

## *Analysis and measurement of the role of public debt in financing Iraq's sustainable development for the period 1990-2022*

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### **Abstract:**

Given the growing public debt burden and the volatility of global oil prices — the primary source of budget revenues — this study examines the economic impact of public debt on sustainable development in Iraq from 1990 to 2022. Using modern econometric models and quarterly time series data, the research analyzes the relationship between domestic and external public debt, economic growth, and sustainable development.

The study aims to identify the short- and long-term effects of public debt on growth and sustainability and clarify how oil price volatility affects this relationship. The results indicate that domestic debt has a less negative impact than external debt. While external debt supports expenditures in the short term, it increases long-term risks due to repayment obligations. The results also indicate weak links between high debt and sustainable development outcomes, reflecting the inefficient use of borrowed resources. Heavy reliance on oil revenues exacerbates the economy's vulnerability to external shocks. The study concluded with a set of recommendations: adopt wise debt management strategies; direct borrowing toward productive and developmental sectors; enhance transparency and institutional efficiency; diversify the economy to reduce dependence on oil; and cooperate with international financial institutions to design debt sustainability policies consistent with the Sustainable Development Goals.

**Keywords:** public debt, economic growth, sustainable development.

## **1. INTRODUCTION**

Public governance, both internal and external, stands as a paramount challenge confronting developing countries, particularly the least developed nations. This predicament is underscored by the deleterious ramifications on their pursuit of sustainable development and the jeopardy it poses to the stability of their financial, social, and political systems. Notwithstanding the persistent endeavors of developing countries to address and surmount the onerous obligations associated with their debt obligations, the conundrum persists. Nevertheless, these challenges have proven to be more substantial than the capacities and possibilities of these states to sustain them, particularly in the aftermath of their political independence and the adoption of sustainable development agendas. This ensures that she and her citizens have access to adequate living conditions and the opportunity to engage in economic and social development. However, developing countries encounter a range of constraints and challenges.

One of the most critical challenges is the lack of domestic savings, which has led those states to seek external financing to address their economic and social problems, including the imbalance in the structure of the national economy and the promotion of inclusive and socially balanced growth for sustainable development. (Gündoğdu & Aytekin, 2022: 130)

Developing states have the capacity to incur both internal and external (public) debt, which can serve as a complement to domestic savings and aid in financing deficits in those states' public budgets from internal or external sources. In the presence of a sound domestic economic environment, and when the financial climate is favorable to those states, it is imperative that the geographical orientation of the productive resources of the capital economy and the apportionment of national resources should enhance reserves. This can be achieved through increased investment opportunities and increased economic surplus for developing countries (Chopra et al. 2024).

The inability of certain states to cope with their substantial debt burdens, both domestic and foreign, has resulted in an impasse characterized by public indebtedness. This has led to a deepening of economic dependence and a linkage with the acceleration of the capital economy. This acceleration is primarily driven by the prominent role of international financial institutions in the imposition and formulation of monetary policy programs for developing states. The implementation of programs mandated by developing states has given rise to numerous global economic and social challenges. The pursuit of economic growth and sustainable development, as sustainable development is conceptualized at the societal level as a whole rather than at the individual level, has the potential to result in increased total production and national income rather than in the output and income of each individual. This, in turn, can lead to economic growth and sustainable development within society. Nevertheless, the impact of well-being on a significant proportion of the population is often negligible. (Visseren-Hamakers et al., 2021)

**1.1 Problems of study:** Oil-producing states are confronted with a substantial challenge, stemming from the escalating magnitude, recurrence, and direct impact of both internal and external public shocks on sustainable development. This challenge is further compounded by the state's reliance on a single or multiple sources of export, inadequate domestic financing, and persistent budgetary deficits. Consequently, the state depends on debt financing, whether from within or from external sources, to promote capital accumulation and advance its overall economic and social development. The sustainable development of Iraq is influenced by both domestic and foreign factors. A critical question to address is whether there is an impact on Iraq's public debt and its contribution to sustainable development in any areas that can be utilized. Furthermore, it is essential to examine the objectives behind providing debt or assistance by developed countries or organizations.

**1.2 Importance of the study:** Addressing structural imbalances and achieving sustainable development are critical to reducing public indebtedness. It has been incorporated into meticulously devised economic strategies, particularly when employed in conjunction with other resources to enhance debt services and augment GDP.

**1.3 Objectives of the study:** The objective of this study is to ascertain the nature and impact of the relationship between public debt and sustainable development. Furthermore, it seeks to determine the extent to which such debt affects the developmental realities of developing countries in general and the economy in particular. This inquiry draws upon the experience of Iraq. In order to achieve sustainable development, it is necessary to clarify the mechanisms and ways of establishing a path suited to the realities of these economies as a result of international economic developments and the extent to which such experiences have been utilized. Furthermore, it is essential to find solutions to reduce reliance on this type of financing, reliance on domestic resources, and the efficient use of such resources. Finally, analysis and measurement of Iraq's sustainable debt trends and desertification impact on the impact of Iraq is necessary.

**1.4 Main Hypothesis:** Public debt significantly impacts the achievement of sustainable development in Iraq. A set of sub-hypotheses can be derived from the main hypothesis, as follows:

**H1:** Short-term domestic public debt impacts economic growth, which in turn impacts the achievement of the Sustainable Development Goals in Iraq.

**H2:** Long-term external public debt impacts economic growth and sustainable development more than domestic debt in Iraq.

**H3:** Inefficient allocation of borrowed funds impacts public debt and sustainable development projects in Iraq.

**H4:** Increasing reliance on international financing increases debt service costs and reduces resources available for sustainable development in Iraq.

**H5:** Sound domestic financing mechanisms positively impact economic growth and sustainable development in Iraq.

**1.5 Limits of study:**

- Limits of spatial study: (Iraq)
- Study time limits: (1990-2022)

## 2. THEORETICAL FRAMEWORK

### 2.1 The Fundamentals of Public Debt

The conceptualization of public debt is subject to variation depending on the perspective from which it is examined. A comprehensive definition of public debt can be articulated as the sum of funds procured from both internal and external sources by the government, subsequently utilized for the financing of government expenditures. The government's issuance of government bonds or other government securities constitutes an undertaking to refund these funds with interest, which is payable on a specified future date (Heimberger, 2023: 1070). Public debt is defined as a balance of government commitments with different time dimensions that the government is obliged to pay according to a specific timetable. These and other obligations may include government securities, which the government utilizes to settle its financial obligations to others when its regular resources are insufficient to cover them. As Reis (2022:130) asserts, public debt, at a given moment, also represents the amount of pre-unpaid borrowings that arise as a result of financing the general budget deficit by borrowing. Such borrowing can be done from international or regional financial institutions and international markets, as well as from private, public, and non-financial institutions. These include the central bank, commercial

banks, and the local market. In addition to the public, borrowing is at a cost, which is determined at the interest rate. Borrowing is usually at the rate of financing the general budget deficit (Yamin et al., 2023). Thirdly, the term "legal contract" is employed to denote an agreement between two or more parties, wherein the debtor is the recipient of funds that the creditor agrees to provide to the debtor. This agreement is established on the premise that the creditor will be reimbursed by the debtor at a future date, accompanied by the accrued interest. The creditor shall be a private or official institution." As posited by Eichengreen et al. (2023), "The financial obligations payable in hard or local currency shall be borne by the debtor in advance and shall be paid by certain dates." (Hilton, 2021:200) Economist Samuel Samulson defines "debt as the accounting expression that means a reduction in assets and an increase in liabilities." Foreign debt is the result of a state's actions against foreign parties, which may be governments, international organizations, or foreign institutions. Domestic debt, on the other hand, "is owned by the state to its citizens, i.e., when the state borrows internally and subtracts loan bonds in its national currency, and is written by nationals and residents of the state, whether individuals or other economic units" (Sadiq et al., 2022:400). "Public debt is defined as an agreement between two parties, whereby

the debtor and the State or a public legal person undertake to pay the loan's installments and interest. In the event of an external loan, the loan securities may be extinguished with interest repayment within a stipulated period, commencing from a designated date and at a stipulated interest rate as outlined in the loan contract. The manner of payment is to be agreed upon by the parties involved (Farooq et al., 2023:55360). It is concluded that the public debt is defined as any loan or amount owed by the state, either internally or externally, for the purpose of financing its public budget in order to cover its fiscal deficit.

## 2.2 The Concept of Sustainable Development

The term "sustainable development" is defined as follows: Sustainable development is defined as a deliberate, multifaceted, long-term, comprehensive, and integrated process that encompasses economic, social, environmental, and technological dimensions. It involves the strategic management of human and natural resources, the prevention of natural resource degradation, and the transformation of industrial infrastructure. This process is intended to enhance societal well-being in a positive manner (Ruggerio, 2021:1000). It has been established that environmental, economic, and cultural factors are considered in these evaluations (Østergaard et al., 2022:1150). The linguistic concept of sustainability is defined as the continued, proven, and lasting perpetuation of any entity, which implies housing and stability. The sustainability of any attachment and delay is also implied (Halkos & Gkampoura, 2021:100). According to Aleixo et al. (2021), the concept of sustainability can be defined more broadly through linguistic definition as a continuing and non-low benefit to all members of society. This concept refers to the benefit over time. The economic concept of sustainable development is defined as "development that meets the needs of the present without harming future generations to meet their needs" (Buhalis, 2023:300). As Ozili and Iorember (2023) note, other scholars have described this phenomenon as a realistic cumulative process with the capacity to

stabilize, sustain, and communicate from the perspective of using natural resources and seeking social harmony in a society (p. 2630). As demonstrated by the various definitions of sustainable development that have been presented, it can be concluded that sustainable development is a process that takes into account the human, environmental, and developmental aspects. That is to say, it is a comprehensive process that addresses the various elements and components of social life, relying on the extensive planning of the different economic and social aspects of society. The objective of the initiative is to enhance the standard of living while ensuring the conservation of natural and environmental resources.

