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Measuring the Relationship Between Fiscal Discipline and Intergenerational Fiscal Sustainability Using the Autoregressive Distributed Lag (ARDL) Model

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Abstract: This research focuses on the centrality of fiscal discipline in achieving intergenerational fiscal sustainability in Iraq, a rentier economy that relies primarily on unsustainable oil revenues. It highlights the key challenges that undermine sustainability between current and future generations, including the misallocation of public spending, its weak efficiency, and the low contribution of tax revenues to GDP. The research confirms that enhancing fiscal discipline through rationalizing spending and controlling waste is an indispensable strategic approach to building a solid economic foundation capable of confronting resource fluctuations, ensuring long-term fiscal stability, and guaranteeing the rights of future generations to fiscal resources, whether in the form of withheld funds or economic projects with sustainable fiscal returns.

Keywords: Fiscal Discipline, Intergenerational Fiscal Sustainability, Fiscal Sustainability, Intergenerational Equity

1. Introduction

Generational fiscal sustainability refers to the balance between intergenerational benefits and fiscal policy sustainability. Most countries around the world face multiple imbalances and ongoing global fluctuations that impact how fiscal resources should be managed to meet the needs of the current generation and secure the rights of future generations [1], [2].

This requires periodic adjustments to government spending, taxes, and public debt through what is known as fiscal discipline, which is a fundamental pillar for controlling fiscal resources in rentier economies, most notably the Iraqi economy, which is entirely dependent on unsustainable oil revenues to finance its obligations [3]. Furthermore, achieving efficient use of fiscal resources and reducing waste and extravagance represents an indispensable strategic goal in light of resource scarcity and instability. Thus, Iraq faces fundamental challenges that hinder the achievement of intergenerational financial sustainability [4], [5].

Commitment to the rules of fiscal discipline emerges as a crucial first step towards building a stable, sustainable, and just economy that achieves a balance between current needs and future guarantees. The research problem is evident in the stark contradiction between Iraq's vast fiscal potential (the sixth-largest oil reserves in the world) and its weak intergenerational fiscal sustainability (such as recurring budget deficits and high public debt as a percentage of GDP) [6]. This raises the central question: How can intergenerational fiscal sustainability be achieved through fiscal discipline, given the

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structural distortions that deepen waste and undermine the efficiency of public spending in Iraq?

The research is important in revealing how to transform the Iraqi economy from a fragile rentier model to a sustainable one through fiscal discipline. It also provides governments with predictive warnings about the risk of financial collapse and the resulting lack of intergenerational fiscal sustainability and inefficient management of public funds [7], [8].

The research assumes that "strict adherence to the rules of fiscal discipline (controlling current spending, increasing the efficiency of resource allocation, and enhancing non-oil revenues) is the decisive gateway to achieving intergenerational fiscal sustainability in Iraq."

2. Materials and Methods

Literature Review

Fiscal discipline

Fiscal discipline is defined as "a set of preventive and remedial measures taken by Fiscal authorities for the purpose of avoiding imbalances arising from or leading to Fiscal crises, by identifying problems before the disaster occurs and obligating the relevant authorities to take the necessary measures in a manner that prevents exposure to the risks of Fiscal failure, which in turn leads to a collapse of confidence in the state's finances" [9], [10].

The Economic Importance of Fiscal Discipline

1. Public Debt Management:

One of the primary objectives of fiscal discipline is public debt management. It works to reduce debt by reducing the general budget deficit, rationalizing government spending, and avoiding unnecessary debt to maintain the public debt-to-GDP ratio at acceptable levels. In many countries around the world, in order to achieve fiscal discipline and limit excessive debt demand, specific ratios have been set for budget deficits and debt-to-GDP ratios. An example of this is the European Union, which requires governments within the union to keep their budget deficits below 3% of GDP and their public debt below 60% of GDP to ensure fiscal stability, according to the Maastricht Treaty in the Netherlands in 1992 [11].

2. Building strong fiscal institutions:

Building fiscal institutions with a strong fiscal foundation, such as the Budget Stabilization Fund and the Sovereign Wealth Fund, depends on governments' ability to achieve disciplined spending habits and allocate surplus funds to these funds, which can be used as precautionary fiscal reserves to address unexpected economic shocks affecting the state of the general budget and mitigate their impact. This can protect the budget structure from deviations, enhance fiscal stability and soundness, and reduce the need to rely on borrowing during these times [12].

3. Enhancing Economic Efficiency:

Economic efficiency refers to the situation in which the same goals can be achieved with fewer economic resources, i.e., achieving maximum production with the least amount of resources. Fiscal discipline can enhance economic efficiency through the precise allocation and direction of financial resources in a manner that maximizes the efficiency of government spending and maximizes its impact, while addressing all forms of waste in the state's fiscal resources, rationalizing public spending so as not to impact the quality of services provided to citizens, and directing public spending toward more productive areas to achieve the desired objectives of public spending [13].

4. Enhancing Intergenerational Fiscal Sustainability:

The importance of fiscal discipline lies in enhancing intergenerational fiscal sustainability through the implementation of disciplined fiscal policies that reduce the government budget deficit by rationalizing current spending, diversifying revenue

sources, controlling the general budget, and avoiding excessive borrowing, thus supporting sustainable economic growth and enhancing fiscal stability

Indicators of Fiscal Discipline

1. Appropriation Accuracy Indicator

The Appropriation Accuracy Indicator measures deviations between actual total revenues and expenditures realized versus projected total revenues and expenditures. The Appropriation Accuracy Indicator for public revenues and expenditures can be calculated as follows:

- a. Public Revenue Appropriation Accuracy Indicator = $(\text{Actual Total Public Revenues for the Year} \div \text{Planned Public Revenues}) \times 100\%$
- b. Public Expenditure Appropriation Accuracy Indicator = $(\text{Actual Total Public Expenditures for the Year} \div \text{Planned Public Expenditures}) \times 100\%$

If actual figures align precisely with the pre-determined figures in the state budget, the Appropriation Accuracy Indicator is high. Conversely, a significant deviation between actual and planned figures indicates inaccuracy in appropriation [14], [15].

