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The Impact of the Blue Economy, Investment, and Net Exports on Economic Growth in the K.S.A. During 1970–2022[1]

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Abstract

This study uses annual data from 1970 to 2022 to examines the impact of the blue economy, investment, and net exports on economic growth in the Kingdom of Saudi Arabia. It builds, estimates, and tests its hypotheses using econometric techniques and descriptive analytic methodology. The results revealed the existence of a significant partial impact of the blue economy, investment, and net exports, as well as their overall impact on economic growth. Therefore, if the blue economy per Riyal goes up by 1 percent, on average, the economic growth goes up by about 0.19 percent. Moreover, if the investment per Riyal goes up by 1 percent, on average, the economic growth goes up by about 0.056 percent. In addition, if the net exports per Riyal go up by 1 percent, on average, the economic growth goes up by about 0.69 percent. Also, the results found that the explanatory power of the model equals approximately 99 percent. For boosting economic growth, the study recommends that the Kingdom's decision-makers prioritize the implementation of expansionary economic policies to boost blue economy activities. Furthermore, it is vital to encourage investment and exports.

Key Words: Economic Growth, Blue Economy, Investment, Net Exports, Saudi Arabia.
JEL classification codes: O47; E20; E22; F15; F0.

أثر الاقتصاد الأزرق، الاستثمار، وصافي الصادرات على النمو الاقتصادي في المملكة العربية السعودية خلال الفترة (1970 - 2022)

الملخص

تستخدم هذه الدراسة بيانات سنوية من 1970 إلى 2022 لاختبار أثر الاقتصاد الأزرق، الاستثمار، وصافي الصادرات على النمو الاقتصادي في المملكة العربية السعودية. وتعمل على بناء النموذج، تقديره، واختبار فرضيات الدراسة باستخدام تقنيات الاقتصاد القياسي والمنهج الوصفي التحليلي. وكشفت النتائج عن وجود تأثير معنوي جزئي للاقتصاد الأزرق، الاستثمار، وصافي الصادرات، بالإضافة إلى تأثيرها الإجمالي على النمو الاقتصادي. ولذلك، إذا ارتفع الاقتصاد الأزرق بالريال بنسبة 1 في المئة في المتوسط، فإن النمو الاقتصادي يرتفع بنحو 0.19 في المئة. وإذا ارتفع الاستثمار بالريال بنسبة 1 في المئة في المتوسط، فإن النمو الاقتصادي يرتفع بنحو 0.056 في المئة.

وبالإضافة إلى ذلك، إذا ارتفع صافي الصادرات بالريال بنسبة 1 في المئة في المتوسط، فإن النمو الاقتصادي يرتفع بحوالي 0.69 في المئة. كما توصلت النتائج إلى أن القوة التفسيرية للنموذج تساوي حوالي 99 بالمائة. لتعزيز النمو الاقتصادي، توصي الدراسة صناع القرار في المملكة بإعطاء الأولوية لتنفيذ السياسات الاقتصادية التوسعية لتعزيز أنشطة الاقتصاد الأزرق. علاوة على ذلك، ضرورة تشجيع الاستثمار والصادرات.

الكلمات المفتاحية: النمو الاقتصادي، الاقتصاد الأزرق، الاستثمار، صافي الصادرات، السعودية.

رموز تصنيف JEL: O47؛ F20 ؛ E22 ؛ F15، F0.

1. The General Framework of the Study

1.1 Introduction:

Achieving economic growth is a fundamental objective for any economy, as it is an indicator of its strength. This goal is accomplished by employing economic resources such as capital, labor, land, and entrepreneurship. The significance of economic growth lies in its ability to fulfil several objectives of the economy, including an increase in employment opportunities for economic resources, hence reducing unemployment rates, as well as the provision of products and services that meet people's needs and enhance their standard of living. Economic growth goals can also be accomplished by resorting to the blue economy. The Kingdom's economy depends on oil, and it is trying to diversify it through Vision 2020–2030; therefore, strengthening the blue economy will help achieve this goal and stimulate economic growth. Investment, in both fixed and changing stocks, is considered an important tool that contributes to economic growth. In this case, Akinlo (2022, 43) stated that "the consensus in the literature is that investment plays a critical role in the growth process." Therefore, investment cannot be ignored as an independent variable impacting economic growth in the Kingdom. Net exports, calculated as the difference between exports and imports, can be positive when exports exceed imports and negative when imports exceed exports. Positive net exports contribute to the overall value added to the economy and are a driving force behind economic growth. Therefore, the blue economy, investment, and net exports are anticipated to have the potential to boost economic growth in the kingdom.

1.2 The Problem of the Research :

The economy aims to meet people's diverse, unlimited, renewable, and increasing needs by utilizing scarce resources for continuous growth in the

production of goods and services. And the Kingdom stands out due to its geographic location on the Arabian Peninsula, which includes seashores on its eastern border with the Arabian Gulf and on its western border with the Red Sea. In addition, the Kingdom has a comparative advantage in oil production and export, which enhances its exports of goods and services and improves the Kingdom's net exports. The aforementioned information leads to the main research question, which is: Does the blue economy, investment, and net exports have an impact on the Kingdom's economic growth?

The following sub-questions are derived from the main research question: Does the blue economy impact the Kingdom's economic growth? Does the investment impact the Kingdom's economic growth? Do net exports impact the Kingdom's economic growth? Empirical, data-based analysis is necessary to provide answers to these questions.