## 2.3 GDP and Development Sustainable

Gross Domestic Product (GDP) is defined as the total value of goods and services produced within a nation's borders, including the contributions of domestic and foreign production factors. It signifies the aggregate value of all goods and services that have been produced, subsequent to the subtraction of the value of intermediate consumption or production requirements. This assertion is supported by Bryniuk (2023:6) research, which states that

### **Gross Domestic Product = Total Production - Production Requirements**

Gross domestic product (GDP) is defined as "the sum of the monetary values of all goods and services produced in their final form in a country's economy during a specific period, usually a year." It also represents the value of all goods and services that can be produced within the country's geographic borders by individuals, whether local or non-local" (Force, 2021, 86). The gross domestic product (GDP) is a measure of the returns that production factors receive due to their participation in local production. The gross domestic product (GDP) is widely regarded as a pivotal economic benchmark in economic analysis. It facilitates the formulation of plans and policies and offers insights into prevailing economic trends (Kummu et al, 2025, 160). The Gross Domestic Product (GDP) is of significant importance, as

previously identified by Al-Salman and Islam et al (2023, 6-7). The Gross Domestic Product (GDP) is a measure of the total economic activity carried out by a society over a specific period, typically a year. The GDP is a summary of the returns obtained by the factors of production as a result of their participation in the local production process. The GDP is widely regarded as a pivotal economic indicator, a crucial component of economic analysis, the formulation of development plans and policies, and the comprehension of prevailing economic trends. The Gross Domestic Product (GDP), calculated using the expenditure method, can be utilized to analyze consumption trends within both the basic and targeted sectors. The time series of Gross Domestic Product (GDP) is a critical component of economic forecasting procedures,

which are essential for informed decision-making. The average per capita GDP indicator is a measure of a society's welfare and standard of living. It is also used to compare countries in terms of economic performance.

The relationship between Gross Domestic Product (GDP) and sustainable development is complex and interactive. Economic growth constitutes a key pillar for achieving sustainability by providing the financial resources needed to fund infrastructure, education, health, and environmental protection. However, focusing solely on increasing GDP does not guarantee sustainability unless it is accompanied by balanced economic, social, and environmental policies that ensure the efficient use of resources, reduce social inequalities, and safeguard the rights of future generations.

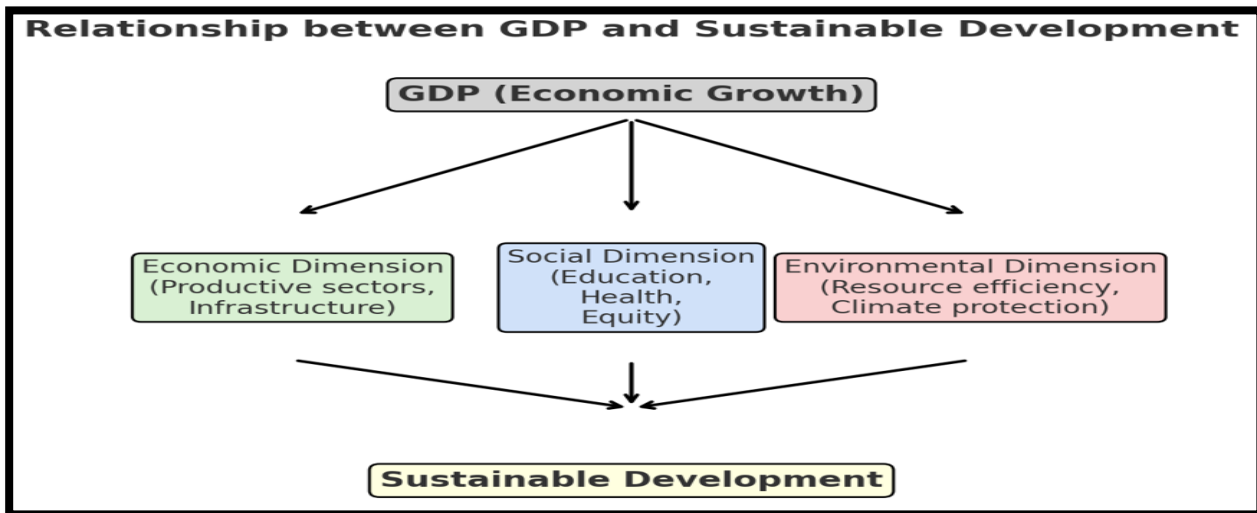


Figure 1: The relationship between GDP and sustainable development

## 2.4 Requirements of Sustainable Development

The term "sustainable development" is a broad concept with numerous designations, including continuous development and comprehensive development. Sustainable development is defined as a deliberate, multifaceted, long-term, and comprehensive process that integrates economic, social, environmental, and technological dimensions, as well as the advancement of human and natural resources, while preserving natural

resources and transforming industrial infrastructure. Sustainable development is regarded as a positive process that can lead to significant societal improvements (Zakari et al, 2022: 500). It is also defined as taking into account the environment, economy, and society (Al-Daghiri, 1992: 60). The linguistic concept of sustainability is defined as the quality of being sustained, stable, and lasting. This phenomenon is characterized by its perpetual and enduring nature, suggesting a consistent and uninterrupted continuation. The term

"Damam" is derived from the Arabic root d-m-m, which carries the connotations of "dwelling" and "being stable." The term "Istadama" is derived from the Arabic root s-d-m, which carries the connotations of "being gentle and patient" (Hajam et al., 2023: 745). According to the linguistic definition, the concept of sustainability can be defined more broadly as a continuous and undiminished benefit for all members of society. It is important to acknowledge that this concept pertains to the temporal aspect of benefits (Sharma & Gupta, 2024, 1010). The economic concept of sustainable development has been defined as "development that meets the needs of the present without causing any harm to future generations in meeting their needs" (Yang & Solangi, 2024: 925). Other scholars have defined it as a realistic, cumulative process that has the potential for stability, continuity, and continuity, based on its use of natural resources and the pursuit of social harmony within society (Salman, 2007: 53). A comprehensive review of the definitions of sustainable development reveals that it is a development that considers the human, environmental, and developmental aspects. It is a comprehensive process that addresses the various aspects and components of social life, relying on comprehensive planning for the various economic and social aspects of society. The objective of this initiative is to enhance the quality of life for individuals while ensuring the conservation of natural and environmental resources.

Sustainable development serves as the conduit between the present and future generations. The significance of this phenomenon lies in its role in ensuring and maintaining a dignified life for all individuals, as well as its contribution to the equitable distribution of resources, the achievement of social justice, the enhancement of national income, the advancement of education, and the provision of capital and a higher standard of living (Abu al-Nasr, Mohammed, 2017: 90-91). This development is characterized by its ability to address contemporary concerns while

ensuring that future generations will not be disadvantaged. Therefore, it is evident that achieving a balanced and harmonious economic and social development is imperative. Such development must prioritize the enhancement of quality of life while ensuring the preservation of life support systems. This underscores the significance of sustainable development, as evidenced by the following (Al-Najjar, 2017:15). The conscious and rational management of natural resources is imperative for the enhancement of national capacity to ensure a decent life for all societal strata. It is imperative to demonstrate respect for and to refrain from causing harm to the environment. This can be achieved by regulating the relationship between environmental factors and human activities. Additionally, enhancing people's ecological security, awareness, and responsibility for environmental issues is crucial. It is imperative to achieve a rational and informed utilization of natural resources by incorporating environmental planning at all stages of development planning. Fourthly, it is imperative to amass sufficient fundamental information and precise data concerning environmental attributes. Thereafter, advanced technologies must be integrated to facilitate the realization of societal objectives, thereby enabling meticulous and comprehensive development planning. Fifth, it is imperative to raise society's awareness and provide them with information regarding the challenges they face in ensuring their participation in environmental preservation. Sixthly, particular emphasis is placed on economic systems that may be at risk due to depleted or polluted water sources or agricultural land vulnerable to desertification.

### **2.5 Sustainable development requirements**

The existing policies are inadequate to address the imbalances and gaps in the development trajectories of most countries. The absence of complementary policies to address sustainable development issues, with a primary focus on these policies, may further exacerbate the situation (Karam, 1997, pp. 10-12). The initial step in this process is the reforming of

the educational sector, which must be linked effectively to productive sectors. In order to ensure the contribution of private sector companies and institutions to vocational education and technology, as well as the funding of scientific research, the mobilization of available capacities and guidance towards direct participation in the economic cycle must be considered. It is imperative to implement effective measures to eradicate illiteracy in its entirety. Thirdly, there is a necessity to reform the conditions of central and local administrative bodies. In addition, the independence of their employees in their material lives must be secured. These measures are imperative to eradicate corruption and bribery. Moreover, it is crucial to put an end to the influence of influential politicians and wealthy individuals on the loyalty of employees in those departments. Fourthly, it is essential to ensure that individuals have equal access to financial resources, including loans and means of production, thereby facilitating economic empowerment and sustainable development. Fifth, it is imperative to achieve tax justice among disparate social groups. In order to do so, the income tax system—imposed on individuals and companies—must be adapted to meet two key requirements. Firstly, it must meet the requirements of developing technological capabilities. Secondly, it must meet the requirements of local development. It is imperative that public and private sector

institutions implement the requisite environmental measures. The development of the institutional and legal framework is a key component of the project. Eighth, efforts must be made to impede the migration of rural populations to urban areas and the phenomenon of housing concentration in cities.

3. **Study methodology:** In order to accomplish the objectives and hypotheses of the study, the analytical descriptive method is employed to analyze the data and statistics from the selected states' stakeholders, including the Ministry of Finance, the International Monetary Fund, and the World Bank.

