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A Dynamic Analysis of Sustainable Economic Growth and FDI Inflow in Saudi Arabia Using ARDL Approach and VECM Technique

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Abstract: This study investigates the relationship between sustainable economic growth and foreign direct investment (FDI) in Saudi Arabia from 1980 to 2023. The ARDL approach and VECM technique are employed to analyze the short-run and long-run dynamics. The short-run results show mixed effects. Sustainable economic growth has a positive impact on current and one-period lagged FDI but a negative impact on the two periods lagged. Trade openness and infrastructure negatively affect FDI in the short run. Interestingly, oil rents and real economic growth also have negative short-run impacts on FDI, but these effects become positive with a longer lag. Long-run analysis reveals a negative relationship between trade openness, infrastructure, and oil rents with FDI, suggesting a potential crowding-out effect. Trade openness has a positive long-run impact on most variables, including sustainable growth, FDI, real growth, and CO_2 emissions. Oil rents also have a positive long-run impact on these variables. This study finds six bidirectional causal relationships in the short run, primarily between trade openness, infrastructure, oil rents, and FDI. Unidirectional causality runs from oil rents, trade openness, exchange rate, sustainable growth, and real growth to FDI and infrastructure. Additionally, CO_2 emissions cause FDI, and trade openness causes sustainable growth. While sustainable economic growth benefits FDI in the long run, short-term policies regarding trade openness and infrastructure require reevaluation. Oil revenue and real economic growth may initially deter FDI, but this reverses in the long term. To attract sustainable FDI, policymakers should focus on long-term economic growth strategies and consider reforms in trade and infrastructure policies. A comprehensive FDI strategy that moves beyond oil dependence and leverages trade openness is crucial to long-term economic diversification.

Keywords: sustainable economic growth; trade openness; official exchange; government effectiveness; inflation; oil rents; CO_2 emissions; real economic growth

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1. Introduction

Foreign direct investment (FDI) plays a pivotal role in enhancing the economic growth and development of Saudi Arabia. Given its tremendous importance and profound significance, FDI acts as a catalyst for the nation's economy, contributing to its remarkable progress in various sectors. FDI in Saudi Arabia has been vital for attracting large-scale investments and fostering economic diversification. In fact, Saudi Arabia's net foreign direct investment (FDI) jumped over 5% year-on-year in Q1 2024, reaching SAR 9.5 billion, according to the General Authority for Statistics (GASTAT). By encouraging global companies to establish their presence within the country, Saudi Arabia has created a favorable environment for economic growth. FDI facilitates the transfer of technology, knowledge, and expertise, ultimately shaping a sustainable economic future for the nation. In fact, according to the World Bank annual meeting (2022) sustained economic growth is a comprehensive concept that involves continuous increases in economic output over a long period. It is driven by factors such as human capital, technological innovation, institutional quality, and infrastructure development. Understanding and promoting sustained economic

growth is vital for policymakers to achieve long-term economic stability and improve living standards. Moreover, FDI plays a crucial role in boosting employment opportunities within Saudi Arabia. By attracting foreign investors, a country can create new jobs, leading to reduced unemployment rates and improved living standards for its citizens. This influx of investment enables Saudi Arabia to harness the full potential of its human resources and build a skilled workforce that drives innovation and productivity.

Additionally, FDI serves as a platform for knowledge exchange and capacity building. Through partnerships with international investors, Saudi Arabia benefits from exposure to various business practices, managerial expertise, and innovative ideas. These collaborations stimulate economic growth, foster entrepreneurship, and enhance the competitiveness of local industries, propelling the country toward further development. Furthermore, FDI has a significant impact on the expansion of Saudi Arabia's infrastructure. With foreign investment, the nation can bolster its transportation networks, power grids, and communication systems, facilitating trade and connectivity. This strategic development of infrastructure creates a favorable business climate, attracting more investors and fueling economic growth.

Vision 2030 outlines a bold vision for Saudi Arabia's future, aiming to reduce its dependence on oil revenue and propel the nation toward a knowledge-based economy. Achieving this ambitious plan hinges heavily on attracting significant FDI. Foreign investors bring not only capital but also cutting-edge technologies, operational know-how, and access to international markets. These contributions are crucial for developing new industries, creating jobs, and fostering innovation in the key sectors targeted by Vision 2030, such as renewable energy, tourism, and advanced manufacturing.

However, attracting FDI is a complex endeavor. This study investigates various factors that influence investment decisions by exploring the positive and negative forces shaping the landscape of foreign investors in Saudi Arabia. In fact, our problem is summarized by the following question: What are the key factors that influence foreign direct investment decisions in Saudi Arabia?

To answer this question, the Autoregression Distributed Lags (ARDL) approach and the Vector Error Correction Model (VECM) technique were applied to examine the effects of different factors on FDI net flows in the short and long term during 1980–2023. Time series data analysis can be performed using two econometric techniques: the VECM approach and the ARDL methodology. Owing to their distinct benefits, these techniques can be applied to examine the relationships among FDI net outflows, sustainable economic growth, trade openness, official exchange, government effectiveness, inflation, oil rents, CO_2 emissions, and real economic growth. In essence, the ARDL approach is a flexible way to perform a cointegration analysis. First, it operates best when variables have a range of integration orders. Some of these variables may be stable (constant variance over time) at level (I(0)) or after one differentiation (I(1)). In fact, it works best when the variables have a mixed integration. Secondly, sparse data handling, a common issue in environmental and economic studies, makes the ARDL technique extremely useful. This is because, in a single step, it incorporates the estimation of both short-run dynamics and long-run cointegration, making it efficient, even with smaller datasets. Limit testing, a statistical technique to determine whether a cointegrating relationship between the variables is present, is finally made feasible by the ARDL. As a result, figuring out whether these components are in long-term balance is made simpler. The VECM approach, however, operates on the presumption that the variables are already cointegrated. Since we must first confirm cointegration using tests like Johansen's cointegration test before utilizing the VECM, this might not be the ideal choice for our study at first. Focus on short-run dynamics: After cointegration is reached, the VECM is very effective in analyzing the short-run dynamics between the variables. It shows how adjustments are made to temporal departures from the long-run equilibrium, as shown by the cointegrating equation.

The structure of the document is as follows: The Section 3 is a description of the research methods employed in the study. The methods used to collect the data, the specific

variables (FDI net outflows, sustainable economic growth, trade openness, official exchange, government effectiveness, inflation, oil rents, CO_2 emissions, and real economic growth) that were examined, and the econometric techniques used to examine the correlations between these variables must all be reviewed. Despite the recognized importance of FDI in driving economic growth and diversification, there is a limited comprehensive analysis of the multifaceted factors influencing FDI in Saudi Arabia over an extended period. This study fills this gap by employing robust econometric techniques to provide a detailed examination of these factors for more than four decades. By integrating variables such as government effectiveness, oil rents, CO_2 emissions, and trade openness, this research offers a nuanced understanding of the interplay between FDI and economic growth. The findings contribute to the existing literature by highlighting the critical determinants of FDI, thus informing more effective policy decisions to foster sustainable economic development and align with the Vision 2030 objectives.