1.3 The Significance of the Research :

From a theoretical perspective, this research provides data and information that enriches libraries, benefits students, and helps researchers in this field conduct future research. Moreover, the significance of the research from a practical aspect of view is that, in this fast-developing economic world, economic growth plays a crucial role in diminishing poverty and unemployment, optimizing the allocation of resources, boosting output, and enhancing the overall standard of living. Therefore, this research plays a vital role in identifying the most important economic variables that impact economic growth in the Kingdom of Saudi Arabia. Furthermore, it helps in developing economic plans and policies that benefit the decision makers in the Kingdom. It benefits the Ministry of Finance, the Ministry of Trade, the Ministry of Investment, and the Saudi Central Bank in planning economic growth and implementing economic policies.

1.4 The Aims of the Research :

This research aims at measuring and analyzing the impact of the blue economy on economic growth in the Kingdom. Furthermore, it aims to insert investment and net exports as independent variables to examine their impact on economic growth and test the economic theory. Additionally, the objective is to address the research questions that are outlined in the research problem.

1.5 The Hypotheses of the Research :

To answer the questions of research, the study tests the following hypotheses:
The first hypothesis: There is a statistically significant positive impact of the blue economy on economic growth.
The second hypothesis: is that there is a statistically significant positive impact of the investment on economic growth.
The third hypothesis: is that there is a statistically significant positive impact of net exports on economic growth.
The fourth hypothesis: is that there is a statistically significant positive impact of the blue economy, investment, and net exports jointly on economic growth.

1.6 The Methodology of the Research :

The research uses the descriptive-analytical method and applies traditional econometric techniques to build a multiple linear regression model. The E-Views programme is used to analyze the research data, estimate the parameters, and test the research hypotheses. The research uses secondary data related to the study obtained from the General Authority of Statistics (2023) in the Kingdom of Saudi Arabia. The data covers the period from 1970 to 2022. The research uses Gross Domestic Product (GDP) as a dependent variable that represents an indicator of economic growth. It also uses three independent variables: the blue economy, investment, and net exports.

1.7 Limitations of the Research:

The research period extends from the year 1970 to 2022. Moreover, the scope for application is the geographic boundaries of the Kingdom of Saudi Arabia.

1.8 The Structure of the Research :

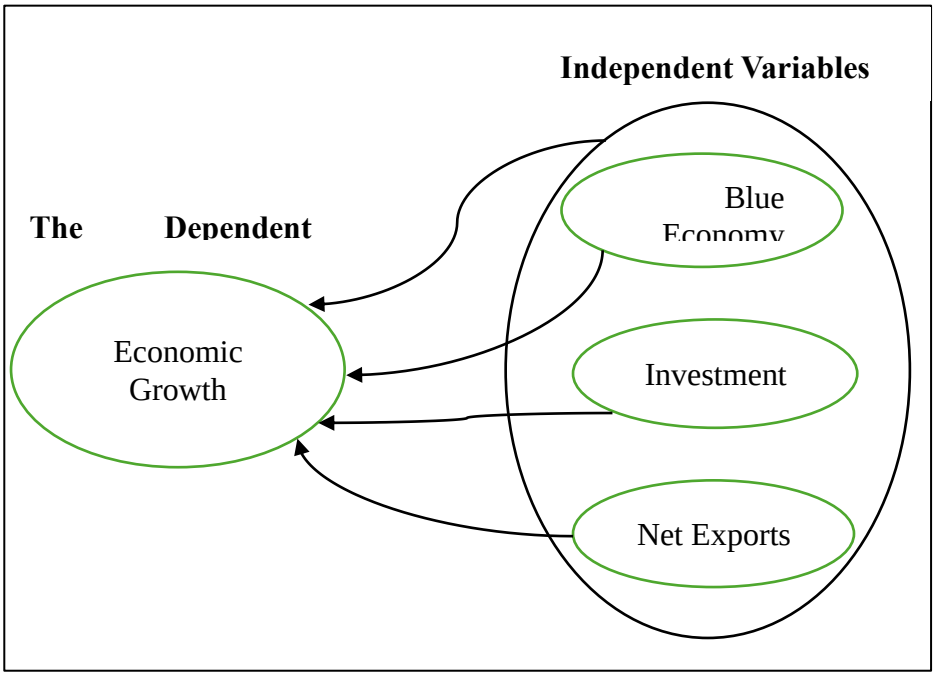
This research is organized as follows: In section 1, it presents the general framework of the research, its contents, the introduction, the problem of the research, aims, significance, hypotheses, methodology, limitations, and the structure of the research. In section 2, it demonstrates the theoretical framework; it deals with the variables of research, which include economic growth, the blue economy, investment, and the net of exports. Moreover, it contains literature reviews. In section 3, it deals with the practical aspect, which comprises building the model, estimating the parameters, and

discussing the results. Section 4 presents the conclusion and recommendations.

2. Theoretical Framework:

This section of the research deals with economic growth, the blue economy, investment, net exports, and the literature review. In Figer (1), research variables are classified.

Figer (1): The Conceptual Farmwork of Research's Variables.



Source: Prepared by the researcher.

Figer (1) shows the conceptual farmwork of the research's variables and explains graphically the relationships between them. Economic growth represents the dependent variable, which is explained by three independent variables: the blue economy, investment, and net exports. The Figer states how the independent variable impacts economic growth. The study anticipates that each independent variable will positively impact economic growth and that their combined effect will also be positive.

