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Governance, Financial Development, and Green Growth in Iraq: An Empirical Study

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Abstract: The primary objective of "green growth" is to achieve an environment that is both pleasant and sustainable. The attainment of green growth has emerged as an imperative necessity in light of the prevailing circumstances surrounding global warming and climate change. Hence, the present study aims to assess the impact of governance and financial development (FD) on the promotion of green growth in Iraq during the period spanning from 2000 to 2022. A number of previous investigations have examined the impact of financial development and governance on economic growth and environmental quality in Iraq. However, these studies have not specifically focused on the concept of green growth. The present study utilizes the Autoregressive Distributed Lag Model (ARDL) Bound Testing approach, based on an initial assessment of stationarity. The results of our study reveal a noteworthy positive influence of governance and financial development on the promotion of green growth in Iraq, both in the short and long term. Furthermore, it has been observed that the adoption of renewable energy sources and the process of urbanization play a significant role in fostering the advancement of sustainable economic growth. The adverse impact of non-renewable energy on sustainable development in Iraq has been observed. It is advisable for policymakers to prioritize the advancement of financial sector services in order to effectively harness the advantages associated with green growth. In addition, it is advisable for the government of Iraq to enhance its regulatory framework, specifically in relation to environmental considerations, in order to ensure the sustained progression of green growth in the long term.

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1. Introduction

The United Nations (UN) proposed a novel concept called "Green Growth" at the "Rio20" sustainable development conference. The concept of green development entails an increase in economic practices and activities, such as economic growth or GDP, over the long and short term without compromising or diminishing natural resources. Green growth has been described in various ways throughout the years. Green growth, for example, is increased economic growth without environmental damage and with a strong emphasis on environmental protection (Jacobs, 2013). According to the Organization for Economic Cooperation and Development (OECD), green growth can be defined as the attainment of a heightened level of economic development and growth, while simultaneously ensuring the preservation and sustainable use of natural resources that are essential for the overall welfare of humanity. Furthermore, "green growth can be defined as a form of economic growth that aims to mitigate pollution through the efficient and effective utilization of natural resources." The concept of green growth encompasses the integration of economic growth and sustainable development goals. It entails the pursuit of macroeconomic growth, reduction of carbon emissions, promotion of social inclusion, and the maintenance of environmental sustainability World Bank (2012). Achieving the goal of green growth is closely linked to the majority of sustainable development goals (Ahmed, Kousar, Pervaiz, & Shabbir, 2022). Green growth can be defined as an enhanced iteration of gross domestic product (GDP) or economic growth. The argument posits that economic progress should be aligned with both social sustainability and environmental sustainability. There are multiple pieces of evidence that suggest a positive correlation between economic growth and environmental pollution, particularly in developing nations. There is evidence suggesting that economic development has a negative impact on environmental quality (Reid, Simms, & Johnson, 2007). This finding underscores the importance of pursuing green growth or sustainable growth as a means of reducing these unnecessary and hazardous environmental concerns (Ahmed, Kousar, Pervaiz, & Shabbir, 2022). The global trend of green growth has exhibited a lack of significant progress during the period spanning from 2010 to 2018, with per capita measurements remaining relatively constant at 4483 and 4484 MT. From the period of 1980 onwards, there has been a noticeable decrease in the phenomenon of green growth, primarily attributed to the persistent increase in carbon emissions. Therefore, in terms of carbon dioxide emissions, global green growth has not been fully realized (Ngo, Trinh, Haouas, & Ullah, 2022). In recent decades, the global economy has experienced significant growth due to a rapid acceleration in its pace. The expansion can be attributed to various human activities undertaken in order to satisfy human desires. On a global scale, the Gross Domestic Product (GDP) has experienced a notable increase of 28% over the past decade, with its value rising from $66,142 trillion to $84,706 trillion between the years 2010 and 2020. The expansion of global GDP is attributed to the increasing demands of the human population. However, it is important to note that the rapid increase in GDP can be attributed not only to the fulfilment of human needs, but also to the advancement and growth of human civilizations. The use of financial instruments to sustain individuals' future lifestyles constitutes a fundamental facet of a burgeoning civilization. Financial development, also referred to as financial sector development, is of significant importance in the economic development of a country. It facilitates growth by fostering technological advancements and the accumulation of capital through various means, including the conversion of savings into investments, the increase in savings rates, and the management of inflows of foreign capital. The phenomenon of FD has been observed to exhibit a significant upward trend over time in various economies. Based on an estimation provided by the International Monetary Fund (IMF), the level of foreign direct investment (FDI) has exhibited a notable increase of approximately two-fold between the years 1980 and 2018. Specifically, it has expanded from 0.16 to 0.33 during this period. The aforementioned indicator, however, has exhibited minimal growth over the previous decade, with a marginal increase from 0.32 in 2010 to 0.33 in 2018 (Ngo, Trinh, Haouas, & Ullah, 2022).