This study comprehensively analyzes the factors influencing foreign direct investment (FDI) in Saudi Arabia using the ARDL and VECM techniques. However, it identifies a gap in the understanding of the short- and long-term interplay between these factors and their evolution over economic cycles and global shifts. Additionally, the impact of the emerging industries targeted by Vision 2030 on FDI inflows and the broader economy remains unexplored. Addressing these gaps could offer deeper insights for policymakers to attract and sustain FDI, aiding Saudi Arabia's economic diversification efforts.

The test and estimation results are explored in the Section 5. It investigates the connections between variables statistically. The interaction between these variables is examined in this part, along with the possibility of targeted government initiatives to promote sustainable development. The main conclusions are summarized in the Section 6. The necessity of an all-encompassing strategy that tackles these interrelated problems holistically is emphasized in the Section 8. The study's core findings are finally discovered in the Section 7.

2. Literature Review

The literature review focuses on the investigation of the mystery surrounding FDI net outflows, the examination of existing theories and research, and the discovery of empirical evidence. The initial part of this analysis details understanding the relationship between FDI net outflows and sustainable economic growth, trade openness, official exchange, government effectiveness, inflation, oil rents, and CO_2 emissions.

2.1. Sustainable Economic Growth and FDI

The impact of sustainable economic growth on foreign direct investment (FDI) has been a topic of interest in recent literature. Xie, Q. et al. [1] highlighted the spillover effect of FDI on CO_2 emissions through economic growth, suggesting that FDI can decrease CO_2 concentrations. Tkalenko, S. et al. [2] emphasized the need for digital transformation for economic development and the role of FDI in promoting economic growth in the context of global digitalization. Yusuf, H. et al. [3] examined the role of FDI in West Africa's economic growth, while Oyegoke, E. et al. [4] specifically studied the impact of FDI on economic growth in Nigeria. Udemba, E. et al. [5] explored the interaction between FDI, natural resources, and economic growth in determining environmental performance, finding that positive shocks to FDI and natural resources decrease carbon emissions, impacting the environment positively. Le, Q. et al. [6] analyzed the impact of FDI on income inequality in Vietnam, emphasizing how FDI affects income through economic development and employment. Furthermore, Jushi, E. et al. [7] investigated the impact of remittances on economic development in Balkan countries, with empirical findings suggesting that population growth, remittances, and labor force participation are insignificant factors for sustainable growth. Finally, Iheanachor, N. et al. [8] assessed the nexus between FDI inflows and sustainable development in Nigeria and Ghana and found that an increase in FDI inflow enhances economic growth and sustainability. Overall, the

literature review indicates a growing interest in understanding the relationship between sustainable economic growth and FDI, with studies focusing on various regions and aspects, such as environmental performance, income inequality, and the role of digital transformation in promoting economic development. These studies provide valuable insights into the complex dynamics between FDI and economic growth in various contexts.

2.2. Trade Openness and FDI

The impact of trade openness on foreign direct investment (FDI) has been a subject of interest in recent literature. Peizhi, W. et al. [9] conducted a study on 10 developing nations and found that trade openness has a positive and significant impact on FDI inflows. However, Canh, P. et al. [10] explored the drivers of the shadow economy and noted a weaker negative influence of trade openness on the shadow economy. Tang, C. et al. [11] extend their model to examine the moderating effects of financial development on the impact of inflation volatility, trade openness, and FDI on growth volatility in Malaysia. Alhakimi, S. [12] emphasized the importance of trade openness policies in encouraging FDI flows. Wiredu, J. et al. [13] found that trade openness, investment, and inflation have a positive and significant impact on economic growth in West Africa. Nguyen, C. et al. [14] investigated the influences of trade openness and FDI inflows on economic complexity, noting the positive impact of trade openness and the negative impact of FDI inflows. Adegboye, F. et al. [15] examined the impact of trade openness and FDI on economic welfare in sub-Saharan Africa, highlighting the significant impact of trade openness on economic welfare. Tsaura, K. [16] studied the determinants of trade openness in transitional economies, focusing on the complementarity between FDI and human capital development. Nguyen, C. et al. [17] evaluated the relationship between trade openness and FDI in developing countries, considering the effects of economic vulnerability. Overall, the literature suggests that trade openness plays a crucial role in attracting FDI inflows and promoting economic growth, although the relationship between trade openness and FDI can be influenced by various factors such as economic vulnerability, institutional quality, and financial development.

2.3. Official Exchange and FDI

Chen, K. et al. [18] examined the impact of exchange rate movements on foreign direct investment (FDI) and found that the relationship between exchange rates and FDI is dependent on the motives of the investing firms. Vita, G. and Abbott, A. [19] focused on the impact of exchange rate volatility on FDI flows into the UK and concluded that volatility has a negative impact on FDI disrespect of the destination sector. Chowdhury, A. and Wheeler, M. [20] studied the impact of exchange rate uncertainty on FDI in developed economies and found a positive impact with a lag. On the other hand, Rao, K and Dhar, B. [21] investigated the impact of the real exchange rate on FDI in Mauritius and found that depreciation enhances FDI inflows in both the short and long run. Asmah, E. and Andoh, F. [22] explored the impact of exchange rate volatility on FDI in Sub-Saharan Africa and discovered a robust negative impact on FDI in African countries. Furthermore, Mowlaei, M. [23] studied the impact of different forms of foreign capital inflows, including FDI, on economic growth in African countries. The study indicated the impact of each FDI, personal remittances, and official development assistance on economic growth. Additionally, Iqbal, S and Malik, I. [24] investigated the impact of FDI and external debt on economic growth in Pakistan and found no impact of external debt on economic growth in the long run. Overall, the literature suggests that exchange rate movements and volatility play a significant role in influencing FDI flows in different countries and regions. The impact of exchange rates on FDI can vary depending on the specific context and motives of the investing firms.

2.4. Government Effectiveness and FDI

Sharma, C. and Dangwal, R. [25] examine the relationship between government effectiveness and FDI in the BRICS economies. Using panel data analysis, the study finds a

positive and significant relationship between government effectiveness and FDI inflows in BRICS countries. Asongu, S. and Nwachukwu, J. [26] suggest that improved government effectiveness positively influences FDI inflows into Sub-Saharan African countries. Abduazizova, K. [27] indicates a positive and statistically significant impact of government effectiveness on FDI inflows in the Middle East and North Africa (MENA) region. Hassan, S. and Rahman, M. [28] investigate the relationship between government effectiveness and FDI inflows in BRICS countries. These findings suggest that government effectiveness significantly affects FDI inflows in these economies. Chaudhry, I. and Munir, A. [29] have found that government effectiveness has a positive and significant impact on FDI inflows. Khan, M. and Lefen, L. [30] examine the relationship between government effectiveness and FDI inflows in developing economies. They find that political stability and regulatory quality moderate the relationship between government effectiveness and FDI inflows. Nguyen, C. and Nguyen, L. [31] investigate the impact of political stability, government effectiveness, and regulatory quality on FDI inflows in Southeast Asia. The findings suggest that government effectiveness has a positive and significant impact on FDI inflows in the region.