2.1 Economic Growth :

Economic growth is defined as the increase in real GDP per capita. This means an increase in the gross domestic product greater than population growth.

EGBULONU and AJUDUA. (2017) noted that Keynes suggested the use of government expenditure to raise aggregate demand through the multiplier effect, thereby getting the economy out of recession and achieving economic growth. Khang and Hung (2021) stated that Harrod and Domar developed the Harrod-Domar growth model in the 1940s, which sheds light on the relationship between economic growth and unemployment in developed countries and the demand for investment capital in developing countries.

Solow model of economic growth represents the neoclassical theory, and according to Powell et al. (2023), the Solow model of economic growth was first introduced in 1956 and used output as a measure of economic growth, which is dependent on two independent variables: physical capital inputs and effective labor units. Therefore, in the current study, investment can represent physical capital inputs and labor, while gross domestic product (GDP) can represent output. According to Caloca Martínez (2020), Mankiw, Romer, and Weil developed this neoclassical model in 1992 by inserting human capital as a third production input. According to Capolupo (2009), the overall picture we anticipated from a new theory is one in which several endogenous factors collaborate with one another to cause growth rather than a single factor acting alone. Thus, the new growth theory, also known as endogenous growth theory, EGBULONU and AJUDUA. (2017) stated that the endogenous growth theory models technology as the result of competitive firms that invest in knowledge generation. Innovation is seen here as the driving force behind economic growth, and this innovation is primarily the result of ideas that investment in research and development frequently generates.

GDP is a quantitative indicator that represents the monetary value of all final goods and services produced within an economy for one year. The positive value of gross domestic product is considered one of the indicators of economic growth and boom. The economic growth rate is measured by subtracting the GDP of the current year from the GDP of the previous year and dividing the result by the GDP of the previous year. GDP is significant because it is used to determine the level of economic activity, or economic success, as well as the rate of economic growth. Also, it helps in developing economic policies to treat macroeconomic problems related to the economic cycle, such as economic recession, deflation, inflation, and unemployment. In

addition, it is the most comprehensive measure because it encompasses all sectors of the economy, consisting of the family sector, business sector, government sector, and external sector. An alternative measure of economic growth that considers price fluctuations is real GDP, which is determined by dividing GDP at current prices by the GDP deflator. Furthermore, GDP per capita, which is measured as GDP divided by the population, is an alternative metric for economic growth. It is distinct from GDP in that it considers population.

2.2 The Blue Economy:

The blue economy is an economic activity that is linked to seas, oceans, and rivers. There are many of these activities, the most important of which are fishing, maritime transport, energy production, and marine tourism. Youssef (2023) stated that the blue economy is concerned with creating economic growth and encompasses activities such as fishing, aquaculture, tourism, and shipping. It focuses on creating value from ocean resources to support local communities.

Fishing is seen as one of the blue economy's elements. Johnson et al. (2018) surmised that the catching of fish is considered one of the oldest marine industries compared to shipping, and its roots are lost in pre-history. For centuries, it has been the cornerstone of the blue economy. Currently, it has become less significant in monetary value when compared to offshore oil and tourism. However, fishing remains enormously important in terms of employment and subsistence for coastal communities anywhere, and it is the largest maritime employer.

Lee et al. (2020) emphasized that in the literature, the terms ocean economy and blue economy are used interchangeably. Kwiatkowski and Zaucha (2023) also argued that the terms blue economy, maritime economy, and ocean economy are used in many studies and reports interchangeably, and they consist of all the economic activities related to the oceans, seas, and coasts. Picken (2023, 5) stated that "the UN stipulates that the term is not to be taken to exclude inland and freshwater environments like rivers, lakes, canals and estuaries."

Due to the lack of data on the blue economy during the study period, the research uses data on agriculture, forestry, and fishing available at the General Authority for Statistics (2023) to represent the blue economy. Based on the aforementioned information, the study anticipates that the blue economy, as an independent variable, will have a positive impact on economic growth.

2.3 Investment:

It is known as the total value of productive goods produced during a specific period for the purpose of producing other goods. It is divided into fixed investments and inventory investments. Investment is one of the most important sectors of the economy and represents the business sector. This sector aims to achieve profits when it produces goods and services. Four production factors help in generating production in this sector: entrepreneurship, labor, land, and capital. Thus, it contributes to reducing unemployment in the economy, resulting in an increase in the production of goods and services. Ogunyomi et al. (2023, 46) concluded that "Investment is widely accepted in the literature as the main driver of economic growth." Furthermore, Saadah et al. (2019, 30) emphasized that "investment is the main supporting factor in driving economic growth." So, investment leads to capital accumulation, which impacts output by affecting aggregate supply, demand, and production possibilities.

According to the acceleration principle of investment, which Clark put forth in 1917 and Samuelson applied in 1939, rising income encourages greater investment and consumption, which calls for more production of goods (EPAPHRA & MASSAWE, 2016). The Keynesian theory of investment is also called marginal efficiency of capital, which means the expected rate of return. In this theory, the firm makes an investment decision if the expected rate of return from the project is greater than the interest rate.

Therefore, the study anticipates a positive impact of investment on economic growth in the Kingdom.