The correlation between the expansion of FD and improved environmental quality is not necessarily evident. There are multiple pieces of evidence that illustrate the influence of stimulated financial development on energy consumption, resulting in a deterioration of environmental quality and an increase in carbon emissions. The results mentioned earlier provide empirical evidence to substantiate the notion that substantial and sophisticated expansion within the financial sector can incentivize individuals to generate profits that surpass the average while simultaneously exacerbating environmental degradation and undermining the development of sustainable, environmentally-friendly economic practices (Pan, Zhuang, Zhou, & Yang, 2021). However, there are academics who argue against this argument, presenting evidence that the advancement of the financial sector actually contributes to sustainable growth by mitigating energy consumption and carbon dioxide emissions (Ngo, Trinh, Haouas, & Ullah, 2022).

However, there are academics who argue against this argument, presenting evidence that the advancement of the financial sector actually contributes to sustainable growth by mitigating energy consumption and carbon dioxide emissions. The need to address concerns regarding sustainability and human well-being has prompted policymakers to reevaluate the economic growth model in light of rapid growth and environmental issues. In this new framework, the imperative of proficient governance is crucial for the restoration of equilibrium among economic, environmental, and social objectives. Governance plays a crucial role in facilitating the sustainable coordination of economic activities and the protection of the environment, leading to enhanced economic growth and, ultimately, the achievement of sustainable development and green growth. Currently, there is a significant focus among researchers on the role of governance in green growth, as evidenced by empirical studies (Wang, Peng, Luo, & Du, 2023), (Razzaq, Sharif, Ozturk, & Afshan, 2023) and (Ahmed, Kousar, Pervaiz, & Shabbir, 2022). Governance is a manifestation of the underlying principles and beliefs upheld by governing bodies, encompassing the constitutional framework, property rights, customary practices, and legal systems that facilitate the interaction among diverse economic sectors. Scholars in the past have posited that in economies characterized by abundant natural resources, effective governance can exert a significant influence on the attainment of sustainability. The economic development of any nation is significantly impacted by its governance, as it establishes effective strategies for governmental actions and promotes overall sustainability within the country. A transparent institutional structure facilitates the advancement of

public finances and the mitigation of social dishonesty and corruption. It also supports the adoption of environmental protection technologies and other measures that can substantially contribute to the achievement of green growth (Wang et al., 2022).

Given the preceding setting, the researchers are driven to assess the potential impact of governance and financial development on the attainment of green growth in Iraq, within the time frame spanning from 2000 to 2022. Iraq is a country of interest due to its notable economic growth over time, with its GDP accounting for approximately 0.32% of the global GDP. The Gross Domestic Product (GDP) of Iraq experienced a significant increase, rising from a low point of 1.70 billion US dollars in 1960 to 197.72 billion US dollars in the year 2017. The year 2014 witnessed a peak amount of 234.65 billion US dollars (Abdulla & Ali, 2019). However, the expansion of economic activity has been accompanied by a concomitant increase in environmental degradation, which has become a significant cause for concern regarding the prioritization of sustainable development (Abed, Al-Douri, & Al-Shahery, 2014). Over the course of time, the economy of Iraq has been implementing environmentally sustainable practices, commonly referred to as green economic practices. However, the progress of green growth has encountered significant fluctuations, as depicted in Figure 1.