#### 4. Practical/ analytical framework

##### 4.1 GDP and per capita in Iraq for the period 1990-2022

The calculation of GDP per capita is typically performed by dividing the population. The latter is also an indicator of economic growth; however, it differs from GDP in that it incorporates the rate of population growth. Therefore, the calculation is performed subsequent to the inclusion of the population, as illustrated in Table 1 below:

Table 1: The following study will examine the development of Iraq's gross domestic product and per capita product for the period 1990-2022.

Year	Economic Growth Rate (%)	Per Capita Output (million dinars)	Population	GDP at Constant 2007 Prices (million dinars)
1990	57.82	10,216.67	17,658,381	559,265
2000	17.82	1,548.30	23,820,734	344,640
2010	6.41	4,320.13	29,312,684	132,687
2022	7.64	6,441.92	44,496,122	415,628

#### Sources:

- (1) Data of the Central Statistical Agency of Iraq and the Central Bank of Iraq published on the statistical website of the Bank on 4/11/2022
- (2) Statements of the Baldan Bank published on the Bank's website on 4/11/2022.
- (3) Researcher's work

As illustrated in Table 1, there has been a continuous increase in GDP since the beginning

of 1990, when it reached 55 million Iraqi dinars (IQD). Since then, GDP has fluctuated. This

period was distinguished by its volatile circumstances, a substantial economic embargo, and a military engagement that reached its zenith in 2004. As of 2016, the value had reached 101 million Iraqi dinars (IQD 208 million). Thereafter, it underwent a decline in 2017, reaching 201 million Iraqi dinars (IQD 201 million). This phenomenon can be attributed to the decline in the price of a barrel of oil. The Iraqi economy is predominantly reliant on its exports of crude oil, which account for a substantial percentage of the nation's GDP. A significant portion of the Iraqi economy is typified by a rentier economy. The GDP demonstrated a recovery in 2018 and 2019, reaching 211 million Iraqi dinars (IQD 211 million) by the conclusion of the period. This value signifies the most substantial GDP documented during the research period, as the population growth rate exhibited a notable increase throughout the study period (3%), with a population of 26.3 million at the beginning and 39.3 million at the end. In a similar fashion to the GDP at constant prices, per capita GDP demonstrated a consistent upward trajectory from the beginning of 1990, when it was 10,216.56881, to 2004 (1,314.969584), to 2013 (6,612.902252), and then to 2014 (6,215.986033). Thereafter, it remained at a constant level until 2015. The decline to 4416.942924 can be attributed to the fact that, in June 2014, certain armed groups seized control of several regions in Iraq, seceded from the central government, and initiated military operations with the objective of liberating themselves from governmental authority. In 2016, per capita GDP reached its highest value during the study period and throughout the entire period under consideration. However, a subsequent decline was observed in 2017 and 2018, reaching 201,059. Subsequently, it ascended once more, reaching a peak of 415,628 in 2022.

#### **4.2 Time Series Analysis of Public, External, and Internal Debt**

The external and internal public debts of the government were observed over the period from 1990 to 1999. During the period from

2000 to 2002, fluctuations in the rate of ascent and descent were observed, with a slight decrease in the internal debt to 20.33285). Although domestic debt experienced a substantial increase during the period (2004-2016), as evidenced by the data presented in Table 2, the total internal government debt escalated from 592,5061 million dinars in 2004 to 473,622,510 million dinars by the conclusion of 2016 (321,428,050) million dinars in 2015, exhibiting a growth rate of (1. The escalating maintenance deficit that began in 2013 (232197) has led to a significant increase in the country's internal public debt. This deficit was financed by the government through a combination of treasury remittances, bonds, and loans from commercial banks. As a result, the total public debt reached 47,678,796 million dinars by 2017. This substantial increase in debt can be attributed to the government's borrowing through general debt bonds and dollar-term delivery bonds. The internal public debt was significantly reduced by the issuance of peasants' bonds, bonds, contractors, and national bonds. The debt reached 40,586,247 million dinars in 2019. This decline can be attributed to the return of price stabilization, high oil rates, the extinguishment of part of the bonds and remittances of the Iraqi Central Bank, and the reduction of the government's debt interest rate by some banks. The debt continued to stabilize in 2022 at 513,559 million dinars.

The external public debt in 1995 (926,988 million dinars) increased in 1999 to 220,5019 million dinars (3.87 billion dinars), 931,490 million dinars (931,490 million dinars), and the composite growth was (-2.25 billion dinars). A thorough examination of Table 2 reveals that the volume of external debt exhibited a fluctuating trend during the period from 2004 to 2016. Specifically, the external debt volume for 2009 decreased to 111,979,690 million dinars, in contrast to the 178,258,590 million dinars recorded in 2004. The rise in global oil prices resulted in increased revenues and enhanced external debt servicing, thereby contributing to the repayment of a portion of the debt.

However, this was followed by a substantial increase within a year. According to the most recent data, the global oil prices have declined, public expenditure on public revenues has increased, and the government has resorted to external loans to finance the public budget deficit. Consequently, the volume of external debt decreased for the year 2014 by a slight ratio to 641,037,909 million dinars. In 2016, the total debt rose to 69,964,198 million dinars due

to an increase in rescheduled loans, untreated debt, new loans, creditors' commercial debt, and new commercial debt. This rise was further exacerbated by the high costs of the war on terror, which strained the federal budget. As a result, the government was compelled to finance a significant portion of its expenditures through external debt, which reached 38,841,320 million dinars in 2022.

**Table 2: development of Iraq's external and internal public debt and growth rates from 1990 to 2022.**

Year	External Government Debt (Million \$)	External Debt Growth Rate (%)	Internal Debt (Million \$)	Internal Debt Growth Rate (%)	Total Public Debt (%)
1990	30.20	-1.00	31.70	-1.19	61.90
1994	40.48	20.57	45.28	-10.27	85.76
1998	1,965,807	3.87	31.99	-3.36	88.90
2002	3,552,858	-8.27	17.69	-2.64	73.71
2006	16,205,374	-6.13	5,655,376	-2.07	22,460,912
2010	6,309,960	-0.73	9,180,806	-4.40	78,771,746
2014	6,173,070	5.60	9,524,009	2.33	73,623,809
2018	22,522,000	-6.49	4,182,291	-2.89	75,383,000
2022	3,884,132	-42.97	51.36	-12.46	55.43

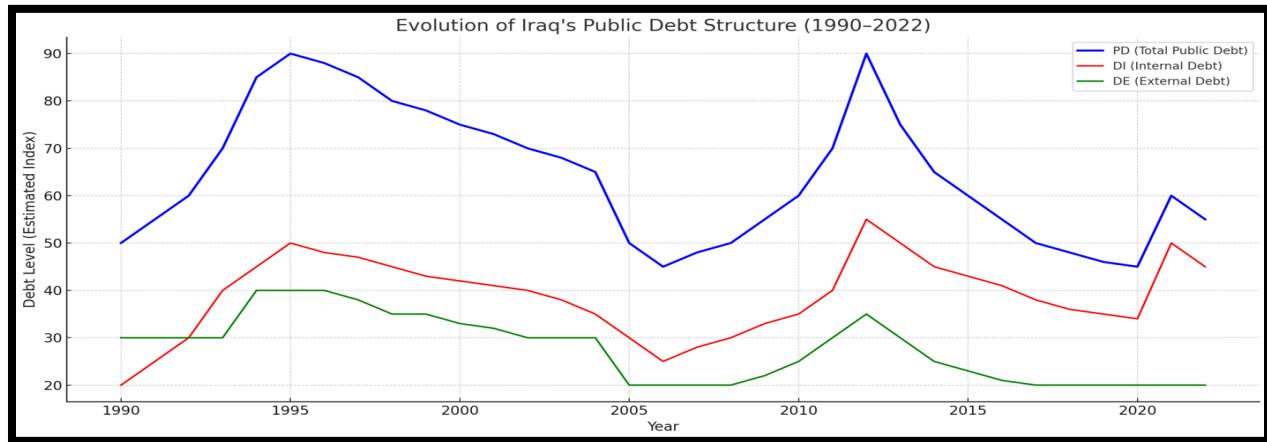
**Source: Column (1) and (3), (5) (7) Central Bank of Iraq, Directorate General of Statistics and Research, Annual Bulletins.**

**Column (2), (4) (6) of the researcher's work based on column data (1), (3) and (6).**

**\* External debt was calculated by multiplying dollar amounts at the official exchange rate of the Central Bank of Iraq (CBI) of 1,166 dinars per dollar.**

It is noteworthy that the public debt for the period from 1990 to 2003 decreased from 61.90467 in 1990 to 66. In 2003 or 2004, the value was IQD 23,750,920 million, representing 44% of the GDP volume at current prices. This was the highest value achieved, and it was reached in 2008, when the value was IQD 15,781,445 million. This represented a growth rate of (-10%) and constituted Mansporta (10%) of GDP volume, the lowest duration ratio (2004-2016). The improvement in global oil prices and the increase in the quantities of exported production led to a significant rise in public debt, which reached 787,717,460 million dinars in 2010, with a growth rate of 300%. This was due to the fact that the total public debt constituted 50% of the

gross domestic product (GDP). This high proportion and its adverse effects on the Iraqi economy necessitate a response from the government. In 2016, the public debt reached 117,326,449 million dinars, the highest value recorded during the study period. This debt constituted 60% of the GDP for the same year. The federal budget deficit, the imbalance in public spending, and inadequate planning have contributed to the instability in public expenditure. Furthermore, the introduction of the general budget has exacerbated the already precarious state of the Iraqi economy. Consequently, public debt has escalated from 7,922,400,000 in 2017 to 9,457,500,000 in 2018 and reached 5,542,891 in 2022.



**Figure 2 evolution of the structure of internal and external government debt, as well as total public debt, for Iraq from 1990 to 2022.**

**Sources: (1) EViews-12, (2) Data from Table 2**

The figure above illustrates the evolution of Iraq's public debt structure from 1990 to 2022. The data demonstrate substantial fluctuations in total public debt, with a conspicuous increase during the mid-1990s consequent to economic sanctions imposed on Iraq. Subsequent to 2004, there was a relative decline in debt due to international debt relief initiatives. However, following 2014, there was a marked increase in debt levels, precipitated by mounting security concerns, a decline in oil prices, and an increased reliance on public spending in the absence of diversified income sources.

