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Fiscal Policy and Sustainable Development: Assessing Algeria's Strategic Pathway to Achieving the SDGs

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Abstract :
Fiscal policy emerges as a pivotal tool for nations to allocate resources efficiently and equitably. For Algeria, a dependent country on hydrocarbon revenues, aligning fiscal strategies with the Sustainable Development Goals (SDGs) is both a challenge and an imperative. This study delves into the intricacies of fiscal policies, examining their implications to the SDGs, and identifying areas of opportunity and improvement especially in view of economic diversification. Using the Vector Autoregressive (VAR) model, we analyse the interaction between different variables of interest including tax revenue structures, public expenditures and SDG global score. Findings highlight the importance of strategic fiscal decisions using both tools in driving both economic growth and sustainability in the short run.
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Introduction:

The discourse surrounding sustainable development has evolved from a mere environmental concern to a holistic approach that encompasses economic, social, and environmental dimensions. At the heart of this global conversation are the United Nations' Sustainable Development Goals (SDGs) - a set of 17 goals that serve as a blueprint for nations to achieve a better and more sustainable future for all.

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While the SDGs provide a global framework, the onus of actualizing these goals rests on individual nations and their policy mechanisms. One of the most potent tools at the disposal of national governments is fiscal policy, which, if wielded judiciously, can significantly influence a country's trajectory towards sustainable development. Notably, Algeria has shown significant strides towards achieving SDGs related to education, sustainable consumption, partnerships, industry innovation, climate action, terrestrial ecosystems, and peace and justice as highlighted in sustainable development report 2022 by **(Sachs et al., 2022)** .Despite Algeria's commendable progress, the report underscores a global stagnation in SDG advancement, emphasizing the need for peace, diplomacy, international cooperation, and a comprehensive financing plan to achieve the SDGs by 2030.

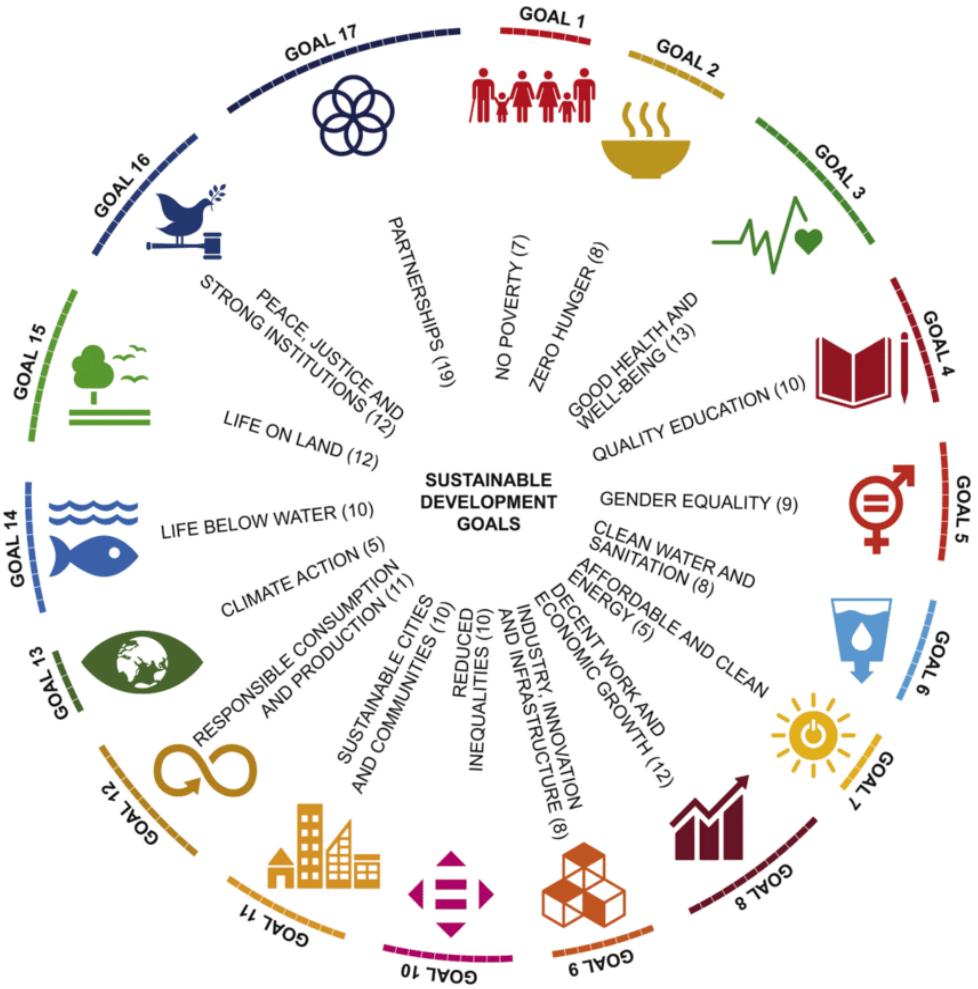
Consequently, this paper critically interrogates a pertinent research question: *How does Algeria's fiscal policy align with its sustainable development goals, and where do potential challenges lie?* .The problematic at the heart of this research arises from the observed contrasts between Algeria's fiscal decisions, influenced heavily by its oil-based economy, and the multi-dimensional targets set by the SDGs. Hence, it seeks to navigate this complex intersection, through rigorous empirical analysis, we aim to shed light on the successes, challenges, and potential avenues for fiscal reform, providing insights that could guide Algeria's journey towards achieving a balanced and sustainable development.