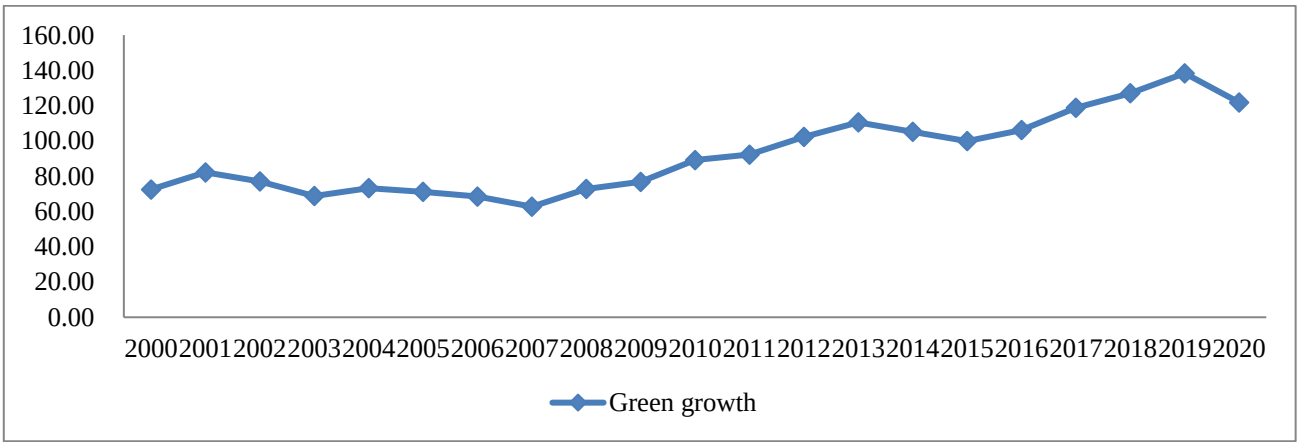

Figure 1: Green Growth in Iraq over (2000-2021) period

This study makes a substantial contribution to the existing body of literature in at least two distinct dimensions: First, there is a limited body of literature that has examined the influence of these factors on the concept of green growth. Previous research primarily focused on assessing the influence of governance and foreign direct investment (FD) on either carbon dioxide (CO2) emissions or economic growth. Secondly, it is worth noting that previous research has not adequately addressed the impact of financial development (FD) and governance on the promotion of green growth in Iraq. Foreign direct investment (FDI) is widely acknowledged as a significant catalyst for economic development in developing economies (Sadorsky, 2010). However, a conclusive agreement has yet to be reached regarding the most suitable indicator for measuring financial development. Several researchers conducted a study in which they measured financial development (FD) using indicators such as stock market capitalization as a percentage of GDP and the turnover ratio of the stock market (Ibrahim & Sare, 2018; Sadorsky, 2010). While other studies have made estimations regarding domestic credit for the private sector (Begum & Aziz, 2019; Jammeh, 2022). In contrast to the studies mentioned above, the current study introduces a novel approach by constructing a comprehensive index that incorporates three distinct measures of FD. The details of this index can be found in section 3, thereby enhancing the originality and contribution of the present study to the existing body of literature. The research employs the Autoregressive Distributed Lag (ARDL) approach and calculates both short-run and long-run coefficients. The implications of the present study's findings hold significant importance for policymakers and researchers alike, as they pertain to the promotion of green growth not only in Iraq but also in other developing nations.

The remaining study is categorised into four sections for organisation purposes. The second section of the paper provides a review of the existing literature. In the third section, we provide an exposition of the data and methodology employed in this study. The fourth section of the paper presents empirical findings and their corresponding interpretations. The fifth section of the document pertains to the formulation of concluding remarks and recommendations specifically aimed at policy makers.

2. Review of Existing Literature

This section provides a concise summary of the available literature on financial development, governance, and green growth.

2.1 Financial Development and Green Growth

Researchers in the field of literature have carried out thorough examinations of the correlation between financial development (FD) and the environment. However, there has been a lack of adequate attention given to the interconnection between financial development and the concept of green growth. Several scholarly studies, including the research conducted by Zafar, Saud, and Hou (2019), have proposed that an effective financial sector plays a crucial role in enhancing environmental sustainability. This is achieved through the allocation of financial resources towards renewable energy projects and the adoption of environmentally friendly technologies. These initiatives are often facilitated through financial mechanisms and technology transfer from more developed economies.On the contrary, alternative studies conducted by Usman and Hammar (2021), Saud, Chen, and Haseeb (2020), and Liu and Song (2020) have revealed a correlation between financial

development and the degradation of the environment. In their study, Shahbaz, Shahzad, Ahmad, and Alam (2016) examined the asymmetric impact of foreign direct investment (FDI) on the environment in Pakistan. They employed the Nonlinear Autoregressive Distributed Lag (NARDL) approach to analyse quarterly data from 1985 to 2014. It was suggested that it contributed to the exacerbation of environmental degradation. In a study conducted by Acheampong (2019), an examination was conducted on the data pertaining to 46 economies in Sub-Saharan Africa. The study employed the Generalised Method of Moments (GMM) approach to investigate the impact of Foreign Direct Investment (FD) on carbon dioxide (CO2) emissions. The findings indicated that there was a non-linear relationship between the variable under investigation and the emission of CO2. In addition, it was determined that financial development (FD) has a positive moderating effect on the role of economic growth and a negative moderating effect on the relationship between energy consumption and CO2 emissions. In a study conducted by Ibrahiem (2020), the relationship between carbon dioxide (CO2) emissions and financial development (FD) in Egypt was examined. The researchers employed various econometric techniques, including FMOLS, ARDL, DOLS, and Toda-Yamamoto estimations, to examine the impact of FD on the environment. Their findings indicated a negative effect of FD on environmental conditions. In contrast, the study conducted by Saidi and Mbarek (2017) examined a total of 19 countries over the period from 1990 to 2013. Through the implementation of System GMM estimation, the researchers discovered that foreign direct investment (FD) had a mitigating effect on carbon dioxide (CO2) emissions. Nawaz, Ahmad, Hussain, and Bhatti (2020) carried out an estimation of the relationship between FD and CO2 emissions in the economies of the Association of Southeast Asian Nations (ASEAN) during the period of 2000-2018. The results of the study's FMOLS and DOLS estimations indicate that the presence of FD and other variables is positively associated with the increase in CO2 levels within the examined countries. Nasir, Huynh, and Tram (2019) conducted a study in the ASEAN-5 economies to examine the impact of foreign direct investment (FD) on carbon dioxide (CO2) emissions during the period of 1982-2014. Based on their research findings, it can be observed that the increase in financial development, foreign direct investment (FDI), and economic growth has been associated with a corresponding rise in environmental degradation. The research conducted by Zeraibi, Balsalobre-Lorente, and Murshed (2021) was designed to examine the relationship between the ecological footprint and foreign direct investment (FD) in ASEAN economies. The study also considered the influence of renewable electricity and technological innovations as controlling factors in this analysis. The findings of the CS-ARDL analysis indicate that the increase in ecological footprints in these countries can be attributed to the growth and financial sector.