The Appropriation Accuracy Indicator can be adopted as one of the indicators used to measure fiscal discipline. This helps evaluate the extent to which actual revenues and expenditures conform to the financial plans specified in the state budget. Significant deviations between actual and planned figures indicate fiscal indiscipline stemming from inaccurate projections of public revenues and expenditures. This leads to deficits, reductions in fiscal surpluses, and consequently, reliance on unrealistic levels of public expenditures and revenues [16].

2. Public Expenditure Productivity

Public Expenditure Productivity expresses the relationship between the economic growth rate and the public expenditure growth rate. Productivity is measured according to the following formula:

Public Expenditure Productivity = $(\text{Change in Gross Domestic Product (GDP)} / \text{Change in Public Expenditures})$

This illustrates the productivity per unit of public expenditure by showing the impact of that unit on GDP. Productivity can be positive, negative, or equal to zero. If an increase in public expenditure by one unit results in a positive increase in output, public expenditure is deemed productive by a certain amount (greater than zero). If expenditure increases but output remains unchanged, expenditure productivity is zero, indicating it is non-productive. If public expenditure increases while output declines, public expenditure productivity is negative (less than zero), signifying that output is unresponsive to public expenditure. Thus, there are three potential states of public expenditure productivity [17].

Fiscal indiscipline can be inferred from the absence of public expenditure productivity, indicating inefficient expenditure and the presence of unjustified waste. Conversely, achieving public expenditure productivity enhances spending efficiency by directing it towards more productive channels, thereby mitigating fiscal indiscipline [18].

3. Fiscal Space

Fiscal space is defined as the government's capacity to finance its public expenditure without compromising its ability to service its current or future debt obligations. It represents the upper limit of the public debt level that the government can reach without jeopardizing its creditworthiness or risking its loss, Fiscal Space Constraints Limited fiscal space reflects a high level of public debt, exposing the state to risks of losing market access. When temporary budget deficits occur and insufficient fiscal space exists, the state is forced to borrow and incur debt [19], [20]. Fiscal space can be measured through multiple monetary and fiscal indicators, as follows:

- a. Tax revenue-to-GDP ratio indicator.
- b. Oil revenue-to-GDP ratio indicator.
- c. Savings rate-to-GDP ratio indicator.

d. Foreign reserves-to-GDP ratio indicator.

4. **Budget balance-to-GDP ratio indicator.**

Fiscal space analysis is used to detect fiscal discipline and ensure the credibility and transparency of financial information.

Rules of Fiscal Discipline

Fiscal discipline imposes constraints on all major aggregates—total public revenues, public expenditures, public debt, and fiscal balance—thereby optimizing financial performance. Fiscal discipline follows several rules that also serve as measurement indicators:

1. **Public Expenditure Rule:**

Fiscal discipline is measured through public expenditure control, a primary objective in every budget. Multiple constraints are placed on public expenditures to rationalize government spending and prioritize allocations, leading to reduced annual growth in government expenditures. A comparison is made between projected and actual spending; if actual expenditure equals or falls below projections, fiscal discipline is maintained, and vice versa [21], [22].

2. **Budget Deficit Rule:**

This rule establishes a safe public debt threshold that the government can sustain without adverse economic impacts. It caps the general budget deficit-to-GDP ratio at no more than 3%, per the Maastricht Treaty adopted by most countries to achieve fiscal sustainability.

3. **Public Revenue Rule :**

This sets upper and lower bounds for projected revenues to prevent excessive tax burdens and improve actual revenue collection relative to GDP. Revenue constraints follow the economic cycle (expansion and contraction). Just as expenditures face constraints, revenues are similarly bounded. Since public expenditures are determined by attainable revenue levels, tax revenues must not fall below the minimum required for the government to fulfill its obligations [23]. This requires maintaining a tax burden (the share of GDP collected as taxes) that does not exceed the economy's tax capacity, ensuring the fiscal sustainability necessary for fiscal discipline.

4. **Public Debt Rule**

Public debt can serve as an indicator for measuring fiscal discipline. When increased government spending reflects fiscal indiscipline and insufficient public revenues exist to finance it, governments resort to public debt. Rising public debt exacerbates budget deficits, necessitating further increases in public expenditures and revenues while diminishing the ability to control them [24]. Crucially, the public debt-to-GDP ratio should not exceed 60%

To ensure disciplined fiscal policy, a multi-year perspective and strategy must be established through:

- a. Implementing disciplined financial plans
- b. Formulating general budgets based on available resource constraints
- c. Developing expenditure prioritization frameworks that optimize resource allocation .

This approach aligns long-term expenditure growth with future resource generation capacities to achieve:

- a. Fiscal stability and sustainability
- b. Rationality and efficiency in public spending
- c. Prevention of waste and economic resource depletion
- d. Intergenerational equity.

Intergenerational financial sustainability

Fiscal sustainability is defined as a government's ability to maintain its spending and tax policies over the long term without defaulting on obligations or being able to repay debts. Fiscal sustainability also refers to the ability of governments to manage financial

resources in a way that achieves a balance between revenues and expenditures without sacrificing long-term fiscal stability [25].

Intergenerational financial sustainability focuses on ensuring the rights of future generations to fiscal resources and not burdening future generations with fiscal burdens resulting from current policies without corresponding benefits. It is achieved through

- a. Distributive justice: Distributing returns between current and future generations.
- b. Efficient management of non-renewable resources, such as oil, where natural capital is replaced by productive assets.
- c. Debt protection: Preventing future generations from bearing the costs of current decisions [26].

Generational public fiscal sustainability is defined as the institutional framework that ensures public finances are managed to meet the needs of the current generation without undermining the ability of future generations to finance their basic services (such as health and education) or incurring significant debts that they cannot benefit from.

To solve the problem of the increasing public deficit, the Maastricht Treaty was concluded for the member states of the European Union to set certain, safe, and non-exceeding ratios for both the public deficit and public debt relative to the gross domestic product, to be 3% and 60%, respectively. Achieving intergenerational justice is an ethical principle that requires current policymakers to manage fiscal and natural resources and risks in a way that does not harm current and future generations. In the context of intergenerational fiscal sustainability, neglecting this principle may lead to:

- a. Resource depletion: Overconsumption of natural resources (such as fisheries and forests) undermines their future availability.
- b. Fiscal burdens: High public debt imposes repayment obligations on future taxpayers
- c. Environmental degradation: Short-term economic gains often come at the expense of climate destabilization.