This paper contributes to the literature in threefold: First, it provides a comprehensive assessment of Algeria's fiscal landscape, bridging a notable gap in the literature. Second, by adjusting fiscal instruments against SDG targets. Lastly, in highlighting best practices and identifying challenges, this paper provides policymakers, scholars, and stakeholders with a roadmap, not only for Algeria but potentially for other resource-rich nations, underscoring the transformative potential of fiscally-informed sustainable strategies.

1- Literature review:

Fiscal policy, as a tool of government intervention through taxes and expenditures, plays a pivotal role in economic trajectory and can significantly influence macroeconomic variables such as economic growth, employment, and inflation. In the context of sustainable development, fiscal policy can be harnessed to allocate resources efficiently and equitably, ensuring that economic growth is both inclusive and sustainable (Đorđević & Krstić, 2020). Further, the United Nations' Sustainable Development Goals (SDGs) provide a comprehensive framework for global development, addressing a wide range of issues from poverty and hunger to climate change and peace **(figure 01)**. The SDGs emphasize the interconnectedness of economic, social, and environmental dimensions of development, underscoring the need for integrated and holistic policy approaches. The global commitment to sustainable development, has been the subject of extensive academic research and policy discourse.

Figure 01: the SDGs



Source: (Carr et al., 2021)

A study by **(Yang et al., 2022)** emphasized that while fiscal and monetary policies can effectively regulate economic growth, an excessively high government debt ratio could inhibit it. The study also pointed out that the coordination of fiscal and monetary policies, whether expansionary or contractionary, plays a crucial role in achieving sustainable development outcomes. Another study by **(Sushkova et al., 2021)** proposed a methodological approach to assess the promotion level of fiscal policy towards sustainable development, integrating a set of indicators corresponding to the 17 SDGs. Their research, focusing on Ukraine, highlighted the importance of understanding the hierarchical relationship between state parameters and the support level for fiscal policies in sustainable development. Furthermore, and in a broader context, **(Martens, 2020)** critically discussed the role of public and private actors in implementing the SDGs. The study underscored the challenges posed by privatization and public-private partnerships (PPPs), arguing that such approaches can exacerbate inequalities and jeopardize the fulfilment of human rights. Martens emphasized the need to reclaim public policy space and strengthen public finance to achieve the SDGs. **(López & Figueroa B, 2016)** argues that tax policies can influence the composition of factor endowment and the structure of production, potentially leading to overinvestment in physical

capital and underinvestment in human capital. This can result in an economy heavily dependent on natural resources and environmentally dirty industries.