Cao et al. (2021) conducted a study that examined the relationship between foreign direct investment (FD) and the nexus of green growth. The authors specifically focused on the role of FD and technological innovations in influencing the volatility of green growth in China during the period from 2011 to 2018. Based on the findings of the study, it can be concluded that technological innovations and foreign direct investment (FDI) have effectively mitigated the fluctuations in green growth in China. In a separate investigation conducted by Cao et al. (2022) in the context of China, it was determined that financial development (FD) exhibited an adverse impact on green growth, while technological innovations made a positive contribution to the advancement of green growth. Sadiq et al. (2022) conducted an estimation of the effects of financial development on the promotion of environmentally sustainable economic growth in the South Asian region during the period spanning from 1995 to 2018. The application of Ordinary Least Squares (OLS) estimation revealed a robust and significant association between FD and the concept of green growth. The dataset utilised by Yang and Ni (2022) encompassed the information pertaining to countries involved in the Belt and Road Initiative (BRI) during the time span of 2005 to 2017. The findings of the study indicate that FD played a detrimental role in facilitating the advancement of sustainable and environmentally friendly economic growth within the countries under investigation.

Thus, our first hypothesis is:

H1: There is a significant impact of financial development on green growth.

2.2 Governance & Green Growth Nexus

A number of scholarly investigations have been conducted to examine the impact of governance on a country's socioeconomic development and environmental performance. In their study, Andlib and Salcedo-Castro (2021) conducted an estimation of the influence of governance on carbon emissions within the South Asian economies, focusing on the time frame spanning from 1995 to 2019. The empirical analysis employed the FMOLS, DOLS, and FEOLS estimation techniques to examine the relationship between government effectiveness and CO2 emissions. The results consistently indicated a negative association between government effectiveness and CO2 emissions. Baloch and Wang (2019) conducted a study on the relationship between governance and CO2 emissions in the BRICS economies, utilising data from the period spanning 1996 to 2017.The application of the Driscoll-Kraay Standard error revealed that governance plays a significant role in promoting environmental sustainability through the mitigation of CO2 emissions. In a study conducted by Güney (2022), an analysis was conducted on data from 35 countries, categorizing them based on income groups. The study aimed to estimate the impact of governance on CO2 emissions. The study utilized the CCEMG estimation method to examine the relationship between governance and CO2 emissions and found evidence suggesting that governance plays a mitigating role in CO2 emissions. In their investigation, Huang and Ho (2017) examined the relationship between governance and economic growth in twelve Asian economies during the period from 1996 to 2014. The examination of frequency domain estimation revealed a discernible positive correlation between governance and economic growth. In a study conducted by Samarasinghe (2018) the author examined the impact of six governance indicators on economic growth across a sample of 45 countries during the period from 2002 to 2014. The study employed the Fixed Effects and Random Effects Model to examine the relationship between various indicators and economic growth across countries, revealing a positive association. In their study, Safdar, Khan, and Andlib (2022) examined the interrelationship between governance and the sustainability dimensions of social, environmental, and economic factors across six South Asian economies. The analysis spanned the time period from 1996 to 2020. Empirical analysis was conducted utilising first and second-generation panel estimations to examine the impact of governance on economic, social, and environmental sustainability in various countries. The findings of the analysis revealed a positive relationship

between governance and the enhancement of sustainability across these dimensions. The study conducted by Ashraf, Luo, and Anser (2022) examined the relationship between institutional quality and economic growth, as well as environmental sustainability, in South Asian countries during the period from 1984 to 2019. The findings of this empirical investigation revealed that higher institutional quality positively influenced both economic growth and environmental sustainability within these countries.

However, the available research contains only a limited number of studies that attempt to estimate the relationship between governance and green growth. Wang, Peng, Luo, and Du (2023) conducted a study to examine the influence of ecological governance on green growth, utilizing data from the economies of BRICS countries during the period from 1990 to 2019. The researchers employed the MMQR estimation approach in their empirical analysis, revealing a favorable association between ecological governance and the advancement of green growth in the countries under investigation. In their research, Razzaq, Sharif, Ozturk, and Afshan (2023) examined the interrelationship between environmental governance, energy transition, and green growth within countries belonging to the International Energy Agency (IEA). By employing the dataset covering the time frame from 2010 to 2020 and employing the Dynamic Panel Threshold Model, the study revealed a positive association between environmental governance and energy transition with green growth. The study conducted by Ahmed, Kousar, Pervaiz, and Shabbir (2022) involved a thorough examination of data from South Asian countries spanning the years 2000 to 2018. The primary objective of the research was to investigate the impact of financial development and institutional quality on the concept of green growth. The study employed the FMOLS and DOLS estimation techniques to examine the relationship between institutional quality, financial development, and green growth. The results indicated a positive correlation between both institutional quality and financial development with green growth.

Thus, the second hypothesis of the study is:

H2: Governance has significant effect on green growth.

