Fiscal Policies and health financing in Algeria: The role of institutional quality

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Abstract:

In rentier economies such as Algeria, health financing is constrained by dependence on volatile hydrocarbon revenues. This study examines the effects of fiscal policy, focusing on non-hydrocarbon tax instruments—including direct and indirect taxes, GDP per capita, government expenditure, and out-of-pocket spending—on government health expenditure over 1995–2022, while treating institutional accountability as a moderating factor.

Results indicate that direct taxes have a weak positive effect, limited by a narrow tax base, a large informal sector (25–40%), and hydrocarbon dependence (>60% of the budget and ~95% of exports). whereas indirect taxes are positive in the short run but negative in the long run due to regressive and inflationary effects. Government expenditure has a positive but weak long-run impact that strengthens under institutional accountability, indicating that governance quality enhances the allocation of public resources to health. Similarly, the fiscal effects of both direct and indirect taxes on health spending become more pronounced when accountability is introduced. Out-of-pocket spending reduces public expenditure but becomes complementary under stronger accountability.

Overall, institutional accountability emerges as the main transmission channel of fiscal policy effects on health financing in Algeria, highlighting the need to strengthen direct taxation, improve tax administration (DGI), modernize healthcare management through cost accounting and medical monitoring systems, and establish National Health Accounts (NHA), alongside economic diversification in Algeria to ensure fiscal sustainability.

Key words: Health Financing, Universal Health Coverage, Fiscal Policy, Institutional Quality.

Jel Codes Classification : H51, I13, E62, D73.

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السياسات المالية والتمويل الصحي: دور الجودة المؤسسية

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ملخص:

في الاقتصادات الريعية مثل الجزائر، يظل تمويل القطاع الصحي مقيدا بالاعتماد الكبير على عائدات المحروقات المتقلبة. تهدف هذه الدراسة إلى تحليل أثر السياسة المالية على الإنفاق الصحي خلال الفترة 1995–2022، من خلال تقييم دور الضرائب المباشرة وغير المباشرة، ونصيب الفرد من الناتج المحلي الإجمالي، والإنفاق الحكومي، والإنفاق المباشر من جيب الأسر في الانفاق الحكومي على الصحة، مع إدراج المساءلة المؤسسية كعامل معدّل.

تظهر النتائج أن الضرائب المباشرة لها أثر إيجابي ضعيف على الإنفاق الصحي، نتيجة ضيق الوعاء الضريبي واتساع القطاع غير الرسمي والاعتماد الكبير على الإيرادات النفطية. في المقابل، تؤثر الضرائب غير المباشرة إيجابا في الأجل القصير، لكنها تتحول إلى أثر سلبي في الأجل الطويل بسبب آثارها التراجعية والتضخمية. كما يظهر الإنفاق الحكومي أثرا إيجابيا ضعيفا على المدى الطويل، إلا أن هذا الأثر يتعزز بشكل ملحوظ عند إدراج المساءلة المؤسسية، مما يؤكد أن جودة الحوكمة تعزز كفاءة تخصيص الموارد العمومية نحو القطاع الصحي. كذلك تصبح آثار السياسة الضريبية أكثر قوة في ظل مستويات أعلى من المساءلة المؤسسية. أما الإنفاق المباشر من جيب الأسر فيحدّ من فعالية الإنفاق العمومي، لكنه قد يتحول إلى عنصر مكمل في ظل مؤسسات أكثر مساءلة.

تخلص الدراسة إلى أن المساءلة المؤسسية تمثل قناة رئيسية لانتقال أثر السياسة المالية إلى تمويل الصحة في الجزائر، مما يبرز أهمية تعزيز الجباية المباشرة، وتطوير إدارة الضرائب من خلال المديرية العامة للضرائب، وتحديث تسيير القطاع الصحي عبر اعتماد محاسبة التكاليف وأنظمة تتبع النشاط الطبي، إضافة إلى إنشاء الحسابات الصحية الوطنية، مع ضرورة تنويع الاقتصاد الوطني لضمان الاستدامة المالية للمنظومة الصحية.

الكلمات المفاتيح: تمويل الصحة، التغطية الصحية الشاملة، السياسة المالية، الجودة المؤسسية.

التصنيف JEL : D73, E62, I13, H51

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Introduction

The issue of health financing in Algeria is currently being raised in various forms, as it remains constrained by the dominance of hydrocarbon revenues, which exposes public finances to external shocks, thereby reinforcing the need for continued economic diversification, as a strategic priority identified by Algerian authorities in recent development plans. Over the period 2014–2024, oil revenues continued to account for more than 50% of total fiscal resources and reached nearly 90% in 2024. This structural dependence has made fiscal policy highly vulnerable to fluctuations in international oil prices, as illustrated by the 2014–2016 price collapse, which led to widening fiscal deficits and reduced fiscal space for public spending, particularly in the health sector.

Non-hydrocarbon revenues represent a potential alternative source of financing due to their relatively higher stability when measured against non-oil GDP. However, their contribution remains limited, averaging around 10% of GDP, and has not yet recovered from the COVID-19 shock, declining from 12.3% in 2019 to 10.6% in 2024. Although they slightly outperform the average of resource-dependent economies, they remain significantly below the levels observed in non-resource-based countries, indicating limited fiscal diversification.

Weaknesses in the fiscal structure have had direct implications for health financing, as government health expenditure declined from 3.28% of GDP in 2019 to 1.72% in 2022, reflecting a contraction in fiscal space allocated to the health sector. In this context, the World Health Organization recommends that countries allocate at least 15% of total government expenditure and 5% of GDP to public health spending; however, Algeria remains below these thresholds. This situation has led to increased reliance on out-of-pocket (OOP) payments, which rose to approximately 38.5% of total health expenditure, exceeding the average observed in upper-middle-income countries. Consequently, this highlights the need to strengthen financial protection mechanisms, a challenge also faced by many upper-middle-income countries in the region, particularly for vulnerable populations, while also constraining the availability and quality of health services.

Health financing in Algeria has followed a gradual historical path strongly shaped by the legacy of free healthcare introduced in 1974, which established the State as the main financier and generated long-term dependence on public funding and social security. While the State dominated health financing during the 1970s and 1980s, the decline in oil revenues in the 1980s and 1990s, combined with the expansion of healthcare demand driven by free access, shifted financial pressure toward social security and led to an increase in household out-of-pocket payments. Although partial recovery occurred in the 2000s, the system structure remained largely unchanged, and Since 2010, household spending has risen significantly, with estimates for 2023 and 2024 indicating that it reached around 45%–50% of total health expenditure, reflecting a persistent structural imbalance.

In the context of persistent challenges in controlling public health expenditures, accountability is a key element of health governance, aimed at improving transparency, oversight, and efficiency in public spending. In Algeria, the Court of Accounts and the Directorate General of Taxes contribute respectively to audit control and revenue mobilization; however, while the legal framework has been strengthened, full effectiveness of oversight institutions remains contingent on further digitalization and administrative modernization efforts. Challenges in procurement processes have occasionally led to supply disruptions and quality concerns, which ongoing reforms in public financial management aim to address. Within this context, Organic Law No. 18-15 on Finance Laws represents a significant step toward embodying the principles of financial governance and ensuring more efficient public expenditure management through a shift toward program-based budgeting and results-oriented public spending, although its impact remains limited by institutional and implementation challenges.

From a theoretical perspective, public expenditure is constrained by fiscal capacity, while weak institutional oversight may generate inefficiencies in resource allocation. Building

on Kutzin (2013)framework for Universal Health Coverage (UHC), this study emphasizes accountability and transparency as key intermediate objectives of health financing, alongside efficiency, quality, and equity. These dimensions are essential for achieving the core objectives of UHC, including financial protection and improved health outcomes. UHC is not simply a matter of increased funding; it requires transparent governance mechanisms. Accordingly, this paper seeks to address the following central research question: What is the long-term relationship between fiscal policy and government health spending in Algeria?

Based on this core inquiry, the study investigates the following specific research sub-questions:

Direct Relationships:

(1) Does direct taxation have a statistically significant association with government health spending in Algeria?
(2) Does indirect taxation have a statistically significant association with government health spending in Algeria?
(3) Does GDP per capita growth have a statistically significant association with government health spending in Algeria?
(4) Does overall government spending have a statistically significant association with government health spending in Algeria?
(5) Does out of pocket health expenditure have a statistically significant association with government health spending in Algeria?

Moderated Relationships:

(5) a. Is there evidence that institutional accountability moderates the relationship between direct taxation and government health spending in Algeria?
(5) b. Is there evidence that institutional accountability moderates the relationship between indirect taxation and government health spending in Algeria?
(5) c. Is there evidence that institutional accountability moderates the relationship between GDP per capita growth and government health spending in Algeria?
(5) d. Is there evidence that institutional accountability moderates the relationship between overall government spending and government health spending in Algeria?
(5) e. Is there evidence that institutional accountability moderates the relationship between out of pocket health expenditure and government health spending in Algeria?

This study uses annual data from 1995–2022 and applies the ARDL model to examine the relationship between fiscal policy instruments—direct taxes, indirect taxes, GDP per capita, and government expenditure—and government health spending in Algeria. It also includes institutional accountability as a moderating variable to capture governance effects.

The study aims to identify suitable fiscal sources for universal health coverage in Algeria and to assess the prioritization of health within public budgets, while incorporating institutional accountability as a moderating variable.

The importance of this study lies in addressing a critical gap in the literature on health financing in developing countries, as limited research has examined the relationship between fiscal policy variables and government health spending in Algeria, particularly with institutional accountability. This study fills this gap by providing context-specific evidence from a developing-country perspective. It further contributes by introducing institutional accountability as a moderating variable, offering new insights into how governance quality shapes health spending decisions and budget prioritization.

To address the research problem, the study first examines Algeria's fiscal structure, health financing dynamics, and accountability mechanisms. Section 2 reviews the theoretical and empirical literature, identifies the research gap, and defines the study's hypotheses and explanatory variables. Section 3 presents the data, variables, and ARDL econometric

methodology with its justification. Section 4 reports and discusses the empirical results. Finally, Section 5 concludes the study and outlines key policy implications.