Based on the above, the research suggests that integrating generational justice into fiscal policy highlights the concept of intergenerational fiscal sustainability, which is based on three guiding principles

- a. Equity: Achieving a balance between benefits and burdens across generations by ensuring that no generation is marginalized or unduly exploited.
- b. Sustainability: Maintaining resource stocks—natural, fiscal, and infrastructure—at least at their current levels.
- c. Precaution: Applying the precautionary principle to uncertain risks (e.g., climate tipping points and biodiversity loss).

Intergenerational Fiscal Sustainability

Concerned with public debt and financial resource impacts on future generations—shares multiple overlapping objectives with Fiscal Discipline (focused on annual control of public expenditure, revenues, deficits, and debt), Their aligned objectives include:

- a. Achieving Intergenerational Equity through strict fiscal rules:
 - 1) Investing 30% of non-renewable resource revenues (e.g., oil/gas) in sovereign wealth funds or future generations funds.
 - 2) Capping public debt at <60% of GDP in fragile states with compromised economic/policy sovereignty.
- b. Building Fiscal Resilience : Establishing fiscal buffers equivalent to 20% of GDP to absorb commodity price shocks (e.g., oil crises) or economic volatility.
- c. Converting Exhaustible Wealth into Permanent Assets :Channeling finite resource revenues (e.g., oil/gas proceeds) into productive infrastructure, renewable energy projects, or human capital development.

- d. Ensuring Fiscal Transparency : Mandatory disclosure of material environmental, social, and governance (ESG) risks affecting public finances.

Methodology And Data

Data

The open-access datasets from 2004 to 2024 from the Iraqi Ministry of Planning and The Iraqi Central Bank are used in this research. Gross Domestic Product (GDP), allocative efficiency of public expenditure (CA), Public Expenditure Productivity (OG), Tax gap (GT), and fiscal space (TR) are , Public debt- to – gdp ratio (dgdg) , the most important factors that have been taken into account here. Table 1 provides a Concise overview of the factors under investigation.

Analysis of the reality of financial discipline and generational financial sustainability in Iraq

The table (1) illustrates the following:

Accuracy of public expenditure allocation:

Public Expenditure allocation ratios are high and far from reality for most years ,This unrealistic high ratio indicates that budget planning is inaccurate or that implementation deviates significantly from established plans , This is often the result of:

- Unrealistic estimates of revenues or expenditures.
- Political or social pressures leading to unplanned budget transfers.
- Weak oversight and monitoring systems.

The lack of accurate allocation leads to the waste of resources and their failure to be directed toward productive investments that yield long-term benefits (such as education, health, and infrastructure) , This undermines the ability of future generations to prosper.

CA



Figure 1. shows the evolution of Accuracy of public expenditure allocation for the period 2004-2024.

Public Expenditure Productivity:

We note from the table 1 that public expenditure productivity is weak in most years, and negative in specific years (2005, 2016, 2019) , This indicator measures the economic and social return per unit of government expenditures , Weak productivity means that government expenditures does not achieve the desired results with the required efficiency (for example, large spending on education and health without tangible improvement in their outcomes, large expenditures on infrastructure but unsustainable) , Negative productivity, on the other hand, is an economic disaster, meaning that government expenditures destroys economic value rather than creating it. It is often associated with widespread corruption, gross waste, or spending on ineffective or harmful projects, as is evident in the Iraqi economic reality.

This weak or negative productivity means the leakage and waste of financial resources (mostly oil) without achieving fiscal policy objectives or real development.

Current generations receive poor services, while future generations inherit a weak economy and depleted resources (Figure 2).

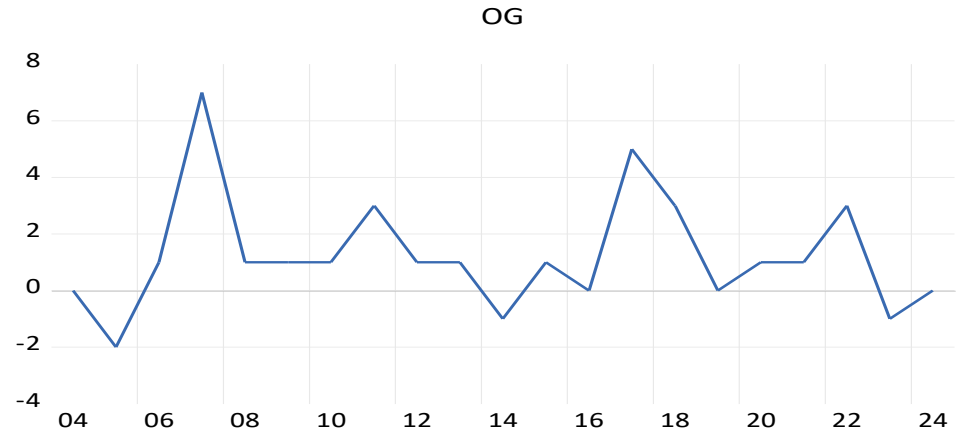


Figure 2. shows the evolution of Accuracy of public expenditure allocation for the period 2004-2024.

Fiscal Space (Ratio of Tax Revenues to Public Revenues):

the fiscal space ratio is very low for most years , This indicates an almost total dependence on oil revenues (non-tax) to finance the general budget. The lack of a diversified and sustainable tax revenue base is a clear sign of structural fiscal indiscipline. Also, reliance on a depletable resource (oil) makes the budget highly volatile and fragile with fluctuations in oil prices This exposes future generations to a severe financing crisis when oil resources are depleted or lose their relative value, without a robust tax system to finance public services and investments (Figure 3).