Recent studies have indicated that internal debt has become the predominant factor contributing to the overall increase in public debt. The Iraqi government increasingly relied on domestic borrowing to finance its fiscal deficit, especially in light of limited access to external loans and international financial support. Conversely, external debt exhibited stability and even declined during certain periods, attributable to debt forgiveness and Iraq's constrained capacity to borrow internationally.

A comparative analysis of the United States with other prominent oil-producing countries, including Saudi Arabia, the United Arab Emirates (UAE), and Algeria, reveals salient differences. Saudi Arabia has demonstrated its capacity to sustain moderate debt levels, a feat facilitated by substantial financial reserves and

a cautious fiscal policy approach. The United Arab Emirates (UAE) employed a strategy of leveraging debt for productive investment in infrastructure, energy, and real estate, ensuring that debt contributed to long-term development rather than creating fiscal burdens. Despite its reliance on hydrocarbon revenues, Algeria endeavored to minimize extensive foreign borrowing. Instead, the country sought to address its budget deficits through unconventional domestic financing strategies.

Conversely, Iraq has not implemented a coherent or efficacious debt management strategy. A significant portion of the borrowing was allocated toward current expenditures, including employee compensation and subsidies, rather than being directed toward productive projects with the potential to generate future returns. This has led to a deterioration in Iraq's financial stability, increasing its vulnerability to external shocks such as oil price volatility or political and security instability.

#### **4.3 GDP and Per Capita Income in Iraq (1990–2022)**

Changes in Gross Domestic Product (GDP) are a reliable indicator of economic growth. These variables are among the most significant macroeconomic indicators, reflecting the degree of financial advancement or underdevelopment of nations. The calculation of GDP per capita is typically executed by

dividing the total GDP by the population size. The latter is also an indicator of economic growth; however, it differs from GDP in that it takes into account the population growth rate.

Therefore, the calculation was performed subsequent to the inclusion of the population as demonstrated in Table 3, as follows:

**Table 3: Development of GDP, per capita economic growth rate and population in Iraq (1990–2022)**

Year	GDP Fixed Prices (1 million dinars)	Population	Per capita GDP (1 million dinars)	Economic growth (%)
1990	559265000	17658381	1660.8	5.78
1994	165833000	20248073	957.9	3.85
1998	196580000	23053488	1564.8	3.48
2002	410229000	26255343	1578.1	-8.19
2006	109389941	27448124	1660.9	3.68
2010	132687029	29741976	4430.4	3.74
2014	178951407	34411951	6215.9	-3.57
2018	202776268	38433600	5601.4	0.29
2022	415628000	44496122	6441.9	7.63

**Sources:**

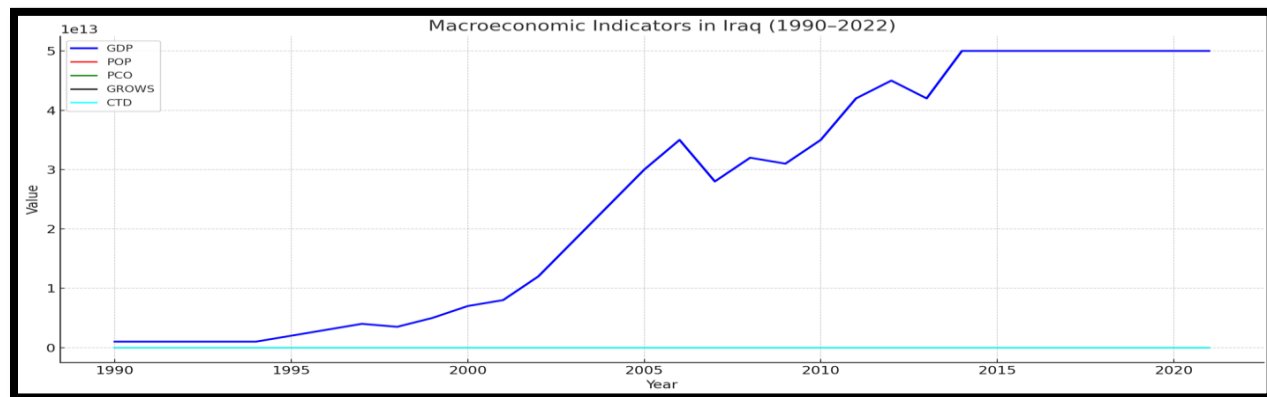
- (1) Data of the Central Statistical Agency of Iraq and the Central Bank of Iraq published on the statistical website of the Bank on 4/11/2023
- (2) World Bank data published on the Bank's website on 4/11/2023.
- (3) The researcher worked by dividing (1) by (2).

Nevertheless, the development of average GDP per capita may not accurately reflect the real development goal of raising the per capita standard of living, as the average may rise without a corresponding increase in the standard of living for most individuals. However, subsequent development literature was accompanied by the implementation of a development indicator that reflected the country's economic and social characteristics. Economic growth is defined as a sustained increase in the average GDP per capita over time. Such an increase could raise living standards in the absence of problems, including inflation and balance-of-payments imbalances, as well as issues related to distributional equity. As illustrated in Table 3, the development of GDP per capita in Iraq has been characterized by fluctuating annual growth rates. The indicator reached its nadir in 1991, with GDP per capita at 583.1 dinars, marking a substantial decline of 64.9% compared to 1990. By the conclusion of 1995, the GDP per capita had escalated to 953.0 dinars, though this

represented a decline of 707.8 dinars compared to 1990 levels. This period was significantly influenced by the country's circumstances, including the repercussions of the Second Gulf War and the international sanctions imposed on Iraq, particularly with regard to its oil exports. Consequently, the annual per capita growth rate for the years 1990 to 1995 was negative, at -3.0%. From 1996 to 2001, the per capita output growth rate exhibited a notable increase, reaching approximately 12%. However, this figure obscures a narrative of volatility. The trajectory of this phenomenon commenced with a substantial growth rate of 7.9% in 1996, which subsequently escalated to an impressive 31% in 1998. However, this ascension was followed by substantial challenges, as evidenced by negative growth rates in 2000 and 2001. This remarkable fluctuation underscores the potential for economic success and the risks that can arise in a dynamic environment. The combined growth rate between 2002 and 2007 reached approximately 4.8%, indicating a downward trend compared to earlier years. In

2002, the per capita output was approximately 1,578.1 dinars, which increased to 1,634.3 dinars by 2007—a positive change of approximately 56.2 dinars. While the average growth rate during this period was approximately 4%, it is imperative to acknowledge that such economic expansion does not inherently guarantee an improvement in living standards for individuals. The persistent challenges associated with deficient infrastructure and constrained social services underscore the necessity for a more comprehensive strategy to enhance the quality of life for all citizens. As illustrated in Table 3, there has been a consistent rise in GDP since the inception of the period under consideration, reaching approximately 102 trillion dinars in 2016 (approximately 209 trillion dinars). In 2017, the value of the Egyptian pound fell to approximately JD 201 trillion. This is attributable to two factors: the decline in the price of a barrel of oil and the fact that the Iraqi economy is heavily reliant on the export of crude oil, accounting for a substantial proportion of its GDP and rent economy. Subsequently, the GDP exhibited an increase in 2018 and 2019, reaching its zenith by the conclusion of the term (approximately 212 trillion dinars). This figure signifies the highest GDP during the study period. The population exhibited an increase in size over the course of the study, with a growth rate of approximately 3% from the beginning of the period (approximately 26.3 million people) to the end of the term (approximately 39.3 million people). Analogous to the development of the gross domestic product (GDP), the GDP per capita exhibited a sustained increase following its initial value (approximately 3.9 million dinars) at the inception of the period. The initial amount arrived in 2013, amounting to approximately 5.2 million dinars, and

subsequently decreased to approximately 5.1 million dinars in 2014. This dynamic persisted in 2015, attributable to the diminution of the control of substantial regions of Iraq by armed groups in June 2014, their secession from central authority, and the State's engagement in military operations to liberate these regions. In 2016, per capita GDP reached its highest recorded value during the examined period (approximately 5.6 million dinars). This figure represents the highest value recorded during the specified period. However, it underwent a decline in 2017 and 2018, reaching approximately 5.2 million dinars. However, at the conclusion of the period under consideration, the rise was restored (approximately 5.4 million dinars). It is also important to note the timeline of the rate of economic growth, which is calculated by subtracting the rate of population growth from the rate of GDP growth. This is due to the fact that the time series has varied throughout the study. The highest value was recorded in 2016, when the index reached 10.87%, while the lowest value was observed in 2020, with a decline of 17.98%. It is also observed that the negative values in 2005, 2014, and reality (-0.65%) and (-3.57%), respectively, are below the corresponding population growth rate values. This indicates that, although GDP increased in those years, its growth rates were lower than the population growth rates. The time series values in 2017 and 2020, which are high (-4. The decline in GDP, which was both real and significant, was the primary cause of the observed economic downturn. Concurrently, the growth rates of output also exhibited a negative trend. In accordance with mathematical principles, the values of the time chain of economic growth in these two years were negative, high, and exceeded their peer population growth rates.



**Figure 3, analysis of Gross Domestic Product (GDP) and per capita growth in Iraq from 1990 to 2022**

**Sources: (1) EViews-12, (2) Data from Table 3**

The chart illustrates a discernible upward trend in Iraq's gross domestic product (GDP) during the period spanning from 1990 to 2022. This growth commenced at a relatively modest pace during the 1990s, largely due to the economic embargo in place at the time. However, it underwent a substantial acceleration following Iraq's re-entry into global oil markets in 2003, a development that coincided with a significant surge in international oil prices. The Iraqi economy became excessively reliant on oil revenues, exhibiting minimal diversification of income sources. Although Gross Domestic Product (GDP) figures exhibited a marked increase, other macroeconomic indicators, including population, public spending, economic growth rate, and non-oil revenues, remained relatively stagnant or inactive. This finding indicates that the observed enhancements in Gross Domestic Product (GDP) were not uniformly reflected in other sectors of the economy.

