International Journal of Studies in Business Management, Economics and Strategies
Volume 3, Issue 11, November - 2024
ISSN (E): 2949-883X
Scholarsdigest.org

EXAMINING THE IMPACT OF NATURAL GAS IMPORTS ON IRAQ'S ECONOMIC GROWTH

Dr. Abdulrahim Hashami Dizej
University of Mohaghegh Ardabili
a.hashemi@uma.ac.ir

Mohammad Shakir Barad Ali
University of Mohaghegh Ardabili
mohamne.457@gmail.com

Abstract
Investigating the relationship between energy consumption and economic growth has been one of the main issues in the field of energy economics; One of the most important and cheapest sources of energy among fossil fuels is natural gas. Natural gas can be a source of energy and vital raw materials for industries, and understanding its economic effects can help countries to use opportunities to expand and modernize key sectors and promote diversification and economic development; It is also necessary to study the effect of natural gas import on economic development and growth that is aligned with the economic, social and environmental goals of countries. Considering the importance of this issue, the main goal of this study was to investigate the effect of natural gas imports on Iraq's economic growth during the period from 1990 to 2022 with the auto-explanatory vector model with extended intervals (ARDL). The findings of this study showed that the import of natural gas had a positive and significant effect on Iraq's economic growth in the long term. According to other results of this study, foreign trade, human capital, capital formation and foreign investment have also had positive and significant effects on Iraq's economic growth.

Keywords: Economic growth, energy economy, natural gas, self-explanatory vector model with extensive discontinuities (ARDL), Iraq.

Introduction

Economic growth is one of the most important macroeconomic variables, and examining the factors influencing it has always held a prominent position in macroeconomics. Among the most significant variables affecting economic growth are the inputs of energy production. Energy plays a crucial role in the life and economy of societies. Crude oil and natural gas are among the most important energy sources that influence both a country's economy and the regional economy. Natural gas is a vital input for the production of many goods and services and, as an accessible and clean energy source, plays a significant role in meeting the increasing global demand across various sectors, including power, industry, transportation, and others.

Energy is recognized as the most vital issue in the modern global economy. The increase in gas production in producing countries, lower prices, and reduced pollution have turned it into

a focal point. Natural gas, a vital input for many goods and services, has a significant impact on people's daily lives (Sadas and Acharya, 2021). Consequently, the living standards of millions of people fluctuate when energy prices become unstable. Countries whose economies are wholly or partially dependent on energy also face economic issues with energy price changes. There are various types of energy in the world, such as crude oil, natural gas, coal, electricity, solar energy, and others (Ting et al., 2022). Among these, crude oil and natural gas are the main driving forces of the energy market, especially crude oil, which has dominated the energy market as a key commercial energy factor since the oil shocks. In recent years, with the expansion of natural gas production in Qatar, the USA, and Russia, and the increase in exports, the use of natural gas, due to its advantages over oil and other fossil fuels and its much lower prices, has attracted the attention of many industries and countries (Galdina and Amino, 2020). Using natural gas significantly reduces production costs compared to other fuels and also increases industrial profit margins. This can have positive effects on the production sector in both the short and long term (Mirnazemi et al., 2023). Additionally, by replacing gas with crude oil in oil-exporting countries, cheap gas can be made available to the public, allowing for more oil exports, thereby increasing revenues and subsequently the economic growth of these countries (Kom et al., 2018).

Iraq possesses significant natural gas reserves; however, decades of conflict, underinvestment, and lack of infrastructure have hindered Iraq's ability to fully develop its domestic natural gas sector. Consequently, Iraq has been forced to rely on natural gas imports, primarily from Iran, to meet its growing energy needs. Examining the impact of natural gas imports on economic growth is of great importance for Iraq. Natural gas imports and their use in various industries can help expand economic activities and increase employment. It also helps to develop a more diverse mix of energy sources, thereby improving energy security. Analyzing the effects of natural gas imports can aid in decision-making regarding investments in related infrastructure and industries, ensuring that available resources are used efficiently. Overall, the results of studying the effects of natural gas imports can help policymakers make more informed decisions about energy policies, thus achieving sustainable economic growth.

Given the importance of the subject, the main objective of the research is to answer the question: Can increasing natural gas imports have a positive effect on Iraq's economic growth? Additionally, this study examines the impact of foreign trade, capital index, gross fixed capital formation, Foreign Direct Investment (FDI), and government expenditures on Iraq's economic growth. For this purpose, the structure of the article is as follows: theoretical foundations are reviewed in the second section, the literature review is presented in the third section; the fourth and fifth sections respectively present the model and introduce the variables and analyze the results, and the final section provides conclusions and recommendations.

