The Impact of External Debt Shocks on Sustainable Economic Growth: Emphasizing Trade Openness and the Rule of Law in Developing Countries

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Abstract

This study investigates the shock effects of external debt on sustainable economic growth, with particular emphasis on the roles of trade openness, institutional quality, and the rule of law in developing countries. Although external debt is recognized as an important financing instrument for compensating for domestic resource shortages and implementing development projects, its effects on sustainable economic growth are highly dependent on the institutional environment, regulatory frameworks, and economic structures of countries. In this study, panel data from ten selected countries, including Algeria, Bahrain, Egypt, Iraq, Iran, Jordan, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates, covering the period from 2000 to 2024, were utilized. The sustainable economic growth index was measured based on the World Bank Sustainable Development Indicator. Explanatory variables included external debt, institutional quality, regulatory quality, the rule of law, financial development, trade openness, inflation rate, government budget deficit, and population growth rate. To analyze the short-run and long-run relationships among the variables, the Panel Vector Autoregression (PVAR) econometric approach was employed. In the first stage, the stationarity of the variables was examined using the ADF–Fisher panel unit root tests. The results indicated that all variables were stationary at level. After determining the optimal lag length, the PVAR model was estimated, and an error correction framework was employed to investigate short-run dynamics. The estimation results reveal that external debt exerts a negative and statistically significant effect on sustainable economic growth in the selected countries. In contrast, institutional quality, regulatory quality, the rule of law, financial development, and trade openness have positive and statistically significant effects on sustainable economic growth. Furthermore, inflation and government budget deficits, as sources of macroeconomic instability, impose significant negative effects on sustainable development. The error correction coefficient is negative and statistically significant, indicating the gradual adjustment of short-run disequilibria toward long-run equilibrium. Variance decomposition results further demonstrate that, over medium- and long-term horizons, shocks originating from external debt account for a substantial proportion of fluctuations in sustainable economic growth. Overall, the findings suggest that the impact of external debt on sustainable economic growth is not solely determined by the volume of debt but also depends on institutional quality, regulatory frameworks, and the degree of economic openness. Strengthening the rule of law, improving institutional and regulatory quality, promoting financial development, and adopting open trade policies can mitigate the adverse effects of external debt and facilitate the achievement of sustainable economic growth in developing countries.

Keywords: *External Debt, Sustainable Economic Growth, Institutional Quality, Rule of Law, Trade Openness.*

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1. Introduction

External debt has long been regarded as a major financing instrument for developing countries seeking to overcome domestic savings gaps, finance infrastructure, stabilize public budgets, and support long-term development objectives. In many developing and emerging economies, external borrowing is not merely a fiscal choice but a structural necessity arising from limited domestic capital formation, volatile export revenues, insufficient financial depth, and persistent development financing needs. However, the developmental consequences of external debt remain theoretically and empirically contested. While debt can expand productive capacity when allocated to growth-enhancing investment, excessive or poorly governed debt accumulation may generate debt overhang, fiscal stress, exchange-rate vulnerability, macroeconomic instability, and declining investor confidence. Recent evidence from developing and emerging economies confirms that the effect of external debt on economic growth is neither uniform nor linear, but depends on macroeconomic conditions, debt structure, institutional capacity, governance quality, and the productive use of borrowed resources [1-3].

The renewed importance of external debt has become more visible in the context of post-pandemic fiscal pressures, inflationary shocks, commodity price volatility, tightening global financial conditions, and the increasing cost of sovereign borrowing. Developing countries, particularly those dependent on oil revenues or primary commodity exports, face a dual challenge: they must finance development while preserving debt sustainability and macroeconomic resilience. In such economies, external debt shocks may transmit rapidly through fiscal balances, exchange rates, inflation, public investment, and private-sector confidence. Studies on emerging market economies show that external debt dynamics interact strongly with inflation and economic growth, suggesting that debt accumulation under unstable macroeconomic conditions can undermine growth performance rather than support it [4]. Similarly, research on fiscal policies emphasizes that fiscal decisions affect growth and development through public expenditure composition, deficit financing, and the credibility of macroeconomic management [5].

In theoretical terms, the relationship between external debt and sustainable economic growth can be explained through both the debt-overhang hypothesis and the growth-financing perspective. According to the growth-financing view, borrowing from external sources can relax domestic savings constraints and enable countries to invest in infrastructure, education, industrial capacity, energy systems, technology, and institutional modernization. Under this condition, external debt may enhance long-term growth if borrowed funds are invested efficiently and generate returns higher than borrowing costs. In contrast, the debt-overhang hypothesis argues that when debt exceeds a sustainable threshold, expected future debt-service obligations reduce incentives for domestic and foreign investment, weaken fiscal flexibility, and divert public resources from productive expenditure toward repayment obligations. Evidence on threshold effects suggests that the growth impact of debt may become negative beyond certain levels, particularly when governance quality, financial stability, and institutional capacity are weak [2, 6].

The sustainability dimension of growth adds further complexity to this debate. Sustainable economic growth is not limited to increases in gross domestic product; rather, it implies growth that is economically viable, socially inclusive, institutionally supported, and environmentally responsible. Debt-financed growth may be unsustainable if it depends on short-term consumption, extractive expansion, environmentally damaging projects, or recurrent fiscal deficits. Recent research has increasingly connected debt dynamics with ecological efficiency, natural resource exploitation, and environmental sustainability. For example, resource-backed loans may affect the ecological efficiency of human development by linking public borrowing to natural resource extraction and repayment structures [7]. Similarly, debt pressure may intensify the unsustainable exploitation of natural resources, especially when governments rely on extractive revenues to service external obligations [8]. These findings suggest that external debt should be analyzed not only in relation to economic growth but also in relation to the broader sustainability of development outcomes.