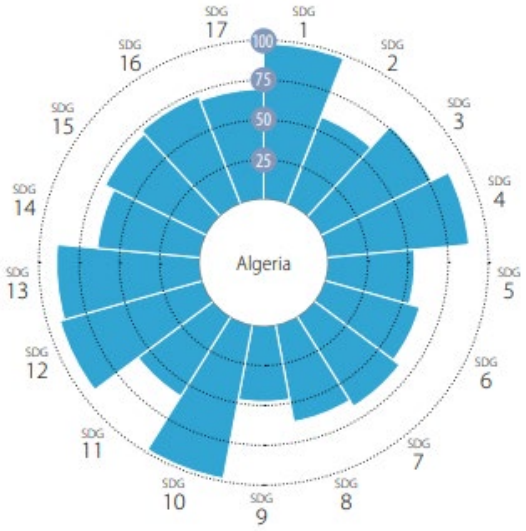
These studies collectively suggest that fiscal policy plays a crucial role in achieving sustainable development and underscore the multifaceted relationship between fiscal policy and sustainable development, highlighting the challenges and opportunities that nations face in aligning their fiscal strategies with the SDGs. To the best of our knowledge, this is the first paper that offers a comprehensive analysis of Algeria's fiscal policy in the context of its pursuit of the Sustainable Development Goals (SDGs), especially against the backdrop of its hydrocarbon dependency.

2- SDG performance in Algeria :

According to the sustainable development goals report (2022), Algeria, ranks 64th out of 163 countries in the Sustainable Development Goals (SDGs) with a score of 71.5%. The country faces varying challenges across the SDGs, from poverty to education.

Its International Spillover Index score is 97.4% indicating its global impact on sustainable development. However, its Statistical Performance Index is 55%, suggesting room for improvement in data quality and availability for SDG assessment.