A comparative analysis of these trends with those observed in other oil-producing countries, such as Saudi Arabia, the United Arab Emirates (UAE), and Algeria, reveals significant disparities. In Saudi Arabia, for instance, the government has implemented significant structural reforms, most notably Vision 2030, which aims to reduce the country's dependency on oil and to expand sectors such as tourism, technology, and services. The government also promoted entrepreneurship, women's

empowerment, and private sector development, which contributed to more stable and resilient economic growth. Conversely, the United Arab Emirates (UAE) has effectively utilized long-term strategic planning to establish itself as a prominent regional hub for financial activities, tourism, and trade. The nation's economy has diversified beyond oil revenues, with significant contributions from real estate, aviation, logistics, and commercial services.

While the Algerian economy shares certain similarities with that of Iraq in terms of its dependence on hydrocarbons, the country has managed to maintain a certain degree of balance through the implementation of large-scale social welfare programs and investments in infrastructure and housing. Nevertheless, the absence of economic diversification and inadequate structural reform has resulted in moderate and vulnerable growth, particularly during periods of declining oil prices. Conversely, Iraq has not effectively utilized its oil revenues to establish a diversified economic base. The government's financial strategy has been predominantly reliant on a rent-based model of public spending, with a conspicuous absence of allocating investments to strategic non-oil sectors. Political instability and ongoing security challenges have further disrupted the path toward sustainable development.

In summary, although Iraq's GDP growth has been quantitatively substantial, it lacks the quality and sustainability seen in other oil-

producing nations. Saudi Arabia and the UAE have successfully transformed their oil wealth into long-term development strategies. In contrast, Iraq's growth remains fragile, narrowly based, and vulnerable to external shocks.

#### 4.4 Analysis of school enrolment data and illiteracy rate.

As illustrated in Table 4, the gross school enrollment rate in Iraq has remained relatively stable over the examined period. From 1990 to 1996, the rate increased to \$35,000.12, subsequently decreasing to \$34,986.52 from 1997 to 2000. This decline can be attributed to the economic conditions in Iraq and the subsequent imposition of an economic embargo. The gross enrollment rate exhibited an upward trend, reaching its highest point during the study period. The data indicates a positive annual growth rate of 0.32659 for the

year 2005, which is indicative of an increase in the gross school enrollment rate. This growth trajectory persisted, with the gross school enrollment rate increasing to 0.4598972 in 2008 and 0.4799992 in 2013. Notably, the gross school enrollment rate reached 0.5000235 in 2017, signifying a substantial increase in educational access and participation. Subsequently, the gross enrollment rate exhibited a gradual increase, reaching its peak during the period of schooling. (51.32655) The factors contributing to the high gross school enrollment rate in 2019 are attributed to the government's heightened commitment to literacy initiatives. The government has issued directives to certain civil and military departments and institutions, encouraging the pursuit of graduate employment opportunities. The number of enrollments increased in 2022 to 53,654.81, as illustrated in **Figure 4**.

**Table 4: Developments in GDP, per capita income, and economic growth in Iraq (1990–2022)**

Year	GDP Fixed Prices (1 million dinars)	Population	Per capita GDP (1 million dinars)	Economic growth (%)
1990	559265000	17658381	1660.8	5.78
1994	165833000	20248073	957.9	3.85
1998	196580000	23053488	1564.8	3.48
2002	410229000	26255343	1578.1	-8.19
2006	109389941	27448124	1660.9	3.68
2010	132687029	29741976	4430.4	3.74
2014	178951407	34411951	6215.9	-3.57
2018	202776268	38433600	5601.4	0.29
2022	415628000	44496122	6441.9	7.63

#### Sources:

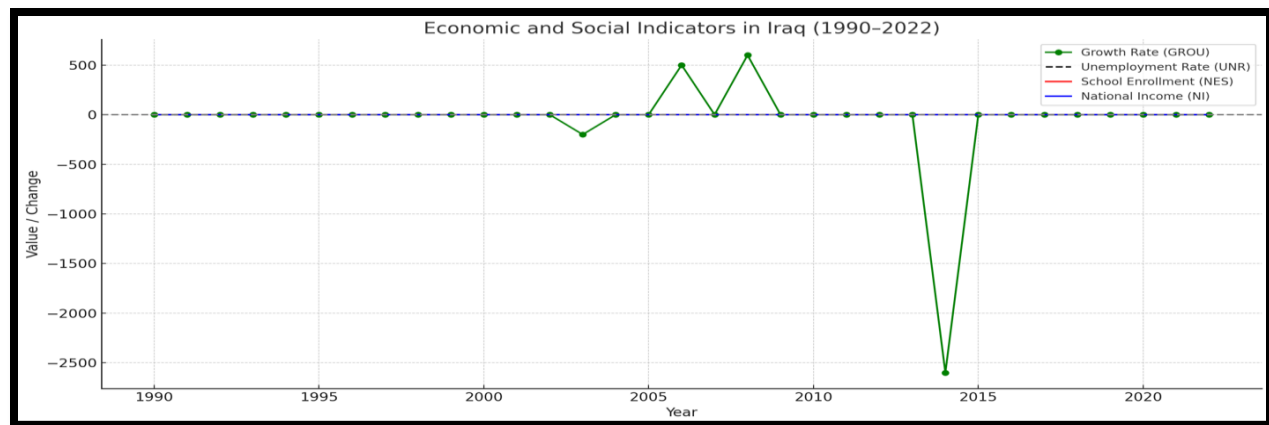
- (1) Data of the Central Statistical Agency of Iraq and the Central Bank of Iraq published on the statistical website of the Bank on 4/11/2022
- (2) Statements of the Baldan Bank published on the Bank's website on 4/11/2022.
- (3) Researcher's work

As demonstrated in Table 4, the gross school enrollment rate in Iraq is one year old, with a peak of \$35,000.12 in the 1990-1996 period. However, due to the economic conditions in Iraq and the imposition of an economic embargo from 1997 to 2000, the rate decreased to \$34,986.52. The gross enrollment rate exhibited an upward trend, reaching its highest point during the study period. The data

indicates a positive annual growth rate of 0.32659 for the year 2005, which is indicative of an increase in the gross school enrollment rate. This growth trajectory persisted, with the gross school enrollment rate increasing to 0.4598972 in 2008 and 0.4799992 in 2013. Notably, the gross school enrollment rate reached 0.5000235 in 2017, signifying a substantial increase in educational access and

participation. Subsequently, the gross enrollment rate exhibited a gradual increase, reaching its peak during the period of schooling. (51.32655) The factors contributing to the high gross school enrollment rate in 2019 are attributed to the government's heightened commitment to literacy initiatives. The government has issued directives to certain civil and military departments and institutions, encouraging the pursuit of graduate employment opportunities. The number of enrolments increased in 2022 to 53,65481, as illustrated in Chart No. 6. As illustrated in Table 4, the illiteracy rate in Iraq decreased from 20% in the early 1990s to 19% in the late 1990s, due to improvements in security and

economic conditions. This trend continued, with the rate dropping to 18% in the 2000s and 14% in 2022. The data, presented in Chart No. 6, also show a gradual increase in the literacy rate from 1990 to 1993, from 20% to 19%, likely due to the aforementioned improvements in security and economic conditions. As illustrated in Table 4, the unemployment rate in Iraq during the 1990s was 13%, with an increase to 14% from 1993 to 2008. From 2009 to 2014, the unemployment rate remained at 12%, but subsequently increased significantly to 21% from 2015 to 2017. Notably, the unemployment rate continued to rise, reaching 28% in 2022, as illustrated in Figure. (4).



**Figure (4): Unemployment developments, growth rate, school enrolment and illiteracy rate (1990-2022)**

**Sources: (4) EViews-12, (5) Data from Table 4**

The figure under scrutiny reveals pronounced fluctuations in the economic growth rate, particularly during the years 2015 and 2017, where substantial increases were followed by a precipitous decline in 2022. This phenomenon is indicative of the structural fragility of Iraq's economy, which continues to be heavily reliant on volatile oil revenues and exhibits an absence of effective diversification strategies. In contrast, the other indicators—unemployment, school enrollment, and national income—appear relatively stable across the same period, suggesting a stagnation in socio-economic development policies rather than notable progress or reform.

A comparative analysis of the economic growth patterns of the United States and other oil-producing countries, such as Saudi Arabia and the United Arab Emirates, reveals that the former has exhibited a more stable and consistent growth trajectory. By diversifying their economies and allocating substantial resources to education and employment policies, they have been able to mitigate the adverse effects of oil price volatility and ensure a more balanced developmental trajectory. In Algeria, while some fluctuations in growth are observable, they tend to be less severe due to the presence of social protection programs and broader economic resilience.

In conclusion, the indicators presented for Iraq point to an inability to absorb economic shocks effectively, as well as a lack of integration between educational, employment,

and economic policies. In contrast, other oil-rich countries have achieved relative stability through long-term planning and structural reforms.