2.4 Net Exports:

Net exports are the difference between exports and imports of goods and services during a specified period. Exports are the value of goods and services produced within the Kingdom, crossing its borders, and sold abroad. Exports represent an injection into the circular flow of income model. The Kingdom has a comparative advantage in oil production and exports. Imports are the value of goods and services produced abroad and sold within the Kingdom during a specific period. Imports represent leakage from the circular flow of income model. If exports are greater than imports, net exports will be positive, and vice versa. "Exports of goods and services are seen as an engine of economic and social development." Sayef and Mohamed (2017, 67). In addition, Kulu. (2024) stated that "export is a major driver of economic growth". In the classical theory of growth, Sultanuzzaman et al. (2019) summarized that Ricardo in the year 1821 and Adam Smith in the year 1776

theorized that countries could benefit from trade by exporting goods and services they produce at a lower labor cost and importing what they produce at a higher price.

Komarudin (2021) emphasizes that net exports are one of the driving factors of economic growth. Therefore, the research expects a positive impact of net exports on economic growth in the Kingdom.

2.5 Literature Review:

The researcher found many studies conducted in this field; for instance, EPAPHRA & MASSAWE (2016) studied Investment and Economic Growth: An Empirical Analysis for Tanzania. The study aims at examining the effect of foreign direct investment, public or government investment, and domestic private investment on real GDP growth. It uses a double logarithmic model and employs econometric techniques to achieve this. The findings demonstrate that the factors included in the estimation model jointly explain 77 percent of the variation in real GDP growth, according to the estimated coefficient of determination R^2.

EGBULONU and AJUDUA. (2017) used a macro-econometric approach for studying determinants of economic growth in Nigeria. They used GDP as a dependent variable to represent economic growth. The study utilized the ordinal least squares method for double logarithmic regression analysis; furthermore, it utilized unit root, cointegration, causality, stability, and long run analysis among variables. It found a positive relationship between foreign direct investment, openness level, gross capital formation, money supply, government spending, and labor force with economic growth.

Sayef and Mohamed (2017) dealt with the impact of exports and imports on economic growth: new evidence from Panama. The study aims to examine the direct relationship between trade and economic growth through an econometric approach. It utilized unit root and cointegration tests, the vector error correction model (VECM), and the double logarithmic function, using exports and imports as independent variables and GDP as a dependent variable representing economic growth. It found that both exports and imports influence economic growth.

Hussain et al. (2018) studied major opportunities for blue economy development in Bangladesh. The objective is to exploit the marine environment to increase food security, alleviate poverty, create jobs, lift trade and profits, and improve regional security and peace, which would determine

economic growth. The study reveals that blue economy sectors can contribute to food security, economic development, job creation, and significant livelihood benefits for millions in coastal areas. The study recommended that the government establish a strategy that is consistent with the blue economy objectives of the United Nations Environment Programme.

Saadah et al. (2019) studied The Effect of Investment Toward Economic Growth in The Local Economy. The purpose of the study was to evaluate the impact of various investment factors on the economic growth of South Sumatera Province, Indonesia, including the total amount of foreign and domestic direct investment, inflation, and road infrastructure The study quantitatively analyzed the logarithmic multiple regression model, using real GDP as economic growth and the consumer price index as inflation. The study discovered that investment and the development of road infrastructure have a significant impact on economic growth.

Sultanuzzaman et al. (2019) dealt with the effects of exports and technology on economic growth in selected emerging Asian economies. Their objective was to investigate the economic link between technology and exports in emerging Asian markets. The two-step generalized method of moments (GMM) and the pooled ordinary least squares (OLS) procedure were implemented. They find that if exports increase by 1%, economic growth will increase by 0.15%, proving the key role of exports in the economic growth of emerging Asian countries.

Alharbi and Hanif (2020) studied the impact of blue economy factors on economic growth in the SAARC countries. The study aimed to investigate the influence of blue economy factors on the economic growth of the countries of the South Asian Association for Regional Cooperation. It examined the relationship between economic growth and blue economy determinants using a general multiple regression model, and it employed two control variables: inflation and trade. Moreover, it used the used a pooled ordinary least square (OLS) and feasible generalized least square (FGLS) method. It used GDP to represent economic growth, and it also used the sum of aquaculture, forestry, and fishing to represent the blue economy. It found that the blue economy factors play a statistically significant role in the economic growth of SAARC countries. Additionally, the FGLS model, with an F-statistic of around 232.25 ($p = 0.000$), is considered the best fit. It recommended that sustainable ocean resource management and cooperation among nations can boost economic growth and enhance people's livelihoods by ensuring food security.

Akinlo (2022) examined the relationship between investment (public and private) and economic growth in Nigeria over the period 1970–2016. The study employs Markov regime-switching methodology. It found that both public and private investments have a significant positive impact on economic growth in Nigeria. Moreover, it found that during the expansion period, private investment contributed more to economic growth than public investment. It is recommended that the government be innovative by spending more during this period of slump, as more public investment will be required to prime the economy for increased private investment.

Sarwar (2022) deals with the impact of energy intensity, the green economy, and the blue economy on achieving sustainable economic growth in GCC countries. It was argued that Saudi Vision 2030 matters to GCC countries. It stated that Vision 2030 not only enhances the economy of Saudi Arabia, but also has a beneficial impact on the GCC countries. It represented the blue economy by utilizing factors of marine commerce, tourism, and fishing. It reports that the contributing factors to economic growth in the Gulf countries are labor and maritime trade.