I-Fiscal Structure, Health Financing Dynamics, and Accountability in Algeria:

This section examines the interrelationship between Algeria's fiscal structure, the evolution of health financing, and the role of accountability mechanisms in shaping the efficiency and sustainability of public health expenditure.

I-1- Fiscal Structure in Algeria:

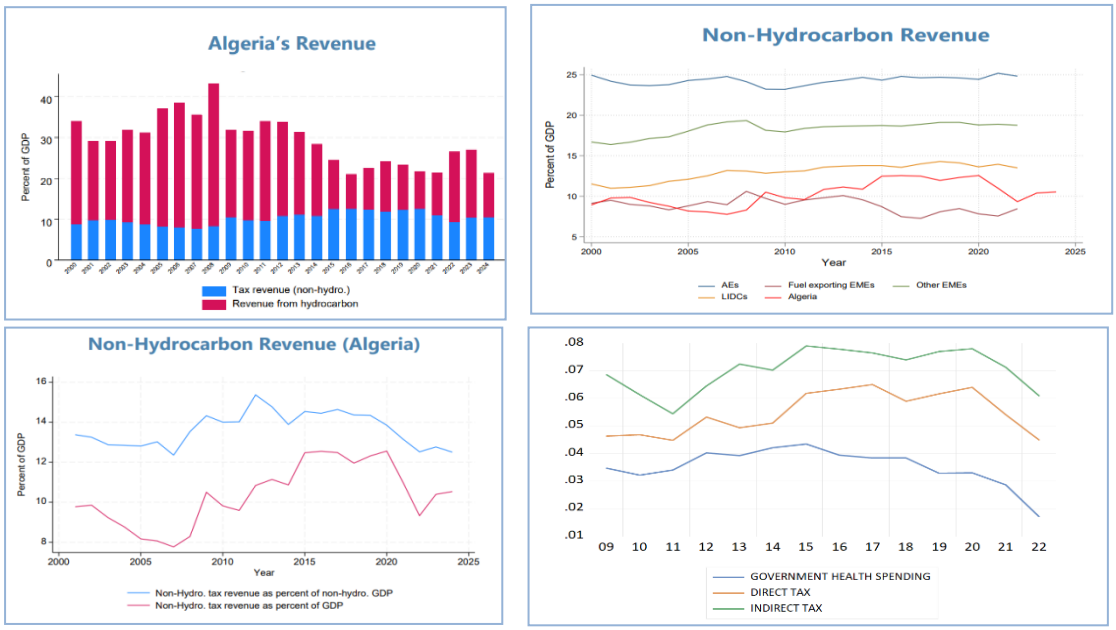
The structure of public revenues in Algeria remains heavily dependent on the hydrocarbon sector, which constitutes the main source of budget financing, accounting for an average of about 67% in recent years. This strong reliance exposes public finances to significant vulnerability, as fiscal revenues remain highly sensitive to fluctuations in international energy markets, reinforcing structural instability.

This dependence is clearly reflected in the long-term evolution of hydrocarbon revenues, which peaked in 2008 at over 40% of GDP, driven by exceptionally high oil prices, before entering a sustained downward trend following the 2014 oil price shock and stabilising at around 20% of GDP in recent years. This trajectory highlights the persistent exposure of the budget to external shocks and underscores the cyclical nature of energy dependence.

In contrast, non-hydrocarbon tax revenues have remained relatively stagnant over the past two decades, fluctuating between 8% and 12% of GDP, with only a slight decline observed in the post-COVID-19 period. Although this level is broadly comparable to that of other hydrocarbon-exporting economies, it remains significantly lower than in more diversified emerging economies. This gap reflects structural constraints, including the expansion of the informal sector, inefficiencies in tax administration, weak institutional capacity, limited tax collection effectiveness, widespread tax evasion, and the persistence of extensive tax exemptions.

Meanwhile, the non-hydrocarbon primary deficit widened markedly, increasing from -6.9% of non-oil GDP in 2018 to -15.3% in 2024. This deterioration highlights growing fiscal pressures and underscores the urgent need to strengthen domestic tax revenue mobilisation and reduce reliance on external borrowing(IMF Country Report, 2022).

Figure n°1: Fiscal Structure in Algeria



Source: IMF Country Report, 2022; GHS, DT, and IDT graphical data. Processed by the authors using EViews

I-2-Free Healthcare and Rapid Growth in Expenditure:

The evolution of health financing in Algeria reflects a path-dependent process shaped by the institutional legacy of free healthcare introduced in 1974, leading to successive shifts in financing responsibilities across the State, social security, and households. This evolution is analytically organized into four main phases:

I-2-1-State-led expansion and centralized financing (1970s–early 1980s):

The introduction of free healthcare in 1974 established a long-lasting institutional legacy that fundamentally shaped the Algerian health financing system, by institutionalizing state responsibility for healthcare provision and significantly influencing demand patterns, cost dynamics, and the reliance on public and social insurance financing. Building on reforms initiated in the early 1970s, Algeria restructured its health financing system prior to the formal implementation of free healthcare, notably through the replacement of the per diem hospital pricing system with a global budget mechanism.

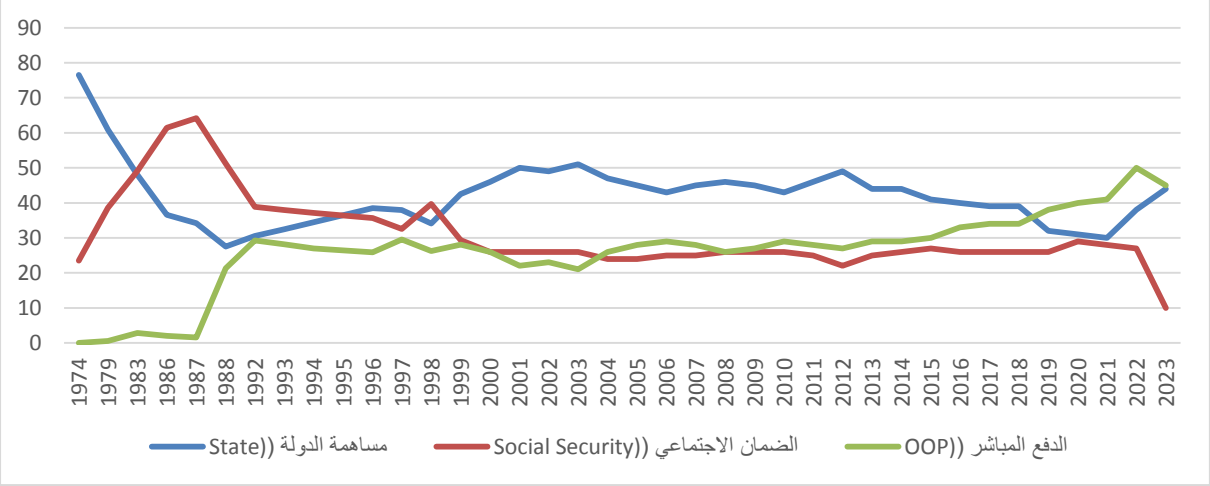
With the establishment of free healthcare, the State became the dominant financier of the health system, supported by oil revenues, covering about 76.5% of total health expenditure, while social security contributed 23.5%.This expansion generated a rapid increase in demand for healthcare services and pharmaceuticals. However, the reliance on fixed budgets created a structural mismatch between financing and actual service utilization, resulting in inefficiencies and rigid resource allocation (Y.ABBOU & BRAHAMIA, 2017).

I-2-2-Shift toward social security financing and structural stress (1980s–1990s):

Following the decline in oil revenues, the State's contribution to health financing fell from over 74% in 1974 to below 35% in 1987, while the National Social Security Fund (CNAS) became the main financier, covering around 65% of health expenditures. This transition exposed significant structural vulnerabilities within the system, as CNAS faced increasing financial pressure due to the expansion of beneficiaries, including retirees, chronic patients, and dependents, alongside rising unemployment and the growth of informal employment. These pressures were further exacerbated by the limited growth of payroll contributions and the continuous increase in healthcare and pharmaceutical costs(F. Z. OUFRIHA,1988).

As a result, financial imbalances intensified, leading to the gradual emergence of household participation and co-payments. During the 1990s, structural adjustment policies reinforced this shift toward a mixed financing system, with household contributions increasing to nearly 29% by 1999. Out-of-pocket payments also exhibited high volatility, peaking in the early 1990s, reflecting both the economic crisis and the growing reliance on private healthcare services.

Table n°1: Evolution of Health Financing Sources in Algeria as a % of total health expenditure



Source:Ziani, Lila&Ziani, Zoulikha. The role of social security in health financing; World Health Organization (WHO) data.

I-2-3-Mixed financing consolidation and macroeconomic recovery (2000s–2010s):

This period was characterized by improved macroeconomic conditions, which enabled an increase in public health expenditure and a relative decline in the role of social security. Key reforms, notably the introduction of the "Chifa" card, improved access to healthcare services but also increased reimbursement costs, particularly for pharmaceuticals and chronic diseases. Despite relative financial stability, household contributions remained significant, driven by persistent weaknesses in public service provision and the growing reliance on the private healthcare sector.(A.HAMADI 2020).

I-2-4-Persistence of household burden (post-2010):

Despite reforms, household out-of-pocket payments continued to rise due to increasing reliance on the private sector and limited coverage of certain services, reaching around 25% in 2014 and gradually increasing to 45%–50% in 2023–2024. This trend reflects a structural transformation in health financing in Algeria and persistent weaknesses in financial protection.

I-3-Fiscal Structure and Government health spending in Algeria:

Government health spending in Algeria expanded steadily from the early 2000s, with growth exceeding 2.6% in 2001 following the relatively low expenditure levels of the 1990s. Although health spending as a share of GDP declined during the Economic Recovery Program (2001–2004), this trend reflected faster economic growth driven by oil revenues rather than reduced public investment in health. The program nevertheless laid the institutional and infrastructural foundation for subsequent expansion in health expenditure.