A. 2.Theoretical Foundations of the Study

Energy is the ability or capacity to do work; in fact, it is energy that controls and manages the limitations created by societies, nations, or any social institution. This has always been of great importance for the development of societies throughout history (Wissenbacher,

2012). In the traditional world, the major sources of energy were based on animal power, manure, wood, charcoal, water, and wind. These sources were relatively abundant and specific; however, even in the traditional era, energy was the main factor in economic development and closely related to technology. This relationship became more evident after the Industrial Revolution, with the emergence of higher heat energy sources such as coal and oil (Rodrigo et al., 2017).

Energy economics was introduced into economic literature after the oil crisis of 1973. Since then, not only the economic aspects of major energy sources like oil, natural gas, coal, and renewable energies but also the environmental issues related to them have been examined in detail by energy economists (Galdina and Amino, 2020). Until the end of the last century, energy economics was mainly about coal, oil, and their economies. However, after the emergence of the concept of a green economy, the interest of energy economists has expanded to nuclear and renewable energy. In the meantime, the natural gas industry also underwent significant changes. Energy economists are usually interested in further investigating affordable energy sources for consumption in different regions. Additionally, in the last decade, the monopolistic structure of energy markets has become more competitive. Developments in the European Union and the United States in this area are notable, and significant reforms have also been made in many developing countries such as Brazil, Argentina, and Turkey. With this change in markets, energy economists have not only examined the relationship between economic variables and energy products but also the prices of various energy sources. As a result, energy production, distribution, and consumption activities have also improved (Sadas and Acharya, 2021).

Geostrategy, which deals with a combination of geopolitics and strategic factors, has become a globally significant concept in the economy after World War I. However, the widespread use of geostrategy began after the 1973 oil crisis, which was a major bottleneck in the supply of oil to the global economy (Isui, 2009).

The 1973 oil crisis not only weakened global economic growth but was also one of the fundamental reasons that geopolitical competition in the Middle East emerged. After the 1973 crisis, the United States suddenly lost its energy independence, economic hoarding increased, and neoliberal ideology changed global trade relations. Inevitably, many researchers in the field of energy economics began to include geostrategic and geopolitical interpretations in their studies (Smith-Nonini, 2016). The major oil shock in 1990 began with the occupation of Kuwait in Iraq. The 1991 Gulf War and the collapse of the Soviet Union were often cited as the first test of the new world order. Understanding and solving problems are beyond the capacities of individual countries; therefore, energy markets were integrated into the global economic system since events affecting energy security in one part of the world can threaten countries far from potential conflicts (Gaddis, 2006). Changes in the global economy, increasingly influenced by natural gas, have a significant impact on global energy geopolitics. The race to control and access natural gas resources, export routes, and market characteristics has led to the formulation of international relations agendas. With the participation of new regional players in a multipolar world, several jurisdictions, and international policies have shaped the situation. This new situation also highlighted the need

for permanent coalition formations regarding specific political and economic principles and interests (International Gas Union, 2012).

1) The Relationship Between Energy and Economic Growth

Within the framework of the neoclassical school, Stern and Cleveland (2004) described the relationship between energy consumption and economic activities using the following production function:

$(Q_1 \ldots, Q_m) = f(A, X_1, \ldots, X_n, E_1, \ldots, E_p)$

In this relation, \(Q1\) represents the production of goods and services, \(X1\) represents production inputs such as capital and labor, \(E1\) represents energy carriers, and \(A\) represents the technological structure of production or the total factor productivity index. In the above function, the relationship between energy and total production will be influenced by factors such as substitution between energy and other inputs, technological changes, changes in the composition of energy factors, and changes in the composition of the produced product (Galdina and Amino, 2020).

From a theoretical perspective, various reasons can be provided for the relationship between growth and energy consumption. The machinery and equipment used in the production and transportation of goods require energy consumption. Growth in exports and production also indicates increased economic activities, which raises the demand for energy. Additionally, changes in energy consumption can affect exports since energy consumption is a crucial input for the production and transportation of goods. Moreover, the export of manufactured goods or raw materials requires energy consumption for transportation, making energy a vital input for expanding exports (Sadorsky, 2011).