Waheed et al. (2022) dealt with relevance of energy, green and blue factors to achieve sustainable economic growth: Empirical study of Saudi Arabia. The study used Nonlinear Autoregressive Distributed Lag (NARDL) method. It aims to examine the impact of the Saudi government's actions and procedures on energy consumption, the green economy, and the blue economy to achieve sustainable development. It divided the data into pre- and post-Vision 2030 to identify the factors that require government attention. The results of the study show that Saudi Arabia can achieve sustainable economic growth by boosting sea trade and tourism. The study recommended enhancing the role of blue factors by putting effort and investment into these factors.

Waheed (2023) studied Energy Challenges, Green Growth, Blue Indicators, and Sustainable Economic Growth: A Study of Saudi Arabia. It used the nonlinear ARDL approach. According to the study, blue economic activities are not mature enough to play a role in meeting Saudi Vision 2030's sustainable targets. Also, it found out that blue indicators are neglected to attain sustainable economic and environmental goals. It recommends that Saudi Arabia emphasize sea trade and ocean tourism.

Ahammed et al. (2024) examined the impact of blue economy factors on the sustainable economic growth of China. They used Autoregressive Distributed Lag (ARDL) methodology. The study found that total fisheries

production, aquaculture, (agriculture, fisheries, and forestry), aquaculture production, capital, and trade have a positive and significant impact on the economic growth of China, with coefficients of 0.000522, 1167.467940, 0.000031, 853.716549, and 147.703645, respectively. In other words, there is a positive correlation between economic growth in China and blue economy factors. The study recommended promoting more resilient and sustainable forms of marine and coastal tourism and facilitating market access for innovative marine products.

Although there are several studies conducted in the field of this research, the current study is not considered a replication, as it differs from them in adding independent variables represented in investment and net exports. Therefore, it fills this gap to test economic theory in its application scope in the Kingdom.

3. The Practical Aspect of Research:

In this part, the research measures and analyses the model, and applies traditional econometrics techniques to build and estimate the parameters of the model. Then it detects and remedies the model's econometric problems. Furthermore, it tests the research hypotheses.

3.1 Building the Model:

According to the theoretical framework and literature review, the research uses four variables: economic growth, blue economy, investment, and net of exports, to build the model and test the hypotheses. The data for the variables in this research is presented in Table (3) from year 1970 to 2022, so it is time series data. Therefore, the research uses the logarithmic function to get the best results; in addition, it reduces the fluctuations in the variables' observations and reduces the econometric problems. In the present instance, Alharthi and Hanif (2020, 260) confirmed that "we used normal logarithm (Log) because the log transformation also helps to reduce the problems such as multicollinearity." The model is a double log-linear regression model, as follows:

$$Log(GDP_t) = \beta_0 + \beta_1 log(Blue_t) + \beta_2 log(I_t) + \beta_3 log(NX_t) + \mu_t \quad ....(1)$$

Where the dependent $log(GDP_t)$ is the logarithm of Gross Domestic Product (GDP), it represents economic growth and is linearly related to explanatory variables: the $log(Blue_t)$ logarithm of the blue economy, the $log((I_t)$ logarithm of the investment, and the $log(NX_t)$ logarithm of the net of

exports (EX_t-IM_t). Where β_0 is the intercept, β_1, β_2, and β_3 respectively represent the blue economy elasticity of economic growth, investment elasticity of economic growth, and net of exports elasticity of economic growth. (t) refers to the time from 1970 to 2022, (u) known as the random error term and represents stochastic factors that affect the growth but are not explicitly included in the model. The model is a multiple double log-linear regression model because it includes more than one independent variable. The research uses the E-Views programme to estimate the model via the ordinary least squares method (OLS). In the present instance, the E-Views programme automatically adjusts the data and excludes negative observations of net exports (NX_t) when it computes the logarithm; it also excludes other variables' observations corresponding to the negative data. The research anticipates positive signs from the β_1, β_2, and β_3 estimators. The ordinary least squares (OLS) conditions for using a multiple linear regression model are no autocorrelation between the error terms from period to period, no heteroscedasticity within the error terms, and no high linear correlation between the independent variables.

3.2 Estimating the Parameters:

Table (1) represents the results of the model estimation:

Table (1): Model (1) results

Dependent Variable: Log(GDP_t) in model (1)			
Variable	Coefficient	t-Statistic	Prob.
Constant	2.221761	13.35222	(0.00)
log($Blue_t$)	0.193306	8.040821	(0.00)
log(I_t)	0.053567	3.774769	(0.00)
log(NX_t)	0.724625	25.04399	(0.00)
(R^2 = 0.993),	(Adj R^2 = 0.992),	(Prop F = (0.00)),	(DW = 1.32)

Source: Prepared by the researcher depending on the research's data

According to Table (1), all the estimated parameters are statistically significant. However, the Durbin-Watson statistic value (DW=1.32) for testing the autocorrelation problem in model (1) is far from 2, and it suggests positive autocorrelation. Also, the (DW=1.32) value is less than the lower tabular value (dL_3^{44}=1.383, du_3^{44}=1.666) at a 0.05 significant value; therefore, the research cannot accept the null hypothesis, which says that there is no

autocorrelation problem in the model. This problem is most apparent in time series variable data, and in order to solve it, the research adds a first-order autoregressive function ($AR_{(1)}$) to the model (1) Dougherty (2011). Then the research gets the model (2) as follows:

$$Log(GDP_t) = \beta_0 + \beta_1 log(Blue_t) + \beta_3 log(I_t) + \beta_4 log(NX_t) + AR_{(1)} + \mu_t \quad \ldots.(2)$$