Institutional quality is one of the most important channels through which external debt affects sustainable growth. Strong institutions improve the allocation of borrowed resources, reduce corruption and rent-seeking, strengthen public financial management, enhance contract enforcement, and increase the credibility of economic policies. Weak institutions, by contrast, may transform external borrowing into a source of fiscal fragility and inefficient expenditure. Recent studies confirm that institutional quality shapes the external debt–growth relationship in developing countries, indicating that similar levels of debt can produce different growth outcomes

depending on the quality of governance and institutions [9]. In the same vein, evidence from selected Muslim and ECO member countries shows that institutions play a decisive role in the effect of government debt on economic growth [10]. These findings justify the inclusion of institutional quality as a central explanatory variable in the study of external debt shocks and sustainable growth.

Governance quality also determines the volume, management, and consequences of public debt. In countries where governance mechanisms are weak, debt accumulation may occur without sufficient transparency, accountability, or alignment with development priorities. Research on OPEC member countries indicates that government governance quality influences public debt volume, suggesting that institutional and governance structures are directly related to debt behavior in resource-dependent economies [11]. Moreover, the moderating role of governance has been emphasized in regional evidence from South Asia, where governance quality shapes the effect of external debt on economic growth [12]. These studies imply that external debt should not be treated as an isolated macroeconomic variable; rather, its growth consequences must be evaluated within the broader framework of governance, institutional credibility, and regulatory effectiveness.

The rule of law is particularly relevant in this context because it affects the security of property rights, contract enforcement, predictability of regulations, control of opportunistic behavior, and the credibility of public commitments. A strong rule-of-law environment can improve the effectiveness of debt-financed investment by reducing uncertainty and encouraging private-sector participation. Conversely, weak rule of law can increase transaction costs, discourage investment, and reduce the developmental return of external borrowing. Regulatory quality is equally important, because inefficient or unpredictable regulations can weaken the business environment and prevent borrowed funds from translating into productive economic activity. The literature on institutional channels suggests that regulatory quality, legal effectiveness, and governance structures are necessary conditions for converting debt-financed resources into sustainable economic outcomes [9, 10, 12].

Trade openness represents another key factor in the external debt–growth relationship. Open economies may benefit from external debt if borrowed resources are directed toward export capacity, technological upgrading, infrastructure, and integration into global value chains. Trade openness can increase foreign exchange earnings, improve productivity through competition and technology transfer, and expand the capacity to service external debt. However, openness may also increase vulnerability to external shocks, particularly in economies dependent on a narrow export base. For oil-producing developing countries, trade openness often reflects exposure to commodity price cycles and external demand fluctuations. Therefore, the impact of debt shocks on sustainable growth may depend on whether openness is accompanied by diversification, institutional quality, and macroeconomic stability. Multinational evidence on external debt dynamics emphasizes that sustainable growth requires careful navigation of debt exposure within broader macroeconomic and structural conditions [3].

Financial development is another mechanism that can either moderate or amplify the effects of external debt. A developed financial system can mobilize domestic savings, allocate credit efficiently, support private investment, and reduce excessive dependence on external borrowing. Conversely, weak financial systems may increase the need for external debt and reduce the economy's ability to absorb borrowed resources productively. Studies in Iran have examined the asymmetric effect of public debt on financial development, indicating that debt can influence financial depth and stability in different ways depending on economic conditions and policy regimes [13]. Similarly, research on the relationship between growth and long-term debt among firms listed on the Tehran Stock Exchange highlights the relevance of debt structure for corporate growth and financial performance [14]. These findings suggest that financial development should be incorporated into models that examine debt, growth, and sustainability.

Fiscal stability also plays a central role in determining the consequences of external debt. Government budget deficits may increase reliance on borrowing, raise future debt-service burdens, and reduce fiscal space for development-oriented expenditure. In governmental institutions, long-term public debts have both accounting and economic dimensions, affecting transparency, intergenerational fiscal responsibility, and the evaluation of public-sector liabilities [15]. Policy uncertainty and interest-rate fluctuations can further increase the risk associated with government bank debts, creating additional instability in public finance and financial-sector balance sheets [16]. These studies indicate that the effect of external debt on sustainable growth cannot be separated from fiscal discipline, debt management quality, and the stability of public financial institutions.

Inflation is another destabilizing variable that may weaken the growth effects of debt-financed development. High inflation erodes purchasing power, distorts investment decisions, increases uncertainty, and may raise the domestic cost of servicing debt when monetary instability affects exchange rates and interest rates. In emerging market economies, inflation, economic growth, and external debt dynamics are closely interconnected, and inflationary environments may intensify the adverse effects of debt accumulation [4]. Therefore, inflation should be treated not only as a control variable but also as a macroeconomic condition that shapes the sustainability of debt-financed growth.

Population growth may also affect sustainable economic growth through labor supply, human capital demand, public service pressure, and resource use. A growing population can expand domestic markets and increase the labor force, but it can also intensify fiscal burdens if job creation, infrastructure, education, and health systems do not expand proportionally. The sustainability implications of population dynamics become more complex when external debt is used to finance current expenditures rather than productive investment. In addition, sustainability research increasingly emphasizes that development outcomes are affected by social and institutional structures, including representation, cultural conditions, and environmental governance. For instance, recent work on female parliamentarians and environmental sustainability shows that political and cultural factors can shape national sustainability outcomes [17]. This broader perspective supports the view that sustainable growth depends on institutional, social, and environmental conditions in addition to macroeconomic indicators.