Further growth was supported by the Complementary Program for Growth Support (2005–2009), hospital autonomy reforms introduced under Executive Decree No. 07-140 (2007), and delays in contractual financing between hospitals and Social Security, which increased the State's share of health expenditures to more than 21%. The Five-Year Development Program (2010–2014) reinforced this trajectory, with health expenditure reaching 4.03% by 2012. This increase was driven by rising medical costs, demographic pressures, and the integration of health professionals in 2011, including retroactive compensation payments and the creation of new financial positions(NazihaMaghdich, 2022).

Despite substantial financial commitments, the implementation of development plans in Algeria has been constrained by weak planning capacity and delays in project execution. The second five-year development program (2010–2014) allocated approximately USD 130 billion—representing nearly 45% of its total budget—to complete unfinished projects inherited from previous programs, reflecting inefficiencies in resource allocation and project management. (Ali Dahman Mohamed, 2017).In 2013, government health expenditure increased by 3.9%, partly driven by health district reforms aimed at restructuring healthcare delivery and improving organizational efficiency. Nevertheless, health expenditure trends became increasingly disconnected from tax revenue dynamics, particularly after the 2014 oil crisis, when fiscal priorities shifted toward deficit containment. As a result, the fiscal deficit expanded sharply from 1.4% to 16.2% of GDP, reducing the scope for sustained social sector investment.

The depletion of the Revenue Regulation Fund—from approximately 34% of GDP to zero—further constrained fiscal space and intensified competition between health expenditure and mandatory obligations such as wages and debt servicing. Domestic debt reached nearly 27% of GDP, reinforcing the crowding-out effect on health financing(Chibi et al. 2019).. Although the health sector accounted for 8.55% of the national budget in 2018, improvements in service quality remained limited due to governance weaknesses and administrative inefficiencies. Between 2015 and 2019, annual increases in the health budget ranged from

0.79% to 4.38%, with a contraction of 0.67% recorded in 2016. During the COVID-19 pandemic, more than DZD 65.5 billion was allocated to emergency health responses; however, the overall impact remained constrained by inflationary pressures and rising crisis-related costs (NazihaMaghdich 2022).

The annual increases in Algeria's health budget largely reflect nominal cost growth—such as higher wages and expanded infrastructure—rather than proportional improvements in service quality or system efficiency. Rising expenditure does not necessarily indicate better performance, as much of the increase is linked to the fiscal burden of free healthcare rather than reform-oriented investment. The persistence of governance challenges and delayed reforms reflects the coexistence of a centralized interventionist model alongside gradual market-oriented mechanisms within the Algerian health system.

I-4-Strengthening Accountability in Health Financing:

Accountability is a key pillar of good governance and public financial management, enhancing transparency, oversight, and expenditure efficiency, particularly in the health sector. It relies on clear objectives, performance standards, and independent monitoring mechanisms supported by modern accounting systems to reduce corruption and waste. International evidence highlights its importance: a 2010 study by Transparency International (2010)covering 48 countries found that higher transparency and accountability are associated with better outcomes in health, education, and water services. Likewise, the experience of the United Kingdom showed that anti-corruption measures in healthcare generated substantial financial gains, with approximately £170 million recovered since 1999 and broader savings sufficient to finance ten new hospitals(Report on Combating Corruption in the Health Sector, 2006). These findings demonstrate that accountability can expand fiscal space and improve the sustainability of health financing.

Despite Algeria's accession to the International Organization of Supreme Audit Institutions (INTOSAI), the effectiveness of external audit bodies, particularly the Court of Accounts and the General Inspectorate of Finance, remains limited in improving public spending efficiency due to weak independence, limited human resources, and a predominance of compliance-based auditing over performance auditing. Moreover, audit activities are largely confined to ex-post evaluation, with insufficient involvement in ex-ante or concurrent assessment of major public policies, alongside weak transparency and limited enforceability of audit recommendations. These constraints reduce the corrective impact of oversight and contribute to persistent inefficiencies and waste of public resources. Accordingly, strengthening audit effectiveness requires enhancing institutional independence and shifting toward performance-based evaluation to ensure a more results-oriented public financial control system(Tarek Mokhalfa&LouayGhamrani, 2024).

The expansion of the health sector during oil boom periods was accompanied by corruption risks, project delays, and weak compliance with standards, reflecting limited accountability mechanisms and administrative collusion. There remains scope for improving the efficiency of public spending, particularly through performance-based budgeting and enhanced audit mechanisms. Consequently, there is a strong need to reinforce the independence of oversight institutions, especially the Court of Accounts (COA) and the General Inspectorate of Finance, while shifting toward performance auditing and advancing digitalization of the budgetary and accounting system to enhance transparency and public spending efficiency in the health sector(Chaabane Faraj, 2017).

Weak governance is particularly evident in resource wastage in pharmaceuticals and medical equipment, including recurrent supply disruptions, shortages of essential medicines, the emergence of parallel markets, and the circulation of substandard or near-expiry imported products. These issues are exacerbated by weak procurement oversight, inadequate storage management, and insufficient transparency.

The World Bank report (2006) on health sector governance in Algeria highlighted the absence of a long-term strategy, weak institutional coordination, and excessive

centralization(Noui Nabila 2015). Nevertheless, the centralization–decentralization debate does not offer an automatic solution; decentralization remains more effective in improving efficiency and bringing oversight closer to service delivery. Moreover, weak integration between service providers and payers undermines oversight effectiveness, requiring stronger accountability from providers in supplying information for monitoring and evaluation, as well as greater involvement of beneficiaries in reporting service quality issues. This is consistent with Tendler's findings, which highlight the positive impact of non-governmental participation in improving health service delivery(Ali Dahman&Bouknadil 2018).

On the revenue side, the Directorate General of Taxes plays a key role in tax collection; however, its effectiveness remains constrained by limited digitalization and fragmented databases, which hinder tax base expansion and weaken anti-evasion capacity, despite ongoing public finance reforms .While progress has been made in budget transparency, Algeria's Open Budget Index score of 20/100 indicates room for further improvement, consistent with many countries undergoing fiscal governance reforms like 43/100 for Egypt, and 62/100 for Botswana. This reflects a significant transparency gap that limits public oversight of the budget process(the international budget partnership).

The transition toward a performance-based budgeting framework, initiated under Organic Law 18-15, is still underway; full implementation will require further development of efficiency indicators and program evaluation capacities. It also does not apply rational choice budgeting (RCB), since each ministry estimates its own expenditures, often leading to inflated budget requests, weak prioritization, and potential public resource waste. Improving efficiency in health investment and reducing misallocation requires strengthening audit and control institutions and enhancing parliamentary oversight through the review of settlement laws and the creation of investigative committees on public financial irregularities. However, legal provisions alone are insufficient; effective reform also depends on modernizing public administration and strengthening anti-corruption mechanisms.

Organic Law No. 18-15 on finance laws represents a major milestone in the reform of public finance in Algeria, as it aims to establish the principles of financial governance through a shift from a budget based on inputs (means) to a budget based on programs and objectives, thereby enhancing transparency, efficiency, and accountability in public financial management. This law introduced a set of provisions focusing on results-based planning, strengthening the role of Parliament in oversight, improving public accounting systems, and promoting the digitalization of financial management. To implement these provisions, a gradual action plan was adopted, including the reform of the legal framework, capacity building of human resources, and the development of information systems. However, the implementation process faces several challenges, mainly weak human resource preparedness, delays in the digitalization of financial systems, and the absence of a performance evaluation culture(Karima Belouadh, 2021).

Overall, improving public expenditure efficiency—especially in the health sector—requires strengthening the independence of oversight institutions, institutionalizing performance-based auditing, expanding financial transparency, and modernizing management and digital systems in order to reduce waste and enhance the efficiency of public resource allocation.

II-Literature review

II-1-Theoretical literature

Fiscal policy theory supports the link between fiscal orientation and public expenditure, emphasizing that fiscal decisions can either increase or reduce government spending based on prevailing priorities. Musgrave (1959) and Johansen (1965) argue that the scope of fiscal policy extends beyond macroeconomic stabilization to include income redistribution and resource reallocation. These objectives are often pursued through progressive taxation and targeted social spending, as well as by influencing health-related behaviors via taxes and

subsidies on specific goods. However, the implementation of fiscal policy can be politicized, with public funds occasionally diverted to serve political agendas rather than development-oriented programs, potentially undermining policy goals. Tanzi (2006) highlights the critical role of institutional quality and the behavior of public officials in determining the effectiveness of fiscal policy. The theory is most valid when it achieves a balance between equity and efficiency objectives, utilizing an appropriate mix of instruments depending on factors such as administrative capacity and societal preferences.

Adolph Wagner's "Law of Expanding State Activities" posits that as a society develops economically and socially, citizens increasingly demand improved social services, prompting an expansion in state activities, including infrastructure investment and social protection expenditures. However, Wagner (1883) emphasizes the importance of government efficiency in service delivery. If public sector efficiency declines relative to the private sector, the share of government spending may also diminish. According to Peacock & Wiseman (1961), if the government loses its comparative advantage in providing services, the proportion of public expenditure relative to GDP may decrease.

Wagner (1883)argues that public expenditure expands as a natural outcome of economic development, driven by increasing social complexity, rising incomes, and technological progress. However, this expansion is constrained by fiscal capacity and tax revenues (Bird, 1971; Peacock & Wiseman, 1961). This perspective is consistent with Wagner's broader view that the expansion of the state's role should remain subject to institutional and fiscal constraints, highlighting the importance of oversight mechanisms such as tax limitation rules that allow citizens to impose ceilings on government budgets and thereby strengthen accountability in public financial management (Jurow Kleiman 2019). Building on this, Friedman (1978)tax–spend hypothesis suggests that taxation determines government spending, implying a unidirectional relationship where higher revenues lead to higher expenditures. In contrast, Cheng (1999) rejects this view, arguing that governments may finance deficits through borrowing, while Buchanan & Wagner (1978)emphasize a negative relationship based on fiscal illusion, where higher revenues reduce the perceived need for public spending.