Figure 02: SDG indicators rates in Algeria

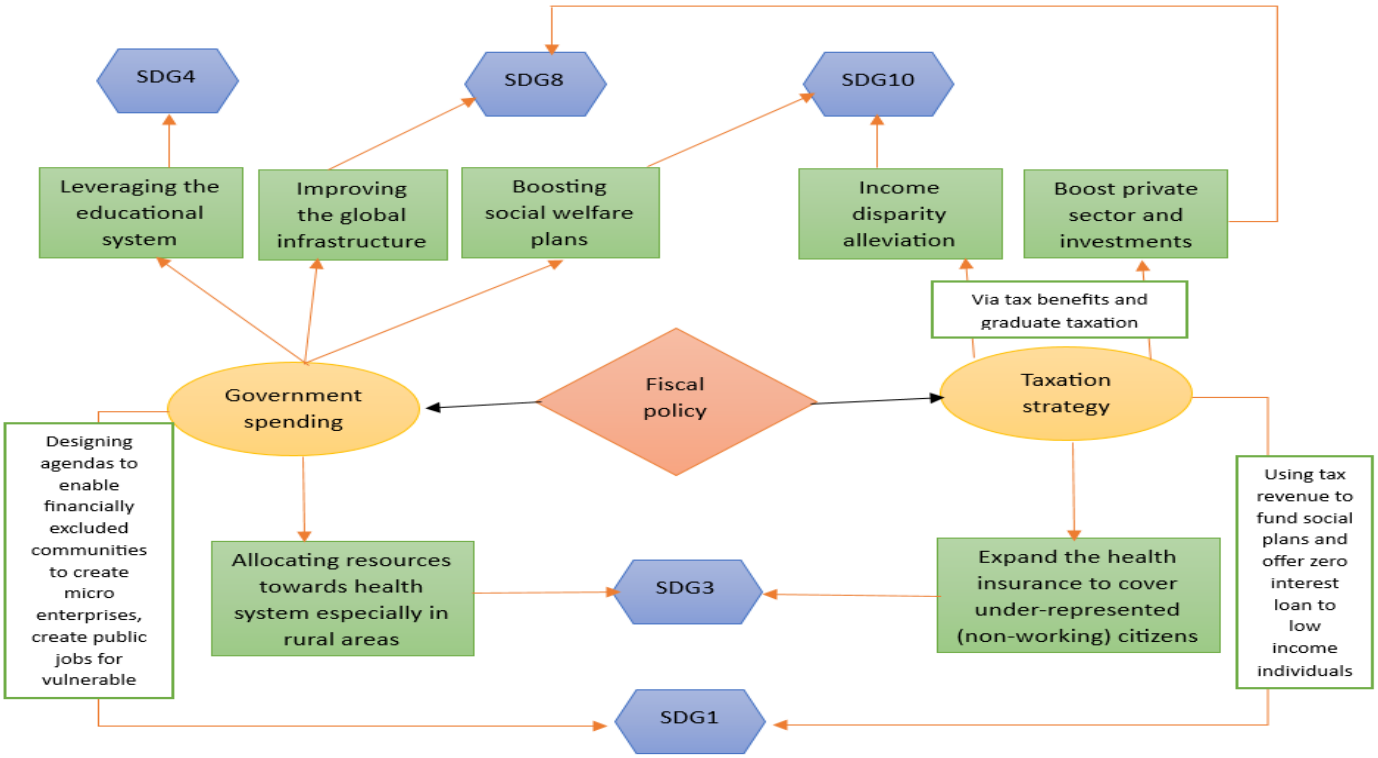


Source: Sustainable development report 2022

Figure (02) provides a revealing Algeria's progress towards the Sustainable Development Goals (SDGs). Algeria demonstrates noticeable achievements in several SDGs, with their attainment percentages spanning between 50 to 100%. Specifically, SDG 1 (No Poverty) and SDG 10 (Reduced Inequality) stand out as the frontrunners, with both surpassing the 90%. This suggests that Algeria has

made significant strides in alleviating poverty and reducing inequalities within its borders, potentially reflecting robust policy interventions and resource allocations in these areas. However, SDG 9 (Industry, Innovation, and Infrastructure), which lags behind with less than 50%. This suggests potential challenges or gaps in Algeria's approach to fostering a resilient industrial sector, promoting innovation, and building sustainable infrastructure. (Sachs et al., 2022).

Figure (03): conceptual framework Fiscal policy-SDGs



Source: by the authors

Moreover, Figure (03) offers a conceptual framework of the intricate interconnections between fiscal policy and specific Sustainable Development Goals (SDGs) - namely SDG 1 (No Poverty), SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 10 (Reduced Inequality).

Government expenditures can directly influence SDG 1 by allocating funds towards social safety nets and poverty alleviation programs. Similarly, investments in health infrastructure and public health campaigns can advance SDG 3, while fiscal allocations towards education can boost progress towards SDG 4. Taxation, on the other hand, can be structured to promote economic growth (SDG 8) by incentivizing businesses and investments, and to reduce income and wealth disparities (SDG 10) through progressive tax regimes.

3- Data and methodology:

This study seeks to examine the complex dynamics of the "fiscal policy nexus" to understand the profound implications of fiscal policy interventions on Algeria's implications of the Sustainable Development Goals (SDGs).

3.1. Variables' selection and data collection:

A set of essential variables were selected to provide deep understanding of Algeria's fiscal policy landscape in relation to sustainable development, namely government expenditures, tax revenues, SDG index score, non-oil GDP, and employment. The data spans over the period from 2000 to 2022, allowing for a comprehensive analysis of trends and patterns events.

Table 01: the variables definition

Source: by the authors

Collectively, these variables are not only indicative of the multifaceted nature of fiscal policy but are also instrumental in achieving the study's aim: to comprehensively assess Algeria's strategic pathway in aligning fiscal mechanisms with sustainable development aspirations away from hydrocarbon curse.