2.5. Inflation and FDI

Recent studies have shed light on the complex relationship between inflation and foreign direct investment (FDI). According to Smith, A. [32], high inflation rates negatively affect FDI inflows, especially in developing economies, due to increased uncertainty and reduced purchasing power. Conversely, Johnson, R. and Lee, M. [33] argue that moderate inflation can have a positive impact on FDI inflows, as it signals a growing economy with increasing demand. Building on this, Gupta, S. et al. [34] found a non-linear relationship, suggesting that low to moderate levels of inflation can attract FDI, but excessively high inflation rates deter FDI inflows. However, the findings of Li, X. and Wang, J. [35] challenge this, proposing that the relationship between inflation and FDI is contingent on other factors such as market size and infrastructure. In contrast, Rahman, M. and Hassan, M. [36] highlight the importance of exchange rate stability in mitigating the negative effects of inflation on FDI. In a related study, Chen, S. and Zhang, Y. [37] emphasize the role of institutional quality, stating that countries with better institutional frameworks are better equipped to manage the effects of inflation on FDI. Overall, these studies demonstrate the multidimensional nature of the relationship between inflation and FDI and emphasize the significance of various economic factors and policy frameworks.

2.6. Oil Rents and FDI

Several studies shed light on the intricate relationship between oil rents and foreign direct investment (FDI) in oil-dependent economies, particularly in the Middle East, North Africa, and Gulf Cooperation Council (GCC) countries. Cevik, S. and Jalles, J. [38] research reveals that oil rents negatively impact FDI inflows in MENA countries, a relationship exacerbated by policy uncertainty. Similarly, Al-Malkawi, H. and Zu'bi, H. [39] found that higher oil rents in Arab Gulf countries are associated with lower institutional quality, discouraging FDI. Al-Shboul, M. and Anwar, S. [40] study shows that in GCC countries, higher oil rents impede financial development, thereby reducing FDI. Mohey-ud-din, G. et al. [41] highlight how the misallocation of oil rents, particularly in the education and health sectors, hinders human capital development and deters FDI. Omri, A and Nguyen, D. [42] demonstrate the negative impact of oil rents on economic growth, further worsened by expansionary fiscal policy, though FDI partially mitigates this effect. Uddin, M. et al. [43] underline the negative effect of oil rents on FDI inflows in MENA countries, worsened by poor governance quality, emphasizing the importance of governance improvement. Finally, Shahbaz, M. and Balsalobre-Lorente, D. [44] findings suggest that higher oil rents hinder economic diversification, especially in countries with poor institutional quality, although FDI plays a significant role in mitigating this negative impact. Overall, these

studies emphasize the crucial role of institutional quality, policy uncertainty, fiscal policy, and governance in attracting FDI to oil-dependent economies.

2.7. CO_2 Emissions and FDI

Several studies have explored the relationship between foreign direct investment (FDI) and CO_2 emissions in various contexts. Liu, X. et al. [45] found that FDI initially increases CO_2 emissions in developing countries but leads to a decrease in the long run due to technology transfer and environmental regulation. In addition, Madalino, M. and Nogueira, M. [46] show that investments in fixed assets, human capital development, and international trade contribute positively to economic growth within the EU. While increasing renewable energy consumption can lead to economic growth, it may come at the expense of higher CO_2 emissions in the short term, especially in countries heavily reliant on fossil fuels. Wang et al. [47] focused on Belt and Road countries and discovered that, while FDI initially increases CO_2 emissions, this effect is moderated by increased renewable energy consumption. In China, Li, J. and Huang, W. [48] found that FDI inflows have a negative impact on CO_2 emissions, suggesting that FDI contributes to emission reduction through technology transfer and environmental regulation. Hou, Y. et al. [49] investigated ASEAN countries, observing that FDI inflows increase CO_2 emissions, although this effect is mitigated by improved energy efficiency. Xu and Zhang [50] studied emerging market economies and found that FDI increases CO_2 emissions, while financial development mitigates this effect. Zhang, Y. and Wang, S. [51] synthesized existing studies and concluded that FDI generally increases CO_2 emissions, although the extent of this effect varies. Lastly, Dai, Y. and Ma, H. [52] research on G20 countries found that while FDI stimulates economic growth, it also leads to increased CO_2 emissions, indicating the necessity of environmental policies to address this issue.

3. Data and Methodology

This paper uses the ARDL approach and VECM technical evidence from Saudi Arabia during the 1980–2023 period to analyze the effects of sustainable economic growth, trade openness, official exchange, government effectiveness, inflation, oil rents, CO_2 emissions, and real economic growth on FDI net outflows. Because they can capture both the long-term equilibrium connections between the variables and the short-term effects, as well as how changes in one variable quickly influence another, the ARDL method and the VECM technique are utilized in this work. However, in situations like this, when several factors may have an impact on one another, the ARDL and VECM are effective tools.

All things considered, these methods offer a strong foundation for examining how these variables are related to one another over time, evaluating the efficacy of various strategies throughout Saudi Arabia, and understanding the intricate relationships between the many elements influencing foreign direct investment. The Vector Error Correction Model (VECM) technique and the Autoregressive Distributed Lag (ARDL) approach have various drawbacks while providing insightful information on the relationships between poverty, environmental harm, circular economy practices, and renewable energy. The ARDL approach's sensitivity to model definition is one of its drawbacks. If the lag duration and included variables are not properly chosen, they may have a substantial influence on the results and result in estimates that are skewed. Furthermore, the complex dynamics present in socioeconomic and environmental systems may not always be fully captured by ARDL, as it implies that the interactions between variables are linear. In a similar vein, the VECM method has several drawbacks. First of all, for real-world datasets, this requirement that the time series data be steady may not always apply. Furthermore, all variables are assumed to be cointegrated by the VECM, suggesting a long-term link between them. However, in other circumstances, this assumption might not be applicable, producing unreliable outcomes. Furthermore, the dependability of the computed coefficients may be impacted by VECM's sensitivity to outliers and structural fractures in the data.

First, we use the Vector Error Correction Model (VECM) and Autoregressive Distributive Lag (ARDL) to define the econometric model. Step three presents the outcomes of the estimations and testing. We create an empirical model based on a typical production function with constant returns. The combined output function with respect to time (t) is expressed as follows:

$$F_{FDI}(SEG,\ TO,\ OER,\ GE,\ INF,\ OR,\ CO2,\ REG) \quad (1)$$

where FDI indicates foreign direct investment, net outflows (% of GDP); SEG indicates sustainable economic growth measured by GDP per capita growth (annual %); TO indicates trade openness (% of GDP); OER indicates the official exchange rate (LCU per US$, period average); GE indicates Government Effectiveness; INF indicates Inflation; OR indicates oil rents (% of GDP); CO_2 indicates carbon dioxide emissions (kg per kg of oil equivalent energy use), and REG indicates real economic growth measured by the Gross Domestic Product rate. Table 1. provides a summary of all the variables' precise measurements along with the sources of their data.

Table 1. The summary of all the variables' precise measurements along with the sources of their data.