From an economic standpoint, energy is a crucial input in the production of goods and services. Economic growth generally depends on the availability and use of energy resources. As the economy expands, its demand for energy to power industrial processes, transportation, heating/cooling, and other activities increases. Some of the key channels linking energy consumption and economic growth include:

1. Energy as a Production Factor: Energy, alongside capital and labor, is considered one of the primary factors of production. Increasing the availability and use of energy can enhance productivity and enable greater economic output (Ting et al., 2022).
2. Energy Efficiency and Technological Advancements: Improvements in energy efficiency through technological innovations can provide higher economic output with the same or lower energy inputs. This can drive economic growth while reducing energy intensity.
3. Energy Prices and Economic Activity: Fluctuations in energy prices, especially for vital resources like oil, can affect business and consumer spending, investment, and overall economic performance. Sharp price increases can limit economic growth.
4. Energy Security and Economic Stability: Reliable access to affordable energy resources is crucial for maintaining economic stability and growth. Disruptions in energy markets can create economic shocks and instability (Bahian et al., 2021).

However, the relationship between energy consumption and economic growth is neither simple nor linear. Important environmental considerations exist, as increased energy

consumption (especially fossil fuels) can lead to greenhouse gas emissions and other negative externalities that can limit long-term economic development.

According to this perspective, today's interconnected energy sector has reached a point where sustainable economic growth is impossible without energy. As a result, the effort to find cheaper energy alternatives, such as natural gas as a production input, has always been one of the development policies in various countries. From this viewpoint, any effort to access cheaper fuel will lead to lower production costs, greater production profitability, and higher economic growth (Apiragas and Payne, 2010).

Access to reliable and affordable natural gas resources can be a significant driver for economic growth, especially in industries and regions where gas is a key energy input. Countries capable of importing natural gas, whether through pipelines or as liquefied natural gas (LNG), can benefit from diversifying their energy mix and securing sustainable energy sources for economic activities. The price of imported natural gas can directly impact energy costs for businesses and households. Reducing gas prices made possible through imports can lower input costs, boost competitiveness, and support economic development. Conversely, high gas import prices can strain budgets and limit growth (Solariyan and Shahbaz, 2015).

Overall, gas imports can influence economic growth through several channels:

a) Enhancing Industrial Competitiveness: Using natural gas as a reliable and affordable fuel and feedstock for energy-intensive industries like petrochemicals can help Iraqi industries by increasing their competitiveness, attracting foreign direct investment, and strengthening economic diversification and employment.

b) Diversifying Iraq's Energy Mix: Natural gas imports can help diversify Iraq's energy mix, reduce the country's dependence on oil, and increase the overall energy supply for various sectors. This diversity can enhance Iraq's energy security and provide more sustainable and reliable energy infrastructure to support sustainable economic growth.

c) Improving Electricity Production Efficiency: Natural gas imports can improve the efficiency of electricity production, as natural gas power plants generally have higher efficiency and lower emissions compared to other fossil fuel-based power generation technologies. This can lead to cost savings, reduced energy losses, and decreased greenhouse gas emissions, assisting Iraq in addressing energy and environmental challenges.

d) Transition to Sustainable Energy: As a relatively cleaner fossil fuel, natural gas can act as a bridge in Iraq's transition to more sustainable energy, including increased adoption of renewable energy sources. This strategic approach can position Iraq to benefit from global trends toward low-carbon energy systems while maintaining economic growth.

e) Regional Cooperation and Trade: Natural gas imports, especially from neighboring countries, can expand regional cooperation and trade, leading to the development of cross-border infrastructure and enhancing the exchange of expertise and technology. Moreover, regional energy cooperation can increase Iraq's energy security, diversify its supply sources, and create economic opportunities through trade and joint projects.

Reliance on gas imports, particularly from a limited number of suppliers, can create energy security and geopolitical vulnerabilities. Disruptions in gas supply or sudden price spikes due to geopolitical factors can negatively impact the economy. Diversifying sources and import routes can help mitigate these risks. The cost of gas imports, depending on the import-export

balance, can affect the trade balance and current account status of the country. High gas import costs can worsen the trade and current account deficits, potentially reducing economic growth over time. The availability of imported natural gas can stimulate investment and growth in gas-intensive industries such as petrochemicals and electricity generation, increasing productivity and economic returns. However, over-reliance on gas imports may limit the development of domestic energy industries (Solariyan and Ozturk, 2016).

The impact of gas imports on economic growth is multifaceted, encompassing issues of energy security, costs, trade balance, industrial development, and environmental sustainability. Precise policy approaches are needed to maximize benefits while minimizing risks. Balancing domestic gas production and imports can significantly mitigate economic impacts. Countries with large domestic gas reserves may be able to use these resources to advance economic development, whereas countries without sufficient domestic reserves often rely more on imports (Marouf Hassan and Yousef Reza, 2022).