3.2. Methodology:

Variable		Description
Government Expenditures	EXP	Government tools used to shed light on the fiscal strategies and decisions.
Tax Revenues	TX	
SDG Index Score	SDG	Aggregates performance across various SDG indicators into a single score, allowing for a holistic assessment of sustainable development progress in Algeria
Non-oil GDP	Non-oil GDP	Offers a discerning analysis of the broader economic dynamics, especially given Algeria's hydrocarbon-dependent economy.
Employment	EMPL	Reflects the tangible outcomes of fiscal decisions on the populace and serves as a critical socio-economic metric.

In order to investigate the relationship between fiscal policy and sustainable development in Algeria, this study employs the Vector Autoregression (VAR) model. As detailed by Sims (1980), VAR model is particularly adept at capturing the dynamic interplay between multiple time series variables, making it an ideal choice for the research context.

Moreover, the reason behind the adoption of the VAR model is the model's ability to handle multiple endogenous variables without the need to pre-specify any variable as dependent or independent is invaluable (Sims, 1986), given the bidirectional nature of the relationship between fiscal policy and sustainable development.

In line with **(Ciccarelli & Rebucci, 2003) ,** let the VAR model:

$$\boldsymbol{Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t} \ldots (01)$$

Where:

- Y_t is a vector of our endogenous variables at time t.
- $A_1, A_2, \dots A_p$ are matrices of coefficients to be estimated.
- ε_t is a vector of error terms.

4- Results and discussion:

4.1. Augmented Dickey Fuller Unit root test:

In order to evaluate the stationary characteristics of the variables, this study employed the Augmented Dickey-Fuller (ADF) test, results are summarized in table 02.

Table 02: ADF test results

Source: data processing

Table 02 shows the Augmented Dickey-Fuller (ADF) test results for the variables under different model specifications. For the variables EXPN, TX, SDG, and NON-OIL GDP, the ADF test indicates non-stationarity at levels across all models. However, upon first differencing, these variables achieve stationarity, while,

variables	With constant			With constant & trend			Without constand & trend		
	Level	1st diff	Decision	Level	1st diff	Decision	Level	1st diff	Decision
EXPN	0.4109	0.0033	I (1)	0.9504	0.0159	I (1)	0.7629	0.0002	I (1)
TX	0.4924	0.020	I (1)	0.9677	0.0005	I (1)	0.6808	0.0001	I (1)
SDG	0.2417	0.0042	I (1)	0.9758	0.0056	I (1)	0.9885	0.0007	I (1)
NON-OIL GDP	0.1552	0.0009	I (1)	0.5695	0.0055	I (1)	0.2040	0.0001	I (1)
EMPL	0.0070	0.3757	I (0)	0.0229	0.0068	I (0)	0.0007	0.0792	I (0)

EMPL is stationary at levels.

4.2. Johansen cointegration test:

The Johansen cointegration test expands on the augmented Dickey-Fuller test by assessing the linear interplay of multiple variables (Dwyer, 2015) using both the trace and maximum eigenvalue methods to determine the highest rank of cointegration. As shown in Table (3), the variables do not display cointegration, implying that they lack a sustained, long-term association.

Table (3): Johansen cointegration results

Johansen test			
Hypothesized	Eigenvalue	Trace statistics	Probabilities

None	0 .763723	30.29773	0.0621
At most one	0.7031670	25.50628	0.1327
At most two	0.495886	14.38403	0.1517
At most three	0.332872	8.500236	0.1449

Source: data processing

4.3. Lag order selection :

Lag length denotes the number of past periods used as predictors in the vector autoregressive model (Ozcicek & Douglas Mcmillin, 1999). Several criteria, such as the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (BIC), and the Hannan-Quinn Criterion (HQ), help determine the optimal lag.