Variables	Measurements	Sources
FDI (Foreign Direct Investment)	Net outflows (% of GDP)	WDI, 2024
SEG (Sustainable Economic Growth)	GDP per capita growth (annual %)	WDI, 2024
TO (Trade Openness)	Percent of GDP	WDI, 2024
OER (Official Exchange Rate)	LCU per US$, period average	WDI, 2024
GE (Government Effectiveness)	Quality of the civil service, the independence from political pressures and quality of policy formulation	WDI, 2024
INF (Inflation)	GDP deflator (annual %)	WDI, 2024
OR (Oil Rents)	Percent of GDP	WDI, 2024
CO_2 (Carbon Dioxide emissions)	kg (per kg of oil equivalent energy use)	WDI, 2024
REG (Real Economic Growth)	GDP growth rate	WDI, 2024

Note: WDI indicates the World Development Indicators.

To explore the long run relationships among variables, the log-linear equation among variables can be developed as follows:

$$lnFDI_t = \beta_0 + \beta_1 lnSEG_t + \beta_2 lnTO_t + \beta_3 lnOER_t + \beta_4 lnGE_t + \beta_5 lnINF_t + \beta_6 lnOR_t + \beta_7 lnCO2_t + \beta_8 lnREG_t \varepsilon_t \quad (2)$$

where, t indicates time. β_0 designates the constant. β_1, β_2, β_3, β_4, β_5, β_6, β_7 and β_8 are the coefficients of long-run elasticity between explicate variables and Foreign Direct Investment (FDI). All variables are represented using a logarithm function. In fact, lnFDI represents the logarithm function of FDI, lnSEG represents the logarithm function of SEG, lnTO represents the logarithm function of TO, lnOER represents the logarithm function of OER, lnGE represents the logarithm function of GE, lnINF represents the logarithm function of INF, lnOR represents the logarithm function of OR, lnCO_2 represents the logarithm function of CO_2 and lnREG represents the logarithm function of REG. ε indicates the white noise.

Based on Pesaran and Shin [53] and Pesaran et al. [54] the ARDL equation is written as follows:

$$\begin{aligned} DlnFDI_t = \alpha_0 + & \sum_{i=1}^{p} \gamma_i DlnFDI_{t-i} + \beta_1 FDI_{t-1} + \sum_{i=1}^{q} \delta_i DlnSEG_{t-i} + \beta_2 SEG_{t-1} + \sum_{i=1}^{q} \epsilon_i DlnTO_{t-i} + \beta_3 TO_{t-1} \\ & + \sum_{i=1}^{q} \theta_i DlnOER_{t-i} + \beta_4 OER_{t-1} + \sum_{i=1}^{q} \vartheta_i DlnGE_{t-i} + \beta_5 GE_{t-1} + \sum_{i=1}^{q} \mu_i DlnINF_{t-i} + \beta_6 INF_{t-1} \\ & + \sum_{i=1}^{q} \pi_i DlnOR_{t-i} + \beta_7 OR_{t-1} + \sum_{i=1}^{q} \tau_i DlnCO2_{t-i} + \beta_8 CO2_{t-1} + \sum_{i=1}^{q} \varphi_i DlnREG_{t-i} + \beta_9 REG_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

In effect, the first difference operator is represented by the symbol (D). q is the number of optimal lags. γ, δ, θ, ϑ, μ, ρ, τ and φ indicate the coefficients of short-run elasticity. β_1 to β_8 indicate the coefficients of long-run elasticity.

In order to verify the existence (the null hypothesis H0) or not (the alternative hypothesis H1) of long-run relationships among variables, we apply the Wald test. We based on the value of the F-statistic to choose these two hypotheses. If the F-statistic value is higher than 10 percent, so we choose H1, meaning that long-run relationships between variables exist. The H_0 and H_1 hypothesis are represented as follows:

H0. $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$ *(no long-term relationship exists).*

H1. $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq 0$ *(the existence of a long-term relationship).*

In the next step, we apply the Bounds test developed by Pesaran and Shin [53] and Pesaran et al. [54] in order to capture the presence or not of long-run cointegration between variables.

Consequently, the Granger causality test, which is based on Engle and Granger [55], can be used to examine the direction of causation in the short run between variables. On the other hand, the VAR model-based VECM technique [56] should be used to investigate the long-run equilibrium. In fact, The Toda-Yamamoto VECM methodology is a specific approach to analyzing cointegrated time series data and testing for Granger causality among variables within a Vector Autoregression (VAR) framework. It offers an advantage over traditional Granger causality tests by addressing potential issues of non-stationarity and cointegration. As a last stage, the relevance of the lag in error correction term (ECT_{t-1}) must be examined in order to assess the long-term correlations between the variables. The following is the VECM model:

$$\begin{aligned} DlnFDI_t = \beta_1 + & \sum_{i=1}^{\alpha 1} \alpha_{1i} DlnFDI_{t-i} + \sum_{i=1}^{\gamma 1} \gamma_{1i} DlnSEG_{t-i} + \sum_{i=1}^{\delta 1} \delta_{1i} DlnTO_{t-i} + \sum_{i=1}^{\theta 1} \theta_{1i} DlnOER_{t-i} + \sum_{i=1}^{\vartheta 1} \vartheta_{1i} DlnGE_{t-i} \\ & + \sum_{i=1}^{\mu 1} \mu_{1i} DlnINF_{t-i} + \sum_{i=1}^{\pi 1} \pi_{1i} DlnOR_{t-i} + \sum_{i=1}^{\pi 1} \beth_{1i} DlnCO2_{t-i} + \sum_{i=1}^{\pi 1} \Omega_{1i} DlnREG_{t-i} + \varphi_1 ECT_{t-1} \\ & + \varepsilon_{1t} \end{aligned} \quad (4)$$

4. Empirical Analysis

The ARDL technique is used in this empirical study. Pesaran et al. [54] created this method, which is based on a number of tests and procedures.The stationarity test is really used in practice to determine the order in which variables are integrated. At either level (I_0), the first difference (I_1), or both (I_0 and/or I_1), all the variables should be stationary. The Bounds test Pesaran et al. [54] must be used in the second stage to confirm that long-term cointegration between variables exists. The Wald test (the third test) is used to determine the long-term correlations between variables.

It could estimate the various associations simultaneously in the short and long term after these tests are used and validated.

4.1. Descriptive Analysis

The results in Table 2 show that the skewness of all the variables in Saudi Arabia is slightly positive, indicating a right-skewed distribution. This implies that there are more data points on the right-hand side of the distribution. The kurtosis values are slightly higher than those of a normal distribution, suggesting a leptokurtic distribution with heavier tails, reflecting more extreme values of the variables. The Jarque-Bera test, which assesses normality, has a *p*-value of 0.000 for Saudi Arabia, which is less than 0.05. This indicates that the distribution of the variables in Saudi Arabia deviates from normality.

Table 2. Descriptive statistics.