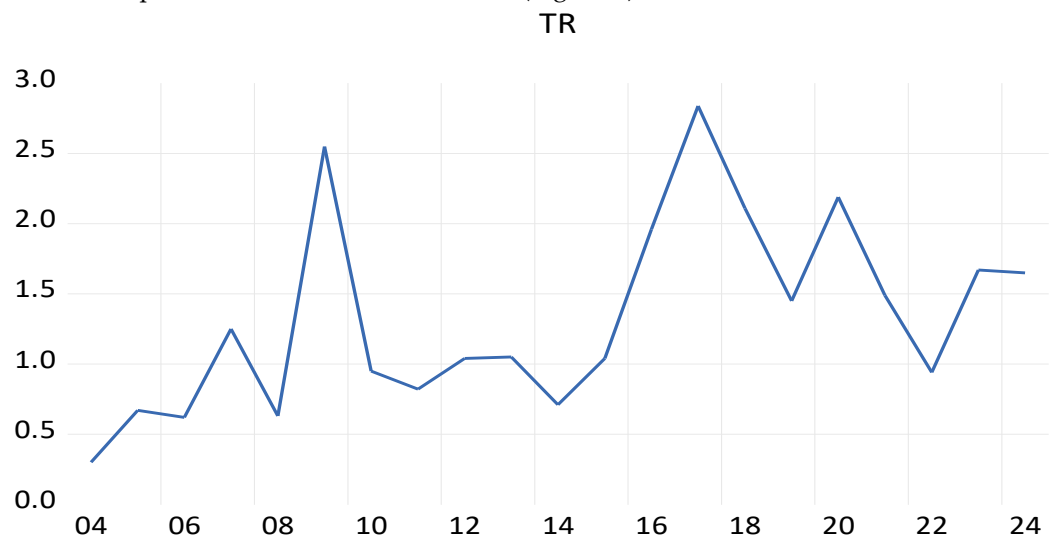


Figure 3. shows the evolution of Accuracy of Fiscal Space for the period 2004-2024.

Deficit/Surplus Index as a Percentage of GDP:

The fluctuations in the state of the general budget between surplus and deficit, with the deficit exceeding the safe limit (3%) for many years. This persistent or large deficit indicates that the state is spending more than it receives in revenues, and exceeding 3% increases fiscal risks (debt accumulation, inflation, and pressure on the currency). The chronic fiscal deficit in Iraq burdens future generations with debt and interest and reduces the space available for development investments that serve their future. The oil surplus is often not invested sufficiently to achieve true sustainability (Figure 4).

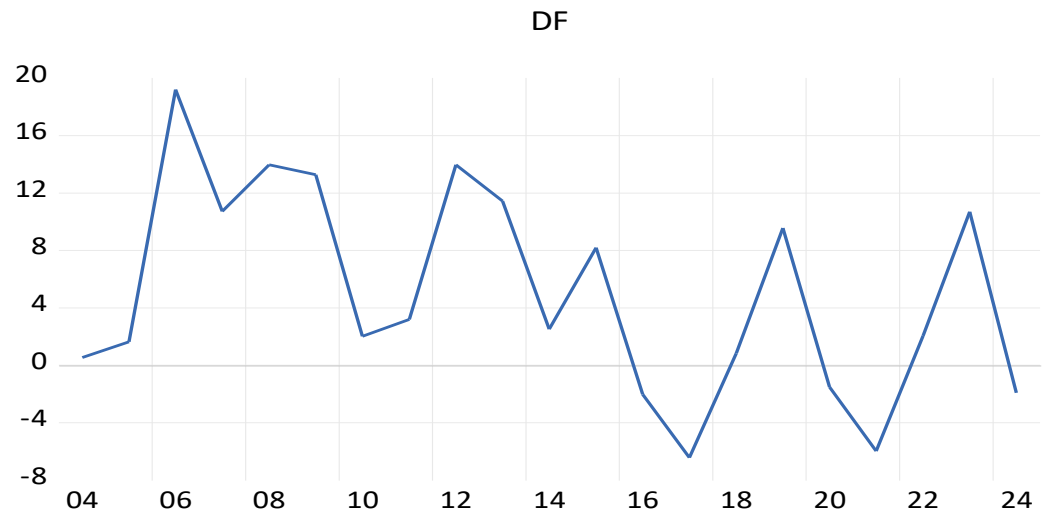


Figure 4. shows the evolution of Accuracy of Deficit/Surplus Index as a Percentage of GDP for the period 2004-2024.

Tax Gap Index:

The extremely high tax gap, which represents the difference between the tax revenues that should theoretically be collected (based on laws and economic activity) and the actual tax revenues collected. This extreme increase is evidence of:

Widespread tax evasion.

Structural weaknesses in the administration of the tax system (complex laws, corruption, weak collection capacity).

Informal economy.

The large tax gap deprives the public treasury of essential revenues necessary for sustainability. This increases dependence on oil, exacerbates inequality, and weakens the state's ability to provide services and invest in the future, burdening future generations (Figure 5).

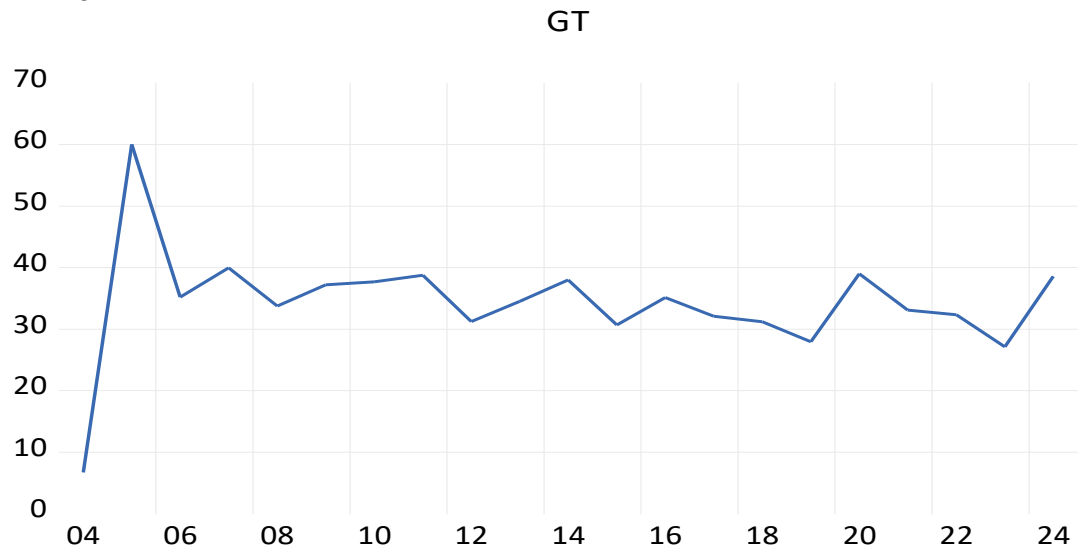


Figure 5. shows the evolution of Accuracy of Tax Gap Index for the period 2004-2024.

Indicators of intergenerational financial sustainability (which measure long-term affordability):

Public Debt-to-GDP Ratio.