Table 04: lag order selection results:

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-270.5668	NA	172031.2	26.24446	26.49315	26.29843
1	-197.1385	104.8976*	1853.151*	21.63224*	23.12441*	21.95608*
2	-172.4048	23.55590	3120.891	21.65760	24.39325	22.25131

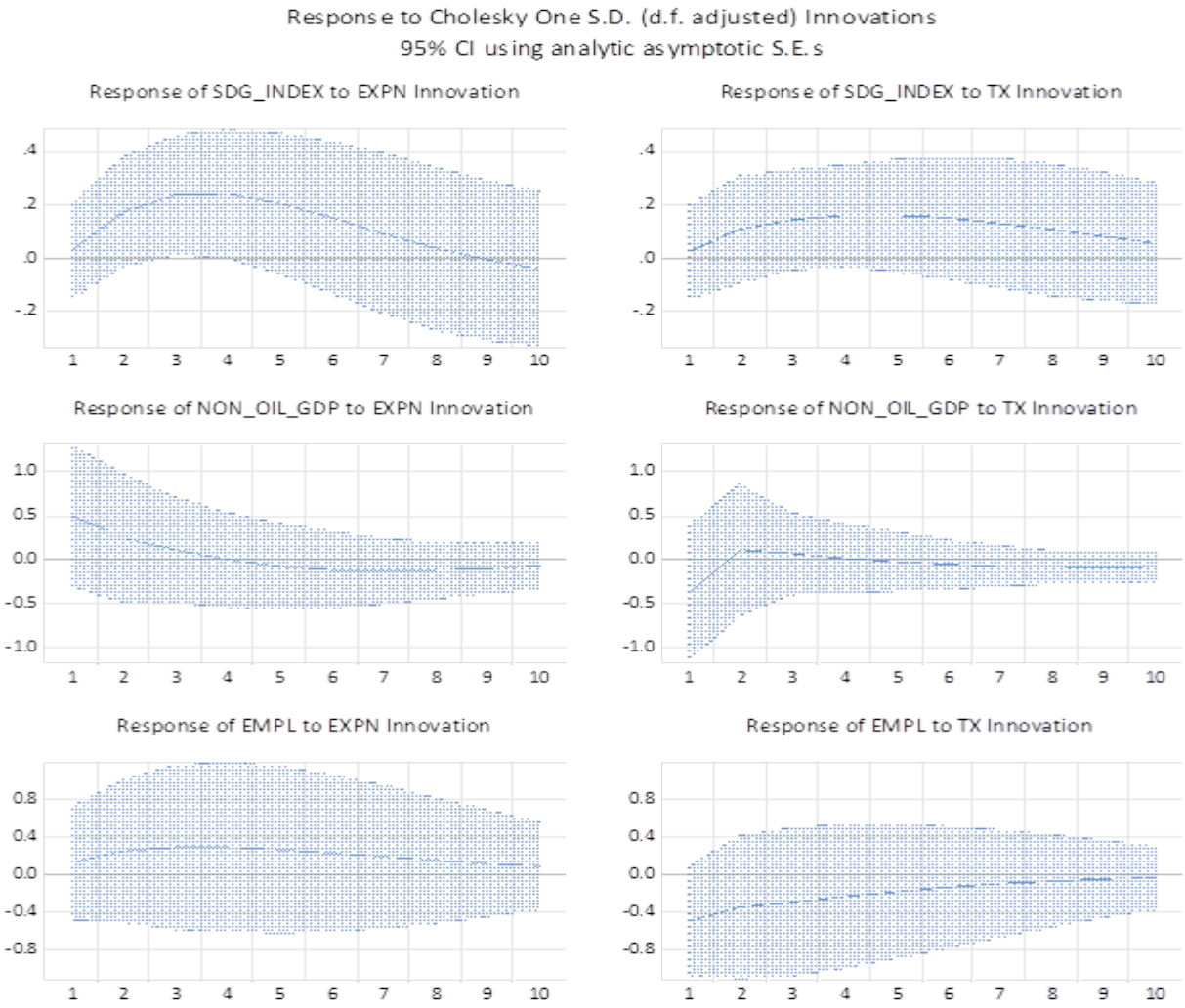
Source: data processing

Results in table 04 indicates a lag order of 1 suggesting that in the Vector Autoregression (VAR) model, only one previous period (or lag) of the time series data is used as a predictor for the current period.

