5% level and the 10% level, respectively.

We calculate the p-value using 10000 bootstrap repetitions.

According to the bootstrap p-values (p = 0.057), we can reject the null hypothesis. The results indicate that government revenues Granger cause government expenditure at the 1% level, while government expenditure does not Granger cause government revenues. This supports the tax-spend hypothesis (H1), corroborating Friedman's (1978) theory that revenues drive expenditure. An alternative explanation by Wagner (1976) and Buchanan and Wagner (1978) argues that raising revenues reduces expenditures via fiscal illusion.

4.2.2. Parameter Stability Results

To verify the reliability of the full sample Granger bootstrap causality findings, it is necessary to evaluate the stability of parameters in the short and long terms based on the VAR model (Gaies et al., 2022).

If the assumption of constant and stable VAR parameters is not valid, the full sample bootstrap Granger causality test results become unreliable. Parameter stability testing is needed to ensure the reliability and applicability of the full sample test results. We employ several statistics tests, with results presented in Table 5.

Table 5: Parameter stability tests in VAR model.

Tests	**LREV Equation**		**LSPE Equation**		**VAR Process**	
	Statistics	**p-Value**	**Statistics**	**p-value**	**Statistics**	**p-Value**
Sup-F	479.97 *	0.000	209.23 *	0.000	34.76 **	0.020
Ave-F	36.78 *	0.000	57.75 *	0.000	25.98 *	0.000
Exp-F	236.43 *	0.000	101.08 *	0.000	15.48 *	0.000
Lc					4.59 *	0.000

Note: The p values are calculated using 10,000 bootstrap repetitions. P-values are calculated using Hansen's (1997) method. *, ** and *** denote significance at 1, 5 and 10%, respectively.

The Sup-F, Mean-F, and Exp-F tests (Andrews & Ploberger, 1994) examine the same null hypothesis but differ in their alternative hypotheses. The Sup-F test assesses whether a sudden shift in regime occurs, while the Mean-F and Exp-F tests evaluate the gradual stability of the model over time, if parameters follow a Martingale process (Nyakabawo et al., 2015).

The results indicate that all tests reject the null hypothesis of parameter constancy at the 1- percent level for both the government revenue and spending equations, providing strong evidence of parameter non-constancy. This implies that the parameters estimated using the complete dataset exhibit instability in the short term. Moreover, the Lc test reveals that the VAR system's parameters exhibit time variation at the 1% significance

level.

The traditional causality tests prove to be unstable in full sample studies. To address this instability, we opt for the rolling-window causality test, which also enables us to quantify the impact of government expenditures on revenues in Algeria, and vice versa.

4.3. Time-Varying Analysis Results

4.3.1. Rolling Window Causality Tests

Due to the instability of parameters, we examine the dynamic causal relationship between Algerian government revenues (REV) and government spending (SPE) from 1980 to 2022 using a rolling window approach (Liu and Ma, 2023). The results are shown in Figures 1, 2, 3, and 4.