	FDI	SEG	TO	OER	GE	INF	OR01	CO_2	REG
Mean	0.610	−0.540	72.504	3.708	−0.264	4.560	34.434	2.847	2.261
Median	0.207	0.211	69.667	3.750	−0.224	5.887	32.347	2.601	2.699
Maximum	3.692	11.865	96.102	3.750	0.583	37.814	70.290	5.447	17.012
Minimum	−0.542	−24.430	49.713	3.326	−0.984	−26.870	15.978	2.367	−20.729
Std. Dev.	0.871	7.482	11.770	0.107	0.434	11.412	11.428	0.614	7.301
Skewness	1.743	0.931	0.352	2.505	0.064	0.128	0.888	2.455	0.671
Kurtosis	5.819	4.633	2.146	7.811	1.954	4.171	3.591	9.454	4.670
Jarque-Bera	36.867	11.250	2.245	88.469	2.034	2.639	6.429	120.592	8.426
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Probability	0.000	0.003	0.025	0.000	0.001	0.07	0.040	0.000	0.014
Observations	44	44	44	44	44	44	44	44	44

4.2. Correlation Coefficients

The results in Table 3 show that the correlation coefficient between FDI and SEG is positive (0.296). This finding suggests a positive relationship between foreign direct investment and economic growth. In other words, countries with higher FDI levels of foreign direct investment tend to experience greater economic growth.

Table 3. Correlation coefficients.

	FDI	SEG	TO	OER	GE	INF	OR01	CO_2	REG
FDI	1.000	0.296	−0.323	0.239	0.635	0.156	−0.408	−0.114	0.090
SEG	0.296	1.000	−0.137	0.486	0.340	0.031	0.056	−0.126	0.956
TO	−0.323	−0.137	1.000	−0.463	−0.318	0.348	0.825	0.167	−0.050
OER	0.239	0.486	−0.463	1.000	0.585	−0.244	−0.420	−0.745	0.411
GE	0.635	0.340	−0.318	0.585	1.000	0.032	−0.312	−0.574	0.159
INF	0.156	0.031	0.348	−0.244	0.032	1.000	0.551	0.113	−0.007
OR01	−0.408	0.056	0.825	−0.420	−0.312	0.551	1.000	0.240	0.169
CO_2	−0.114	−0.126	0.167	−0.745	−0.574	0.113	0.240	1.000	−0.041
REG	0.090	0.956	−0.050	0.411	0.159	−0.007	0.169	−0.041	1.000

There is a weak negative correlation between trade openness and real economic growth (−0.050). This means that there is no strong statistical relationship between the two variables.

The correlation coefficient between government effectiveness and real economic growth is positive (0.159). This finding suggests a weak positive relationship between the two variables. Countries with more effective governments tend to have slightly higher economic growth.

Real economic growth (REG) has a strong positive correlation with SEG (sustainable economic growth, 0.956), as expected. This is because both the variables measure economic growth.

4.3. Diagnostic Test

The Breusch-Godfrey serial correlation LM test must be performed to record the residual correlation. The diagnostic test findings verify that neither of the two econometric models exhibits any indication of serial correlation. Additionally, the findings of the

heteroscedasticity test (ARCH test) indicated in Table 4 show that the two models are homoscedastic with error terms having a normal distribution.

Table 4. Diagnostic test.

Model	LM Test (t-Statistic)	ARCH Test (t-Statistic)	Reset Test (t-Statistic)	JB Test (t-Statistic)
$\mathbf{F_{FDI}(SEG, TO, OER, GE, INF, OR, CO2, REG)}$	0.001	0.000	0.000	0.460

4.4. Unit Root Tests

To capture the order of integration (stationarity) of each variable, we have chosen the ADF test (Augmented Dickey Fuller), created by Dickey and Fuller [57], and the PP test (Philips Perron), established by Phillips and Perron [58]. The findings in Table 5 demonstrate that the GE and CO_2 variables are stationary at this level according to the PP test. The ADF test, however, shows that CO_2 and SEG are level and steady. All variables appear to be stationary when looking at the stationarity in the first difference, indicating that the variables are integrated in order (I_1).

Table 5. Unit root tests.

Variables	PP Test Statistic	ADF Test Statistic	Multiple Breaks LM Unit Root Tests			
			m = 1		m = 2	
			Test statistics	Break years	Test statistics	Break years
Stationarity at level						
FDI	0.427(0.329)	0.231(0.384)	1.881	2019	−0.542	2019, 2020
SEG	−0.521(0.955)	−0.643(0.001) ***	−5.532	2020	−9.001	2019, 2010
TO	1.082(0.827)	0.985(0.218)	2.091	1978	−7.047	2019, 2021
OER	−0.637(0.538)	−0.591(0.870)	−0.739	1978	−0.882	2019, 2021
GE	−2.224(0.054) *	−1.839(0.754)	−1.921	2019	−1.991	2019, 2021
INF	0.902(0.753)	0.883(0.327)	1.020	2021	−5.209	2019, 2020
OR	−0.073(0.864)	−0.067(0.681)	−0.742	2020	−4.628	2019, 2021
CO_2	−0.792(0.009) ***	−3.801(0.074) *	−3.030	2021	−1.472	2019, 2022
REG	−1.242(0.322)	−4.772(0.543)	−6.930	2019	−2.110	2019, 2021
First differences						
DlnFDI	−3.905(0.001) ***	−4.273(0.000) ***				
DlnSEG	−8.031(0.000) ***	−9.759(0.000) ***				
DlnTO	−4.992(0.008) ***	−6.332(0.007) ***				
DlnOER	−5.482(0.000) ***	−8.030(0.000) ***				
DlnGE	−1.329(0.076) *	−3.142(0.042) **				
DlnINF	−2.640(0.003) ***	−5.937(0.000) ***				
DlnOR	−7.925(0.000) ***	−9.097(0.000) ***				
$DlnCO_2$	−2.953(0.053) *	−4.854(0.049) **				
DlnREG	−4.386(0.000) ***	−6.438(0.000) ***				

*, ** and *** indicate the significant respectively at 10%, 5% and 1%.

4.5. Bounds Test

To confirm the existence or not of long run cointegration among variables, it is necessary to employ the Bounds test and to compare the F-statistic value with the critical values at 1 percent (0.01), 5 percent (0.05), and 10 percent (0.1).

The results in Table 6 show that the F-statistic value (7.747011) of our econometric model is higher than the critical value bounds of 1 percent, 5 percent, and 10 percent.

Table 6. Bounds test results.

Econometric Model	**F_{FDI}(SEG,TO,OER,GE,INF,OR,CO2,REG)**	
F-statistic	**7.747011 *** **	
	Critical value bounds	
Significance level	I(0)	I(1)
10%	3.13	4.68
5%	3.41	5.01
1%	3.65	5.3

*** indicate the significant respectively at 1%.

Based on these results, the hypothesis of the existence of long-run cointegration involving variables was established.

4.6. Wald Test

It appears that the probability of the Wald test (0.0010) indicated in Table 7 is significant at 1 percent, 5 percent, and 10 percent. This result confirms the existence of long-run relationships between the different variables of the econometric model.

Table 7. Wald test.