Table (2) represents the results of the estimating model (2):

Table (2): Model (2) results

Dependent Variable: $Log(GDP_t)$ in model (2)			
Variable	Coefficient	t-Statistic	Prob.
Constant	2.568714	8.616637	(0.00)
$log(Blue_t)$	0.196996	5.060585	(0.00)
$log(I_t)$	0.056127	3.730659	(0.00)
$log(NX_t)$	0.690898	14.98598	(0.00)
$AR_{(1)}$	0.381477	2.492647	(0.02)
(R^2 = 0.993) (Adj R^2 = 0.992) (Prop F = (0.00)) (DW = 1.76) (Inverted AR Roots=0.38) (ARCH Test=1.84, Prob = 0.17)			
($VIF_{log(Bluet)}$=4) ($VIF_{log(It)}$=1.54) ($VIF_{log(NXt)}$ = 5)			

Source: Prepared by the researcher depending on the research's data

In this part, the research deals with the detection of econometric problems according to Table (2) results.

Detecting the autocorrelation problem in model (2): The Durbin-Watson statistic value (DW=1.76) in model (2) is close to 2, and it is higher than the upper tabular value (dL_3^{44}=1.383, du_3^{44}=1.666) at 0.05 significant value. This means that the research accepts the null hypothesis, which says that model (2) does not have an autocorrelation problem. Furthermore, the inverted AR roots have a value of 0.38, which is less than 1, confirming this result. Additionally, the significance of the ($AR_{(1)}$) coefficient is statistically significant at the 0.05 level. Hence, the inclusion of the first-order autoregressive function ($AR_{(1)}$) in the model (2) successfully resolved the problem.

Finding the heteroscedasticity problem in model (2): Table (2) shows that the ARCH probability value is 0.17, which is higher than the 0.05 significance level. This means that the null hypothesis is accepted, which states that there is no heteroscedasticity problem in model (2).

Detecting a high linear correlation between the independent variables: The research uses the variance inflation factor (VIF) to test the existence of the problem. Table (2) shows that all values of VIF are less than 10; therefore, the hypothesis of no high linear correlation among the independent variables is not rejected.

The following equation represents the estimated model of the research:

$$\log(GDP_t)=2.569+0.197\log(Blue_t)+0.056\log(I_t)+0.691\log(NX_t)+0.381(AR_{(1)})..(3)$$

3.3 Discussing the Results:

According to Table (2) and the preview analysis, the research comes out with the following results:

Testing the first hypothesis, which says there is a statistically significant positive impact of the blue economy on economic growth: The probability value of $\log(Blue_t)$ equals 0.00 less than the significant value of 0.01; therefore, the research does not reject this hypothesis, so there is a statistically significant impact of the blue economy on economic growth at the 1% significance level. The blue economy elasticity of economic growth equals 0.197, and the interpretation of this result is that if the blue economy per Riyal goes up by 1 percent, on average, the economic growth goes up by about 0.19 percent. Thus, the blue economy as a dependent variable has a significant positive relationship with economic growth, and the blue economy enhances economic growth in the Kingdom.

Testing the second hypothesis, which is that there is a statistically significant positive impact of the investment on economic growth: The probability value of $\log(I_t)$ equals 0.00 less than the significant value of 0.01, so the research does not reject this hypothesis, which means that there is a statistically significant impact of the investment on economic growth at the 1% significance level. The investment elasticity of economic growth equals 0.056, and the explanation for this outcome is that when the investment per Riyal rises by 1 percent, on average, there is an associated increase in economic growth of around 0.056 percent. Therefore, there is a positive relationship between investment as an independent variable and economic growth, indicating that investment boosts economic growth in the Kingdom.

Testing the third hypothesis, which is that there is a statistically significant positive impact of the net exports on economic growth: The probability value of $\log(NX_t)$ equals 0.00 less than the significant value of 0.01, so the study does not reject this hypothesis, which means that there is a statistically significant impact of net exports on economic growth at the 1% significance level. The net exports elasticity of economic growth equals 0.69, and the interpretation of this result is that if the net exports per Riyal go up by 1 percent, on average, economic growth goes up by about 0.69 percent. Thus, net exports as an independent variable have a positive relationship with economic growth, and this indicates that net exports increase economic growth in the Kingdom.

Testing the fourth hypothesis, which is that there is a statistically significant positive impact of the blue economy, investment, and net exports jointly on economic growth. According to Table (2) results, it is noted that the probability value for the F statistic test equals 0.00 less than the significant value of 0.01, therefore, the study does not reject this hypothesis, and this suggests that the blue economy, investment, and net exports as independent variables jointly enhance economic growth. This result is confirmed by the adjusted R^2 value of 0.99, which indicates the model's explanatory power; it states that the blue economy, investment, and net exports in the Kingdom account for about 99% of the total variation in the logarithm of economic growth in the Kingdom.

4. Conclusions and Recommendations:

Finally, this study quantitatively estimated and measured the size of the partial coefficients for the blue economy, investment, and net exports. Moreover, it investigated econometric problems and detected autocorrelation, which is treated to avoid spurious regression in the model. The aim is to test the partial impact of the independent variables as well as their overall impact on economic growth in the Kingdom, using annual data from 1970 to 2022.