Peacock & Wiseman (1961)propose the displacement effect, showing that crises generate permanent upward shifts in public expenditure, as higher post-crisis spending rarely returns to previous levels. Barro (1979) reinforces this view, linking current spending to future taxation. However, this literature does not address efficiency concerns, as highlighted by Gupta & Verhoeven (2001) and Afonso et al.(2010, 2013, 2021), who show that fiscal sustainability depends more on expenditure efficiency than expansion. Similarly, Kyriakopoulos et al.(2025)warn that social spending may generate ratchet effects, creating long-term fiscal pressure if not properly managed.

Institutional quality is also central to fiscal outcomes. While direct taxes are often associated with evasion Atkinson (1977), this depends on governance quality and tax administration efficiency Slemrod & Yitzhaki (2002). Fiscal legitimacy theory suggests that trust and transparency improve tax compliance and expand the tax base (Kirchler et al., 2008; Musgrave & Musgrave, 1984a), supporting direct taxation as an equitable financing tool. In contrast, Buchanan (1977a) argues that indirect taxes, being less visible, may increase spending through fiscal illusion.However, indirect taxes remain less equitable and less suitable for health financing in developing economies with narrow tax bases (Feger 2014; Musgrave &Muscrave, 1989b). Yet Bird & Zolt (2005)argue that their regressivity can be mitigated if revenues are effectively redistributed toward social programs benefiting vulnerable groups.

From a political economy perspective, public spending may also reflect short-term electoral incentives (Downs, 1957; Premchand, 1994). In contrast, the developmental state approach emphasizes long-term investment in human capital, particularly health(Jacobs, 2016), Schick (1998)further proposes that effective public financial management requires

macro-fiscal discipline, allocative efficiency, and operational efficiency rather than simple expenditure expansion.

II-2-Empirical evidence

II-2-1-Direct and Indirect Taxation and Government Health Spending

Several studies such as those by Behera and Dash (2019a), Zhou et al. (2020), and Sfakianakis et al. (2021) have examined tax revenue as an independent variable explaining the growth of public health expenditure. These studies generally confirm that higher tax revenue positively influences health spending. However, the majority of existing literature tends to treat total tax revenue as a single aggregated variable, without distinguishing between the effects of direct and indirect taxes. Even in the few instances where this distinction is made such as in the cross-country analysis by Reeves et al.(2015) or the India-specific study by Behera & Dash (2018)the findings are context-dependent and may not be easily generalized to other national settings. Health financing systems are shaped by institutional, economic, and political factors that vary across countries, limiting the external validity of findings, particularly in resource-dependent economies such as Algeria. Moreover, empirical studies distinguishing the effects of direct and indirect taxation on health financing in such contexts remain limited.

This study examines the relationship between direct and indirect tax revenues and government health expenditure in Algeria. It provides context-specific empirical evidence to inform policy design. Direct taxes are expected to support more equitable and sustainable health financing, while indirect taxes may have regressive effects that reduce government health spending. The variation in findings across countries such as those reported by Reeves et al.(2015), Behera & Dash (2018),(Cameron 1978), and(Albayrak 2008) further reinforces the importance of conducting country-specific empirical analyses.Based on this theoretical foundation and in response to the lack of research focused on Algeria, the study develops the following hypotheses:

Hypothesis H1: Direct taxation has a statistically significant positive association with government health spending in Algeria.

Hypothesis H2: Indirect taxation has a statistically significant negatively association with government health spending in Algeria.

II-2-2-GDP per capita growth and Public Health Expenditure

Substantial and expanding empirical literature investigates the role of GDP per capita growth in shaping government spending patterns, including allocations to the health sector. Yet, the evidence remains decidedly mixed. Several studies, such as those by Behera & Dash (2018), Liang & Mirelman (2014), Ke et al. (2011),Piscopo et al. (2024), and Sfakianakis et al. (2021), consistently report a long-run positive association between economic growth and public health expenditure, with income elasticities below unity. This pattern suggests that healthcare is treated as a necessity good, thereby warranting sustained government involvement.

However, contrasting evidence emerges from the work of Zhou et al. (2020), who finds a positive but more than proportional elasticity of health expenditure with respect to income, implying that healthcare may be regarded as a luxury good in certain settings. Conversely, (Ali et Dekaraja 2024), using data from Indian states, find a statistically significant negative relationship between health expenditure and GDP per capita. Similarly, evidence from a broader sample of 12 OPEC countries between 2007 and 2018 (Ghaleno et al. 2023) reveals a negative elasticity of public health expenditure with respect to GDP per capita.

The literature provides no clear consensus on the relationship between GDP per capita and public health expenditure. Some studies suggest that higher income enhances fiscal capacity and increases social spending, while others argue that economic growth may shift resources away from health, particularly in capital-intensive economies. This inconsistency is more pronounced in countries with limited fiscal space and weak prioritization mechanisms.Theoretically, a positive relationship is expected, as higher GDP per capita increases demand for healthcare and improves living standards, leading governments to expand public health spending. Accordingly, this study proposes a positive association between GDP per capita and government health expenditure.

Hypothesis H3: GDP per capita growth has a statistically significant positive association with government health expenditure in Algeria.

II-2-3-Total Government Expenditure and Government Health Spending

Existing studies (Reeves et al.,2015; Behera & Dash, 2018, 2019a; Zhou et al.,2020; Sfakianakis et al.,2021) have primarily focused on the revenue side of fiscal policy, while paying less attention to government expenditure as a key determinant of health spending. However, total public expenditure more accurately reflects fiscal priorities and the extent to which health is prioritized within national budgets, making it central to the achievement of Universal Health Coverage (UHC).

Empirical evidence remains limited on whether increases in total government expenditure translate into higher allocations to the health sector, particularly in fiscally constrained developing economies such as Algeria. While higher public spending is generally expected to increase health investment, this relationship may be influenced by short-term political considerations. International experiences from countries such as Thailand, Cuba, and Colombia show that sustained, long-term investments in health and education—rather than temporary fiscal expansions—have been key to achieving universal health coverage.Based on the above discussion, we propose the following hypothesis:

Hypothesis H4: Total government expenditure has a statistically significant positive association with government health spending in Algeria.

II-2-4-Out-of-Pocket Health Expenditure and Government Health Spending

The literature provides mixed evidence regarding the relationship between government health expenditure (GHE) and out-of-pocket (OOP) payments. Some studies (Grima et al., 2018; Piscopo et al., 2024) find a positive relationship, suggesting complementarity between the two, while others indicate a substitution effect, whereby reductions in public health spending lead to higher private financial burden Silva et al. (2024).

Overall, in fiscally constrained settings, OOP is expected to be inversely related to government health spending. Insufficient public provision shifts healthcare financing to households, thereby reducing financial protection and increasing vulnerability.

Hypothesis H5: Out-of-Pocket Health Expenditure has a statistically significant negative association with government health spending in Algeria.

II-2-5-Moderating role of institutional accountability

Some research, however, has incorporated institutional quality into analyses of public spending (Svensson 1998), for instance, demonstrated that weak legal institutions lead to reduced public spending due to diminished tax morale and increased leakage into the informal sector. Rajkumar & Swaroop (2008)argued that the quality of governance determines whether public spending translates into improved social outcomes. In the African context, Grigoli & Kapsoli (2018) and Gupta & Verhoeven (2001) found that weak institutional capacity significantly undermines health system performance, even when budget allocations increase.

To the best of our knowledge, no prior study has examined the joint effects of fiscal policy and institutional accountability on government health expenditure in Algeria. This

represents a key gap in the literature, particularly given governance challenges such as corruption, weak public financial management, and inefficiencies in health spending (Khelassi et al., 2024). Algeria's ranking of 104th out of 180 countries in the 2024 Corruption Perceptions Index (Transparency International 2024) . Further highlights institutional weaknesses that may limit the effectiveness of fiscal policy.

In this context, institutional accountability is expected to shape how fiscal instruments influence health spending within a Universal Health Coverage (UHC) framework. It is hypothesized to strengthen the redistributive role of direct taxes, improve the efficiency of indirect taxes, and enhance the allocation of public resources toward health. Accordingly, this study introduces institutional accountability as a moderating variable in the relationship between fiscal policy (direct taxes, indirect taxes, GDP per capita growth, out-of-pocket health expenditure, and total government expenditure) and government health spending.Therefore, we hypothesize the following:

H5a. Institutional accountability positively moderates the relationship direct taxes and government health spending in Algeria.

H5b. Institutional accountability positively moderates the relationship between indirect taxes and government health spending in Algeria.

H5c. Institutional accountability positively moderates the relationship between GDP per capita growth and government health spending in Algeria.

H5d. Institutional accountability positively moderates the relationship between general government expenditure and government health spending in Algeria.

H5e. Institutional accountability positively moderates the relationship between Out-of-Pocket Health Expenditure and government health spending in Algeria.

III-Data and methodology

The empirical analysis follows a four-step procedure: data collection, unit root testing (Augmented Dickey–Fuller and Phillips–Perron), econometric model estimation, and post-estimation diagnostic testing to ensure robustness and validity of the results.

III-1-Data and variables

The study employs annual data covering the period 1995–2022, obtained fromthe World Health Organization (WHO), World Bank, IMF, Algerian National Office of Statistics (ONS), CountryEconomy, and V-Demdatabase.It examines the moderating role of institutional accountability in the relationship between fiscal policy and government health expenditure (Zhou et al. 2020 ;Liang et Mirelman 2014 ;Dinga et al. 2024). Government health expenditure (% of GDP) is defined as public spending through budgetary and extra-budgetary channels (WHO, 2011). The main explanatory variables are summarized in Table 1, which reports their sourcesand measurements.