Debt sustainability has become a major policy issue in many developing economies. Country-level evidence from Ghana, for example, highlights the importance of debt accumulation, mitigation strategies, and sustainability-oriented debt management [18]. Such evidence is relevant for other developing economies that face high financing needs, volatile revenues, and institutional constraints. The experience of debt-vulnerable countries shows that sustainable debt management requires more than reducing debt ratios; it requires transparent borrowing, productive allocation of funds, credible fiscal frameworks, and institutional mechanisms that prevent inefficient or politically motivated debt accumulation.

For oil-producing Middle Eastern developing countries, the issue is especially important because their economies often combine high development ambitions, oil revenue dependence, exposure to global commodity shocks, and varying levels of institutional quality. External borrowing in these countries may support diversification, infrastructure, and public investment, but it may also intensify vulnerability if debt is used to offset fiscal deficits during oil-price downturns. In this setting, trade openness, rule of law, regulatory quality, financial development, inflation, fiscal deficit, and population growth are not peripheral variables; they are core determinants of how external debt shocks affect sustainable economic growth.

Despite the growing literature on external debt and economic growth, several gaps remain. First, many studies examine economic growth without fully incorporating sustainability-oriented development indicators. Second, the moderating and conditioning roles of institutional quality, regulatory quality, rule of law, and trade openness remain underexplored in selected oil-producing Middle Eastern developing countries. Third, much of the existing evidence focuses on static relationships, while the effects of debt shocks are dynamic and may differ across short-run and long-run horizons. Accordingly, a panel-based dynamic approach can provide a more suitable framework for identifying how external debt shocks transmit to sustainable growth over time.

Therefore, the aim of this study is to examine the shock effects of external debt on sustainable economic growth, with emphasis on trade openness and the rule of law, in selected developing oil-producing countries over the period from 2000 to 2024.

2. Methodology

In terms of nature and method, this study is descriptive, and in terms of objective, it is applied research. In the present study, the current status of the variables was analyzed and examined through information collection based on historical data, using an ex post facto approach. The statistical sample of the present study consists of economic data from selected oil-producing Middle Eastern countries during the period from 2000 to 2024. The selected countries include Algeria, Bahrain, Egypt, Iraq, Iran, Jordan, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates. Following the studies of Sandu et al. (2022) and Ahmad et al. (2021), the present article examines the shock effects of external debt on sustainable economic growth, with emphasis on the degree of trade openness and the rule of law in developing

countries. The regression model of the study can be specified as follows:

$$SD_{i,t} = \alpha_0 + \beta_1 ED_{i,t} + \beta_2 RQ_{i,t} + \beta_3 RO_{i,t} + \beta_4 FD_{i,t} + \beta_5 POP_{i,t} + \beta_6 OPEN_{i,t} + \beta_7 INF_{i,t} + \beta_8 RL_{i,t} + \beta_9 BD_{i,t} + u_{i,t}$$

SD: Sustainable economic growth. Different studies use various indicators to represent the level of sustainable economic growth in countries. In this study, the Sustainable Development Index provided by the World Bank is used, as it offers the most recent and comprehensive information related to global development. This index measures the average achievements of a country across dimensions such as poverty, health, hunger, global warming, gender inequality, water scarcity, energy, and environmental degradation. It is ranked from zero to 1; thus, a higher score indicates countries with a higher level of sustainable development, while a lower score indicates countries with a lower level of sustainable development. Data source: World Bank (2020).

Institutional Quality (RQ): The mean institutional quality index. To measure institutional quality, five different groups or subcomponents are combined: (1) size of government, (2) legal system and property rights, (3) accountability and transparency, (4) freedom of international trade, and (5) regulation of credit, labor, and business. The main components exist within these five areas, and these components include subcomponents that lead to the overall index of the independent variables. The Fraser Institute uses a scale for each category and calculates the average of these five indicators to obtain a comprehensive index for each country. In this index, zero represents the lowest institutional value, while five represents the highest institutional quality.

BD: Government budget deficit.

ED: Total external debt, measured as a percentage of gross domestic product.

FD: Financial development, measured by liquidity as a percentage of gross domestic product.

OPEN: Trade openness, measured as the ratio of exports plus imports to gross domestic product, namely trade share.

RO: Regulatory quality. In this study, the percentile rank is used, which is a measure ranging from 0 to 100. The closer a country's rank is to 100, the greater the improvement in the regulatory quality index.

RL: Rule of law. In this study, the percentile rank is used, which is a measure ranging from 0 to 100. The closer a country's rank is to 100, the greater the improvement in the rule of law index.

POP: Population growth rate.

INF: Inflation rate.

3. Findings and Results

First, the stationarity of the variables in the model is examined to ensure that the variables remain stationary throughout the test. If the variables are non-stationary, the estimation of econometric models using these variables leads to spurious regression. A large number of economic time series are non-stationary, and regressions among them are generally spurious or artificial (Granger & Newbold, 1974). Traditionally, the Dickey–Fuller (DF), Augmented Dickey–Fuller (ADF), and Phillips–Perron (PP) tests have been used to detect the presence of a unit root in time-series data. Since panel data include a time dimension, it is natural to use unit root tests. It has been argued that unit root tests introduced for panel data have greater power and accuracy than those related to time-series data, such as the DF and ADF tests (Levin & Lin, 1992). Based on the ADF–Fisher unit root test, if the significance level of the test statistic is lower than the desired error level, which is 0.05 in the present study, the independent, dependent, and control variables of the study are stationary during the research period.