2.3 Research Gap

The review of existing literature identifies significant gaps in the current body of research. There is a scarcity of studies examining the association between financial development (FD) and governance with respect to their impact on economic growth or carbon emissions in the existing literature. However, the number of studies investigating the influence of these factors on green growth is notably limited. Therefore, it is necessary to conduct additional research in this particular domain. In addition, previous scholarly investigations have examined the relationship between financial development (FD), governance, and green growth in various countries. However, it is worth noting that Iraq has not been the focus of attention among these earlier researchers. Therefore, subsequent to identifying these gaps, the current study addresses these gaps in the existing literature and makes a substantial scholarly contribution.

3. Empirical Methodology

This study uses Iraqi data to look into how government and FD affect green growth. To achieve this goal, data about Iraq for the years 2000 to 2022 are evaluated from secondary sources. According to Suki et al. (2022) we gauge green growth in terms of production-based carbon emissions. A composite index made up of domestic credit to the private sector (as a percentage of GDP), liquid liabilities (as a percentage of GDP), and wide money (as a percentage of GDP) is used to calculate FD. In the same way, the measurement of governance is conducted through the creation of an index that encompasses six indicators: control of corruption, rule of law, regulatory quality, voice and accountability, government effectiveness, and political stability. The indices of governance and financial development are derived through the application of Principle Component Analysis (PCA). Based on the research conducted by Ahmed, Kousar, Pervaiz, and Shabbir (2022) and Tawiah, Zakari, and Adedoyin (2021), we present a proposed study model:

$$GG = f(FD, GOV, RENER, NRENR, URB, GDP) \quad 1)$$

And the econometric form is written as:

$$GG_t = \beta_1 + \beta_2 FD_t + \beta_3 GOV_t + \beta_4 RENER_t + \beta_5 NRENER_t + \beta_6 URB_t + \varepsilon_t \quad (2)$$

In this context, the term "GG" refers to the concept of green growth, while "FD" represents financial development. Additionally, "GOV" is used to represent governance, "RENER" denotes renewable energy, "NRENER" refers to non-renewable energy, and "URB" represents urbanization. We present details of all of the variables and their sources of data in following Table 1.

Table 1: Variables of Study and Data Sources

Series	Measurement	Data Source
Green Growth	Production-based CO2 emission (million tons)	OECD
Financial development	Index comprising of liquid liabilities (percent of GDP), domestic credit to private sector (percent of GDP) and broad money (percent of GDP)	WDI
Governance	Governance index	WGI
Renewable energy	Renewable energy (quadrillion btu)	EIA
Nonrenewable energy	Nonrenewable energy (quadrillion btu)	EIA
Urbanization	Urban population growth (annual %)	WDI

Econometric Technique

Unit Root Testing

Prior to assessing any associations between study variables, it is crucial to identify the presence of a unit root or the stationarity of said variables. The concept of stationarity implies the absence of a unit root in the data. Stationarity refers to the property of having a consistent variance,

mean, and auto-covariance over time (Brooks, 2019). In the context of notation, the concept of stationarity at level is denoted as I (0). In contrast to the concept of stationarity, a non-stationary series is characterized by time-varying variance, mean, and autocovariance. Such a series is commonly referred to as a unit root series. The non-stationary series can be rendered stationary through the application of first or second differencing. The notations I(1) and I(2) are used to represent a series that has achieved stationarity after undergoing first or second differencing, respectively. In this study, we employ two widely used unit root tests, namely the Augmented Dickey Fuller (ADF) and Philips-Perron (PP) tests, to ascertain the presence of a unit root or the stationarity characteristics of the series.

Lag Length Selection of ARDL Model

Peseran and Peseran (1997) proposed a methodology for the estimation of long run and short run coefficients that is both efficient and applicable across various orders of integration, such as I(1), I(0), and mixed. Subsequently, Pesaran, Shin, and Smith (2001) made modifications to the aforementioned estimation approach by incorporating the bound testing method. This method offers numerous advantages, such as the alleviation of the requirement for a specific integration order and the ability to accurately estimate coefficients even when working with small sample sizes (Peseran & Peseran, 1997). This approach accounts for the varying levels of endogeneity among variables. The Autoregressive Distributed Lag (ARDL) model incorporates lags of both the dependent and explanatory variables. Thus, the selection of an appropriate lag length is of utmost importance in order to accurately assess the short-term and long-term parameters. The basic form of the ARDL model is represented by equation 3.

$$\Delta GG_t = \alpha_0 + \alpha_1 GG_{t-1} + \sum_{i=1}^{l} \alpha_1 \Delta GOV_{t-i} + \sum_{i=1}^{m} \alpha_2 \Delta FD_{t-i} + \sum_{i=1}^{o} \alpha_3 \Delta RENER_{t-i} + \sum_{i=1}^{q} \alpha_4 \Delta NRENER_{t-i} + \sum_{i=1}^{p} \alpha_5 \Delta URB_{t-i} + \beta_1 GOV_{t-1} + \beta_2 FD_{t-1} + \beta_3 RENER_{t-1} + \beta_4 NRENER_{t-1} + \beta_5 URB_{t-1} + \varepsilon_t \quad (3)$$

In above equation l to p, denote optimal lags selected by Akaike Information Criterion.