Heavy reliance on gas imports, particularly from a few suppliers, can create economic vulnerabilities. Disruptions in gas supply or sudden price increases due to geopolitical factors, export restrictions, or other events can have significant negative impacts, especially on gas-intensive industries. Establishing infrastructure for natural gas imports, such as pipelines, LNG terminals, and storage facilities, requires significant investment. The economic benefits of these investments in terms of improved access and energy security should be weighed against their costs. The pricing mechanisms and market structures for imported natural gas can influence its economic impact. Market-based pricing that reflects global supply and demand is economically more efficient than regulated or subsidized pricing. Transparent and competitive gas markets can ensure that the benefits of imports are passed on to consumers and businesses (James and Taylor, 2023).

Access to affordable and reliable natural gas imports can enhance the competitiveness of gas-intensive industries such as chemicals, petrochemicals, and manufacturing. This can drive economic growth and job creation in these sectors. However, over-reliance on imports may limit the development of domestic gas industries and related value chains. Depending on a country's tax and revenue structure, gas imports can have fiscal implications (Mirnazemi et al., 2023). Revenues from gas-related taxes, royalties, or profits from state-owned companies can contribute to government budgets and public spending. Conversely, subsidies or other support for gas imports can create a financial burden. Increased gas consumption due to imports can also have environmental impacts that need to be managed, such as greenhouse gas emissions, water consumption, and ecosystem effects. Therefore, integrating sustainability considerations into gas import policies is important for long-term economic growth. Ultimately, the economic impact of gas imports heavily depends on the specific conditions of the importing country and requires careful analysis of its market conditions, policy frameworks, and broader development priorities. Precise policy approaches that balance economic, energy security, and environmental factors are crucial (Shahbaz et al., 2013).

2) Research Background

Natural gas imports play a significant role in the economic development of energy-dependent countries. This is especially important for countries like Iraq, which rely on the oil and gas industry. Iraq, with its rich oil resources, has recently made efforts to utilize natural gas and improve its gas infrastructure. However, due to existing shortages, it still needs to import gas. Studying the impact of natural gas imports on Iraq's economic growth can help policymakers develop better strategies for using energy resources and reducing dependence on imports. Since gas imports can have economic as well as environmental consequences, these aspects have also been considered in previous research.

Mohammadi et al. (2012) examined the causal relationship between gas consumption and economic growth in Iran using the VECM approach and Johansen's cointegration method during the years 1974-2007. The findings indicated a positive two-way causality between gas consumption and GDP in Iran.

Mohammad Nejad and Heydari (2015) investigated the relationship between gas consumption and economic growth in Iran using the causality test and ARDL bounds testing method during the years 1972-2012. The results showed a two-way causal relationship between gas consumption and economic growth. Both long-term and short-term results indicated that gas consumption had a positive and significant effect on economic growth in Iran during the study period.

Rezaei et al. (2015) aimed to study the impact of the abundance and consumption of natural resources (oil and gas) on financial repression and economic growth through the channel of income distribution, using the simultaneous equations approach based on the 3SLS method during the period 1973-2010. The results showed that the abundance of natural resources (oil and gas) led to increased inequality in Iran's economy. Additionally, other results indicated that oil abundance had a negative effect and gas abundance had a positive effect on economic growth in Iran during this period. There was also a two-way causality between gas consumption and economic growth, with a positive and significant effect of gas consumption on economic growth in both the long and short term.

Mimarzadeh et al. (2016) examined the relationship between natural gas consumption and economic growth in Iran during the years 1966-2012. The results confirmed a two-way Granger causality between natural gas consumption and economic growth rate, capital stock and economic growth rate, and a one-way Granger causality from capital stock to natural gas consumption and from economic growth rate and capital stock to total factor productivity.

Azimi et al. (2018) studied the relationship between natural gas consumption and economic growth in a selection of natural gas-exporting countries using the Dumitrescu-Hurlin causality test, considering structural breaks during the years 1992-2014. The results indicated a positive and significant relationship between gas consumption and economic growth in the studied countries, with a one-way causal relationship from gas consumption to economic growth.

Mohammadi Samcholi and Khorshidi Athar (2022) examined the impact of natural gas production on economic growth in Iran. The results, based on the ARDL approach, showed that natural gas production had a positive and significant effect on economic growth. Additionally, other results indicated a one-way relationship from gas to economic growth in

the short term and a two-way relationship between natural gas production and economic growth in the long term.

Shahbaz et al. (2013) studied the impact of natural gas imported from Qatar on Pakistan's economic growth. They found that in both the short and long term, imported natural gas from Qatar had a positive and significant effect on Pakistan's economic growth, with a stronger impact in the long term.

The impact of natural gas consumption on economic growth in Malaysia is the subject of a study by Solarian and Shahbaz (2015). The findings of this study showed that natural gas consumption had a positive and significant impact on Malaysia's economic growth in both the short and long term.