Table 1. Results of the Stationarity Test

Situation	Probability	Statistic	Method	Variable
I(0)	0.0000	74.0135	ADF–Fisher Chi-square	BD
I(0)	0.0000	76.2536	ADF–Fisher Chi-square	ED
I(0)	0.0000	78.2598	ADF–Fisher Chi-square	FD
I(0)	0.0000	73.5078	ADF–Fisher Chi-square	INF
I(0)	0.0000	77.4107	ADF–Fisher Chi-square	OPEN
I(0)	0.0000	75.3009	ADF–Fisher Chi-square	POP
I(0)	0.0000	70.5871	ADF–Fisher Chi-square	RL
I(0)	0.0000	72.4871	ADF–Fisher Chi-square	RO
I(0)	0.0000	71.9941	ADF–Fisher Chi-square	RQ
I(0)	0.0000	75.8417	ADF–Fisher Chi-square	SD

The null hypothesis in the Levin–Lin test is based on the non-stationarity of the variables under investigation, and the hypotheses can be written as follows:

H0: The variable under investigation is non-stationary.

H1: The variable under investigation is stationary.

As shown in Table 1, the calculated probability values of the independent variables are lower than 0.05, indicating that the variables are stationary. This means that the mean and variance of the variables over time, as well as the covariance of the variables across different years, have remained constant.

To estimate the model using the Panel VAR method, the optimal lag length of the model is first examined. Determining the optimal number of lags in a VAR model is of great importance. Accordingly, in this study, the Akaike, Hannan–Quinn, Schwarz, and final prediction error statistics were used to determine the optimal lag length for the vector autoregressive model. The Schwarz Bayesian criterion has greater validity for determining the optimal lag length in a vector autoregressive model. The results obtained from the above criteria for the research regressions are presented in the following table.

Table 2. Determination of the Optimal Lag Length of the Regression Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1384.867	NA	2.78e-07	13.28445	13.44384	13.34888
1	-809.8834	1089.731	3.02e-09*	8.760794*	10.51404*	9.469567*
2	-720.0942	161.6206	3.35e-09	8.858040	12.20515	10.21115
3	-618.5058	173.1841*	3.35e-09	8.842912	13.78388	10.84036
4	-542.1821	122.8448	4.32e-09	9.068400	15.60323	11.71019

Based on the results reported in the above table, according to all criteria, an optimal lag length of one is confirmed for the regression model. Therefore, in this study, the optimal lag will be used to estimate the long-run relationship in the vector autoregressive model.

Finally, to ensure model stability, the stability of the regression model is examined using the inverse roots of the characteristic polynomial.

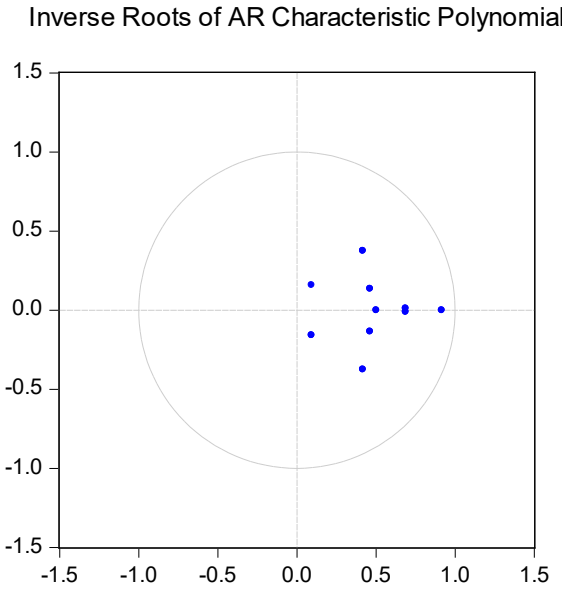

Figure 1. Inverse Roots of the Characteristic Polynomial for the Regression Model

If the Panel VAR model is unstable, the obtained results will not be reliable. To examine the stability of the estimated model, the AR graph is used. This graph shows the inverse characteristic roots of an AR process. If the absolute values of all these roots are smaller than one and lie inside the unit circle, the estimated Bayesian Panel VAR model is stable.

The AR graph of the model in the figure shows that the inverse of all characteristic roots lies inside the unit circle, and the estimated Panel VAR model satisfies the stability condition.

After determining the optimal lag, conducting the diagnostic test, and ensuring the existence of a long-run relationship among the variables of the regression models, the model was estimated using the Panel VAR method. The results are presented in the following table.