#### 4.5 Analysis of agricultural land per capita.

**Table 5: Changes in agricultural area, per capita share, and growth rates in Iraq (1990–2022)**

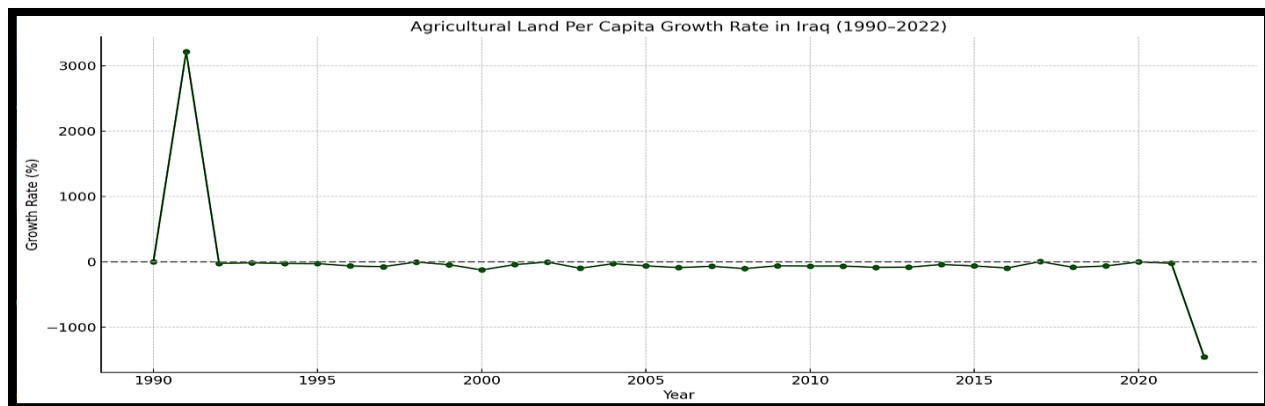
Year	Agricultural Land	Per Capita Agricultural Land	Agricultural Land Growth Rate	Agricultural Land Per Capita Growth Rate
1990	21.1034136	32.96511	0.91455746	0
1994	20.8061824	31.5547	0	-25.9009
1998	19.7773053	29.96143	-0.34295905	-195.535
2002	19.868761	25.00451	0	-1.09091
2006	20.5546791	23.77177	0.34295905	-59.5427
2010	19.6859459	20.04811	0.04259532	-63.1671
2014	21.3508458	17.78609	0	-92.331
2018	21.5811926	15.54986	0.16124277	-81.7406
2022	21.7078834	14.53504		-1453.5

#### Sources:

- (1) Data of the Central Statistical Agency of Iraq and the Central Bank of Iraq published on the statistical website of the Bank on 4/11/2022
- (2) Statements of the Baldan Bank published on the Bank's website on 4/11/2022.
- (3) Researcher's work

As illustrated in Table 5, the agricultural land in Iraq has consistently maintained a significant proportion throughout the examined period (1990-2022), standing at 21.70788339, which is among the highest recorded for agrarian land (22.56670554). Notably, in the year 1993, the minimum recorded value was 18.07423098 thousand general tons, indicating a notable decline in agricultural land per capita during the period spanning from 1990 to 2022,

with a recorded value of 32. The quantity under consideration increased from 96511) in 1990 to 14.53504) in 2022. This increase can be attributed to several factors, including a decline in crop cultivation, improved conditions due to favorable weather, population growth, and decreased water levels in the Tigris and Euphrates rivers. These changes are illustrated in Figure 5.



**Figure 5: Agricultural land per capita growth rate (1990-2022)**  
Sources: (1) EViews-12, (2) Data from Table 5

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The figure illustrating the growth rate of agricultural land per capita in Iraq from 1990 to 2022 reveals notable fluctuations in trend. A particularly pronounced spike occurred in 1991, when the index exceeded 3,000 percent. This unusual surge is attributed to the economic embargo imposed on Iraq following the Gulf War. During this period, the state's focus shifted predominantly toward domestic agriculture as a primary means of securing food, a strategic decision precipitated by a precipitous decline in imports and constrained access to international markets. In response, the government mobilized available resources to expand and utilize agricultural lands, which resulted in a significant increase in the per capita share of arable land—albeit temporarily.

Nevertheless, this expansion ultimately proved to be unsustainable. In the subsequent years, the index underwent a gradual decline, primarily driven by factors including rapid population growth, declining governmental support for the agricultural sector, inadequate investment planning, and the absence of consistent economic policy capable of sustaining agricultural development. The most precipitous downturn occurred in 2022, with a catastrophic collapse in the indicator exceeding 1,400 percent in the negative. This phenomenon can be attributed to two primary factors. The initial factor was the persistent increase in population, which was not accompanied by a proportional expansion in cultivated land. Secondly, Iraq's increasing reliance on food imports, as opposed to domestic production, has led to a pervasive disregard for agricultural lands. Consequently, a considerable portion of these lands were subsequently converted to residential and commercial use, particularly in urban peripheries, due to the absence of effective urban planning and sustainable land-use policies.

A comparison with Algeria reveals both similarities and differences. Algeria is also confronted with challenges related to per capita agricultural land, a consequence of population growth and the limited availability of arable land. However, the Algerian case demonstrates

a relatively more stable pattern. The country's geography imposes constraints on the availability of farmland, with the majority of agricultural activity concentrated in the northern coastal regions. Nevertheless, Algeria has maintained a certain equilibrium between population pressure and available agricultural resources by allocating funds toward irrigation projects and promoting agricultural expansion in the high plateau regions.

In recent years, Algeria has also taken proactive steps to strengthen food security. These steps include supporting local farmers, investing in agricultural infrastructure, and regulating import flows to protect domestic production. These measures have contributed to a more stable per capita share of agricultural land, in contrast to Iraq's continued decline. Despite its considerable agricultural potential, Iraq faces challenges including weak institutional frameworks, political instability, and an increasing abandonment of strategic agricultural planning. This has resulted in a gradual decline in the per capita agricultural land share over time.

The fundamental difference between the two countries lies in policy continuity and institutional resilience. Despite the environmental constraints faced by Algeria, the nation has demonstrated a notable capacity to maintain a relatively cohesive agricultural policy framework. Conversely, Iraq, endowed with more favorable natural resources, has been unable to capitalize on them due to fragmented governance, economic dependence on oil revenues, and a lack of integration between agricultural and demographic planning. These conditions underscore the pressing need for Iraq to adopt a comprehensive development vision that prioritizes agricultural reform, land management, and population policy in pursuit of long-term sustainability.

## **5. Standard analysis**

### **5.1 Statistical description of variables.**

The results in the table demonstrate that the time series exhibits a normal distribution, as evidenced by the value of J-B, which is 0.2324

and exceeds the 0.05 threshold, corresponding to the 5% significance level. As indicated by the fluctuation coefficient (2.96), a peak is

present in the time chain. Furthermore, the skewness coefficient demonstrates a tendency towards the left.

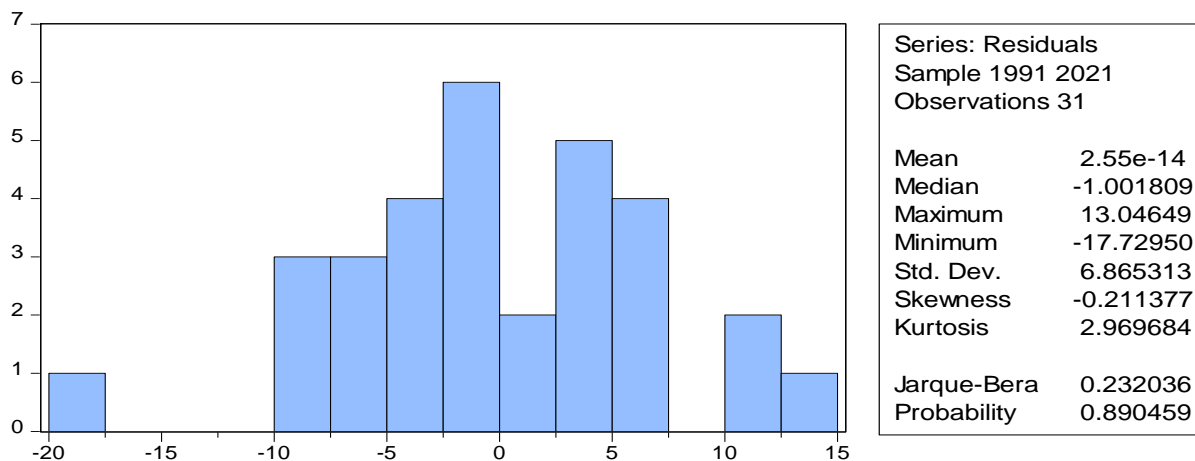


Figure (6): Statistical description of Model (Iraq)

Source: Researcher's preparation by reference to statistical analysis results

### 5.2 Test the stability of the time series of the second model (Iraq)

The findings presented in Table 6 offer critical insights into the evolving dynamics of unemployment growth. It is noteworthy that the growth rate of agricultural land per capita has stabilized at an impressive 5%. This stability is evident in key economic indicators, including the country's external debt, gross domestic product, agricultural land, literacy rates, per capita agricultural land, and the unemployment rate. All of these indicators are

measured with a 5% significance level. Moreover, subsequent to the implementation of the second differentiation, the population growth rate has demonstrated resilience at this substantial level. Furthermore, the growth rate of agricultural land and the number of out-of-school students have stabilized at commendable levels. This data underscores the necessity of continuous monitoring and strategic planning to maintain and enhance these positive trends.

Table 6: Dickie Fuller's Second Model Test Results

Level of stability	ADF test value	Critical value at 5% indication level	variable
First Difference	-3.565234	-2.960411	<b>CTD</b>
First Difference	-4.236288	-2.963972	<b>GDP</b>
Unstable	=	=	<b>Grown</b>
Level	-7.037238	-2.986225	<b>Growu</b>
Level	-8.320968	-2.960411	<b>growa</b>
Level	-8.963171	-2.957110	<b>grows</b>
Unstable	=	=	<b>NES</b>
First Difference	-4.959039	-2.963972	<b>Ni</b>
First Difference	-5.576066	-2.960411	<b>PCO</b>
Level	-3.330194	-2.957110	<b>PGL</b>
First Difference	-3.616316	-2.976263	<b>POP</b>
Second difference	-6.178401	-2.967767	<b>UNR</b>
First Difference	-4.333734	-2.981038	<b>NGL</b>

Source: Researcher's preparation by reference to statistical analysis results

### 5.3 Joint Integration Test of Iraq's Model

As shown in the table below, the F statistic is 2.04. This is less than the 3.04 value at a 5%

confidence level, which allows for zero imposition in the absence of standard integration.