Table n°1: Data sources

Variable	Symbols	Unit	Source
DependentVariable			
Government health spending	GHS	Measured in % of GDP	WHO Global Health Expenditure Database, https://apps.who.int/nha/database + Country Economy,https://countryeconomy.com/
Independent Variable			
Direct taxes	DT	Measured in % of GDP	National Office of Statistics (Algeria), https://www.ons.dz/
Indirect taxes	IDT	Measured in % of GDP	Worldwide Governance Indicator, https://databank.worldbank.org/source/worldwide-governance-indicators + National Office of Statistics (Algeria)
GDP per capita growth	GDP	Annual %	Worldwide Governance Indicator, https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG
General government expenditure	GGE	Measured in % of GDP	Worldwide Governance Indicator (World Bank database), https://www.imf.org/en/Publications/WEO/weo-database/2025/april

OOP health expenditure	OOP	Measured in % of THE	WHO Global Health Expenditure Database, https://apps.who.int/nha/database
Moderator			
Institutional accountability	ACC	Ranges from -1.6 to 1.6	Varieties of Democracy (V-Dem), https://www.v-dem.net/

Source: Processed by the authors

III-2-Econometric methods

This study investigates the determinants of government health expenditure using direct taxes, indirect taxes, GDP per capita, general government expenditure, and out-of-pocket (OOP) spending, while accounting for institutional accountability as a moderating variable. Structural breaks are controlled using dummy variables for 2014 (oil price shock) and 2019 (political instability and COVID-19).

The baseline model is specified as:

$$GHS_t = \beta_0 + \beta_1 DT_t + \beta_2 IDT_t + \beta_3 GDP_t + \beta_4 OOP_t + \beta_5 GGE_t + \beta_6 ACC_t + \beta_7 DUM_{2014} + \beta_8 DUM_{2019} + \varepsilon_t \quad (1)$$

To capture the moderating role of institutional accountability, interaction terms are introduced sequentially:ACC□ × DT□, ACC□ × IDT□, ACC□ × GDP□, ACC□ × GGE□, ACC□ × OOP□ (2–6)

Theoretically, β_6 is expected to be negative.A significant interaction term indicates a moderating effect, while a non-significant one implies a direct effect only. Dummy variables are excluded when necessary to preserve model robustness.

III-2-1-Unit Root Tests

Stationarity is a prerequisite for time-series analysis, as non-stationary variables may lead to spurious results in cointegration tests. This study applies the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests to examine unit roots. The null hypothesis assumes non-stationarity, while the alternative hypothesis indicates stationarity.

III-2-2-ARDL Co-integration Approach

The ARDL bounds testing approach Pesaran et al. (2001) is used to examine long-run relationships among variables integrated of order I(0), I(1), or a combination, provided none are I(2). It is suitable for small samples and allows simultaneous estimation of short- and long-run dynamics while addressing endogeneity and autocorrelation(Haug, 2002;Narayan & Narayan, 2010).

III-2-3-Testing for the Existence of a Long-Run Relationship

The existence of a long-run relationship is tested using the ARDL bounds testing procedure based on the specification in Equation (7), followingPesaran et al. (2001). The test assesses the joint significance of lagged level variables to determine whether cointegration exists among the variables.

$$\Delta GHS_t = \theta_0 + \theta_1 GHS_{t-i} + \theta_2 DT_{t-i} + \theta_3 IDT_{t-i} + \theta_4 GDP_{t-i} + \theta_5 GGE_{t-i} + \theta_6 OOP_{t-i}$$

$$+ \sum_{i=1}^{k} \gamma_{1i} \Delta GHS_{t-i} + \sum_{i=0}^{k} \gamma_{2i} 1\Delta DT_{t-i} + \sum_{i=0}^{k} \gamma_{3i} \Delta IDT_{t-i} + \sum_{i=0}^{k} \gamma_{4i} \Delta GDP_{t-i} +$$

$$\sum_{i=0}^{k} \gamma_{5i} \Delta GGE_{t-i} + \sum_{i=0}^{k} \gamma_{6i} \Delta OOP_{t-i} + \varepsilon_t (7)$$

The null hypothesis assumes no cointegration among the variables:

The null hypothesis is $\theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = 0$

The alternative hypothesis indicates the presence of a long-run relationship:

The alternative hypothesis is non H0

Rejection of the null hypothesis confirms the existence of a statistically significant long-run equilibrium relationship among the variables.

III-2-4-Selection of the Optimal Lag Length in the ARDL Model

The optimal lag length is selected using the Schwarz Information Criterion (SIC), where the lowest value indicates the preferred specification. The ARDL bounds test is then used to assess cointegration by comparing the F-statistic with critical values. Values above the upper bound confirm a long-run relationship, while values below the lower bound indicate no relationship; intermediate values are inconclusive. Once cointegration is confirmed, both short-run and long-run dynamics are estimated.

III-2-5-Error Correction Model (ECM)

Short-run dynamics are estimated using an ARDL-based ECM(see Equation 8).The error correction term (ECT) must be negative and significant, indicating adjustment toward long-run equilibrium.

$$\Delta GHS_t = \beta_0 + \sum_{i=1}^{k} \pi_1 \Delta GHS_{t-i} + \sum_{i=0}^{k} \pi_2 \Delta DT_{t-i} + \sum_{i=0}^{k} \pi_3 \Delta IDT_{t-i} + \sum_{i=0}^{k} \pi_4 \Delta GDP_{t-i} +$$

$$\sum_{i=0}^{k} \pi_5 \Delta GGE_{t-i} + \sum_{i=0}^{k} \pi_6 \Delta OOP_{t-i} + \emptyset ECT_{t-i} + \varepsilon_t \quad (8)$$

In Equation (8), π captures short-run dynamics, while ϕ is the error correction term (ECT), which must be negative and significant, indicating adjustment toward long-run equilibrium. Moderation effects are tested through interaction terms between institutional accountability and fiscal variables, with X denoting fiscal variables and Z all first-differenced variables, including interactions.

$$\Delta GHSt = \rho 0 + \rho 1 \Delta GHS_{t-i} + \rho 2\, X_{t-i} + \rho 3 \Delta ACC_{t-i} + \rho 4 \Delta (X \times ACC)t + \sum_{i} \varphi \Delta Zt - + \varepsilon t \quad (9)$$

III-2-6-Stability and Diagnostic Tests

Model robustness is assessed using the Breusch–Godfrey LM test (serial correlation), Breusch–Pagan–Godfrey test (heteroscedasticity), Ramsey RESET test (specification), and Jarque–Bera test (normality). Stability is tested using CUSUM and CUSUMQ, where stability is confirmed if plots remain within 5% bounds.

IV-Estimated Results and Discussion

This section presents and interprets the estimated results. The discussion begins with descriptive statistics and an exploration of the correlations among the variables.

Table n°2: Descriptive statistics

	GHS	DT	IDT	GDP	OOP	GGE	ACC
Mean	0.03	0.045	0.071	6.509	0.013	0.33	0.202
Median	0.028	0.046	0.072	0.292	0.016	0.329	0.2
Maximum	0.043	0.111	0.09	89.805	0.051	0.409	0.31
Minimum	0.017	0.02	0.054	0.211	-0.066	0.264	0.06
Std, Dev,	0.007	0.021	0.01	22.75	0.022	0.047	0.066
Coefficient of Variation	0.236	0.466	0.138	3.495	1.692	0.141	0.328
Skewness	0.327	1.045	-0.118	3.335	-1.546	0.065	-0.375
Kurtosis	1.987	4.514	2.14	12.137	7.499	1.611	2.519
Jarque-Bera	1.697	7.774	0.928	149.284	34.77	2.272	0.925
Probability	0.428	0.021	0.629	0.000	0.000	0.321	0.63
Observations	28	28	28	28	28	28	28

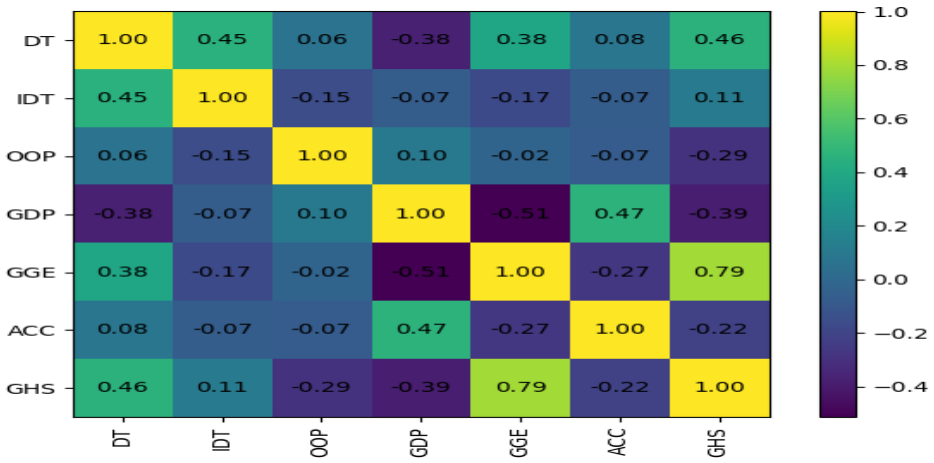
Source: Processed by the authors based on Eviews 13 outputs

IV-1-Descriptive Statistics

Table 2 reports descriptive statistics for 28 annual observations. Higher variability is observed in OOP (3.495), GDP growth (1.692), DT (0.466), and ACC (0.328), while GHS (0.236), IDT (0.138), and GGE (0.141) show lower dispersion. Skewness is mixed across variables, with IDT, GDP, and ACC negatively skewed. Kurtosis indicates both leptokurtic (DT, OOP, GDP) and platykurtic (GHS, IDT, ACC, GGE) distributions, and overall the variables deviate from normality.

The Jarque–Bera test rejects normality for IDT, GGE, and ACC at the 5% level, while DT, GDP, and OOP are normally distributed. Overall, the data show non-normal and asymmetric distributions. The correlation matrix (Figure 1) indicates no multicollinearity, as all pairwise correlations are below 0.6 (in absolute value).