4.4. Impulse response functions:

The Impulse Response Function describes how a variable responds over time to a one-time shock or "impulse" in another variable while holding all other shocks constant. In the context of a VAR model, where multiple interrelated time series variables are considered, the IRF provides insights into the dynamic interplay among these variables.

Figure (04): IRF to expenditures and taxes



Source: data processing

The Impulse Response Function (IRF) results (figure 04), provide a dynamic view of how various economic variables respond to shocks in government expenditures and taxes over time. Here's an analysis of the given results:

- **SDGs and Government Expenditures**: figure 04 shows a positive response of SDGs to government expenditures for the initial five periods suggesting that increased government spending directly correlates with improvements in sustainable development goals. This could be due to investments in public goods, infrastructure, health, or education that directly contribute to achieving SDGs. However, this response start declining starting from t=6 this can be attributed to the law of diminishing returns, where initial significant investments address urgent needs, yielding rapid improvements. As spending continues, subsequent investments might not have as pronounced an effect. Additionally, the system might reach its capacity to effectively utilize additional funds, leading to inefficiencies.

- **SDGs and Taxes**: a positive response of SDGs to taxes until t=6 implies that tax revenues, when efficiently utilized, can foster sustainable development. This could be through redistribution mechanisms, public welfare programs, eco-friendly taxes or other developmental projects funded by these taxes. The slight decrease post t=6 might suggest potential inefficiencies in tax utilization or the onset of negative effects of higher taxation on economic activity.

- **Non-Oil GDP**: recorded an initial positive response of non-oil GDP to expenditures until t=3. This indicates the country's efforts to diversify its economy and mitigate the "oil curse". However, the subsequent negative shift at t=4 proposes challenges in maintaining fiscal discipline amid fluctuating oil revenues and the potential crowding out of private investment in a dominant oil economy. The mixed response to taxes (negative than positive at t= 2) further highlights the delicate balance required to stimulate non-oil sectors without exacerbating the vulnerabilities associated with the oil curse.

- **Employment**: The positive response of employment to government expenditures suggests that increased spending leads to job creation, possibly through public projects or stimulation of private sector activity. The negative response to taxes, on the other hand, might indicate that higher taxation levels or certain tax structures could be acting as a deterrent for businesses to hire or expand, or they might be reducing disposable income, leading to decreased consumption and, consequently, lower demand for labor.

4.5. Granger causality:

This research further enhances its analytical depth by implementing the Granger causality test through the examination of the causal relationship among fiscal policy and economic development.

Table 05: Granger causality results

Null Hypothesis:	F-Statistic	Prob.
TX does not Granger Cause EXPN	4.86371	0.0399
EXPN does not Granger Cause TX	0.05100	0.8237
SDG_INDEX does not Granger Cause EXPN	0.10328	0.7514
EXPN does not Granger Cause SDG_INDEX	10.3040	0.0046
NON_OIL_GDP does not Granger Cause EXPN	0.30908	0.5847
EXPN does not Granger Cause NON_OIL_GDP	2.20735	0.1538
EMPL does not Granger Cause EXPN	6.62917	0.0186
EXPN does not Granger Cause EMPL	0.90160	0.3543
SDG_INDEX does not Granger Cause TX	1.30702	0.2671
TX does not Granger Cause SDG_INDEX	7.82594	0.0115
NON_OIL_GDP does not Granger Cause TX	14.2518	0.0013
TX does not Granger Cause NON_OIL_GDP	0.82837	0.3741
EMPL does not Granger Cause TX	0.12692	0.7256
TX does not Granger Cause EMPL	0.03305	0.8577
NON_OIL_GDP does not Granger Cause SDG_INDEX	1.28427	0.2712
SDG_INDEX does not Granger Cause NON_OIL_GDP	4.23334	0.0536
EMPL does not Granger Cause SDG_INDEX	1.97493	0.1761

SDG_INDEX does not Granger Cause EMPL	0.54820	0.4681
EMPL does not Granger Cause NON_OIL_GDP	2.33640	0.1429
NON_OIL_GDP does not Granger Cause EMPL	1.23527	0.2803

Source: data processing

Table 05 revealed that:

Taxes and government expenditures: There's evidence to suggest that TX Granger-causes EXPN (p=0.0399), but not the other way around (p=0.8237).