ARDL Bound Test

The following procedure involves assessing whether the endogenous and exogenous variables of the study exhibit cointegration, subsequent to the selection of the optimal model based on the conventional criterion of lag length. This approach is deemed more suitable and advantageous compared to other cointegration techniques due to its lack of requirement for a specific order of integration for cointegration in its application. Therefore, this methodology is employed to evaluate the presence of cointegration among a set of endogenous and exogenous variables.

The Wald joint F statistic test is employed to assess cointegration in this study. The null hypothesis posits the absence of cointegration, while the alternative hypothesis asserts the presence of cointegration. The computed F-statistics are compared with the upper (I1) and lower (I0) critical boundaries. If the estimated F statistic value exceeds the upper boundary I1, it signifies the presence of cointegration. Conversely, if the estimated F statistic value falls below the lower boundary I0, it indicates the absence of cointegration. If the calculated F statistic falls within the range of I1 and I0, then the test result is inconclusive if the computed F statistic is within the lower and upper boundaries (Azam, Nawaz, & Riaz, 2019).

Short Run and Long-Run Estimation

Next, long run and short run models are evaluated separately. Eq. 4 shows the long run model of our study.

$$\Delta GG_t = \sigma_0 + \sum_{i=1}^{l} \sigma_1 GG_{t-1} + \sum_{i=1}^{m} \sigma_2 GOV_{t-i} + \sum_{i=1}^{o} \sigma_3 FD_{t-i} + \sum_{i=1}^{q} \sigma_4 RENER_{t-i} + \sum_{i=1}^{p} \sigma_0 NRENER_{t-i} + \sum_{i=1}^{r} \sigma_0 URB_{t-i} + \varepsilon_t \quad (4)$$

Next, we estimate the short run model in terms of following equation 5.

$$\Delta GG_t = \varphi_0 + \sum_{i=1}^{l} \varphi_1 \Delta GG_{t-1} + \sum_{i=1}^{m} \varphi_2 \Delta GOV_{t-i} + \sum_{i=1}^{o} \varphi_3 \Delta FD_{t-i} + \sum_{i=1}^{q} \varphi_4 \Delta RENER_{t-i} + \sum_{i=1}^{p} \varphi_5 \Delta NRENER_{t-i} + \varphi_5 ECT + \varepsilon_t \quad (5)$$

Where, φ_1 *and* σ_1, represents the long-run and the short run values respectively. ECT stands for ECT, which must be significantly negative, and it also illustrates how quickly the system returns to equilibrium. The value of coefficient must therefore be less than 1.

4. Results and Interpretations

Descriptive or Summary Statistics

Table 2 presents the characteristics of the data, including the average, data range, standard deviation, and results of the normality test. It is evident from our observations that GG exhibits the highest mean value among all data series, while GOV displays the lowest average value. The data range of GG is the highest, while RENER exhibits the lowest data range. It is observed that the data exhibits a normal distribution in the Jarque-Bera Test.

Table 2: Summary Statistics Analysis

series	Average Value	Min Value	Max Value	Standard Deviation.	Jarque-Bera Stats
GG	92.242	62.720	138.370	22.272	1.640
FD	0.0038	-133.1	2.364	1.000	1.371
GOV	0.00136	-2.367	0.9342	1.000	6.178
RENER	0.065	0.00434	0.1649	0.0423	0.556
NRENER	1.467	0.8141	2.536	0.510	2.184
URB	2.897	0.771	4.899	1.155	15.952

*** denotes P<0.05

Correlation Matrix

In the following section, we present the correlation analysis of all variables, as depicted in Table 3. It has been observed that there exists a positive correlation between variables. A negative correlation has been observed between urbanisation and renewable energy. Additionally, the observed correlation coefficients between variables are below 0.8, suggesting that multicollinearity is not a significant concern in our

dataset.

Table 3: Correlation Matrix

	GP	GOV	FD	RENER	NRENER	URB
GG	1.00					
GOV	0.502	1.00				
FD	0.745	0.544	1.00			
RENER	0.759	0.662	0.551	1.00		
NENER	0.756	0.531	0.699	0.749	1.00	
URB	0.308	0.025	0.181	-0.067	0.158	1.00

The next and most important initial step entails the estimation of unit root or stationarity properties of the variables. Therefore, the application of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests is employed. The F Statistic is not suitable for series with a second order of integration [I(2)]. Therefore, it is essential to confirm that the series is stationary at either the first difference or level in order to employ the ARDL approach. The findings of both tests are presented in Table 4.

Table 4: Unit Root Tests (ADF & PP)

level	ADF	PP	Decision
GG	-0.494	-0.496	I(1)
GOV	-2.668***	-5.279***	I(0)
FD	-1.308	-0.943	I(1)
RENER	-1.228	-0.671	I(1)
NRENER	-0.817	-1.123	I(1)
URB	-2.819	-2.209	I(1)
first difference			
GG	-3.341***	-3.342***	I(1)
GOV	---------	---------	I(0)
FD	- 4.518***	- 6.973***	I(1)
RENER	-5.268***	-10.099***	I(1)
NRENER	-3.988***	-2.766***	I(1)
URB	-4.598***	-4.365	I(1)

*** = 1 percent significance level.

Table 4 indicates that with the exception of financial development, all variables exhibit non-stationarity at the level, but achieve stationarity after undergoing differencing. Given that ARDL can be applied to any order of integration, it is advantageous to choose ARDL for the purpose of estimation.