From Table (4), we note that the debt-to-GDP ratio is high in most years but within the safe limit (60%). Although it remains below the theoretical safe limit, the continued rise or stability at relatively high levels indicates:

Debt accumulation to finance the deficit or unproductive projects.

Potential pressure on the future budget for debt service (principal repayment + interest).

Public debt is a pledge of resources for future generations. Even if it is within safe limits, it consumes a portion of future revenues (oil or tax) to repay debts accumulated to finance the expenditures of current generations. Its chronic rise limits the state's ability to achieve true financial sustainability for future generations (Figure 6).

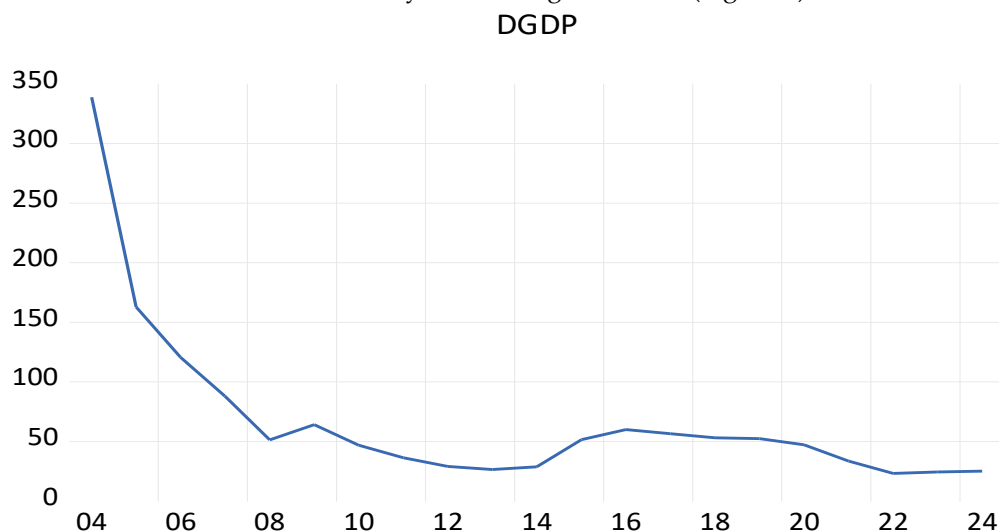


Figure 6. shows the evolution of Accuracy of Tax Gap Index for the period 2004-2024.

Table 1. The Relationship between Fiscal Discipline Indicators and Intergenerational Fiscal Sustainability in the Iraqi Economy (2004-2024)

Year	Fiscal discipline indicators					Intergenerational Fiscal Sustainability
	Accuracy of public expenditure allocation	Public Expenditure Productivity	Fiscal Space	Deficit/Surpl to – GDP Ratio -	Tax Gap Index	Public Debt-to-GDP Ratio
2004	159%	0	0.30	1.63	60.03	338.91
2005	73%	-2	0.67	19.21	35.19	162.97
2006	75%	1	0.62	10.72	39.98	120.54
2007	75%	7	1.25	13.97	33.77	87.99
2008	99%	1	0.63	13.28	37.20	51.43
2009	76%	1	2.55	2.02	37.68	64.13
2010	83%	1	0.95	3.19	38.76	46.83
2011	81%	3	0.82	13.97	31.22	36.41
2012	90%	1	1.04	11.44	34.51	29.04
2013	86%	1	1.05	2.52	38.01	26.58
2014	#DIV/0!	-1	0.71	8.20	30.67	28.68
2015	69%	1	1.04	-2.02	35.13	51.51
2016	69%	0	1.96	-6.43	32.10	60.07
2017	75%	5	2.84	0.83	31.21	56.58
2018	78%	3	2.11	9.56	27.96	53.17
2019	84%	0	1.45	-1.51	39.00	52.36
2020	#DIV/0!	1	2.19	-5.97	33.09	47.15
2021	79%	1	1.49	2.05	32.33	33.51
2022	#DIV/0!	3	0.94	10.70	27.13	23.22
2023	200%	-1	1.67	-1.91	38.59	24.46

2024	77%	0	1.65	-2.68	39.76	25.12
Average	91%	1	1.33	4.89	35.87	67.65

Source: The table is the work of the researcher based on data issued by the Central Bank of Iraq, the Iraqi Ministry of Planning, and the Iraqi Ministry of Finance.

Estimation And Of Econometric Models.

Methodology And Data

This section is dedicated to estimating and analyzing the relationship according to multiple linear regression between some indicators of (Fiscal Discipline) as independent variables and intergenerational fiscal sustainability as dependent variable represented by the ratio of public debt to GDP , for the period (2004-2024) using semi-annual data and the (EViews 12) software , Statistical analysis methods were adopted in accordance with the Autoregressive Distributed Lag (ARDL) methodology (Table 1).

Before proceeding with the estimation and analysis of the econometric models, it is necessary to provide a table of the symbols used in the econometric analysis.

Table 2. Symbols used in econometric analysis

Dependent & Independent Variables	The meaning	Code
Dependent Variable	Public debt- to - gdp ratio	DGDP
Independent Variable	Tax gap	GT
Independent Variable	allocative efficiency of public expenditure	CA
Independent Variable	Public Expenditure Productivity	OG
Independent Variable	Fiscal deficit- to - gdp ratio	DF
Independent Variable	Fiscal space	TR

Source : Prepared by the researcher

The Autoregressive Distributed Lag (ARDL) model has gained widespread use as a framework for co-integration analysis, as introduced by Pesaran et al. (Table 2) This model integrates autoregressive models with distributed lag models into a single structure, where time series data depend on their lagged values, along with the current values of explanatory variables and their lags over one or more periods. The general form of the ARDL model, which represents the relationship between the dependent variable (Y) and the independent variable (X), follows the autoregressive principle, incorporating the lags of the dependent variable into the equation, as outlined by (Pesaran et al) as follows :

$$\Delta Y_t = \alpha_0 + \theta y_{t-i} + \theta x_{t-i} + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \sum_{i=1}^q \beta_i \Delta x_{t-i} + \varepsilon_t \quad (1)$$

θ : represents long-run relationship coefficients.

β_i : represent short-run relationship information.

Δ : the first difference of variables.

q, p : The number of lags that are not necessarily equal.