Figure n°1: Correlation heatmap



Source: Processed by the authors based on R-Studio.

IV-1-1-Unit Root Test Results

Prior to cointegration analysis, stationarity is examined using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests, where PP is more robust to heteroskedasticity and serial correlation (Argyro& Stylianos,2010). Results (Table 3) show that government health expenditure, direct taxes, GDP per capita, and institutional accountability are stationary at level and/or first difference. In contrast, indirect taxes, out-of-pocket expenditure, and general government expenditure become stationary after first differencing, indicating integration of order I(1). Overall, all variables are integrated of order I(0) or I(1), with no I(2) variables, confirming the validity of the ARDL bounds testing approach.

Table n°3: Unit root tests for ADF and PP.

Variables	ADF test		Decision	PP test		Decision
	At Level	At First Difference		At Level	At First Difference	
GHS	-2.720*	-	I(0)	-1.005	-2.640*	I(1)
DT	-3.981***	-	I(0)	-3.644**	-	I(0)
IDT	-2.234	-4.060***	I(1)	-2.164	-3.902***	I(1)
GDP	-3.767***	-	I(0)	-3.736***	-	I(0)
GGE	-1.924	-5.522***	I(1)	-1.813	-7.049***	I(1)
OOP	1.444	-5.263***	I(1)	-0.423	-4.770***	I(1)
ACC	-2.485	- 4.517***	I(1)	-2.634*	-	I(0)

Notes: *, **, * indicate the significance of variables at 10%, 5%, and 1% levels, respectively.**

Source: estimate by the authors using Eviews 13

IV-1-2-Cointegration Analysis

Following the confirmation of the integration order of the variables, the next step involves testing for the existence of cointegration relationships among them, the optimal lag length was selected using the Schwarz Information Criterion (SIC). The ARDL bounds testing approach was then employed to examine cointegration among the variables. Table 4 presents the optimal lag structures and the corresponding F-statistics for the five estimated models. The results consistently indicate the existence of a long-run relationship among the variables. In the baseline model, the computed F-statistic (11.156) exceeds the upper critical bound at the 1% significance level, leading to the rejection of the null hypothesis of no cointegration. These findings confirm the presence of a stable long-run equilibrium relationship between fiscal variables and government health expenditure in Algeria, thereby justifying the estimation of long-run coefficients.

Moreover, the null hypothesis was also rejected when incorporating the interaction terms, DT*ACC, IDT*ACC, GDP*ACC, OOP*ACC, and GGE*ACC, into the models. The corresponding F-statistics were approximately 21.135, 19.869, 23.142, 6.923, and 11.617, respectively, all of which exceed the upper critical bound at the 1% significance level. These results provide further evidence of a stable long-term cointegration relationship among the variables, including the moderating role of institutional quality.

Table n°4: Results from the ARDL bounds test

Spec	Main Model	k	Optimal lags	F-statistic	Decision	Significance level	Lower Bound I (0)	Upper Bound I (1)
1	[GHS, DT, IDT, OOP GDP, GGE, ACC]	1	(1, 0, 1, 0, 0, 1, 1)	11.156***	Cointegration exists	1%	3.15	4.43
						5%	2.45	3.61
						10%	2.12	3.23
Spec	Moderating Model	k	Optimal lags	F-stat		Significance level	I (0) Bound	I (1) Bound
2	[GHS, DT, DT*ACC, IDT, OOP, GDP, GGE, ACC]	**3**	(3, 0, 1, 0, 1, 1, 0, 0)	21.135***	Cointegration exists	1%	2.96	4.26
3	[GHS, DT, IDT, IDT* ACC, OOP, GDP, GGE, ACC]	**2**	(2, 0, 1, 0, 0, 1, 0, 1)	19.869***	Cointegration exists	1%	2.96	4.26
4	[GHS, DT, IDT, OOP, GDP, GGE, GDP* ACC, ACC]	**1**	(1, 0, 1, 0, 0, 1, 1, 0)	23.142***	Cointegration exists	1%	2.54	3.91
5	[GHS, DT, IDT, OOP, GDP, GGE, OOP*ACC, ACC]	**3**	(3, 0, 1, 0, 1, 0, 1, 1)	6.923***	Cointegration exists	1%	2.96	4.26
6	[GHS, DT, IDT, OOP, GDP, GGE, GGE*ACC,	**1**	(1, 0, 1, 1, 0, 1, 0, 1)	11.617***	Cointegration exists	1%	3.31	4.63

	ACC]							

Note: ***denote 1%- significance levels.

Source: estimate by the authors using Eviews 13.

IV-1-3-ARDL Model Results for Short-and Long-Run Periods (Models 1 to 6)

IV-1-3-1-The effect of direct tax on government health spending:

Following cointegration, the ARDL model was estimated to assess short- and long-run effects. The results (Table 6) indicate a positive and statistically significant long-run relationship between direct taxes and government health expenditure across most specifications. In the baseline model, the coefficient is 0.149, implying that a 1% increase in direct taxes (as a share of GDP) raises long-run government health spending by 0.149%. This supports the "tax-and-spend" hypothesis (Friedman, 1978), which posits that increases in tax revenues, particularly those generated from direct taxes, enhance the government's capacity to fund public services, including healthcare and is consistent with prior studies (Reeves et al., 2015; Kazemikhasragh&Buoni Pineda, 2023).

Table n°5: Short-term relationships (ARDL model).

Variable	Spec 1 (Main)	Spec 2 (IQ*DT)	Spec 3 (IQ*IDT)	Spec 4 (IQ*OOP)	Spec 5 (IQ*GDP)	Spec 6 (IQ*GGE)
Short-run Coefficients	Coeff (Prob)	Coeff (Prob)	Coeff (Prob))	Coeff (Prob)	Coeff (Prob)	Coeff (Prob)
ECM(-1)	-0.2995 (0.0049)***	-0.3733 (0.0000)***	-0.3629 (0.0000)***	-0.3015 (0.0000)***	-0.2652 (0.0000)***	-0.6491 (0.000) ***
D(GHS(-1))	-	-0.4787 (0.0000)***	-0.2856 (0.0004)***	-0.6844 (0.0000)***	-	-
D(GHS(-2))	-	-0.4130 (0.0001)***	-	-0.3612 (0.0004)***	-	-
D(DT)	-	-	-	-	-	-
D(IDT)	0.1443 (0.0213)**	0.1394 (0.0005)***	-0.2992 (0.0000)***	0.2265 (0.0000)***	0.1385 (0.0066) ***	0.2100 (0.000) ***
D(GDP)	-	-	-	-	-	-0.0099 (0.392) ***
D(GGE)	-	0.0366 (0.0000)***	-	0.0513 (0.0000)***	-	-
D(OOP)	-1.79E-05 (0.3913)	-6.83E-05 (0.0000)***	-1.34E-05 (0.2461)	-	-1.66E-05 (0.3654)	-4.30E-05 (0.059) ***
D(ACC)	-0.0257 (0.0138)**	-	-	-0.1517 (0.0000)***	-0.0292 (0.0001) ***	-
D(IQ*IDT)	-	-	2.2547 (0.0000)***		-	-
D(IQ*OOP)	-	-	-	0.4986 (0.0000)***	-	-
D(IQ*GGE)	-	-	-	-	-	0.8276 (0.000) ***
D2019	-0.0080 (0.0003)***	-	-0.0066 (0.0000)***	-	-0.0085 (0.0000) ***	-
D2014	0.0034 (0.0406)**	0.0069 (0.0000)***	0.0024 (0.0076)***	0.0059 (0.0000)***	-	0.0052 (0.000) ***
Constant	0.0099 (0.1572)	-0.0002 (0.2026)	0.0525 (0.0000)***	-0.0024 (0.0079)***	-	0.0531 (0.000) ***

Note: *, ** and ***statistical signifcance at 10%, 5% and 1% levels, respectively

Source: Author's own estimates.

The results become stronger when institutional accountability is introduced as an interaction term. The coefficient of (DT × ACC) increases to 0.2153 and remains statistically significant, indicating that higher accountability enhances the positive effect of direct taxes on health spending. These findings suggest that the positive interplay between direct taxes and institutional accountability enhances the government's capacity to respond more effectively to equity-oriented demands, particularly in light of the progressive nature of direct taxation(Razzaque et al., 2023). Although direct taxes may be affected by evasion and avoidance (Atkinson, 1977), this constraint is reduced under stronger institutional accountability. Improved governance strengthens tax collection and limits inefficiencies, consistent with Slemrod and Yitzhaki (2002).

The lagged dependent variable captures memory effects in government health expenditure, indicating that current changes are driven by past spending dynamics. Its negative and statistically significant coefficient suggests a short-run corrective adjustment, whereby previous increases are partially reversed, reflecting fiscal stabilization and weak persistence in health expenditure.

IV-1-3-2-The effect of indirect tax on government health spending:

Across specifications (1), (2), and (3), in the long run, the effect of indirect taxes on health spending appears constrained by their regressive nature and the government's cautious fiscal stance during periods of low hydrocarbon prices. Moreover, the modified Bayesian Information Criterion (BIC′) strongly favors Model 3 over the alternative specifications. This result indicates that an increase in indirect taxes exerts a contractionary effect on government health expenditure in the long term. This can be explained by the fact that higher indirect taxation tends to raise the overall price level in the economy, thereby reducing the real purchasing power of households even when nominal wages remain unchanged. As real income declines, household consumption decreases, including spending on private healthcare services, which in turn weakens aggregate demand for health services.

In an economic environment characterized by declining economic activity, production, and investment, governments tend to adopt more cautious fiscal policies in order to preserve macroeconomic stability. This fiscal restraint ultimately slows the growth of public health expenditure relative to the actual needs of the population. These findings are consistent with several empirical studies, including Kazemikhasragh&Buoni Pineda (2023), Behera and Dash (2018), Cameron (1978), and Albayrak (2008), all of which document that indirect taxes may depress government health expenditure. Our results also align with the arguments of Musgrave (1959) and Ataguba (2021), who argue that indirect taxes are a less equitable instrument for financing social expenditure and are therefore less suitable for funding the health sector.