Marouf Hassan and Yousef Reza (2022) examined the relationship between natural gas consumption and economic growth in Bangladesh based on the ARDL approach (1990-2019). The results indicated that natural gas had a positive and significant impact on economic growth in this country.

James and Taylor (2023) also investigated the impact of gas imports on the economic growth of selected European Union countries during the period 2000-2020. This study, based on the quantile regression approach, showed that gas imports had a positive and significant impact on economic growth in the EU countries.

Mir Nazemi et al. (2023) examined the spillover effects of natural gas consumption on economic growth in 24 countries, including Iran and Russia, using the Global VAR model during the period 1980-2020. The results of this study showed that GDP responded positively to gas price increases in resource-rich countries like Iran and Russia, whereas the response was negative in other countries. Additionally, increased resource rents strengthened GDP in Iran and Russia.

B. 3- Research Methodology

This study is applied in terms of its objective, with the necessary information collected through library research for the theoretical framework and through the websites of the World Bank and the Central Bank of Iraq for the statistical section. The method used is descriptive-analytical. The main objective of this study is to examine the impact of natural gas imports on Iraq's economic growth during the period from 1990 to 2022. In such studies, the use of methods such as Engle-Granger, which are used in studies with small samples (few observations), does not have the necessary validity due to not considering the short-term dynamic reactions existing between the variables. Consequently, the estimates obtained from them are not unbiased, and performing hypothesis testing using standard test statistics like t is not valid. Therefore, the use of models that include short-term dynamics and lead to more accurate coefficient estimates is considered. Hence, in this study, the (ARDL) model has been taken into account. The general reasons for using the Autoregressive Distributed Lag method can be summarized as follows:

1. This method is applicable regardless of whether the model variables are I(1) or I(0).
2. It can be analyzed in both long-term and short-term periods (B. Pesaran, 1997).
3. It is highly efficient in small sample sizes for short-term dynamics between variables (Tashkini, 2006).

EViews version 12 software has been used for data analysis in this study.

Therefore, in order to achieve the objectives of this study, efforts have been made to examine the impact of variables such as foreign trade, the human capital index, gross fixed capital, foreign direct investment, and government expenditures on economic growth in Iraq. The model examined in this research is as follows, adapted from the famous study by Hassan and Yousaf Raza (2022):

$$GDPR_t = \beta_0 + \beta_1 GAS_t + \beta_2 TR_t + \beta_3 FDI_t + \beta_4 IF_T + \beta_5 SI_t + \beta_6 GC_t + \varepsilon_t$$

The method of measuring the research variables is as follows:

- GDPR: The growth rate of Gross Domestic Product at constant 2015 prices.
- TR: Foreign trade (the sum of imports and exports) divided by GDP multiplied by 100.
- FDI: Foreign Direct Investment (FDI) inflows divided by GDP multiplied by 100.
- IF: Gross fixed capital formation divided by GDP multiplied by 100.
- SI: The human capital index, represented by the number of higher education graduates in Iraq each year, normalized between 0 and 1.
- GC: Government expenditures at constant 2015 prices divided by GDP multiplied by 100.

4- Model Testing and Estimation

Before estimating the model, it is necessary to check the stationarity of all variables under study through unit root tests. Examining and analyzing stationarity in time series data is crucial as it helps prevent spurious regression and provides a more accurate interpretation of the relationships between variables. For this purpose, the results of the unit root test (ADF) are presented in Table (1). According to the Dickey-Fuller test results, the variables (FDI), (IF), and (GC) are stationary at the first order (I1), while the other research variables are stationary at the level (I0). Based on the unit root tests, the variables are cointegrated at different levels; therefore, to ensure the validity of the regressions and prevent spurious regression, it is essential to examine the cointegration relationship among the variables.

Table (1): Results of the Augmented Dickey-Fuller (ADF) Stationarity Test

Result	Probability of Test Statistic After First Differencing	Probability of Test Statistic at Level	Variable
(I_0)	-	0045/0	Gross Domestic Product (GDP) growth
(I_0)	-	004/0	Import of Natural Gas (GAS)
(I_0)	-	012/0	Foreign Trade (TR)
(I_1)	0004/0	38/0	Foreign Direct Investment (FDI)
(I_1)	001/0	48/0	Gross Fixed Capital Formation (IF)
(I_0)	-	00/0	Human Capital (SI)
(I_1)	001/0	88/0	Government spending (GC)

Stationary at level, (I1): Stationary at first order

Source: Research Calculations

In this study, the bounds testing approach has been used to examine the existence of a long-term relationship between the variables, and the results of this test are presented in Table (2). Convergence tests are tests that indicate whether there is convergence or divergence, or in other words, the presence or absence of a long-term relationship among the variables under study. If convergence exists between the variables, it is possible to use these variables in the model despite non-stationarity. The results of the bounds testing approach show that the calculated F-statistic is greater than the critical value at the 95% and 90% levels; therefore, there is a long-term equilibrium relationship between the variables.