ε_t : random error with zero mean and constant variance with no serial Autocorrelations.

A semi-annual time series dataset from Iraqi government institutions covering the period from 2004 to 2024 was used to study the relationship between the intergenerational fiscal sustainability index (DGDP) and fiscal discipline indicators (CA, OG, GT, TR, DF). The following standard methodology was used:

$$\Delta Dgdp_t = \alpha_0 + \theta 1Dgdp_{t-i} + \theta 2GT_{t-i} + \theta 3CA_{t-i} + \theta 4OG_{t-i} + \theta 5DF_{t-i} + \theta 6TR_{t-i} + \sum_{i=1}^p \beta 1 \Delta Dgdp_{t-i} + \sum_{i=1}^q \beta 2 \Delta GT_{t-i} + \sum_{i=1}^r \beta 3 \Delta CA_{t-i} + \sum_{i=1}^p \beta 4 \Delta OG_{t-i} + \sum_{i=1}^p \beta 5 \Delta DF_{t-i} + \sum_{i=1}^p \beta 6 \Delta TR_{t-i} + \varepsilon_t \dots \dots (1)$$

In equations (1) , the following variables are considered:

Dgdp , Public debt- to - gdp ratio ; GT , Tax gap ; CA , allocative efficiency of public expenditure ; OG , Public Expenditure Productivity , DF , Fiscal deficit- to - gdp ratio , TR , Fiscal space .

Δ , Differential Factor ; α_0 , Constant Coefficient ; pqr , represents the Lags of the variables ; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ Shortrun Slopes; $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6$, Long-run Slopes ; t , Time Period (2004-2024) ; ϵt , Error Term.

3. Results and Discussion

Unit Root Test

The stability of the study variables was tested using EViews 12 software, and the Augmented Phillips-Perron test was applied to determine whether the variables are stationary or non-stationary whether they contain a unit root and to specify the order of integration , After conducting the test for all variables, the results shown in the table:

Table 3. Results Phillips – Perron Unit Root Test

Variable	Lag Length	Level			First-Difference		
		A	B	Non	A	B	Non
DGDP	I(0)	-13.79*	-11.29*	-8.14*			
GT	I(0)	-5.01*	-5.11*	-1.53*			
CA	I(1)	-1.75	-1.49	0.83	-10.28*	-9.29*	-1.77*
OG	I(0)	-4.36*	-4.65*	-4.35*			
DF	I(1)	-1.58	-1.34	-1.53	-3.59*	-3.59*	-3.76*
TR	I(0)	-2.78*	-2.62*	-0.62*			

A ; means the regression contains only a secant , B ; means the regression has a secant and a general trend

Non; means the regression has neither a secant nor a general trend

*Means significant at 5% significance level

Source : Researchers' effort based on EViews 12 outputs

We note from Table (3) that the time series of variables (CA, DF) were not stationary at the level (Level), so the test was conducted after taking the (first difference) of the original series, and the series became stationary at the 5% significance level and integrated at degree I(1) whether with an intersection point or with an intersection point and direction, while the rest of the variables (Dgdp, GT, OG, TR) their time series were stationary at the level (Level) at the 5% significance level and integrated at degree I.

Estimating functions using the ARDL model

1. ARDL TEST

After testing the stability of the variables, the ARDL model for the intergenerational Fiscal sustainability function was estimated. (Table 4) The model consists of five independent variables for Fiscal discipline (CA, OG, DF, TR, GT) and one dependent variable represented by the debt-to-GDP ratio (DGDP). The following are the results of the ARDL test:

Table (4): Result of the ARDL Model for the intergenerational Fiscal sustainability

Dependent Variable: DGDGP

Method: ARDL

Sample (adjusted): 2005S1 2024S2

Included observations: 40 after adjustments

Maximum dependent lags: 2 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Selected Model: ARDL(2, 0, 2, 1, 1, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
DGDP(-1)	0.244403	0.103592	2.359282	0.0264
DGDP(-2)	0.405073	0.077828	5.204723	0.0000
CA	-9.223452	6.704544	-1.375702	0.1811
OG	-0.502182	0.985882	-0.509373	0.6150
OG(-1)	0.697881	1.028220	0.678727	0.5035
OG(-2)	-3.131703	1.159566	-2.700755	0.0122
DF	-0.853411	0.523811	-1.629234	0.1158
DF(-1)	0.940279	0.412571	2.279072	0.0315
TR	-4.771520	4.057665	-1.175928	0.2507
TR(-1)	5.487926	3.516289	1.560715	0.1312
GT	-2.922751	0.737720	-3.961872	0.0005
GT(-1)	0.740589	0.343101	2.158517	0.0407
GT(-2)	-0.590033	0.328226	-1.797645	0.0843
C	130.4175	38.55803	3.382369	0.0024
@TREND	-0.507572	0.312747	-1.622949	0.1171
R-squared	0.958697	Mean dependent var		54.08750
Adjusted R-squared	0.935568	S.D. dependent var		34.43099
S.E. of regression	8.739802	Akaike info criterion		7.453649
Sum squared resid	1909.604	Schwarz criterion		8.086978
Log likelihood	-134.0730	Hannan-Quinn criter.		7.682641
F-statistic	41.44898	Durbin-Watson stat		1.874820
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.

Source : Researchers' effort based on EViews 12 outputs

We notice from the above mentioned table which shows the results of estimating the ARDL model that the explanatory power of the Function intergenerational Fiscal sustainability was ($R^2=95\%$), the independent variables included in the estimated models explain 95% of the changes in the dependent variable) and the value of Adjusted R-squared of the Function intergenerational Fiscal sustainability was ($R^2=93\%$), and also the models is significant as the calculated F value was which is significant at the 5% level, the estimated model is significant, so we reject the null hypothesis ($H_0: b=0$) and accept the alternative hypothesis ($H_1: b \neq 0$).

(Bounds Test) for the existence of cointegration relationship

Table (5) Results of the Bounds Test for the Function intergenerational Fiscal sustainability

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	10.78106	10%	2.75	3.79
k	5	5%	3.12	4.25
		2.5%	3.49	4.67
		1%	3.93	5.23

Source : Researchers' effort based on EViews 12 outputs

Table (5) shows the results of the (bounds test) of the estimated Function , from which we note that the calculated value of (F-statistics) was greater than (the maximum tabular F) of at a significance level of (5%) , Accordingly, we will reject the null hypothesis and accept the alternative hypothesis of the existence of a long-term equilibrium relationship between the dependent variable and the independent variable (Table 6).