The results showed a positive impact of the blue economy on economic growth in the Kingdom, which is consistent with the studies of Alharbi and Hanif (2020) in South Asian Association for Regional Cooperation countries and Ahammed et al. (2024) in China. In addition, the study found that investment impacted economic growth in the Kingdom, and that is harmonious with the results of Akinlo (2022) in Nigeria. Furthermore, the results suggest that net exports had a positive impact on economic growth in

the Kingdom, which is consistent with the findings of Komarudin (2021) in Indonesia.

The importance of this study lies in identifying the variables affecting economic growth and helping decision-makers plan economic policies. To boost economic growth, the Kingdom's decision-making processes should prioritise the implementation of expansionary economic policies aimed at enhancing blue economy activities. To achieve this, it is possible to encourage and promote marine transportation, marine tourism, and aquaculture. In addition to opening new markets for the sale of marine products, producing offshore oil, and wind production, these will create new opportunities for economic growth. Furthermore, it is vital to encourage investment as well as enhance the exportation of goods and services to increase net exports. These can be done by increasing the confidence of businessmen in economic activity, reducing taxes, and providing subsidies to small enterprises that produce goods intended for export.

To conduct further research, the study recommends inserting consumption as an additional independent variable in this study to test economic theory in the Kingdom; therefore, the recommended title becomes: The impact of the blue economy, consumption, investment, and net exports on economic growth.

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Appendices

Table (3): The Research's Data (in current price, millions Ryals)

Time	Imports (im)	Exports (X)	Investment (I)	GDP	Blue Economy (agriculture, forestry, and fishing)
1970	5218	12292.72	5419.52	24197.71	1022.56
1971	5776	17402.89	7725.06	32237.04	1061.41
1972	7319	24668.36	8074.75	40055.63	1125.41
1973	11588	55240.15	-7427.12	55404.37	1215.11
1974	21284	101462.87	49865.05	161216.05	1337.7
1975	35757	120655.9	28624.68	164529.77	1505.91
1976	54794	134952.69	69514.31	225939.85	1749.84
1977	85154	150167	80021.03	261521.4	3000.83
1978	113508	134571	99019.17	272871.38	4092.12
1979	128736	206226	98803.94	375938.17	4452.15
1980	149437	347345	125402.15	547380.73	5220.06
1981	187591	391591	131898.46	623367.31	6058
1982	205502	266511	135817.4	525333.91	8154.9
1983	212775	171681	153302.29	446287.88	9417.84
1984	190639	145530	138392.51	421558.21	11387.68
1985	137892	113163	80731.77	376318.17	13560.11
1986	115239	85989	62663.45	322020.33	15594.04
1987	119170	99045	56863.15	320931.3	18018.39
1988	116352	103531	65073.63	330519.33	20593.88
1989	135961	120494	69431.41	357064.6	22339.5
1990	138207	177685	69092.31	440525.33	24827.53
1991	180199	189694	98963.89	495176.1	26568.29
1992	184746	200772	117894.04	513394.06	28454.79
1993	166590	171065	124764.8	497964.75	29871.44
1994	131976	172123	103053.57	506229.91	30808.61
1995	148720	200437	108900.02	536819.63	31397.26
1996	158239	237812	110348.6	594190.6	31894.98
1997	161782	243384	116708.66	621533.66	33264.23
1998	145616	163099	126314.86	550407.86	33798.8
1999	140570	210231	130466.9	606438.9	34290.12
2000	175973	308473	137282.24	710680.91	34829.55
2001	165219	273677	135500.81	690515.69	35457.36
2002	168114	291155	140024.1	711022.2	35818.22
2003	194041	371088	157748.42	809278.71	36189.96
2004	233814	494702	192743.2	970283.49	37533.62
2005	306503	702164	248306.29	1230771.34	39205.39
2006	425038	844522	313565.1	1411491.01	41214.73
2007	544434	934321	412667.27	1558827.28	42755.24
2008	662568	1210701	532059.77	1949237.77	44689.94
2009	607759	757711	510336.39	1609117.12	45545.17
2010	653261	981866	612581.98	1980777.37	51877.92
2011	742415	1410841	698822.35	2537379.66	54684.66

Time	Imports (im)	Exports (X)	Investment (I)	GDP	Blue Economy (agriculture, forestry, and fishing)
2012	807023	1497823.5	752412.55	2781937.44	57611.9
2013	862128	1453664.77	760179.25	2826992.04	61345.66
2014	957686	1329530.36	834201.3	2874772.3	65792.66
2015	927402	817538.98	859203.82	2510566.43	69616.13
2016	742913	753225.28	771666.45	2497499.55	73602.09
2017	757409	899975.03	772090.54	2681230.11	76883.32
2018	785960	1180937.18	829325.91	3174689.22	78783.78
2019	821028	1071974.71	889787.29	3144617.64	80487.59
2020	683189	685679.94	762490.17	2753516.94	81511.32
2021	798809	1074381.03	834211.2	3278085.43	87694.23
2022	968298	1672055.97	1098625.09	4157143.19	99976.08

Source: Prepared by the researcher according to data of the General Authority for Statistics.