Table (2): Results of the Bounds Testing Approach (Bound Test)

Critical Values of the F-statistic				*F-statistic*
%10		***%5***		
I(0)	I(1)	I(0)	I(1)	*89/4*
02/3	*51/3*	*62/3*	*19/4*	

Source: Research Calculations

Now, with confidence in the existence of convergence among the variables, we proceed to estimate the ARDL model. The results of the short-term ARDL model estimation are presented in Table (3). Based on the short-term results, the independent variables have been able to explain 86 percent of the changes in the dependent variable. Since the F-statistic probability is less than 0.05, the model is generally significant. The Durbin-Watson statistic in the present study is 1.98, indicating the absence of autocorrelation among the error terms.

Table (3): Short-term relationship results

T-statistic	**Test statistic probability**	**Symbol**
77/1	572/0	GDP(-1)
35/9	428/0	GDP(-2)
71/4	179/0	GAS
71/1	0691/0	GDP(-1)
78/0	159/0	TR
005/2	835/0	TR(-1)
52/1	304/0	TR(-2)
47/1	214/0	FDI
81/2	784/0	FDI(-1)
34/7	554/0	FDI(-2)
38/2	375/0	IF
70/2	137/0	IF(-1)
06/2-	159/0	IF(-2)
40/2	377/0-	SI

T-statistic	Test statistic probability	Symbol
33/1-	367/0	SI(-1)
80/0-	136/0-	SI(-2)
97/7	146/0-	GC
11/2	097/0	GC(-1)
06/2	155/0	GC(-2)
54/9	815/0	C
86/0= R^2=	F (prob)= 0/000	

Source: Research Results

After estimating the short-term relationship, the classical assumptions of the short-term relationship must be examined to ensure the accuracy and validity of the estimated relationship. Four tests for autocorrelation, correct functional form, normality, and heteroscedasticity have been conducted, and the results of the diagnostic tests are presented in Table (4). These assumptions are usually considered in ARDL analysis to ensure that the obtained model results are acceptable and interpretable. However, if the assumptions are not met, the ARDL results may be affected and may not be accurately interpretable. In such a case, it may be necessary to use other methods and models that are compatible with different assumptions.

Table (4): Results of the Examination of Classical Assumptions

Result	Test statistic probability	Assumptions
Correct specification of the functional form of the model	096/0	Specification of the functional form of the model (Function form)
Absence of serial correlation	459/0	(Serial correlation)
Absence of heteroscedasticity	732/0	(Heteroscedasticity)
Normal distribution of error terms	196/0	Normality of error terms (Normality)

Source: Research Calculations

Based on the estimation results, the classical assumptions hold, and the model does not have issues with heteroscedasticity, autocorrelation, or normality, and the specification of the estimated model is also correct. The results of the long-term relationship are presented in Table (5).

Table (5): Long-term relationship results

Probability	T-statistic	Coefficient	Variable
0486/0	05/2	0243/0	Natural gas imports (GAS)
0089/0	79/2	0326/0	Foreign trade (TR)
0937/0	75/1	114/0	Foreign Direct Investment (FDI)
0392/0	31/2	088/0	Gross fixed capital formation (IF)
0911/0	72/1	0729/0	Human capital (SI)
0526/0	09/2	0470/0	Government expenditure (GC)
0000/0	08/9	407/0	Constant term of the model

Source: Research Calculations

Based on the long-term estimation results in Table (4), the effect of the variable of natural gas imports on economic growth is 0.0243, and the estimated T-statistic is 2.05. Given that the estimated T-statistic is greater than the critical values at the 95% confidence level (1.96), it can be said that the variable of natural gas imports has a positive and significant effect on economic growth in Iraq. The long-term estimation results showed a positive and significant relationship between foreign trade and economic growth in Iraq, with the estimated coefficient being 0.032; in other words, for every one percent increase in foreign trade, economic growth increases by 0.03%.

The long-term estimation results showed a positive and significant relationship (at the 90% confidence level) between foreign direct investment and economic growth in Iraq, with the estimated coefficient being 0.114; in other words, a one percent change in foreign direct investment results in a 0.11% increase in economic growth. The long-term estimation results also showed a positive and significant relationship between capital formation and economic growth in Iraq, with the estimated coefficient being 0.088; in other words, a one percent change in capital formation results in a 0.08% increase in economic growth.