ARDL Bound Test

After conducting unit root testing, the ARDL Bound Test (Pesaran, Shin, & Smith, 2001) is employed to identify the presence of a long-run cointegration relationship. The findings are presented in Table 5. The analysis reveals that the calculated F-statistic exceeds the upper bound value, providing confirmation of the presence of long-term cointegration among the variables.

Table 5: Bound Test

Test statistics	Value	K
F-stat	60.08	3
Bound Values		
Significance	I0	I1
10%	2.08	3.
5%	2.39	3.38
2.5%	2.7	3.73
1%	3.06	4.15

Long Run ARDL Findings

The purpose of assessing the long-term relationship is to examine the fluctuations in the dependent variable that are influenced or brought about by alterations in the independent variables. The ARDL model is employed to figure out the long-term relationship between the variables under study. The findings that correspond to the information provided can be found in Table 6.

Table 6: Long-Run Findings

Dependent variable (Green Growth)	Coefficients	Prob-value
GOV	5.071***	0.0002
FD	3.411***	0.0002
RENER	0.487***	0.0001
NRENER	-0.260***	0.0000
URB	6.874***	0.0000
Cons	13.736***	0.0000

At first, it is observed that the impact of foreign direct investment (FD) on green growth is both statistically significant and positive. Based on the research findings, it has been determined that foreign direct investment (FD) plays a significant role in enhancing environmental quality while simultaneously facilitating economic growth. The development of the financial sector facilitates industries' access to advanced technologies and machinery, thereby contributing to the enhancement of environmental quality. Furthermore, the utilization of FD (Financial Derivatives) contributes to the enhancement of the renewable energy transition process, thereby fostering social sustainability, economic sustainability, and overall quality of life, ultimately facilitating the achievement of green growth. The findings of Ngo, Trinh, Haouas, and Ullah (2022), Ahmed, Kousar, Pervaiz, and Shabbir (2022), and Saidi and Mbarek (2017) are in alignment with our research, as these studies similarly confirm the positive relationship between financial development and the promotion of green growth. Secondly, It is observed that governance has a positive impact on green growth over an extended period, which aligns with the findings of Ahmed, Kousar, Pervaiz, and Shabbir (2022), Razzaq, Sharif, Ozturk, and Afshan (2023), and Wang, Peng, Luo, and Du (2023). The anticipated outcome can be attributed to the widely acknowledged understanding that effective governance serves as the fundamental pillar for promoting sustainable development, encompassing holistic economic growth, social advancement, environmental preservation, and the elimination of food insecurity and poverty. More importantly, effective governance encourages environmental sustainability by assisting with the energy transition and advancing environmental protection laws and practices. Along with minimizing pollution, effective governance improves the environment and manages emission levels (Naz & Aslam, 2023).

Thirdly, it is observed that renewable energy exhibits a positive coefficient, while non-renewable energy demonstrates a negative coefficient. This suggests that the promotion of renewable energy has a beneficial effect on fostering green growth, whereas non-renewable energy does not contribute to this objective. The anticipated nature of this discovery can be attributed to the consistent influence of energy type on the determination of green growth. The findings of the study suggest that the utilisation of renewable energy sources contributes to the advancement of environmentally sustainable economic growth. In comparison to other energy resources, renewable energy has the potential to utilise natural resources more efficiently and effectively in both production and consumption processes. Non-renewable energy resources are responsible for the emission of carbon and the generation of pollution, which in turn leads to a decline in sustainable economic growth. The previous studies conducted by Tawiah, Zakari,

and Adedoyin (2021) and Daneshvari, Salatin, and Khalilzadeh (2020) provide support for our findings, which indicate that energy sources play a significant role in determining green growth.

Lastly, it is observed that there exists a positive correlation between urbanization and green growth in the short term. The above-mentioned discovery suggests that the process of urbanization fosters economic growth, a notion that is substantiated by numerous prior scholarly investigations (Glaeser, 2011). In addition, the process of urbanization contributes to a reduction in energy demand through the efficient utilization of public infrastructure, including utilities and public transportation systems. This results in decreased energy consumption and a subsequent decrease in carbon emissions. The present findings are partially consistent with the findings reported by Chen, Jia, and Lau (2008) and Fan et al. (2023) in prior research investigations.

ARDL Short-Run Findings

Table 7 presents the findings obtained in the short run. The ECT values in Table 7 indicate the rate at which the system adjusts towards its long-run equilibrium. According to the estimation, electroconvulsive therapy (ECT) fulfils all the necessary criteria, namely, it exhibits statistical significance, has a coefficient that is less than 1, and possesses a negative value. The coefficient value of -0.32 indicates that the model is capable of returning to its long-term equilibrium at a rate of 32%. Similar to the concept of long-run equilibrium, short-run outcomes hold statistical significance and can exert either positive or negative effects on green growth.