F_{FDI}(SEG,TO,OER,GE,INF,OR,CO2,REG)			
Test Statistic	**Value**	**df**	**Prob.**
F-statistic	5.403201	(9, 19)	0.0010 ***
Chi-square	48.62881	9	0.0000 ***

*** indicate the significant respectively at 1%.

4.7. CUSUM and CUSUMSQ Tests

The long-term stability of the economic models was verified using the request of some commanding and operative practices. One of these techniques is the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUM of squares) created by Brown et al. [59], and then it was developed by Pesaran et al. [54]. In Figure 1, the results show the statistical test outcomes that determine the solidity of the long-run estimated parameters since the charts are within the critical bounds at the 5% significance level. We notice that the curve fluctuates between the two terminals, which shows that the economic model is stable over time.

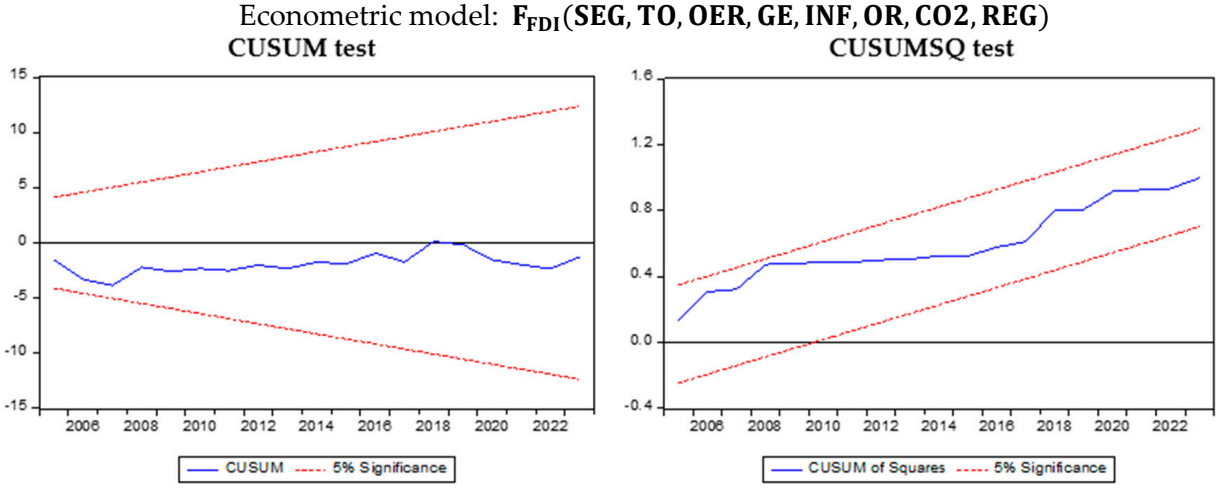


Figure 1. CUSUM and CUSUMSQ tests.

5. Discussion

5.1. Short-Run Estimations

After resolving the order of integration of every one of the variables (stationarity test), the confirmation of the existence of long-run cointegration amid variables (Bounds test), and the presence of long-run relationships among variables (Wald test), it is possible now to use the ARDL approach to estimate the effects in the short term (Table 8) and the effects in the long term (Table 9) of the independent variables on the dependent variable.

Table 8. Short-run ARDL coefficients.

Econometric Model: F_{FDI}(SEG,TO,OER,GE,INF,OR,CO2,REG) Optimal Lags: ARDL (1, 2, 1, 2, 1, 1, 1, 2, 2)				
		Coefficient	**t-Statistic**	**Prob. ***
Dependent variables	FDI(−1)	−0.585	−2.861	0.010 ***
	SEG	0.131	3.147	0.005 ***
	SEG(−1)	0.428	2.540	0.020 ***
	SEG(−2)	−0.239	−1.527	0.143
	TO	0.013	0.616	0.544
	TO(−1)	0.032	1.485	0.153
	OER	14.021	1.036	0.313
	OER(−1)	−21.247	−1.245	0.228
	OER(−2)	18.201	2.039	0.055 *
	GE	−2.242	−3.356	0.003 ***
	GE(−1)	1.669	2.873	0.009 ***
	INF	0.003	0.261	0.796
	INF(−1)	0.029	3.211	0.004 ***
	OR	−0.004	−0.226	0.822
	OR(−1)	−0.062	−3.052	0.006 ***
	CO_2	1.248	1.899	0.072 *
	CO_2(−1)	−0.352	−0.650	0.523
	CO_2(−2)	1.593	3.741	0.001 ***
	REG	−0.172	−3.987	0.000 ***
	REG(−1)	−0.430	−2.601	0.017 ***
	REG(−2)	0.205	1.330	0.199
	C	−48.758	−4.106	0.000 ***
	TREND	0.080	3.294	0.003 ***

* and *** indicate the significant respectively at 10% and 1%.

Table 9. Long run ARDL coefficients.

Econometric Model: F_{FDI}(SEG,TO,OER,GE,INF,OR,CO2,REG)				
		Coefficient	**t-Statistic**	**Prob. ***
Dependent variables	SEG	0.201	2.241	0.037 **
	TO	0.029	2.866	0.009 ***
	OER	6.921	3.532	0.002 ***
	GE	0.361	0.871	0.394
	INF	−0.020	−2.344	0.030 **
	OR	−0.042	−3.512	0.002 ***
	CO_2	−1.570	−5.131	0.000 ***
	REG	0.250	2.710	0.013 **

*, ** and *** indicate significance, respectively at 10%, 5% and 1%.

The short-run estimation results of the ARDL approach show that the dailies number for the econometric model are (1, 2, 1, 2, 1, 1, 1, 2, 2). The numbers represent the number of lags for each variable. The first number in the west (1) represents the optimal lag of the dependent variables. The rest of the numbers represent the optimal lags of independent variables for the SEG, TO, OER, GE, INF, OR, CO_2, and REG variables.

The short-run ARDL estimation yields mixed results. In effect, we find that FDI at (t-1) period has a negative impact on FDI during the actual period (t). The SEG variable positively impacts at (t) and (t-1) periods the value of FDI. However, at the (t-2) period, this impact was negative. The TO and INF variables have negatively impacted FDI at (t) and (t-1) periods. In the short run, the FDI was impacted negatively by the values of the OR variable.

Moreover, FDI was negatively affected by the OER variable at (t-1), GE variable at (t) period, by CO_2 at the (t-1) period, and by the REG variable at (t) and (t-1) periods. However, OER, GE, CO_2, and REG have positive impacts on FDI respectively at (t and t-2), (t-1), (t and t-2), and at (t) periods.

5.2. Long-Run Estimations

The results of long-run estimation (Table 9) show that SEG positively impacts FDI by 0.201 units [60,61]. For international investors, sustainable economic development presents a promising image. A nation with steady, long-term growth indicates a sound labor market, a capable workforce, and an accountable administration. As a result, there is less risk involved, which gives international businesses more confidence to invest their money. This self-assurance encourages foreign direct investment (FDI), which brings in desperately needed capital, know-how, and resources to support the expanding economy. In the long term, TO has a positive effect on FDI. The same result was reported by Xu, C. et al. [62]. When a country is open to trade, it sends a signal to foreign investors that it is welcoming for international business. This openness translates into several benefits that attract FDI. Investors see easier access to a larger market for their products through exports, along with a more efficient and competitive domestic market within which to operate. Trade openness can also indicate a stable economy with clear rules and regulations, making foreign investors feel more secure about their investments.