Table 3. Results of Model Estimation Using the Panel VAR Method

Explanatory Variable	Coefficient	Standard Error	Test Statistic
ED	-0.625156	0.15312	-4.08278
RQ	0.261852	0.10288	2.54521
RO	0.362896	0.14806	2.45100
FD	0.326912	0.11156	2.93036
POP	0.363486	0.12838	2.83132
OPEN	0.256156	0.10226	2.50495
INF	-0.526557	0.20156	-2.61241
RL	0.118216	0.04644	2.54556
BD	-0.559450	0.14041	-3.98440

In the following section, the t-statistic is used to examine the significance of the coefficients of the independent variables in each model. The null hypothesis in the t-test is as follows:

$$H_0: \beta_j = 0$$
$$H_1: \beta_j \neq 0$$

Its validity is examined using the following statistic:

$$t = \frac{\hat{\beta}_j}{SE(\hat{\beta}_j)}$$

To decide whether to accept or reject the null hypothesis, the obtained t-statistic is compared with the tabulated t-value, calculated with N-K degrees of freedom at the 95% confidence level. If the absolute value of the calculated T is greater than the tabulated t-value, the numerical value of the test function falls within the critical region, and the null hypothesis is rejected. In this case, at the 95% confidence level, the relevant coefficient is significant, indicating the existence of a relationship between the independent and dependent variables.

To calculate the significance statistic, or the t-test statistic, the partial regression coefficient is divided by the standard error of the variable. If the calculated value lies between -1.96 and 1.96, this indicates that the initial hypothesis of the t-test, namely the non-significance of the variable, is confirmed. Otherwise, the alternative hypothesis is confirmed, and the variable has a significant effect.

According to the model estimation results, the coefficient of the external debt variable (ED) is -0.62, indicating the negative effect of external debt on sustainable development in the selected countries. Considering the calculated statistic for this coefficient, which is -4.08278 and is greater than 1.96 in absolute value, this effect is significant at the 95% confidence level. In addition, the coefficients of institutional quality, regulatory quality, and rule of law are positive, and the test statistics for these variables fall within the critical region. Therefore, it can be stated that regulatory quality, institutional quality, and the rule of law have positive and significant effects on the improvement of sustainable development. According to the model estimation, the variables of inflation rate and government budget deficit have negative and significant effects on sustainable development. Regarding trade openness, given the coefficient of this variable, which is 0.25, and the test statistic, which is 2.50495, it can be concluded that trade openness has a positive and significant effect on sustainable development in the selected oil-producing countries under study.

An increase in external debt without regard to a country's institutional and regulatory capacities can have destructive effects on sustainable development. Moreover, institutional quality, regulatory quality, financial development, economic openness, and the rule of law have positive and significant effects on sustainable economic growth. These results highlight the importance of institutional reforms and

improvement of the business environment and economic regulations, showing that strengthening institutions and improving legal processes can reduce the negative effects of external debt. In contrast, government budget deficit and inflation rate have negative effects on sustainable economic growth, and fiscal management and inflation control are among the essential policy requirements for maintaining sustainable development. Overall, the combination of prudent fiscal policies, institutional strengthening, and improvement of regulatory quality can moderate the negative effects of external debt and pave the way for sustainable economic growth. The model results also showed that population in the nonlinear part of the model does not have a significant effect on sustainable economic growth, which may indicate that institutional and economic capacities and productivity are more decisive than population size in determining the path of sustainable development. This issue further reveals the importance of focusing on institutional reforms, financial development, and open trade policies. In other words, countries such as Iran, which face external debt constraints and institutional challenges, can reduce the negative effects of external debt and achieve a higher level of sustainable development by strengthening institutional and regulatory quality. The results of this study are consistent with previous research and show that the effects of external debt are not merely a function of debt volume; rather, institutional and regulatory quality, along with other institutional and economic factors, play a decisive role in this relationship. This emphasizes the importance of designing economic policies that are aligned with institutional capacities and of considering the threshold constraints of external debt.

Using the long-run equilibrium relationship, it is possible to estimate short-run relationships, which are referred to as error correction models. These models make it possible to identify short-run fluctuations in the variables and their relationship with long-run equilibrium values. The estimated coefficient of the error correction model for the regression model of the study is presented below.

Table 4. Estimated Coefficients of the Error Correction Model

Variable	ECM(-1)	Standard Error	Statistic
Regression model	-0.097247	0.03558	-2.73325

The coefficient related to ECM(-1), which shows the speed of adjustment of the disequilibrium process, is of fundamental importance in the error correction model. As observed, the error correction coefficient in the model specification is equal to -0.09 and is statistically significant. The fact that this coefficient is negative and smaller than one indicates that short-run disequilibria move toward long-run equilibrium. Since the time period in this study is annual, it can be stated that each year, 0.09 of short-run disequilibria is adjusted to achieve long-run equilibrium in the regression model of the study.

To properly analyze the results of the long-run equilibrium relationship for the structural vector autoregression (SVAR) model, it is necessary to examine the impulse response functions and variance decomposition of the model. In other words, the SVAR model provides two powerful tools for analyzing economic fluctuations: impulse response functions (IRFs) and variance decomposition. Therefore, after estimating the SVAR model, the results of the impulse response functions and variance decomposition can be examined. An impulse response function actually shows the effects of a one-standard-deviation shock imposed on the endogenous variables of the model. For the model used in this study, the response of the sustainable economic growth indicator to a one-standard-deviation shock or sudden change in each of the endogenous variables of the model is shown graphically in Figure 2. The horizontal axis represents time in annual periods, and the vertical axis represents the percentage growth of changes in the variable.