According to the long-term estimation results, there is a positive and significant relationship (at the 90% confidence level) between human capital and economic growth in Iraq, with the estimated coefficient being 0.072; in other words, a one percent change in human capital results in a 0.07% increase in economic growth. Based on these results, there is a positive and significant relationship between government expenditure and economic growth in Iraq, with the estimated coefficient being 0.047; in other words, a one percent change in government expenditure results in a 0.04% increase in economic growth.

Finally, the last step in estimating the ARDL method is the estimation of the ECM coefficient. This coefficient shows how long it will take for a shock to energy efficiency to be absorbed and for the variable to return to its long-term trend. The results of the ECM coefficient estimation are shown in Table (6). The ECM coefficient results indicate that if a shock occurs to the variables in the short term, it will take approximately 2.3 years for economic growth to return to its long-term trend.

Table (6): Error Correction Coefficient Results

T-statistic	Coefficient	Error correction coefficient
43/2-	476/0-	ECM

Source: Research Calculations

5. Conclusion and Recommendations

Natural gas imports can help expand Iraq's overall energy supply, reduce shortages, and ensure more reliable access to energy in various sectors. This can lead to increased productivity, reduced disruptions, and better operational efficiency for businesses, which in turn can boost production and economic growth. According to the results of this research conducted in Iraq over the period 1990-2022, it was found that natural gas imports have a significant and positive impact on economic growth. This finding aligns with the theoretical foundations and the results of studies conducted by other researchers in various countries. The results are consistent with the studies by Memarzadeh et al. (2016), Azimi et al. (2018), and Mohammadi Samcholi and Khorshidi Athari (2022) in Iran, and the studies by Solarin and Ozturk (2016), Ma'ruf Hassan and Yousuf Raza (2022), James and Taylor (2023), and Mir Nazemi et al. (2023) outside of Iran.

Additionally, according to the final estimation results, the variables of foreign trade, foreign direct investment, capital formation, human capital, and government expenditure have a positive and significant long-term impact on Iraq's economic growth during the period under study. These results are consistent with the studies conducted by Memarzadeh et al. (2016), Azimi et al. (2018), and Mohammadi Samcholi and Khorshidi Athari (2022) in Iran, as well as the studies by Solarin and Ozturk (2016), Ma'ruf Hassan and Yousuf Raza (2022), James and Taylor (2023), and Mir Nazemi et al. (2023) outside of Iran.

Based on the research results and the theoretical foundations of the study, the following recommendations and policy measures can be proposed. By implementing these strategies, the country can optimize the economic benefits of natural gas imports, enhance sustainable development, and increase its overall competitiveness in the global energy landscape. It can also amplify the positive effects of natural gas imports on economic growth while mitigating potential risks and challenges associated with reliance on imported natural gas.

1. Diversifying natural gas supply sources and reducing dependence on one or a few major natural gas exporters, which can help reduce the risk of supply disruptions and price fluctuations from any one exporter.
2. Investing in natural gas infrastructure and developing infrastructure for the transmission, storage, and distribution of natural gas.
3. Providing incentives and favorable policies to support research and development in technologies related to the exploration, extraction, and production of domestic natural gas.
4. Promoting the consumption of natural gas as a cleaner transitional fuel to bridge the gap between fossil fuels and renewable energy sources.

5. Investing in and developing industries based on natural gas, such as petrochemicals, chemical fertilizer production, and electricity generation, which can create economic opportunities and increase overall economic productivity.

- Promoting measures to increase energy efficiency in various sectors to optimize the use of natural gas.

6. Engaging in diplomatic and economic cooperation with natural gas exporting countries to ensure sustainable and mutually beneficial trade relations, and exploring opportunities for joint investment, technology transfer, and long-term supply contracts.

References:

1. Azimi, Somayeh; Almasi, Mojtaba; and Ali Niayi, Zahra. (2018). The relationship between natural gas consumption and economic growth in natural gas exporting countries considering structural breaks: An application of the Dumitrescu-Hurlin causality test. Journal of Energy Economics Studies. 14 (57): 64-39.
2. Tashkini, Ahmad (2006). Applied Econometrics using Macroeconomic Data. Tehran: Dibagaran Institute of Cultural and Artistic Publications.
3. Rezaei, Mohammad; Yavari, Kazem; Ezzati, Morteza; and E'tesami, Mansour. (2015). Examining the effect of natural resource abundance (oil and gas) on financial repression and economic growth through its impact on income distribution. Iranian Journal of Energy Economics Research, 4(14): 89-122.
4. Mohammadnejad, Nima; Heydari, Hassan. (2015). Analyzing the relationship between gas consumption and economic growth in Iran. Iran Energy Journal, 12(3): 126-113.
5. Mohammadi Samcholi, Ali Akbar; and Khorshidi Athari, Amirhossein. (2022). Examining the effect of natural gas production on economic growth in Iran using the ARDL model. First National Conference on Green Management in the Third Millennium; Experiences, Challenges, and Solutions, Birjand.
6. Mohammadi, Timour; Bordbar, Azadeh; and Dagighi Asli, Alireza. (2012). Examining the causal relationship between economic growth and natural gas consumption in the Islamic Republic of Iran. Iranian Journal of Energy Economics Research, 1(3): 107-129.
7. Memarzadeh, Abbas; Emami Meybodi, Ali; and Heydaripoor, Ehsan. (2015). Applying the bounds testing approach to cointegration to determine the long-term and short-term relationships between natural gas consumption and economic growth. Journal of Applied Economic Studies, 5(7): 98-65.
8. Apergis, N; Payne, JE (2010) Natural gas consumption and economic growth: a panel investigation of 67 countries. Appl Energy 87:2759–2763.
9. Gaddis, JL. (2006). The cold war: new history. Penguin Books.
10. Galadima, M.D; Aminu, A.W. (2020). Nonlinear unit root and nonlinear causality in natural gas—economic growth nexus: evidence from Nigeria, Energy 190 (2020) 116-123.
11. International Energy Agency. (IEA). (2017). World energy investments. https://www.iea.org/Textbase/npsum/WEI2017SUM.pdf.
12. International Gas Union. (2012). Geopolitics and natural gas, produced by TASK FORCE 3.

http://www.clingendaelenergy.com/inc/upload/files/Geopolitics_and_natural_gas_KL_final_report.pdf.

13. Isswi, C. (2009). The 1973 oil crisis and after. J Post Keynesian Econ 1(2).:197
14. James, H. Taylor, S. (2023). Natural gas Import and Economic Growth in the EU. Energy Policy, 792(: 458-472.
15. Kum H, Ocal O, Aslan A. (2018).The relationship among natural gas energy consumption, capital and economic growth: Bootstrap-corrected causality tests from G-7 countries 2018; 16: 2361- 2365.
16. Maruf Hasan, M; Yousaf Raza. (2022). Nexus of natural gas consumption and economic growth: Does the 2041 Bangladesh development goal realistic within its limited resource?, Energy Strategy Reviews, 41(2): 1-11.
17. NATO Allied Maritime Command. http://www.mc.nato.int/missions/operation-active-endeavour.aspx.
18. NATO-EU-UN Glossary. http://www.cimic-coe.org/wp-ontent/uploads/2014/06/NATO-EU-UNglossary-on-DCB-and-CP.pdf.
19. Pesaran , M.H. and Pesaran. B.(1997)." Working with Microfit4.0: Interactive Econometric Analysis". Oxford: Oxford University Press.
20. Pesaran, M; Shin, Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium Chapter 1, Cambridge University Press, Cambridge.
21. Rodrigue J-P et al (2017). The geography of transport systems. Hofstra University, Department of Global Studies & Geography. http://people.hofstra.edu/geotrans.
22. Sadath, A.C., Acharya, R.H. (2021). The macroeconomic effects of increase and decrease in oil price: Evidences of asymmetric effects from India. Int. J. Energy Sect. Manag. 15 (3): 458-471.
23. Shahbaz, Muhammad, Lean, Hooi Hooi, Farooq, Abdul (2013). Natural gas consumption and economic growth in Pakistan. Renewable and Sustainable Energy Reviews,18, 87-94.
24. Smith-Nonini S. (2016). The role of corporate oil and energy debt in creating the neoliberal era. Econ Anthropol 3(1).:57–67.
25. Solarin, S.A, Shahbaz, M. (2015). Natural Gas Consumption and Economic Growth: the Role of Foreign Direct in Vestment, Capital Formation and Trade Openness in Malaysia. Renewable and Sustainable Energy Reviews, 42, 835-845.
26. Solarin, S.A., Ozturk, I.(2016). The relationship between natural gas consumption and economic growth in OPEC members. Renewable and Sustainable Energy Reviews,1348-1356.
27. Ting, L; Galen, S; Jing, z. (2022). The Economic Impacts on Germany of a Potential Russian Gas Shutoff, IMF Working Papers, Volume/Issue: 34(3):345-357.
28. Weissenbacher M. (2012). Renewable energy in the Mediterranean context: state of the play and future perspectives.http://www.iemed.org/observatori-en/arees/analisi/arxiusadjunts/anuari/med.2012/weissenbacher_en.pdf.