Table 7: ARDL Short Run Results

variables	Coeff	t-statistics	Prob
(ECM)	-0.320***	-34.286	0.000
D(GOV)	3.561	7.935	0.0014
D(FD)	7.820	27.32	0.000
D(RENER)	4.189	41.401	0.000
D(NRENER)	-40.60	-45.341	0.002
D(URB)	8.211	13.560	0.000

Based on the results, it can be observed that all variables exhibit a high level of significance and have the ability to exert either a positive or negative influence on the concept of green growth. Our research reveals that Foreign Direct Investment (FDI) plays a substantial and beneficial role in promoting sustainable economic growth, commonly referred to as "green growth," in the country of Iraq. The coefficient analysis reveals that a 1 unit increase in FD results in a corresponding increase of 7.82 units in green growth. In a similar vein, it is observed that governance exerts a substantial and favourable influence on the promotion of sustainable and environmentally-friendly economic growth. In the short term, there is a positive relationship between governance and green growth, whereby a unit increase in governance leads to a corresponding increase of 3.5 units in green growth. Research has demonstrated that renewable energy has a positive effect on the promotion of green growth, whereas non-renewable energy exhibits a notably adverse impact over an extended period of time. There is an increase of 4.1 units and a decrease of 40.0 units, respectively, for each unit increase in renewable and non-renewable energy. Lastly, the research findings suggest that urbanization has a positive and significant influence on green growth. An increase of 8.2 units in green growth is observed for every unit increase in urbanization.

Following the completion of short-run and long-run analyses, post-estimation tests are conducted to ascertain the validity and reliability of our findings. Residual and stability diagnostic tests are employed in this context. The findings of coefficient diagnostics are presented in Table 8. These findings suggest that the model is unaffected by heteroscedasticity, serial correlation, and exhibits normality in the data. Furthermore, the CUSUM and CUSUMQ plots of residual diagnostics exhibit conformity to the boundaries established at a significance level of 5%, thereby suggesting the stability of the residuals.

Table 8: Diagnostic Test Results

	Test-value	Prob
Serial Correlation	1.235	0.443
Heteroskedasticity Test	1.223	0.464
Normality Test	0.723	0.696
Ramsey RESET Test	1.983	0.141

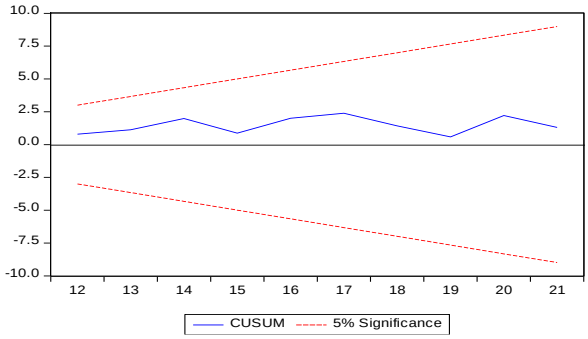

Figure 2: CUSUM figure for Residual Diagnostics

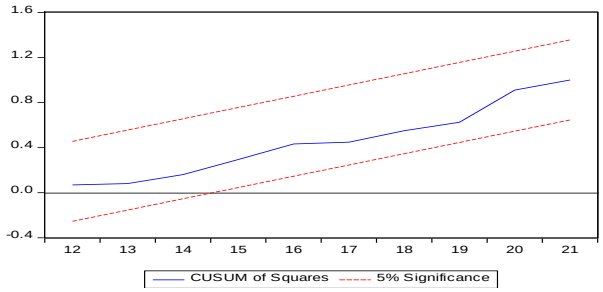

Figure 3: CUSUMSQ Figure for Residual Stability

5. Conclusion of the Study and Policy Recommendations

The idea of green growth has become increasingly recognized as an essential requirement for attaining both environmental sustainability and sustainable development. There has been a substantial body of research examining the causal relationship between governance and environmental and economic sustainability, as well as foreign direct investment (FD) and environmental and economic sustainability. However, the number of studies investigating the role of these factors in green growth is comparatively smaller. Therefore, in order to address this existing void in the literature, the objective of the current study is to assess the impact of governance and foreign direct investment (FDI) on the promotion of environmentally sustainable economic growth in Iraq. The study variables were derived from secondary data sources, encompassing the time period from 2000 to 2022. Empirical estimation was conducted using the ARDL Bound testing approach due to the presence of mixed integration order among the series. The initial results indicate that both financial development (FD) and governance play a significant role in supporting or attaining sustainable green growth. Furthermore, it was observed that control variables such as renewable energy and urbanisation contribute

positively to the promotion of green growth in Iraq. Conversely, the role of non-renewable energy was found to have a negative impact on green growth in the country.

The findings of this study present the following recommendations to the government of Iraq. In light of the conclusion that Foreign Direct Investment (FDI) is deemed beneficial for fostering sustainable economic growth in Iraq, it is imperative for the government to implement effective strategies aimed at promoting the advancement of this sector. Such measures should encompass the facilitation of investments and the promotion of exports. Furthermore, it is imperative to enhance governance by enhancing the quality of regulations, fostering greater accountability and effectiveness within the government, and implementing measures to combat corruption. In addition, it is imperative for the government to prioritize environmental regulations and governance in order to effectively address environmental concerns, as this will facilitate a more stable and sustainable trajectory of green growth.

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