Table (4): Model (1) E-Views Output

Dependent Variable: LOG(GDP)				
Method: Least Squares				
Date: 02/26/24 Time: 11:37				
Sample: 1970 2022				
Included observations: 44				
Excluded observations: 9				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.221761	0.166396	13.35222	0.0000
LOG(BLUE)	0.193306	0.024041	8.040821	0.0000
LOG(X-IM)	0.053567	0.014191	3.774769	0.0005
LOG(I)	0.724625	0.028934	25.04399	0.0000
R-squared	0.992543	Mean dependent var		13.50402
Adjusted R-squared	0.991984	S.D. dependent var		1.229197
S.E. of regression	0.110055	Akaike info criterion		-1.489164
Sum squared resid	0.484485	Schwarz criterion		-1.326965
Log likelihood	36.76160	F-statistic		1774.676
Durbin-Watson stat	1.323942	Prob(F-statistic)		0.000000

Source: E-Views output analysis of the data in Table (3).

Table (5): Model (2) E-Views Output

Dependent Variable: LOG(GDP)				
Method: Least Squares				
Date: 02/27/24 Time: 13:13				
Sample(adjusted): 1971 2022				
Included observations: 40				
Excluded observations: 12 after adjusting endpoints				
Convergence achieved after 10 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.568714	0.298111	8.616637	0.0000
LOG(I)	0.690898	0.046103	14.98598	0.0000
LOG(BLUE)	0.196996	0.038928	5.060585	0.0000
LOG(X-IM)	0.056127	0.015045	3.730659	0.0007
AR(1)	0.381477	0.153041	2.492647	0.0176
R-squared	0.992697	Mean dependent var		13.60914
Adjusted R-squared	0.991862	S.D. dependent var		1.119128
S.E. of regression	0.100958	Akaike info criterion		-1.631759
Sum squared resid	0.356737	Schwarz criterion		-1.420649
Log likelihood	37.63517	F-statistic		1189.325
Durbin-Watson stat	1.763776	Prob(F-statistic)		0.000000
Inverted AR Roots	.38			

Source: E-Views output analysis of the data in Table (3).

Table (6): ARCH Test E-Views Output

ARCH Test:				
F-statistic	1.846728	Probability		0.183112
Obs*R-squared	1.854624	Probability		0.173247
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 05/04/24 Time: 17:58				
Sample(adjusted): 1972 2022				
Included observations: 36				
Excluded observations: 15 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005041	0.002112	2.387063	0.0227
RESID^2(-1)	0.134663	0.099094	1.358944	0.1831
R-squared	0.051517	Mean dependent var		0.006365
Adjusted R-squared	0.023621	S.D. dependent var		0.011379
S.E. of regression	0.011244	Akaike info criterion		-6.084080
Sum squared resid	0.004298	Schwarz criterion		-5.996107
Log likelihood	111.5134	F-statistic		1.846728
Durbin-Watson stat	2.289719	Prob(F-statistic)		0.183112

Source: E-Views output analysis of the data in Table (3).

Table (7): E-Views Output for Calculating VIF$_{(log(Bluet))}$

Dependent Variable: LOG(BLUE)				
Method: Least Squares				
Date: 05/04/24 Time: 18:03				
Sample: 1970 2022				
Included observations: 44				
Excluded observations: 9				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.710473	1.075243	-0.660756	0.5125
LOG(I)	1.014399	0.101155	10.02812	0.0000
LOG(X-IM)	-0.141178	0.089512	-1.577208	0.1224
R-squared	0.751386	Mean dependent var		9.930545
Adjusted R-squared	0.739258	S.D. dependent var		1.400126
S.E. of regression	0.714945	Akaike info criterion		2.232524
Sum squared resid	20.95700	Schwarz criterion		2.354173
Log likelihood	-46.11552	F-statistic		61.95702
Durbin-Watson stat	0.157491	Prob(F-statistic)		0.000000

Source: E-Views output analysis of the data in Table (3).

Table (8): E-Views Output for Calculating VIF$_{(log(It))}$

Dependent Variable: LOG(I)				
Method: Least Squares				
Date: 05/04/24 Time: 18:10				
Sample: 1970 2022				
Included observations: 44				
Excluded observations: 9				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.366132	0.818595	2.890479	0.0061
LOG(BLUE)	0.700294	0.069833	10.02812	0.0000
LOG(X-IM)	0.241710	0.066648	3.626657	0.0008
R-squared	0.800349	Mean dependent var		12.07744
Adjusted R-squared	0.790610	S.D. dependent var		1.298166
S.E. of regression	0.594030	Akaike info criterion		1.861972
Sum squared resid	14.46773	Schwarz criterion		1.983621
Log likelihood	-37.96338	F-statistic		82.17909
Durbin-Watson stat	0.420534	Prob(F-statistic)		0.000000

Source: E-Views output analysis of the data in Table (3).

Table (9): E-Views Output for Calculating VIF$_{(logNXt)}$

Dependent Variable: LOG(X-IM)				
Method: Least Squares				
Date: 05/04/24 Time: 18:11				
Sample: 1970 2022				
Included observations: 44				
Excluded observations: 9				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.293956	1.757497	1.874232	0.0680
LOG(I)	1.004845	0.277072	3.626657	0.0008
LOG(BLUE)	-0.405177	0.256895	-1.577208	0.1224
R-squared	0.350084	Mean dependent var		11.40629
Adjusted R-squared	0.318381	S.D. dependent var		1.467033
S.E. of regression	1.211186	Akaike info criterion		3.286823
Sum squared resid	60.14584	Schwarz criterion		3.408473
Log likelihood	-69.31011	F-statistic		11.04254
Durbin-Watson stat	1.343439	Prob(F-statistic)		0.000146

Source: E-Views output analysis of the data in Table (3)..