The OER variable has an important and positive effect on the FDI variable. In effect, an increase of OER by one unit leads to an increase in FDI by 6.921 units [63]. This positive effect can be explained as follows: firstly, it makes acquiring assets in the host country cheaper for foreign investors, as their home currency buys more of the local currency. Secondly, it lowers the cost of local labor and materials for foreign companies, making their operations more profitable. This is particularly attractive for resource-rich countries with depreciated currencies. The Saudi FDI was positively impacted by the GE variable [64]. This impact was equal to 0.361 units. Thus, an effective government acts as a magnet for foreign direct investment (FDI). Investors seek stable and predictable environments with clear rules and regulations. When a government functions efficiently with low corruption, businesses are more confident that their investments are protected and that they will see a return. This can lead to a boost in economic growth as foreign companies bring capital, technology, and jobs. The REG variable leads to the development of FDI in Saudi Arabia [65]. In fact, Real Economic Growth, which refers to an expansion in a country's productive capacity, creates a positive environment for foreign direct investment (FDI). A growing economy signals stability, rising consumer demand, and potential for profit. This attracts foreign companies looking to expand their reach, access new markets, and benefit from the expanding economy. The influx of FDI brings capital, technology, and expertise, which can further fuel economic growth, creating a virtuous cycle.

However, estimation results show that INF causes a decrease in FDI in Saudi Arabia [66]. In reality, inflation can discourage foreign investment in a few ways. Firstly, inflation erodes the purchasing power of future profits earned in the host country. Secondly, high inflation can create uncertainty regarding future costs and economic stability, which makes foreign investors hesitant to commit. This can lead them to look for more predictable investment destinations.

An increase in OR leads to a decrease in FDI by 0.042 units [67]. Oil revenue can discourage foreign investment in a couple of ways. Firstly, reliance on oil income can lead governments to neglect developing other sectors of the economy, making them less

attractive to foreign firms. Secondly, high oil rents can inflate the currency, making it more expensive for foreign companies to operate in the country. Finally, CO_2 leads to a decrease in FDI by 1.570 units [68]. In fact, high CO_2 emissions can discourage foreign investment in a few ways. Investors may be concerned about a country's reputation for environmental responsibility. Strict environmental regulations could increase their costs in the future. Additionally, climate change itself can create risks, like extreme weather events that disrupt operations. These factors can make a country a less attractive destination.

5.3. Granger Causality and ECT Analysis

After utilizing the ARDL technique to evaluate the various effects of various explanatory factors for the two economic models over short and long terms, we should investigate the direction of causality among variables using the Granger causality test, which was created by Engle and Granger [55]. Table 10 displays the disparate outcomes.

Table 10. Granger causality and ECT test results.

Causality Directions										
	Short Term									**Long Term**
Independent Variables	**DLnFDI**	**DLnSEG**	**DLnTO**	**DLnOER**	**DLnGE**	**DlnINF**	**DLnOR**	**DLnCO$_2$**	**DLnREG**	**ECT**
DLnFDI	---------	1.847 *** (0.001)	0.292 ** (0.007)	0.004 (0.995)	1.542 (0.227)	0.710 * (0.098)	0.617 ** (0.044)	0.235 (0.791)	0.334 ** (0.038)	1.000
DLnSEG	0.805 ** (0.050)	---------	0.483 (0.620)	9.826 (0.870)	0.298 (0.743)	1.041* (0.062)	0.456 (0.637)	9.053 (0.151)	0.958 (0.392)	−1.635 (0.323)
DLnTO	0.509 *** (0.005)	2.177 ** (0.000)	---------	1.110 ** (0.004)	2.829 (0.999)	1.547 (0.226)	1.115 * (0.098)	2.364 (0.108)	1.311 (0.281)	−0.269 ** (0.0342)
DLnOER	0.333 * (0.071)	13.633 (4.E-0)	0.154 * (0.057)	---------	0.206 (0.814)	2.756 * (0.076)	0.792 (0.460)	9.251 (0.872)	13.848 (3.E-0)	−50.355 (4.452)
DLnGE	3.695 (0.334)	1.479 (0.241)	0.266 (0.767)	0.066 (0.935)	---------	0.835 (0.441)	0.191 (0.826)	0.563 (0.574)	0.497 (0.612)	−0.006 (0.788)
DLnINF	0.852 (0.434)	8.372 (0.101)	0.040 (0.960)	0.139 *** (0.000)	0.302 (0.741)	---------	1.365 (0.267)	0.761 (0.474)	9.307 (0.854)	−0.083 ** (0.030)
DLnOR	1.620 ** (0.041)	6.901 *** (0.002)	0.705 * (0.053)	1.328 * (0.077)	0.265 (0.767)	0.832 (0.442)	---------	0.520 * (0.091)	6.236 *** (0.004)	−0.287 ** (0.039)
DLnCO$_2$	0.509 ** (0.007)	3.848 (0.030)	0.038 (0.962)	21.261 (7.E-0)	0.163 (0.849)	0.701 (0.502)	1.094 (0.345)	---------	3.317 (0.147)	−1.541 (0.792)
DlnREG	0.783 (0.464)	2.012 * (0.058)	0.472 * (0.062)	10.103 (0.208)	0.241 (0.786)	0.745 (0.481)	0.501 (0.609)	9.172 (0.629)	---------	1.781 (0.326)

*, ** and *** indicate significance, respectively at 10%, 5% and 1%.

The results show that there are six bidirectional causal relationships in the short run. More precisely, The OER variable has two bidirectional causal relationships with the INF and TO variables. A bidirectional causal relationship exists between the OR and TO. Moreover, the FDI variable has three bidirectional causal relationships with SEG, OR, and TO.

However, it appears that in the short term, FDI causes REG and INF. Four unidirectional causalities exist running from OR to OER, SEG, REG, and CO_2. Nevertheless, CO_2 causes FDI, and TO causes SEG. Also, two unidirectional causalities exist running from REG to SEG and TO. In addition, SEG causes INF. Finally, a unidirectional causality relationship exists running from OER to FDI.

Economically, FDI, TO, and OR can influence each other in both directions. More foreign investment can lead to a stronger economy, and a stronger economy can attract more investment. Similarly, being open to trade can bring in more investment, and investment can boost trade activity. Oil money can also attract investment in the oil sector, which can help find new oil sources.

However, the values of a country's currency (exchange rate) and inflation are connected. If the currency weakens, imports become more expensive, which can increase inflation. The opposite is also true. How open a country is to trade can also affect the exchange rate. More trade can increase demand for a country's currency, making it stronger.

Moreover, OR can attract investment in the oil sector (FDI) but can also lead to more pollution (CO_2) because of increased production. Oil revenue can contribute to overall economic growth (SEG) and real economic growth (REG); however, relying too much on oil is not sustainable in the long run.

Being open to trade (TO) can boost economic activity (SEG) by increasing exports and imports. Economic growth (SEG and REG) can also lead to higher prices (inflation) because of increased demand. Finally, a stronger currency (appreciation) can make a country more attractive for investment (FDI).