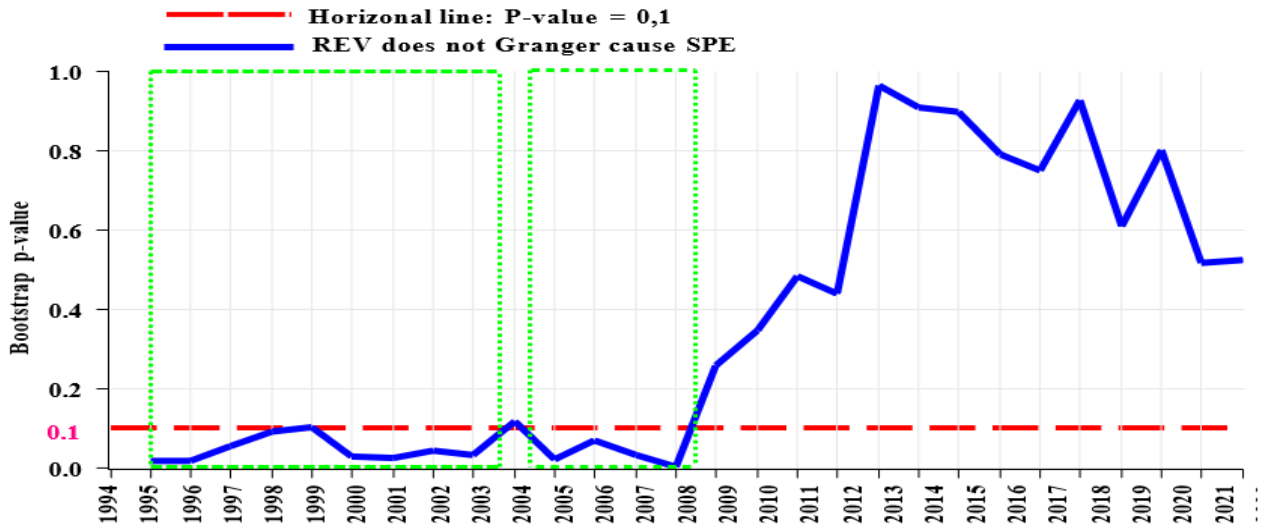

Figure 1: Bootstrap p values of rolling test statistic testing the null hypothesis that REV does not Granger cause SPE.

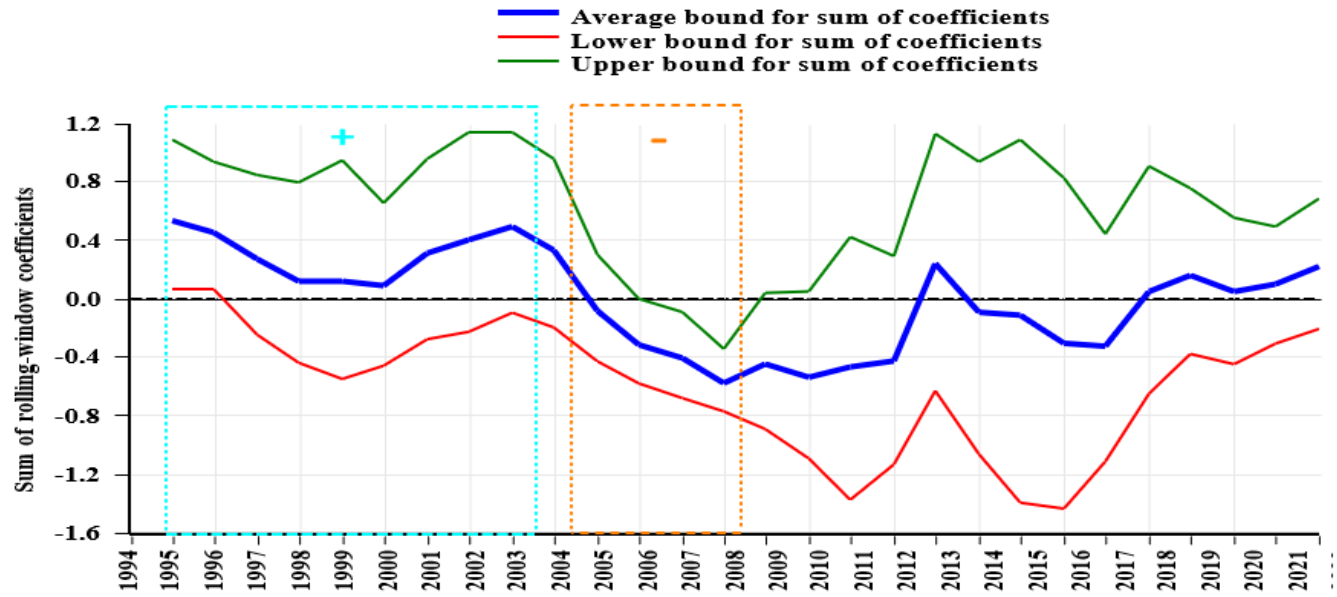

Figure 2: The estimation of the coefficient sum of the bootstrap rolling window is based on the influence of REV on SPE.