Although a positive short-run effect is observed (0.14), specification (3) shows that the interaction between indirect taxes and institutional accountability (IDT × ACC) is positive and statistically significant at the 1% level, with coefficients of 2.25 in the short run and 7.14 in the long run. This suggests that indirect taxes, when combined with stronger institutional accountability, significantly increase government health expenditure in Algeria. The results are consistent with the "fiscal illusion" hypothesis, whereby less visible forms of taxation may support higher public spending, particularly when institutional quality ensures effective translation of revenues into expenditure outcomes.

IV-1-3-3-GDP per capita growth and government health spending

All models indicate the absence of a short-run relationship between GDP per capita and government health expenditure. This finding may reflect periods of political instability and the global health crisis in 2019, during which health expenditure increased despite weak economic growth, driven by intensified social and public health policy responses. These

findings are consistent with (Rana et al. 2019),(Tapia Granados 2012)and(Hansen et King 1996), but contrast with studies reporting long-run cointegration between income and health spending (e.g., D. K. Behera & Dash, 2018; Shimul et al., 2023; Szymańska, 2025). The divergence likely reflects differences in data structure, institutional settings, and sample periods. Methodologically, the model may suffer from potential misspecification due to the limited consideration of supply-side constraintsin the health sector, where limited infrastructure and human resources reduce responsiveness of spending to income changes.

IV-1-3-4-The effect of out-of-pocket healthcare expenditure on government health spending:

Out-of-pocket health expenditure (OOPHE) shows a negative and statistically significant long-run effect on government health spending across all models. In the baseline specification, a 1% reduction in OOPHE is associated with a 0.0004% increase in government health expenditure, suggesting a weak substitution effect where governments partially compensate for reduced private spending. The small magnitude of the coefficient reflects a limited fiscal response by the government in Algeria.This result is consistent with (Silva et al. 2024)and(Grima et al. 2018).

Table n°6:Long-term relationships (ARDL model).

Variable	Spec 1 (Main)	Spec 2 (IQ*DT)	Spec 3 (IQ*IDT)	Spec 4 (IQ*OOP)	Spec 5 (IQ*GDP)	Spec 6 (IQ*GGE)
Long-run Coefficients	Coeff (Prob)	Coeff (Prob)	Coeff (Prob)	Coeff (Prob)	Coeff	Coeff (Prob)
DT	0.149 (0.054)***	-0.8896 (0.106)	0.2788 (0.031)**	-0.6892 (0.155)	0.1475 (0.078)*	0.141 (0.01)***
IDT	-0.355 (0.010)**	-0.1215 (0.399)	-1.9020 (0.018)**	0.0993 (0.478)	-0.3950 (0.024)**	0.112 (0.21)
GDP	0.038 (0.402)	-0.0069 (0.914)	0.0476 (0.370)	-0.0232 (0.772)	0.0649 (0.593)	0.043 (0.38)
GGE	0.070 (0.035)**	0.2179 (0.062)*	0.0409 (0.316)	0.4193 (0.022)**	0.0893 (0.031)**	-0.238 (0.00)***
OOP	-0.0004 (0.000)***	-0.0003 (0.012)**	-0.0004 (0.008)***	-0.2978 (0.032)**	-0.0004 (0.000)***	-0.0002 (0.00)***
ACC	-0.029 (0.130)	-0.1270 (0.012)**	-0.5169 (0.018)**	-0.4353 (0.030)**	-0.0324 (0.177)	-0.405 (0.00)***
IQ*IDT	-	-	7.1496 (0.022)**	-	-	-
IQ*GDP	-	-	-	-	0.0142 (0.989)	-
IQ*GGE	-	-	-	-	-	1.334 (0.00)***
IQ*DT	-	3.8935 (0.015)**	-	-	-	-
IQ*OOP	-	-	-	1.5542 (0.032)**	-	-
Constant	-	-0.8896 (0.106)	0.2788 (0.031)**	-0.6892 (0.155)	0.1475 (0.078)*	0.141 (0.01)**
BIC	-10.18	- 9.794	-10.83	- 10.80	- 9.99	- 10.28

Note: *, ** and ***statistical signifcance at 10%, 5% and 1% levels, respectively
Source: Author's own estimates.

When institutional accountability is introduced (OOP × ACC), the relationship becomes positive and significant, with a coefficient of 1.5542. This indicates that stronger accountability transforms OOPHE from a substitute into a complement of public health spending. The findings highlight that institutional quality is key in strengthening financial protection and improving government responsiveness to private health burdens.

IV-1-3-5-The effect of general government expenditure on government health spending:

General government expenditure is positively and significantly associated with health spending in the long run. In the baseline model, a 1% increase in total public expenditure raises government health spending by 0.07%. Although modest, this indicates a stable fiscal linkage between overall government spending and health allocation.

When interacting with accountability (GGE × ACC), the effect increases sharply ($\beta = 1.33$, $p < 0.01$), suggesting that institutional quality strengthens the allocation of fiscal resources toward health by giving it greater priority in government spending decisions. This finding is consistent with (Ke et al., 2011), who argue that fiscal capacity alone is insufficient, as the effective translation of public resources into health investment depends critically on institutional quality, particularly accountability.

IV-1-3-6-The effect of accountability on government health spending:

Institutional accountability is generally negative and statistically significant in both short and long run across most specifications. This suggests that stronger accountability reduces government health expenditure, likely through improved efficiency, tighter oversight, and reduced corruption. This is consistent with Barra et Ruggiero(2023), Monterubbianesi et al. (2017), and Novignon (2015).

The validity of this interpretation is particularly evident when examining the experience of oil-exporting countries in the region. In countries such as Kuwait and Oman, expenditure levels in the health sector are relatively low, despite these countries recording the highest scores on the "Voice and Accountability" index, as noted by (Kamaly and El-Said (2017). Consequently, the lower spending in these countries does not necessarily indicate governmental neglect; rather, it reflects the effectiveness of institutional accountability in controlling financial waste and achieving better health outcomes at a lower cost.

Finally, the error correction terms are negative and statistically significant across all models (ranging from -0.2652 to −0.6491), confirming convergence toward long-run equilibrium after short-run shocks.

V-Diagnostic and stability tests

Table 7 presents the results of various diagnostic tests applied across all estimated models, confirming their reliability and absence of bias. The Breusch-Godfrey serial correlation test fails to reject the null hypothesis of no autocorrelation, indicating that serial correlation is not a concern. Similarly, the results of the Breusch-Pagan-Godfrey test for heteroscedasticity suggest that the models do not suffer from variance instability

In addition, the Ramsey RESET test shows no evidence of functional form misspecification, implying that the model's structure is correctly specified. The Jarque-Bera test results further indicate that the model residuals are normally distributed. The coefficient of determination (R^2) indicates strong explanatory power of the estimated models, with values showing that between 89% and 97% of the variation in public health expenditure is explained by the included

variables. Figure 2 displays the plots of the CUSUM and CUSUMSQ stability tests. In both cases, the test lines remain within the critical bounds at the 5% significance level (denoted by the orange dashed lines). Accordingly, the null hypothesis of parameter stability cannot be rejected. This indicates that the model parameters exhibit no structural instability over the study period.