Test for autocorrelation and heteroskedasticity

Table (6) Results of the autocorrelation for the Function intergenerational Fiscal sustainability

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.498383	Prob. F(2,23)	0.2445
Obs*R-squared	4.610983	Prob. Chi-Square(2)	0.0997

Source : Researchers' effort based on EViews 12 outputs

Table (7) Results of the heteroskedasticity for the Function intergenerational Fiscal sustainability

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

F-statistic	0.703084	Prob. F(14,25)	0.7512
Obs*R-squared	11.29997	Prob. Chi-Square(14)	0.6623
Scaled explained SS	3.351995	Prob. Chi-Square(14)	0.9983

Source : Researchers' effort based on EViews 12 outputs

We note from the table 7 that the estimated model is free of serial correlation , we accept the null hypothesis that leads to the absence of a serial correlation between the residuals because the value of the F test and Chi-Square is not significant at a significance level of 5% ,We reject the alternative hypothesis of the presence of serial correlation, as well as the model being free of the problem of heterogeneity of variance because the statistical indicators were also not significant, so the variance of errors is homogeneous.

Test Examination of the Residuals' Normal Distribution For the following function intergenerational Fiscal sustainability:

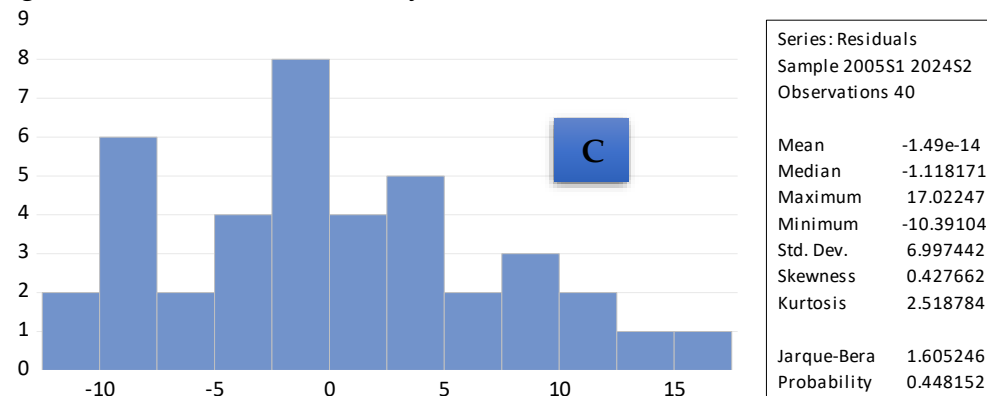


Figure (7) shows the normal distribution of the Function intergenerational Fiscal sustainability

Source : Researchers' effort based on EViews 12 outputs

The Jarque-Bera test for residuals is shown in above Figure 7 , which verifies that the residuals have a normal distribution. The assumption of normalcy is supported by the p-value more than the (5%) significance threshold.

Test of Structural Stability of Estimated ARDL Model

After estimating the error correction formula for the ARDL model, it is necessary to conduct a structural stability test for the short- and long-term coefficients of the estimated model and to ensure that the data used are free of any structural changes. This is done through two tests: the cumulative sum of residuals (CUSUM) test and the cumulative sum of squares of recurring residuals (CUSUM SQ) test, as shown in the following figures:

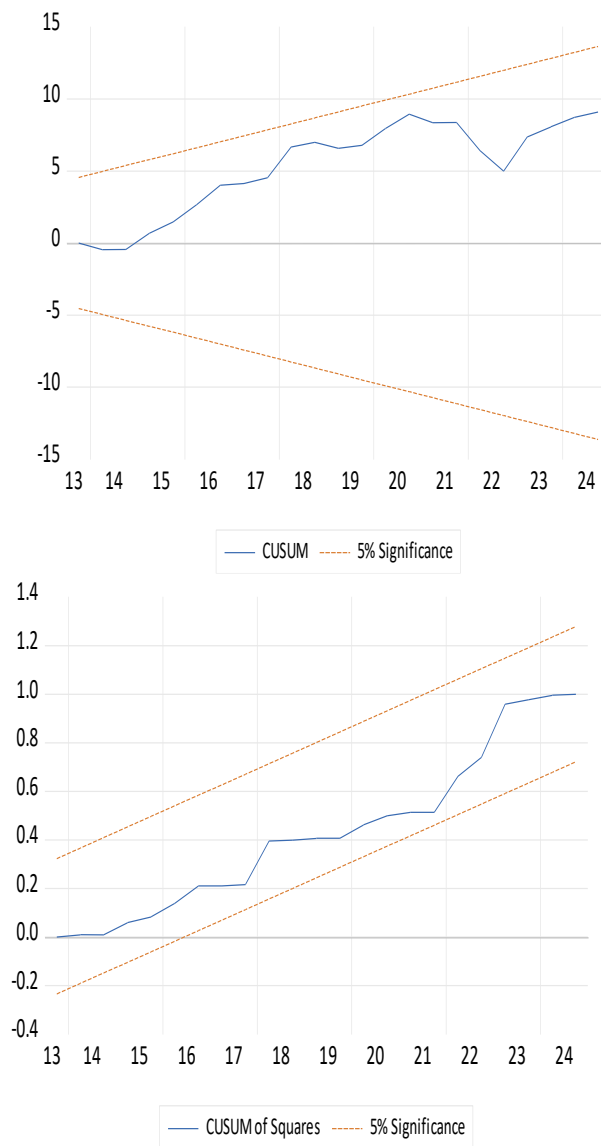


Figure (8) shows the structural stability for the Function of intergenerational Fiscal sustainability

Source : Researchers' effort based on EViews 12 outputs

From the figure 8above, it is observed that the test statistics for the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUM SQ) fall within the critical bounds (upper and lower limits) at the 5% significance level. This indicates that the estimated coefficients of the unrestricted error correction model (UECM) used are structurally stable over the study period. Similarly, the CUSUM SQ test results also lie within the critical bounds at the 5% significance level. These two tests collectively suggest stability and consistency in the model's short-term and long-term dynamics, confirming harmony between the two horizons.