- Key findings from Figures 1 and 2:
- Rejection of null hypothesis during 1995-2003 and 2005-2008
- Positive effects in 1995-2003 period aligning with Friedman's theory
- Negative effects in 2005-2008 suggesting fiscal

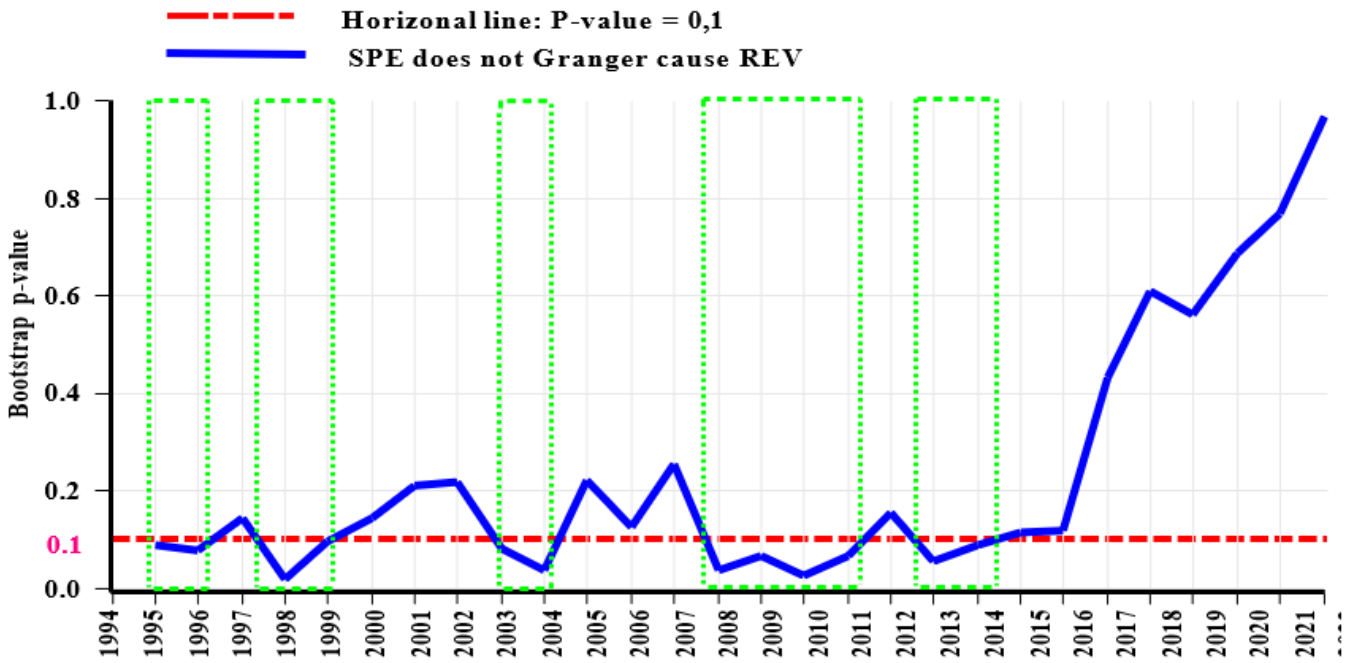

Figure 3: Bootstrap p values of rolling test statistic testing the null hypothesis that SPE does not Granger cause REV.