**Table 7: Joint Integration Test of Iraq's Model**

Test Statistic	Value	k		
F-statistic	2.043708	11		
Critical Value Bounds				
Note: values unavailable for k=11. Displaying critical values for k=10				
Significance	10 Bound	11 Bound		
10%	1.76	2.77		
5%	1.98	3.04		
2.5%	2.18	3.28		
1%	2.41	3.61		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	70.36647	171.4504	0.410419	0.6863
PCO(-1)	-0.001876	0.001048	-1.790769	0.0902
NI(-1)	-2.168007	2.172631	-0.997871	0.3316
NGL(-1)	-0.482076	2.374254	-0.203043	0.8414
GROWS(-1)	-0.032494	0.107858	-0.301269	0.7667
GROWA(-1)	-0.008389	0.004143	-2.024536	0.0580
GROU(-1)	0.006512	0.008221	0.792066	0.4386
GDP(-1)	1.74E-13	6.27E-14	2.773289	0.0125
CTD(-1)	-3.83E-10	1.09E-09	-0.350564	0.7300
PGL(-1)	1.462888	3.332354	0.438995	0.6659
POP(-1)	-2.24E-06	3.12E-06	-0.717684	0.4822
UNR(-1)	1.645909	0.752958	2.185922	0.0423
PD(-1)	-0.438381	0.181785	-2.411531	0.0268
R-squared	0.595749	Mean dependent var	0.282774	
Adjusted R-squared	0.326248	S.D. dependent var	9.427332	
S.E. of regression	7.738177	Akaike info criterion	7.225304	
Sum squared resid	1077.829	Schwarz criterion	7.826653	
Log likelihood	-98.99221	Hannan-Quinn criter.	7.421329	
F-statistic	2.210567	Durbin-Watson stat	2.135338	
Prob(F-statistic)	0.062320			

**Source: Researcher's preparation by reference to statistical analysis results**

### 5.4 Estimated form.

We note from the table below that public debt (GD) has hurt agricultural land and

increased the population and per capita share of agricultural land in Iraq during this period.

**Table No. 8 Estimated Model Iraq.**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-275.7681	201.3063	-1.369893	0.1859
PCO	-0.000324	0.001296	-0.250160	0.8050
NI	-1.092909	2.696637	-0.405286	0.6896
NGL	-6.355911	2.595507	-2.448813	0.0237
GROWS	-0.123272	0.131534	-0.937187	0.3598

GROWA	-0.004346	0.005069	-0.857354	0.4014
GROU	0.008325	0.009977	0.834378	0.4139
GDP	-6.61E-14	7.59E-14	-0.871374	0.3939
CTD	-6.48E-10	1.32E-09	-0.489748	0.6296
PGL	10.70913	3.306559	3.238755	0.0041
POP	7.81E-06	3.45E-06	2.263091	0.0349
UNR	1.157101	0.901773	1.283140	0.2141
R-squared	0.817405	Mean dependent var		61.23651
Adjusted R-squared	0.716978	S.D. dependent var		18.13060
S.E. of regression	9.645452	Akaike info criterion		7.650846
Sum squared resid	1860.695	Schwarz criterion		8.200497
Log likelihood	-110.4135	Hannan-Quinn criter.		7.833040
F-statistic	8.139274	Durbin-Watson stat		1.429735
Prob(F-statistic)	0.000032			

**Source: Researcher's preparation by reference to statistical analysis results**

### 5.5 Error correction form.

The error correction model results in the table indicate the presence of a long-run equilibrium relationship among the economic variables studied in the Iraqi economy. This is confirmed by the negative and statistically significant error correction coefficient of -0.474084. This means the system corrects approximately 47% of previous periods' deviations to reach equilibrium, reflecting a robust corrective response within the model. Regarding the short-term effects, the results showed that a change in public spending positively and significantly impacts the dependent variable, with a value of 0.0079 and a significance level below 0.01. This indicates that an increase in public spending positively affects the performance of the target variable in the short term. Conversely, the results for gross domestic product (GDP) revealed a negative and significant effect. This suggests that an increase in GDP in the short term may be associated with a decline in the dependent variable. This could be due to structural

changes in the economy or shifts in spending priorities. Other variables, such as national income, population, and the unemployment rate, were not statistically significant, meaning their short-term effects are inconclusive. Regarding the long-term relationship, certain trends emerged in some variables, but they did not reach statistical significance. For example, national income had a negative long-term effect, though it was not statistically significant. Similarly, the unemployment rate showed a positive effect, though it was not significant enough. Government spending on sectors such as education and health displayed relatively large, positive values, but these were also not statistically significant. Thus, it can be concluded that, in the long run, the model reflects a strong adjustment dynamic, but significant effects are primarily concentrated in two main variables: public spending and GDP in the short term. The other variables exhibited non-significant effects in both the short and long run.

**Table No. 9 Error correction model for Iraq -Short-term (Cointegrating Form)**

Variable	Coefficient	t-Statistic	Probability	Note
D(PCO)	0.007099	3.4245	0.0030	Positive and statistically significant
D(CTD)	0.000002	4.7258	0.0001	Positive and statistically

CointEq(-1)	-0.470484	-3.4350	0.0030	significant Negative and significant (adjustment towards equilibrium)
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Source: Researcher's preparation by reference to statistical analysis results

#### • Long Run Coefficients

There are no statistically significant variables at the 5% level. This means that long-run relationships are not significant in this model.

#### 5.6. Evaluation of the results of the estimate.

- Assessment according to the criterion of economic theory: When examining the estimated milestones, it is shown:
  - The constant signal is positive.
  - The negative signal of the NGL coefficient is contrary to the logic of economic theory, due to the lack of funding for agricultural production

- The reference to the "POP" coefficient is positive and is in accordance with the operative of economic theory.
- The signal of the PGL coefficient is positive and is in accordance with the operative of economic theory.
- Valuation according to statistical standard: One of the results of the estimated model is that the probability value is less than (0.05).
- Model reconciliation quality test: It turns out that the determination coefficient (R2) was 69% until the interpretive power of the independent variable is reasonable.
- Assessment according to Standard: D-W procedure of 1.21 confirmed that the model does not have a self-correlation problem

Table 10: ARCH Test Results

Heteroskedasticity Test: ARCH				
F-statistic	0.002966	Prob. F(1,28)	0.9570	
Obs*R-squared	0.003177	Prob. Chi-Square (1)	0.9551	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	46.64842	15.07568	3.094283	0.0044
RESID^2(-1)	0.010275	0.188687	0.054457	0.9570
R-squared	0.000106	Mean dependent var	47.13128	
Adjusted R-squared	-0.035605	S.D. dependent var	65.62364	
S.E. of regression	66.78167	Akaike info criterion	11.30507	
Sum squared resid	124874.2	Schwarz criterion	11.39849	
Log likelihood	-167.5761	Hannan-Quinn criter.	11.33496	
F-statistic	0.002966	Durbin-Watson stat	1.959482	
Prob(F-statistic)	0.956958			

Source: Researcher's preparation by reference to statistical analysis results

One of the results of the table above is that the model does not have the problem of variability because the F value is 0.95 and is greater than the morale level 0.05

#### 5.7 Link matrix.

The results of the matrix show that the variables do not have a linear correlation problem.

Table 11: Link Matrix

	PD	PCO	NI	NGL	GROWS	GROWA	GROU	GDP	CTD	PGL	POP	UNR
PD	1.000	-0.558	0.061	0.062	0.083	-0.014	-0.194	-0.574	-0.580	0.514	-0.415	0.074
PCO	-0.558	1.000	-0.400	0.014	0.192	-0.216	0.185	0.712	0.671	-0.607	0.579	0.295
NI	0.061	-0.400	1.000	-0.372	0.177	0.153	-0.187	-0.707	-0.710	0.774	-0.842	-0.850
NGL	0.062	0.014	-0.372	1.000	-0.110	0.280	0.217	0.111	0.086	-0.047	0.133	0.495
GROWS	0.083	0.192	0.177	-0.110	1.000	-0.607	-0.057	-0.141	-0.177	0.198	-0.183	-0.144
GROWA	-0.014	-0.216	0.153	0.280	-0.607	1.000	-0.023	-0.198	-0.195	0.259	-0.260	-0.087
GROU	-0.194	0.185	-0.187	0.217	-0.057	-0.023	1.000	0.238	0.196	-0.224	0.215	-0.045
GDP	-0.574	0.712	-0.707	0.111	-0.141	-0.198	0.238	1.000	0.960	-0.944	0.937	0.582
CTD	-0.580	0.671	-0.710	0.086	-0.177	-0.195	0.196	0.960	1.000	-0.965	0.952	0.593
PGL	0.514	-0.607	0.774	-0.047	0.198	0.259	-0.224	-0.944	-0.965	1.000	-0.987	-0.636
POP	-0.415	0.579	-0.842	0.1330	-0.183	-0.260	0.215	0.937	0.952	-0.987	1.000	0.725
UNR	0.074	0.295	-0.850	0.495	-0.144	-0.087	-0.045	0.582	0.593	-0.636	0.725	1.000

Source: Researcher's preparation by reference to statistical analysis results

### 5.8 Granger's causal test.

The Granger causality test results for the Iraqi economy reveal temporal and directional relationships among various economic variables. These findings suggest that certain variables precede and statistically explain variations in others. This provides a clearer understanding of the internal mechanisms of the Iraqi economy and offers valuable insights for more effective development planning. For example, the study found that public debt significantly impacts per capita government expenditure. This indicates that fluctuations in public debt levels can influence the state's ability to fund infrastructure and public services. Similarly, per capita GDP directly influences both agricultural land area and the rate of economic growth. This highlights how increases in individual income levels may foster broader investment in the agricultural sector and stimulate national growth. Additionally, the share of agricultural land per capita and population size were shown to affect education levels, indicating the close relationship between demographic factors, resource allocation, and human capital development.