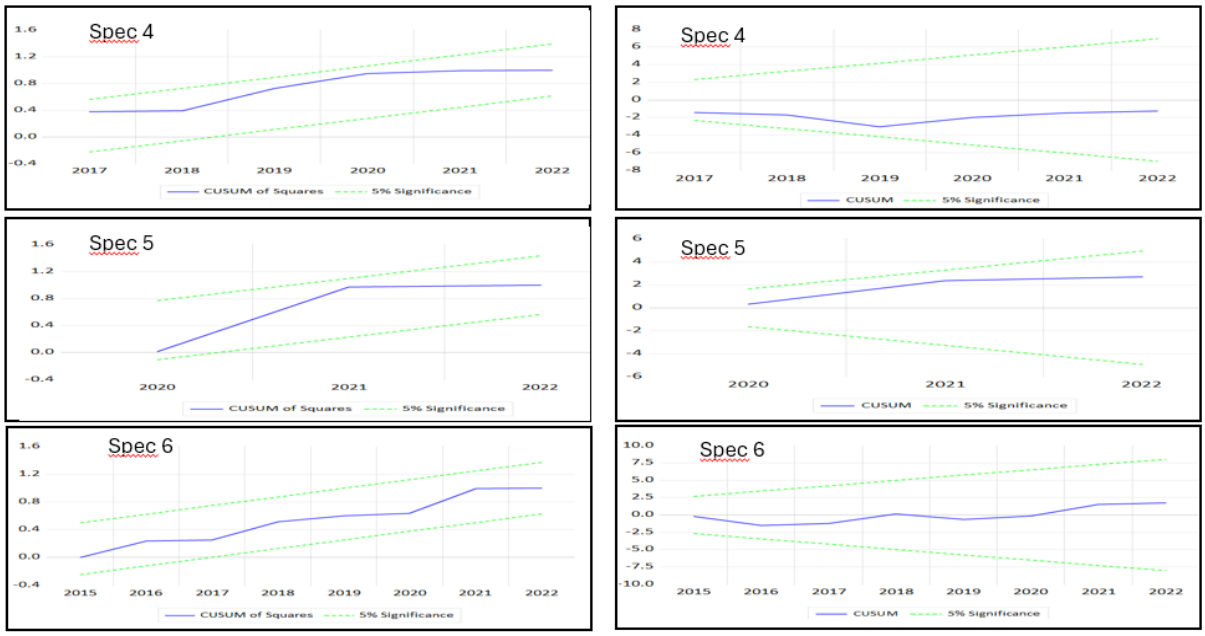
Table 7: Diagnostic tests results

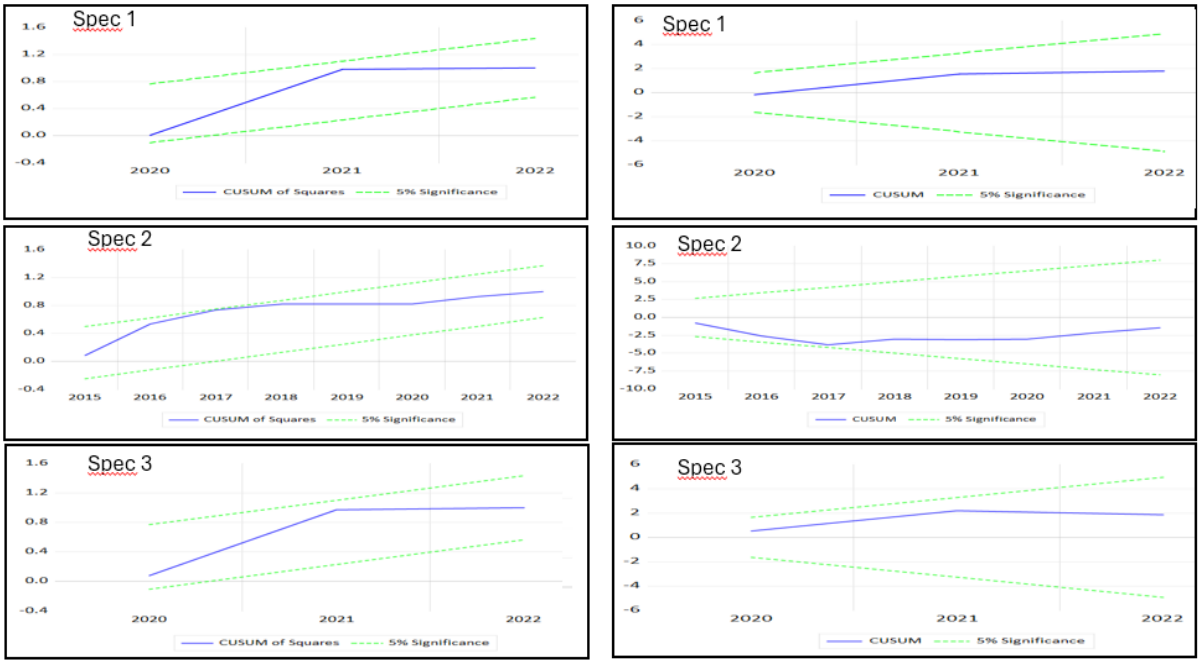
Specification 1		Specification 2		Specification 3		Specification 4		Specification 5		Specification 6		Decision
Test Statistics	p-value	Test Statistics	p-value	Test Statistics	p-value	Test Statistics	p-value	Test Statistics	p-value	Test Statistics	p-value	
JB =1.300	0. 521	JB =4.611	0.099	JB =0.103	0.949	JB =1.270	0. 529	JB =0. 662	0.717	JB =0.611	0.736	Residuals are normally distributed
$\chi2$ =2. 679	0.109	$\chi2$ =5. 50	0.006	$\chi2$ =2.28	0. 31	$\chi2$ =0.36	0. 54	$\chi2$ =5.504	0.06	$\chi2$ =6.03	0.05	No serial correlation (accept H0)
$\chi2$ =21.83	0. 08	$\chi2$ =14.73	0.256	$\chi2$ =11. 97	0. 608	$\chi2$ =13. 68	0. 62	$\chi2$ =5.504	0.25	$\chi2$ =21.83	0.08	No heteroscedasticity (accept H0)
F=0.216	0. 649	F=5.463	0.629	F=1. 524	0.245	F=1.082	0.328	F=0.016	0. 89	F=0.246	0.629	The specification is consistent
-	-	-	-	-	-	-	-	-	-	-	-	Stability Verified (see Fig. 2)
-	-	-	-	-	-	-	-	-	-	-	-	Stability Verified (see Fig. 2)
0.93		0.89		0.96		0.97		0.89		0.93		Model denotes a solid fit

Source: Author's own estimates.

Diagnostic Test	Jarque-Bera Normality Test	[illegible] Correlation LM Test (χ2)	Breusch/Pagan heteroskedasticity test (χ2)	Ramsey RESET test (F)	CUSUM Test	CUSUM of Squares Test	R^2

Figure n°2: CUSUM and CUSUMQ of all specifications.





Source: Processed by the authors based on Eviews 13 outputs

VI- Conclusions and policy implications

VI-1- Conclusions

The results indicate that direct taxes have a positive effect on health expenditure, with a coefficient of 0.149; however, this effect remains weak. This finding influenced by a relatively narrow non-hydrocarbon tax base, a significant informal sector (estimated between 25–40%), and a historical dependence on hydrocarbon revenues, which constrains the capacity of the tax administration to efficiently mobilize resources. This weakness is further reinforced by the dominance of oil revenues, where hydrocarbons account for over 60% of budget revenues, and nearly 95% of export earnings. Such dependence reduces institutional incentives to develop non-oil tax revenues and increases the vulnerability of health financing to fluctuations in oil prices, thereby highlighting the need to continue economic diversification efforts to reduce fiscal fragility.

In contrast, the results show that interaction between direct taxes and accountability is positive and stronger, indicating that strengthening transparency and accountability—particularly through the modernization and digitalization of tax collection systems—helps reduce tax evasion and improve collection efficiency. In this regard, the role of oversight institutions such as the Court of Accounts and the National Authority for the Prevention and Fight against Corruption (ANLC) is crucial in strengthening tax compliance. However, the limited implementation of performance evaluation reports within the Directorate General of Taxes (DGI), and the continued emphasis on compliance-based auditing rather than performance-based control, reduce the effectiveness of these reforms. Accountability remains largely procedural and focused on financial verification, rather than being extended to actual performance outcomes in tax collection. Therefore, it is essential to shift toward results-based accountability, holding the DGI responsible for discrepancies between projected and actual tax revenues, as well as for the effectiveness of tax incentives.

The results further indicate a positive relationship between indirect taxes and health expenditure in the short run, but a negative relationship in the long run. This pattern can be explained by the structure of Algeria's tax system, which relies heavily on indirect taxes,

accounting for more than 53% of total tax revenues. While such taxes may provide relative short-term fiscal stability, they are structurally less sustainable over the long term, particularly in the context of consumption volatility and shifts in trade policy. Moreover, the heavy reliance on indirect taxation contributes to higher overall price levels, thereby eroding households' purchasing power, especially in the presence of relatively rigid wages. This dynamic may lead to a sustained increase in out-of-pocket health expenditure. In addition, given Algeria's strong dependence on hydrocarbon revenues, fluctuations in oil prices often necessitate cautious fiscal policies, particularly during periods of economic downturn. Such fiscal restraint limits the government's capacity to expand public health spending, resulting in growth that lags behind the rising healthcare needs of the population.

Moreover, the regressive nature of indirect taxes places a disproportionate burden on lower-income groups, thereby reinforcing inequality. These findings underscore the importance of strengthening progressive direct taxation based on higher-income brackets in order to ensure equity in access to healthcare and to support the achievement of universal health coverage.However, When accountability improves, tax efficiency and allocation increase, allowing more revenues to support health spending; In this case, the impact of indirect taxes may become positive in terms of financing capacity.

Out-of-pocket health expenditure is negatively associated with public health spending in the absence of strong institutions, despite the formal provision of subsidized care and coverage of at least 80% of medicine costs for insured individuals. High OOP levels persist due to institutional inefficiencies and limited access to quality services, which push households toward private spending. In contrast, stronger institutional accountability improves the alignment between public spending and household financial burdens, making the relationship positive and more effective through enhanced transparency and policy responsiveness.

The results indicate no short-run relationship between GDP per capita and government health expenditure, likely due to political instability and the 2019 health crisis, alongside structural constraints in the health sector that limit responsiveness to income changes.

Finally, Accountability is found to be negatively associated with health spending, which should not be interpreted as reduced commitment, but rather as improved efficiency in reducing waste and achieving better outcomes with fewer resources. Overall, the findings highlight that institutional quality is the key transmission channel through which fiscal instruments affect health financing in Algeria

VI-2-Policy Implications

- Tax policy could gradually increase the share of direct taxation by fostering investment and strengthening the performance of public institutions. A streamlined system of tax brackets and well-targeted exemptions would help improve both equity and revenue mobilization, building on current Gini indicators (4.78).
- Building on existing audit mechanisms, the General Directorate of Taxes (DGI) could further enhance accountability by introducing performance-based assessments of tax collection, regularly evaluating tax expenditures, and reinforcing the follow-up of audit recommendations.

- Further development of contracting procedures and coordination mechanisms between social security and healthcare institutions, alongside continued reinforcement of medical monitoring systems, would consolidate recent progress in this area.
- The full operationalization of Law 07-23, through the deployment of an integrated accounting system in public health institutions and cross-ministerial coordination (Finance, Health, Digitalization), would further strengthen transparency and expenditure tracking.
- A strategic restructuring of indirect taxation could include better targeting of exemptions, focusing reduced rates on essential goods, enhancing VAT credit recovery mechanisms, and gradually phasing out exemptions in the oil, gas, and real estate sectors, and thereby increasing fiscal space for health.
- Reforms of social security (CNAS) could further simplify procedures, optimize contribution rates, and encourage the progressive formalization of economic activities, complemented by wage policies that foster employment in the formal sector.
- Continued efforts to strengthen economic diversification, through targeted support for non-hydrocarbon sectors, would enhance fiscal resilience and reduce vulnerability to oil price fluctuations.
- Enhancing the operational independence and legal authority of oversight institutions (Court of Accounts, General Inspectorate of Finance) would further strengthen the effectiveness of public spending control.
- Further modernization of healthcare institution management; through cost accounting systems, can improve both expenditure control and the efficiency of health spending. The establishment of National Health Accounts (NHA) would also reinforce monitoring, transparency, and evidence-based resource allocation, supporting long-term sector planning.

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