SDG_INDEX and government expenditures: presents a unidirectional causal relationship where EXPN Granger-cause SDG_INDEX significantly (p=0.0046), but the reverse isn't statistically significant.

SDG_INDEX and TX: TX Granger-causes SDG_INDEX significantly (p=0.0115), but not the other way around.

NON_OIL GDP and expenditures: Neither variable appears to significantly Granger-cause the other, with p-values of 0.5847 and 0.1538, respectively.

Employment and expenditures: a unidirectional causality where EMPL Granger-causes EXPN significantly (p=0.0186).

NON_OIL_GDP and taxes: NON_OIL_GDP significantly Granger-causes TX (p=0.0013).

4.6. Discussion and policy implication:

The findings offer a comprehensive overview into the dynamics of fiscal policy and its implications for sustainable development in Algeria. It's evident that tax revenues play a significant role in influencing government expenditures, suggesting that as the government collects more in taxes, there's a corresponding increase in its public spending. This relationship underscores the interconnectedness of revenue generation and budgetary allocations in shaping fiscal policy. These results agreed with (Boukbech et al., 2018; Dizaji, 2014; Maneerat & Fazal, 2020).

Furthermore, in line with (Osuji & Nwani, 2020; Peña-Sánchez et al., 2021) government spending has a direct impact on Algeria's progress towards achieving the Sustainable Development Goals (SDGs). This suggests that targeted allocations, especially in critical sectors like health, education, and infrastructure, can drive positive outcomes in sustainable development. The data also indicates a tangible link between fiscal decisions and employment, emphasizing the socio-economic implications of government spending patterns.

Interestingly, the study highlights the importance of diversifying the Algerian economy beyond oil which aligns with the findings of (Dibeh, 2014). The non-oil GDP's influence on tax revenues underscores the need for economic diversification to ensure consistent revenue streams, especially given the volatile nature of global oil markets. In essence, a diversified economy can act as a buffer, ensuring fiscal sustainability even when oil prices fluctuate.

For policymakers, these findings emphasize the need to:

- Prioritize fiscal decisions that align with sustainable development objectives.
- Diversify economy in ensuring consistent tax revenues, which can be channelled towards SDG-aligned initiatives.
- Reduce dependence on oil revenues and fostering economic diversification. This can ensure fiscal sustainability and provide a buffer against the volatility of global oil prices.

Conclusion:

In the growing landscape of global development, the interplay between fiscal policy and sustainable development has emerged as a pivotal point for countries striving to achieve a balance between economic growth and sustainability. This study embarked on an in-depth exploration of this relationship within the Algerian economy, with its hydrocarbon-rich economy and aspirations to meet the Sustainable Development Goals (SDGs). Through a meticulous analysis, results unveiled the intricate dynamics between tax revenues, government expenditures, and their subsequent impact on SDGs. The findings underscore the pivotal role of economic diversification, especially in an oil-dependent economy like Algeria, emphasizing the need for a broader revenue base to ensure fiscal sustainability. Furthermore, the tangible link between fiscal decisions and socio-economic outcomes, particularly employment, offers valuable insights for policymakers. As we conclude, it becomes evident that strategic fiscal decisions, underpinned by a commitment to sustainable development, can pave the way for a prosperous and sustainable future for Algeria. This study not only contributes to the academic discourse on fiscal policy and sustainable development but also provides actionable insights for policymakers, stakeholders, and researchers looking to delve deeper into this critical domain.

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