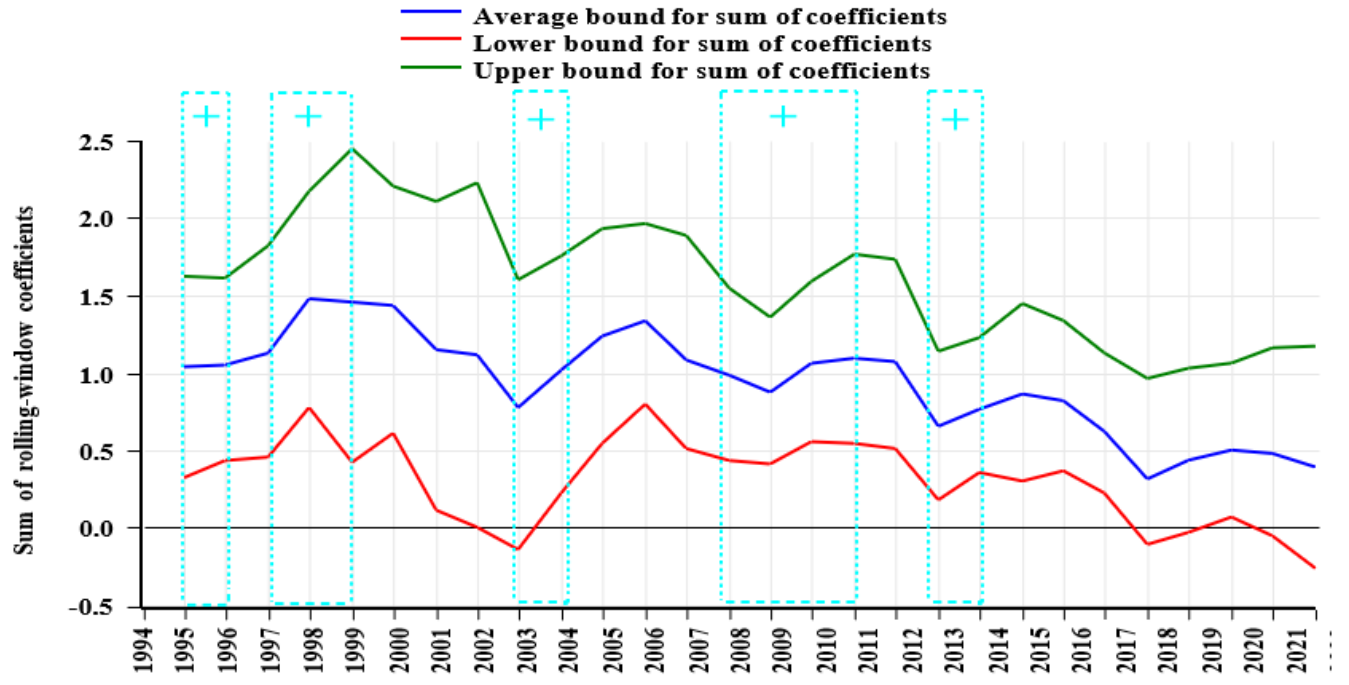

Figure 4: The estimation of the coefficient sum of the bootstrap rolling window is based on the influence of SPE on REV.

- **Temporal Causality Patterns**

The analysis reveals that government spending affects revenue during five distinct periods: 1995--1996; 1997--1999; 2003-2004; 2008-2011; 2013--2014.

Key characteristics:

- Positive causality at 10% significance level
- Short duration (not exceeding three years per period)
- Intermittent rather than continuous effect

- **Evidence of Bidirectional Relationship**

Two periods show special significance: 1995-1996; 1997-1999 During these periods:

- Both spending affects revenue AND revenue affects spending
- Confirms fiscal synchronization hypothesis
- Shows interdependence of fiscal decisions

- Policy Context and Outcomes

Major fiscal programs implemented:

- Economic Recovery Support Plan (2001-2004)
- Supplementary Program to Support Growth (2005-2009)
- Growth Consolidation Program (2010-2014)

- **Results:**
  - Initially successful in stimulating revenue through spending
  - Led to budget deficits after 2008
  - Required subsequent spending rationalization

These findings support Barro's (1979) theory that spending decisions influence revenue generation, while also highlighting the need for careful fiscal management to maintain sustainability.

4.3.2. Spectral Analysis Results

To strengthen the results of this study, we used the Granger spectral causality test in the frequency domain proposed by Breitung and Candelon (2006). This approach provides short, medium and long-term estimates regardless of whether the data are integrated at I(0), I(1), or I(2) (He and Deng, 2023).