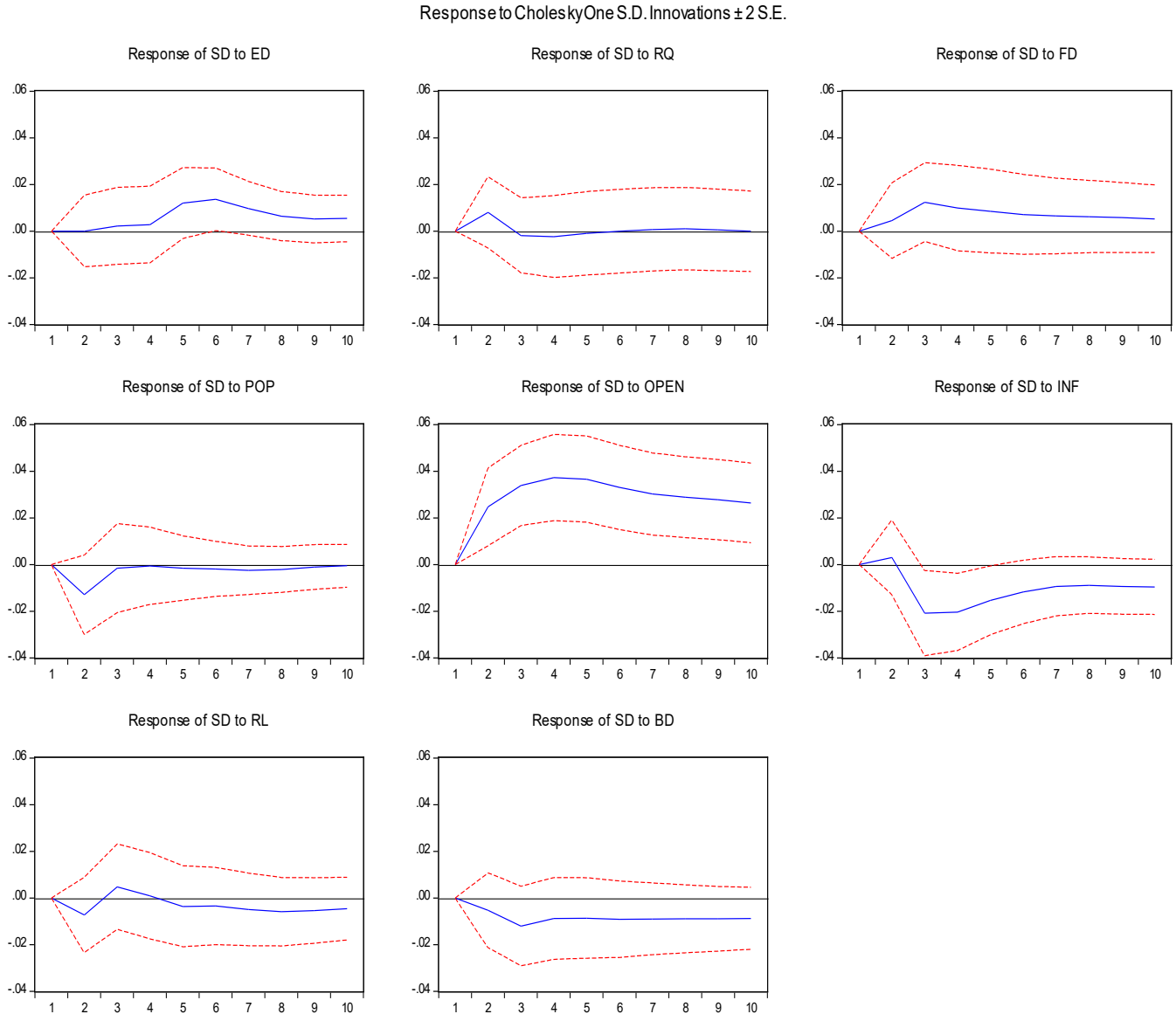

Figure 2. Results of the Impulse Response Functions for the Model

The results of the impulse response functions for the model show that the response of the sustainable economic growth indicator to shocks originating from the endogenous variables of the model converges toward zero in the long run.

Through variance decomposition, it is possible to examine the extent to which changes in a series are affected by its own components and the extent to which they are affected by the disturbance components of other variables within the system (Enders, 2007). Variance decomposition separates changes in an endogenous variable according to shocks from other endogenous variables. In this method, the share of shocks imposed on different variables of the model is decomposed into the forecast error variance of the variable in response to shocks imposed on the variables of the model. In this way, it is possible to measure the contribution of each variable to changes in other variables over time. In fact, by examining variance decomposition, the share of each shock in forecasting a specific variable is determined. The following table presents the variance decomposition for the sustainable economic growth indicator. Variance decompositions are defined in such a way that in the first period, namely the short run, fluctuations in each variable are usually explained by shocks related to that same variable. However, over more distant time horizons, the share of other variables in predicting the behavior of a variable increases according to their importance.

Table 5. Variance Decomposition for the Sustainable Economic Growth Model

Period	S.E.	SD	ED	RQ	RO	FD	POP	OPEN	INF	RL	BD
1	395849.3	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	512855.8	73.41757	20.24541	0.117864	0.025920	0.559661	0.838665	0.091331	1.359473	0.065760	3.278342
3	535402.3	67.42859	19.00452	0.344348	2.360694	3.405298	1.632137	0.704292	1.258474	0.061856	3.799791
4	563649.0	61.77145	18.10732	0.743312	3.046607	3.073052	3.240509	2.197819	1.143257	1.758573	4.918103
5	571643.8	60.70267	17.60674	1.776916	3.130163	3.016153	3.477596	2.140772	1.169612	1.880357	5.099021
6	574519.3	60.10711	17.45222	1.759229	3.262507	3.158852	3.443756	2.342528	1.392118	1.878495	5.203185
7	578110.1	59.36711	17.38096	1.836815	3.231077	3.168562	3.405072	2.478436	2.009442	1.961436	5.161085
8	580638.3	58.86787	17.74568	1.820885	3.206016	3.172337	3.390340	2.485899	2.198078	1.984026	5.128870
9	582451.7	58.51167	17.99016	1.886189	3.206052	3.171688	3.459059	2.470458	2.212420	1.972077	5.120234
10	583884.8	58.22835	17.90244	2.148368	3.206774	3.162367	3.550577	2.458643	2.201854	1.980499	5.160127