The analysis further demonstrates that higher levels of educational attainment lead to lower unemployment rates, strengthening the connection between education and labor market outcomes. Additionally, it was shown that total agricultural land affects the per capita agricultural share. This indicates that macro-

level agricultural policies have direct consequences for the distribution of land at the individual level. Similarly, economic growth, the per capita share of agricultural land, and demographic expansion were found to influence the growth rate of agricultural land per person. This implies that demographic and economic transitions jointly shape access to land resources. Additionally, the relationship between the unemployment rate and its rate of change reflects the dynamic process of labor market adjustments that unfold over time. The results also suggest that external debt sustainability and per capita agricultural resources impact gross domestic product (GDP), underscoring the importance of financial stability and natural resource management for long-term economic performance.

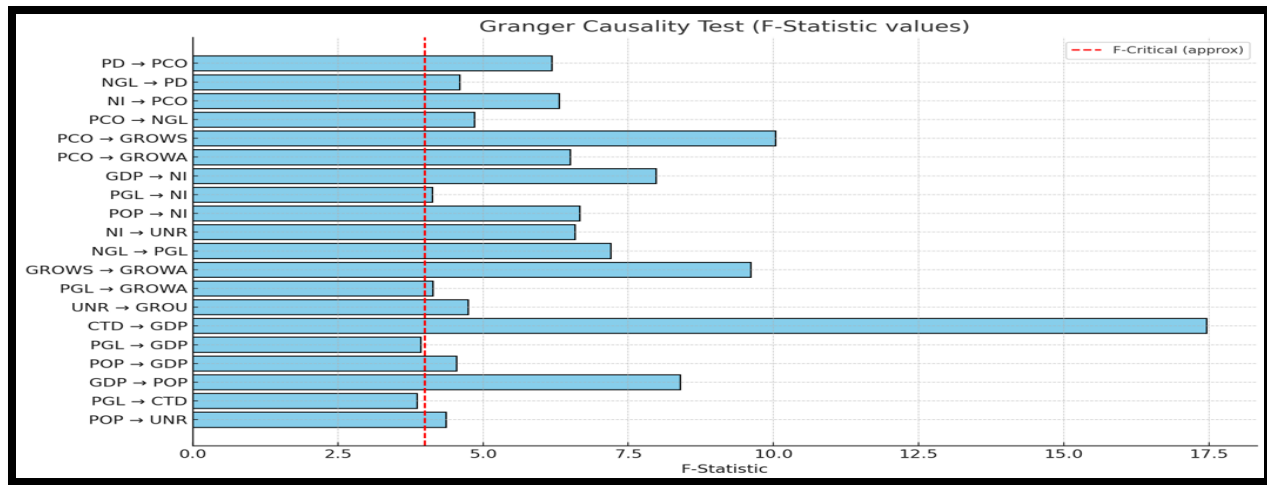
Another notable finding is the bidirectional relationship between GDP and population. This relationship highlights the feedback loop between economic activity and demographic expansion. Additionally, the amount of agricultural land per capita was found to impact a country's ability to take on external debt, while population growth was linked to rising unemployment. This suggests that demographic pressures may hinder job creation.

Notable parallels and distinctions emerge when comparing Iraq's results with those of a structurally similar economy, such as Algeria's.

Like Iraq, Algeria relies heavily on natural resources, particularly oil, meaning government spending and external debt play a central role in shaping GDP. Algeria's empirical evidence shows that public expenditure can stimulate growth. However, excessive debt often constrains investment in development sectors. Both countries also face the challenge of aligning educational outcomes with labor market needs. While increased education levels are correlated with reduced unemployment in Algeria, progress has been slow due to a lack of diversification in non-oil sectors. Additionally, Algeria's population dynamics affect agricultural output and job availability;

however, the country's limited arable land makes the relationship between land and income less pronounced than in Iraq. The relationship between GDP and population in Algeria is characterized by volatility, largely due to social subsidy pressures and a rigid public sector. In conclusion, the observed causal relationships in Iraq and Algeria highlight shared development constraints rooted in resource dependence, population growth, and labor market inefficiencies. However, Iraq's relatively greater agricultural capacity could facilitate more inclusive economic expansion with targeted reforms in education and agriculture.

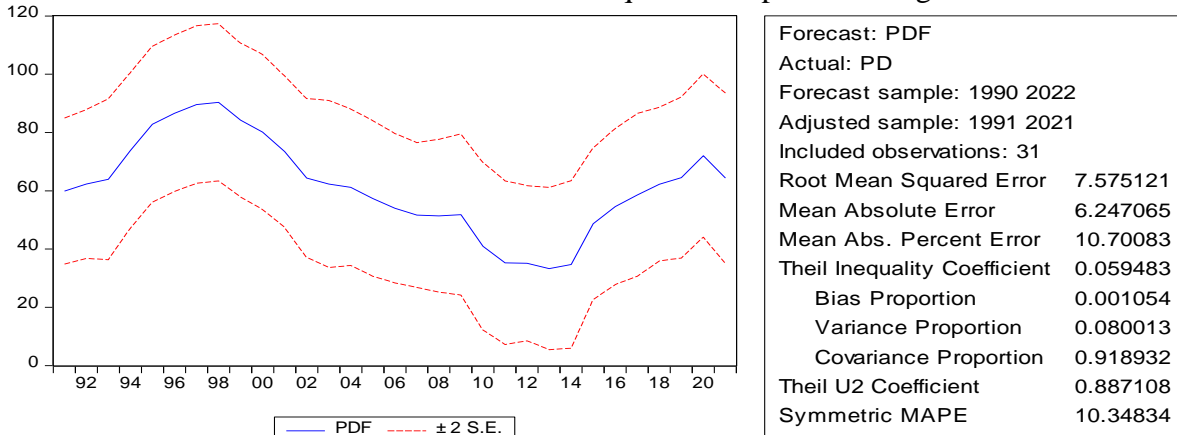
**Table No. (7): Granger Causal Test**



Source: Researcher's preparation by reference to statistical analysis results

**5.9 Forecasting the model.**

The prediction of the second model of the State of Iraq can be explained in figure 9:



**Figure 8: Forecasting the model for the State of Iraq**

Source: Researcher's preparation by reference to statistical analysis results

We note from the table below also that there is a convergence between the actual public debt

(PD) and the expected public debt (PDF) in the State of Iraq in this period.

**Table 12: Forecast of the model for the State of Iraq.**

PDF	PD	year
34.68887	40.90101006	2014
48.63910	48.8453927	2015
54.55904	53.55608163	2016
58.55000	54.19721093	2017
62.26127	52.54432225	2018
64.52216	58.21419539	2019
72.05317	79.88815956	2020
64.33197	70.67066929	2021
NA	55.42891007	2022

**Source: Researcher's preparation by reference to statistical analysis results**

## 6. Conclusion

This study's findings indicate that the relationship between public debt and sustainable development in Iraq is limited and has a weak impact, despite continuous increases in debt levels from 1990 to 2022. Compared with other Arab countries, particularly those with middle and high incomes, it's clear that some have been able to use public debt to support economic growth and finance essential services and infrastructure to varying degrees. In contrast, Iraq has largely failed to direct its borrowing toward productive, long-term investments. Instead, public debt has primarily been used to cover operational expenditures and fiscal deficits, especially due to the absence of sound fiscal policies and long-term development planning.

The limited developmental impact of public debt in Iraq is closely linked to several structural challenges. These include a lack of economic diversification, inefficient management of public resources, and weak investment in human capital and productive sectors. Ongoing political and security instability has also hindered the implementation of effective economic reforms. Furthermore, Iraq's reliance on oil revenues makes its public finances vulnerable to global price volatility, exacerbating the risks associated with debt accumulation and increasing fiscal fragility.

This situation requires a fundamental shift from a short-term, rent-based approach to

borrowing to a comprehensive, forward-looking public debt management strategy that supports sustainable development. Based on the study's results, the following practical, future-oriented recommendations are proposed to guide Iraq's next phase of reform:

First, effective policies must be adopted to diversify the national economy by supporting non-oil sectors, such as agriculture, industry, tourism, and the digital economy. This would reduce oil dependency and generate sustainable, long-term revenue.

Second, a portion of public debt should be allocated strategically to investments in education, vocational training, and healthcare. This will build a qualified and resilient human capital base capable of leading future economic transformation.

Third, revitalizing the agricultural sector must become a national priority. This sector is critical for achieving food security, creating rural employment, and reducing import dependence, especially in light of growing climate and water challenges.

Fourth, Iraq should explore green and sustainable financing tools, such as green bonds and climate funds, to support renewable energy, smart transportation, and environmentally friendly infrastructure projects.

Fifth, the country must accelerate its digital transformation, especially in public administration and service delivery. Digitalization improves operational efficiency,

reduces corruption, and enhances transparency, financial inclusion, and investment attractiveness.

Sixth, an independent public debt management unit should be established that reports directly to the Council of Ministers. This unit would bring together financial and economic experts to ensure better coordination between fiscal and monetary policies and evaluate the risks and benefits of new borrowing decisions.

Lastly, Iraq should expand its cooperation with international institutions to access financing, capacity building, and technical assistance, particularly in areas such as governance, the green transition, and fiscal planning.

While these proposals do not offer immediate solutions, they represent a roadmap for transforming public debt from a growing burden into a development lever that aligns with national priorities and supports long-term economic and social stability in Iraq.

### Data Availability:

The data used to support the results of this study has been included in the article.

### Conflict of Interest:

The authors declare that they have no conflicts of interest.

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