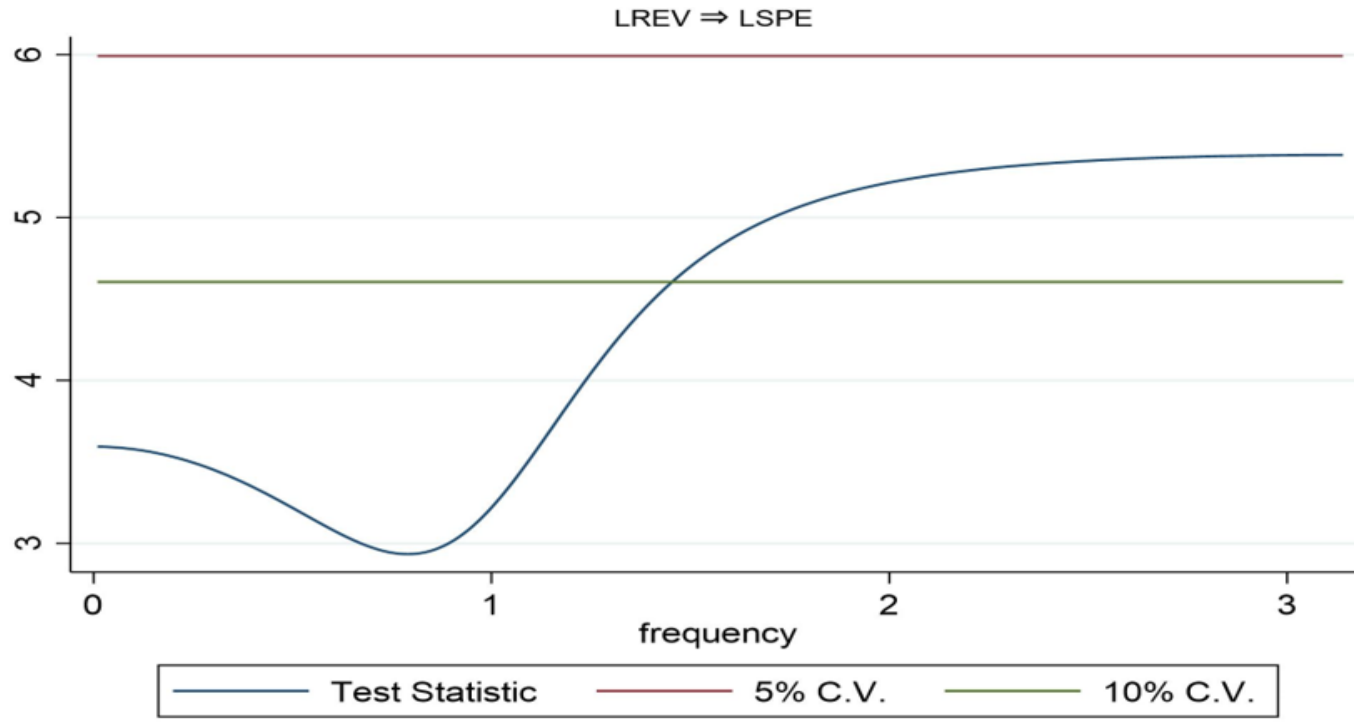

Figure 5: Breitung-candelon spectral granger causality test from REV to SPE.