In this section, based on the estimated model, the variance decomposition of the model variables was performed, and the results are presented in Table 5. In this table, the S.E. column shows the forecast error of the relevant variables over different periods. Since this error is calculated each year based on the previous year's error, and since the source of this error is changes in current values and future shocks, it increases over time. The results of the above table for the model show that, in the sustainable economic growth model, external debt has the greatest explanatory power. This finding confirms the results obtained in the previous sections of the model, according to which this variable has the greatest effect in terms of statistical significance.

4. Discussion and Conclusion

The findings of this study provide important insights into the relationship between external debt and sustainable economic growth in selected oil-producing developing countries. The empirical results revealed that external debt exerts a negative and statistically significant effect on sustainable economic growth. This finding suggests that increasing levels of external indebtedness may reduce the capacity of developing economies to achieve balanced and long-term development outcomes. Although external borrowing is generally considered a mechanism for financing development projects and addressing domestic resource shortages, the results indicate that when debt accumulation exceeds productive absorption capacity or is not accompanied by effective institutional frameworks, its impact becomes detrimental to sustainable growth. This result is consistent with the debt-overhang hypothesis, which argues that excessive debt discourages investment and diverts resources toward debt servicing rather than productive activities. The finding is in line with the studies of [1], [3], and [2], all of which reported that excessive external debt can hinder economic growth and create long-term sustainability challenges. The results also support the argument of [18], who emphasized that debt sustainability depends not only on the amount of debt but also on the effectiveness of debt management mechanisms. Furthermore, the negative effect of external debt may be explained by the vulnerability of oil-producing economies to commodity-price fluctuations. During periods of declining oil revenues, governments often rely on additional borrowing to finance fiscal expenditures, thereby increasing debt burdens and reducing growth potential.

Another important finding of this study is the positive and significant effect of institutional quality on sustainable economic growth. This result highlights the critical role played by institutions in transforming financial resources into productive and sustainable economic outcomes. High-quality institutions improve accountability, reduce corruption, strengthen policy implementation, and enhance public-sector efficiency. Consequently, countries with stronger institutional frameworks are better positioned to allocate borrowed resources toward productive investments that generate long-term economic benefits. This finding is strongly aligned with the conclusions of [9], who found that institutional quality significantly shapes the outcomes of external debt in developing countries. Likewise, [10] demonstrated that institutional effectiveness enhances the positive contribution of public borrowing to economic growth. The positive influence of institutional quality observed in this study suggests that improving governance structures can serve as an important mechanism for mitigating the adverse effects of external debt and promoting sustainable development. In practical terms, institutional reforms can increase investor confidence, improve fiscal transparency, and facilitate efficient public investment management, thereby enhancing economic sustainability.

The results further revealed that regulatory quality has a positive and significant effect on sustainable economic growth. Regulatory quality reflects the government's ability to formulate and implement sound policies and regulations that promote private-sector development and economic efficiency. The positive coefficient obtained in the model suggests that better regulatory environments facilitate productive investment, encourage entrepreneurship, and improve resource allocation. Effective regulations reduce uncertainty, lower transaction costs, and strengthen market efficiency, all of which contribute to sustainable growth. This finding complements the institutional perspective advanced by [9] and [10], who argued that governance and institutional effectiveness are essential for translating financial resources into economic development. In countries characterized by weak regulatory systems, debt-financed investments may fail to achieve intended outcomes due to bureaucratic inefficiencies, corruption, or policy inconsistency. Therefore, the positive relationship observed in this study emphasizes the importance of regulatory reforms as a prerequisite for maximizing the developmental benefits of external borrowing.

Another significant finding concerns the positive effect of the rule of law on sustainable economic growth. The rule of law creates a stable and predictable environment for economic activities by protecting property rights, enforcing contracts, and ensuring legal accountability. The positive coefficient indicates that stronger legal systems enhance economic performance and support sustainable development. This result is consistent with theoretical expectations and complements the findings of governance-related studies such as [12] and [11], which highlighted the importance of governance structures in shaping debt and growth outcomes. A strong legal framework increases investor confidence, encourages long-term investment, and improves the efficiency of public spending. Moreover, the rule of law contributes to debt sustainability by ensuring transparency and accountability in borrowing decisions. Consequently, countries that strengthen their legal institutions may be better able to manage external debt while simultaneously promoting sustainable economic growth.

The findings also demonstrate that financial development exerts a positive and significant impact on sustainable economic growth. Financial development enhances the mobilization of savings, facilitates access to credit, improves investment efficiency, and supports innovation. The positive relationship identified in this study suggests that developed financial systems provide an enabling environment for productive investment and economic diversification. This finding is consistent with the conclusions of [13], who reported that debt and financial development are closely interconnected and that improvements in financial systems can reduce economic vulnerabilities. Financial development may also reduce dependence on external borrowing by expanding domestic financing opportunities. In addition, efficient financial institutions can improve the allocation of debt-financed resources and support private-sector growth, thereby enhancing the sustainability of economic development.