In order to verify the long-term causal linkages between the various variables, the VECM model proposed by Toda and Yamamoto [56] must be used as the basis for the Lagged Error Correction Term (ECT). More specifically, the ECT coefficient needs to be both significant and negative at the same time. In actuality, the long-term results indicate that only the coefficients of the TO, INF, and OR variables are significant and negative, indicating the existence of three bidirectional causal links between these three variables over the long term.

In the long term, the TO variable is causally linked to SEG, FDI, REG, CO_2, GE, and OER. Six unidirectional causalities exist running from INF to SEG, OER, GE, FDI, REG, and CO_2 variables. Finally, the OR variable is causally linked to the GE, OER, SEG, FDI, REG, and CO_2 variables.

In order to make the results listed in Table 8 easier to read and understand, a summary in the form of a chart (Figure 2) has been created as follows:

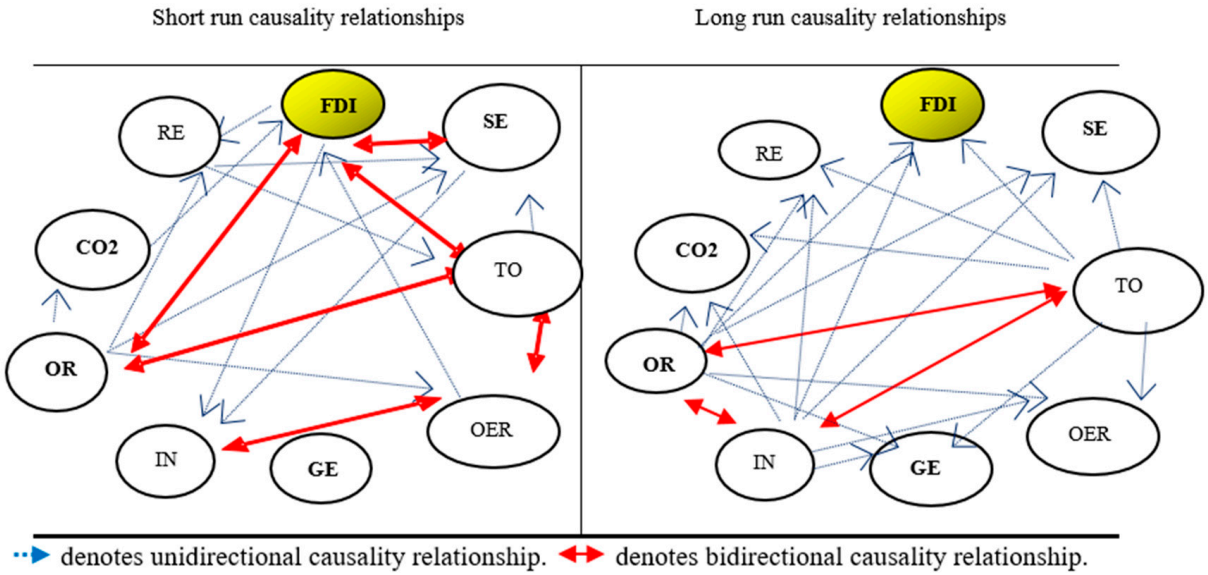


Figure 2. Granger causality directions in the short and long run.

6. Conclusions

This study examines the effect of sustainable economic growth on foreign direct investment (FDI) inflow in Saudi Arabia during the 1980–2023 periods using the ARDL approach and VECM technique. In the first step, we used ADF and PP tests to identify the order of integration of each variable. The Wald test was applied to verify the existence of long-run relationships between variables. To capture the existence or absence of long-run cointegration relationships between variables, we applied the Bounds test. After determining the order of integration of variables, the verification of the existence of long-run relationships, and cointegration relationships between variables, we used the ARDL

approach to estimate the effects of sustainable economic and the other explicative variables on Saudi FDI in the short and long-run. In the Final step, we applied the VECM technique to determine the direction of causality between variables.

Our findings highlight the importance of sustainable economic growth in attracting FDI in the long term. A stable and growing economy fosters a positive environment for foreign investment. However, the short-term effects can be complex. Trade openness and infrastructure require reevaluation to ensure that they do not inadvertently discourage FDI. This study also reveals the interplay between various factors. Although oil rents can provide initial resources, overreliance can hinder long-term diversification. Similarly, real economic growth and a strong government create an attractive market but may have lagged effects on FDI. Conversely, inflation and high CO_2 emissions can deter foreign investment.

The causality analysis uncovers intricate relationships. Interestingly, FDI seems to influence real economic growth and infrastructure in the short term. Additionally, trade openness appears to promote sustainable growth in the long run.

These findings offer valuable insights to policymakers in Saudi Arabia. To attract sustainable FDI and promote economic diversification, a focus on long-term strategies is crucial. Reassessing trade and infrastructure policies, coupled with efforts to improve government effectiveness and environmental responsibility, can enhance the country's attractiveness to foreign investors. By fostering a stable, growing, and sustainable economy, Saudi Arabia can position itself as the prime destination for FDI.

In fact, Future research could focus on extending the dataset to include more recent years or incorporating additional variables that may influence FDI, such as technological advancement and political stability. Additionally, exploring the sector-specific impact of FDI could provide more detailed insights into the industries that benefit the most from sustainable economic growth.

However, one of the limitations of this study is the potential impact of unobserved variables that were not included in the analysis. Factors such as political events, global economic conditions, and technological changes can influence these results. Additionally, reliance on historical data may not fully capture the future trends or emerging factors that influence FDI. If these limitations do not exist, the results may show different dynamics in the relationship between sustainable economic growth and FDI.

These findings offer valuable insights for policymakers in Saudi Arabia. To attract sustainable FDI and promote economic diversification, a focus on long-term strategies is crucial. Reassessing trade and infrastructure policies, coupled with efforts to improve government effectiveness and environmental responsibility, can enhance the country's attractiveness to foreign investors. By fostering a stable, growing, and sustainable economy, Saudi Arabia can position itself as a prime destination for FDI.

7. Key Findings

- Sustainable economic growth positively impacts FDI in the long term, making Saudi Arabia a more attractive destination for investors.
- Trade openness has a complex relationship with FDI. While it discourages FDI in the short run, it fosters long-term growth through increased market access and a more stable economy.
- A weaker Saudi Riyal (official exchange rate) encourages FDI in the short run by making it cheaper for foreign investors to acquire assets.
- Effective governance and real economic growth create a positive environment for FDI in the long run, attracting foreign capital and expertise.
- High inflation and CO_2 emissions deter FDI due to economic uncertainty and environmental concerns.
- Oil rents have mixed impacts. While they may discourage investment in some sectors due to Dutch Disease effects, they also contribute to long-term growth through government spending.

8. Policy Implications

These findings suggest that policymakers should focus on strategies that promote sustainable economic growth and a stable, open economy. This includes:

- Investing in long-term economic development initiatives to create a more attractive environment for foreign investors.
- Reassessing policies related to trade openness and infrastructure to ensure that they do not unintentionally hinder FDI.
- Diversifying the economy beyond reliance on oil revenue to mitigate Dutch Disease effects.
- Implementing environmental regulations to address climate change concerns and improve Saudi Arabia's image as an environmentally responsible investment destination.

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