Interpretation of Long-Term Relationship Results

Table (8) Results of Long-Term Relationship for the Function of intergenerational
Fiscal sustainability

Levels Equation

Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA	26.31329	20.35420	1.292769	0.2079
OG	-8.376033	4.005392	-2.091189	0.0468
DF	-0.247824	1.190811	-0.208113	0.0868
TR	2.043811	10.41776	0.196185	0.8461
GT	-7.908705	3.270995	-2.417829	0.0232

$$EC = DGDP - (26.3133*CA - 8.3760*OG - 0.2478*DF + 2.0438*TR - 7.9087*GT)$$

Source : Researchers' effort based on EVIEWS 12 outputs

The long-term table 8 shows that the CA parameter, the accuracy of public expenditure allocation, has a positive relationship, i.e., it is directly related to the debt-to-GDP ratio, and is insignificant at the 5% level. This insignificance is justified by the lack of accuracy in the allocation of Iraqi public expenditure, which is currently experiencing a phase of consumer expenditure dominance at the expense of investment expenditure. The continuation of this insignificance means the continuous waste of fiscal resources, which pushes the Iraqi government to increase its debt in order to meet its fiscal obligations. Therefore, strategic plans must be developed that bring actual expenditure closer to planned expenditure, as there is a greater possibility of implementing and succeeding economic plans. This enables the government to leverage the role of taxes, which will generate a fiscal resource to support its budgets and reduce reliance on loans to finance the budget. This allows the government to repay the debt and its interest, thus reducing the debt-to-GDP ratio.

The (OG) parameter (public expenditure productivity) has a negative and significant value at the 5% level, meaning it has an Inverse relationship with the debt-to-GDP ratio.

This means that increasing public expenditure productivity by one unit leads to a reduction in the public debt-to-GDP ratio by 8.37%. This aligns with economic theory, but it contradicts the economic reality of public spending in Iraq, which is characterized by leakage and waste without real development. Neither current generations benefit from increased current expenditure, nor will future generations. Instead, they will inherit a fragile economy and depleted resources.

The (DF) parameter (deficit-to-GDP ratio) has a positive and significant value at the 5% level, meaning it has a direct relationship with the public debt-to-GDP ratio. Any increase in the deficit-to-GDP ratio leads, in one way or another, to an increase in public debt-to-GDP. This is typical for countries entirely dependent on crude oil and its constant fluctuations.

As for the (TR) parameter (the ratio of tax revenues to GDP), it has a positive and insignificant value, meaning that it plays no role in GDP. This is consistent with what is stated in Table (1): a sharp decline in the contribution of taxes to GDP, which represents an important aspect of the fiscal space. Consequently, this decline encourages decision-makers to move towards increasing borrowing and indebtedness without regard for the rights of future generations. With the decline in sustainable financing sources, the fiscal deficit will be compensated for by increasing domestic or foreign borrowing and increasing the ratio of public debt to GDP. We conclude from this the lack of a tax revenue base, which means the absence of structural fiscal discipline.

The (GT) parameter (tax gap) also has a negative and significant value, meaning that any increase in the tax gap leads to a decrease in the ratio of public debt to GDP by (7.9). This contradicts the logic of economic theory, which states that increasing the tax gap will deprive the state's public treasury of basic and necessary revenues to achieve justice and sustainability, and thus increase dependence on oil or borrowing and raise debt relative to GDP. With the lack of flexibility of the production system, the money from borrowing and oil will go towards unproductive expenditure.

4. Conclusion

Severely weak fiscal discipline is the direct cause of failed intergenerational fiscal sustainability, Iraq's economy exhibits deep structural dysfunction in financial resource management, characterized by a self-reinforcing cycle of:

1. Inadequate planning,
2. Fiscal waste and rent-seeking,
3. Underdeveloped non-oil revenue base,
4. Chronic deficits.

This pathology systematically undermines Iraq's capacity to secure decent living standards or equitable development opportunities for future generations."

1. Unsustainable fiscal policy planning is evident in the dominance of current expenditure at the expense of investment, as well as the decline in tax revenues and the heavy reliance on oil revenues.
2. Low levels of fiscal security due to the low productivity of public expenditure and the high deficit-to-GDP ratio, which indicates the ongoing waste of fiscal resources. This is one of the manifestations of fiscal and administrative corruption.
3. The lack of precision in resource allocation, the low productivity of public expenditure, and the widening tax gap have proven that governments have not exercised any fiscal control, leading to the depletion of financial resources over the years.
4. The high debt-to-GDP ratio indicates that future generations are bearing debts from which they have not benefited. Furthermore, fiscal waste has undermined the potential for developing strategic economic sectors that could have provided future benefits for future generations.
5. Unclear fiscal policy and unproductive budgets have contributed to weak fiscal sustainability for future generations.
6. Fiscal sustainability for generations in Iraq is directly threatened by the lack of adequate fiscal discipline in the management and allocation of fiscal resources.
7. The breach of fiscal discipline rules —specifically the expenditure rule (through uncontrolled spending policies that expand public expenditure beyond financing capacity) and the deficit rule (through unsustainable debt accumulation at elevated rates)—constitutes a root cause of fiscal illusion and undermined sustainability
8. The research hypothesis is empirically confirmed : fiscal discipline exerts a fundamental and direct impact on intergenerational fiscal sustainability. Analytical results demonstrate that weak fiscal discipline indicators eliminate opportunities for achieving intergenerational fiscal sustainability.

Recommendations

1. Establish an Economic Justice Commission, linked to the executive branch, with the power to veto the budget in the event of unsustainable and unfair spending. Conduct evaluations of all infrastructure projects and hold those responsible accountable.
2. Align short-term fiscal policy objectives with long-term public interest objectives and monitor them to ensure sustainability and equity.
3. Establish binding fiscal rules that set a maximum limit on borrowing and discourage unjustified and high-risk borrowing.

4. Strengthen legal and oversight frameworks and reform the tax and judicial systems to close gaps and overlapping jurisdictions.
5. Improve budget planning and implementation and address the problems of delayed budget approval and inefficient implementation.
6. Create and monitor sustainable private sector job opportunities to reduce the pressure on the public sector.
7. Redirect spending and prioritize productive investment spending over excessive consumption.
8. Work to activate fiscal discipline measures by setting limits appropriate for fragile states for revenues, expenditures, and the fiscal deficit to achieve fiscal sustainability.

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