Trade openness was found to have a positive and statistically significant effect on sustainable economic growth. This finding suggests that greater integration into international markets contributes to economic expansion and sustainable development. Trade openness enhances access to technology, promotes competition, increases productivity, and expands export opportunities. For oil-producing countries, openness can also facilitate economic diversification by encouraging the development of non-oil sectors. The positive impact observed in this study supports the broader literature on globalization and development and aligns with the multinational evidence presented by [3]. Open economies are generally better positioned to absorb external shocks and generate foreign exchange earnings necessary for servicing external debt. Therefore, trade openness appears to function as an important mechanism through which developing economies can improve growth performance and enhance sustainability.

The study additionally found that inflation has a negative and significant effect on sustainable economic growth. This result indicates that macroeconomic instability undermines development by reducing purchasing power, discouraging investment, and increasing uncertainty. Inflation distorts market signals and weakens economic planning, thereby reducing the effectiveness of both public and private investment. The negative relationship observed here is consistent with the findings of [4], who emphasized the interconnected nature of inflation, debt dynamics, and economic growth in emerging economies. High inflation can also increase the burden of debt servicing and weaken fiscal sustainability. Consequently, inflation control emerges as an essential component of strategies aimed at promoting sustainable growth and improving the effectiveness of external borrowing.

Government budget deficit was another variable found to have a negative and significant impact on sustainable economic growth. Persistent fiscal deficits often increase

borrowing requirements, elevate debt burdens, and reduce fiscal flexibility. The results suggest that unsustainable fiscal practices undermine long-term economic performance and weaken development prospects. This finding is consistent with the arguments advanced by [5], who highlighted the importance of fiscal policy decisions in shaping economic growth outcomes. Similarly, the studies of [15] and [16] emphasized that public debt management, fiscal transparency, and policy stability are essential for maintaining sustainable economic performance. Large fiscal deficits may crowd out productive investment, increase borrowing costs, and create macroeconomic vulnerabilities that ultimately constrain growth.

The variance decomposition results provide further support for the central role of external debt in explaining fluctuations in sustainable economic growth. Over medium- and long-term horizons, shocks originating from external debt account for a substantial share of forecast error variance in sustainable growth. This finding reinforces the argument that debt dynamics constitute a major determinant of development outcomes in oil-producing developing countries. The impulse response analysis further demonstrated that although the effects of debt shocks gradually diminish over time, their initial influence on growth is substantial. These results are broadly consistent with the conclusions of [1], [2], and [12], who emphasized the long-term implications of debt accumulation for economic performance.

An additional observation concerns the role of population growth. Although the estimated coefficient was positive, the broader interpretation of the model suggests that population alone does not guarantee sustainable development. Rather, the economic benefits of population growth depend on the quality of institutions, labor-market conditions, human capital formation, and economic opportunities. This interpretation is compatible with the broader sustainability perspective emphasized by [17], which highlights the importance of social and institutional factors in determining development outcomes. Consequently, the sustainability of economic growth appears to depend more on institutional and economic productivity than on demographic expansion alone.

Overall, the findings of this study support the view that external debt is not inherently detrimental or beneficial to sustainable economic growth. Instead, its effects depend heavily on the institutional, regulatory, legal, and macroeconomic environment within which borrowing occurs. Countries characterized by strong institutions, effective governance, sound regulations, developed financial systems, and open trade regimes are more capable of transforming borrowed resources into sustainable development outcomes. Conversely, countries experiencing weak governance, persistent inflation, fiscal imbalances, and institutional deficiencies are more likely to experience adverse consequences from debt accumulation. Therefore, the relationship between external debt and sustainable economic growth should be understood as conditional rather than universal. The evidence presented in this study reinforces the growing consensus in the literature that sustainable debt management requires a comprehensive policy framework integrating fiscal discipline, institutional strengthening, regulatory improvement, financial development, and trade openness [9-11, 18].

One limitation of the present study is that it focuses exclusively on selected oil-producing developing countries, which may limit the generalizability of the findings to other groups of developing or developed economies. In addition, the analysis relies on aggregate macroeconomic indicators and therefore does not capture sector-specific effects of external debt. The study also measures institutional and governance dimensions using composite indicators, which may not fully reflect all aspects of institutional performance. Furthermore, differences in political systems, economic structures, and debt composition across countries may introduce heterogeneity that cannot be completely captured within the model.

Future research could examine the relationship between external debt and sustainable growth using broader samples of countries and longer time horizons. Comparative studies between oil-exporting and non-oil-exporting economies may provide additional insights into the role of resource dependence in debt sustainability. Future studies may also investigate nonlinear effects, threshold levels of debt, and interaction effects between governance quality, institutional development, and debt dynamics. Moreover, incorporating environmental sustainability indicators, climate vulnerability measures, and green investment variables may contribute to a more comprehensive understanding of sustainable growth.

From a practical perspective, policymakers should prioritize strengthening institutional quality, improving regulatory effectiveness, and enhancing the rule of law as mechanisms for increasing the developmental returns of external borrowing. Governments should also adopt prudent fiscal policies aimed at reducing persistent budget deficits and maintaining debt sustainability. Expanding financial-

sector development and promoting trade openness can further support economic diversification and resilience. Finally, external borrowing should be directed toward productive investments in infrastructure, technology, education, and sustainable development projects rather than financing recurrent expenditures, thereby ensuring that debt contributes positively to long-term economic prosperity and sustainability.

Authors' Contributions

Authors equally contributed to this article.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

All procedures performed in this study were under the ethical standards.

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