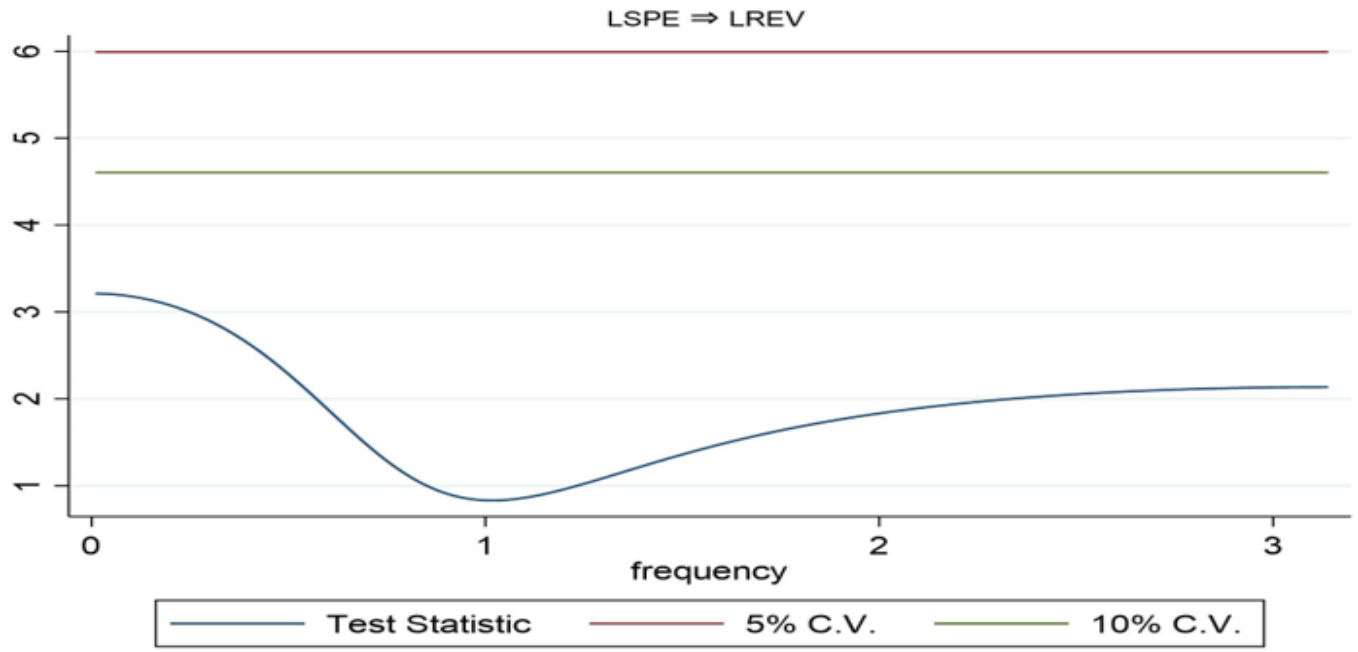

Figure 6: Breitung-candelon spectral granger causality test from SPE to REV.

Key findings from spectral analysis:

- No causal relationship from expenditure to revenue across time horizons
- Medium-term causality from revenue to expenditure at 10% significance level
- Results reinforce the tax-spend hypothesis in medium term

5. CONCLUSION

This research paper investigates the dynamic relationship between government revenue and spending in Algeria from 1980 to 2022. Unlike prior studies that presuppose a consistent causal link, our investigation employs the rolling window bootstrap methodology and the frequency domain Granger causality test (Breitung and Candelon, 2006) to unveil the time- varying causality between revenue and spending, considering Algeria's significant fiscal policy shifts over the study period.

Our empirical analysis yields several significant findings. The results strongly support the tax- spending hypothesis, indicating that government revenues influence spending over extended periods. This influence was positively observed from 1995 to 2003, characterized by a contractionary fiscal policy aimed at streamlining expenditures. During this period, reforms successfully balanced revenue enhancement with expenditure control. However, from 2005 to 2008, despite declining tax revenues, authorities pursued an expansionary fiscal policy, leading to increased spending driven by financial illusion, highlighting the challenges of maintaining fiscal discipline.

The spectral Granger-causality tests provided additional confirmation of the causal relationship between revenue and expenditure, particularly in the medium term. Moreover, our analysis revealed intermittent support for both the spending-tax and fiscal synchronization hypotheses over shorter periods, underscoring the complex and evolving nature of fiscal relationships in Algeria's economy.

The study emphasizes the critical importance of sound fiscal policy management in Algeria, urging policymakers to navigate the complex fiscal landscape with prudence and foresight. Understanding the dynamic relationship between revenue and expenditure can help formulate effective strategies to promote fiscal discipline, sustainability, and economic stability.

Our findings contribute to the broader literature on fiscal policy dynamics, providing valuable insights for policymakers, researchers, and practitioners. To address the identified fiscal challenges, we propose several policy measures, focusing on revenue-side interventions while minimizing adverse effects on economic growth and social welfare:

5.1. Tax Reform and Administration

- Implement tax reforms at a faster pace and adjust policies to generate additional revenues
- Broaden the tax base and adjust rates for specific income brackets or economic activities
- Combat tax evasion through enhanced enforcement mechanisms
- Introducing new revenue streams such as carbon taxes or luxury taxes

5.2. Compliance and Transparency

- Enhance tax compliance through improved revenue collection systems
- Invest in technology for better monitoring and enforcement
- Simplify tax procedures and enhance transparency
- Increase taxpayer compliance through education and incentives

5.3. Economic Sustainability

- Carefully manage debt levels to avoid exacerbating fiscal vulnerabilities
- Implement policies that stimulate economic growth and expand the tax base
- Invest in infrastructure and support innovation and entrepreneurship
- Focus on generating sustainable revenues in the long term

The current study has limitations, primarily the omission of certain macroeconomic variables that may affect the revenue-expenditure relationship. Future research could address these by:

- Including oil price shocks and exchange rate variables
- Studying the interconnection between public spending and revenues in a broader macroeconomic context
- Conducting comparative analyses in other rentier developing countries
- Testing the validity of the four hypotheses in different economic contexts

Targeting fiscal deficits through revenue-side interventions requires a balanced approach considering both short-term revenue needs and long-term economic sustainability. The success of fiscal policy reforms will depend on the government's ability to implement these recommendations while maintaining social welfare and economic growth. As Algeria continues to face fiscal challenges, the insights provided by this study can serve as a valuable guide for policy formulation and implementation.

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