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The Impact of International Trade on Sustainable Development in Saudi Arabia

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Abstract

Globally, sustainable development has been considered the key policy objective to achieve through international trade. Not surprisingly, this aspect has captured the attention of policy regulators and scholars alike. Thus, the present study identifies the need to investigate into the impact of international trade (trade openness) on sustainable development in Saudi Arabia. This study uses the real interest rate, foreign direct investment (FDI), exchange rate and inflation as the control variables. The author employees' secondary sources of data such as sustainable development reports and World Development Indicators (WDI) from 1986 to 2020. The autoregressive distributed lag (ARDL) model is used to test the association among constructs and the Granger causality to investigate the causality between variables. The results reveal that trade openness, interest rate, FDI, exchange rate and inflation a have positive and significant relationship with sustainable development in Saudi Arabia. This study guides policymakers in formulating regulations related to sustainable development through international trade.

Introduction

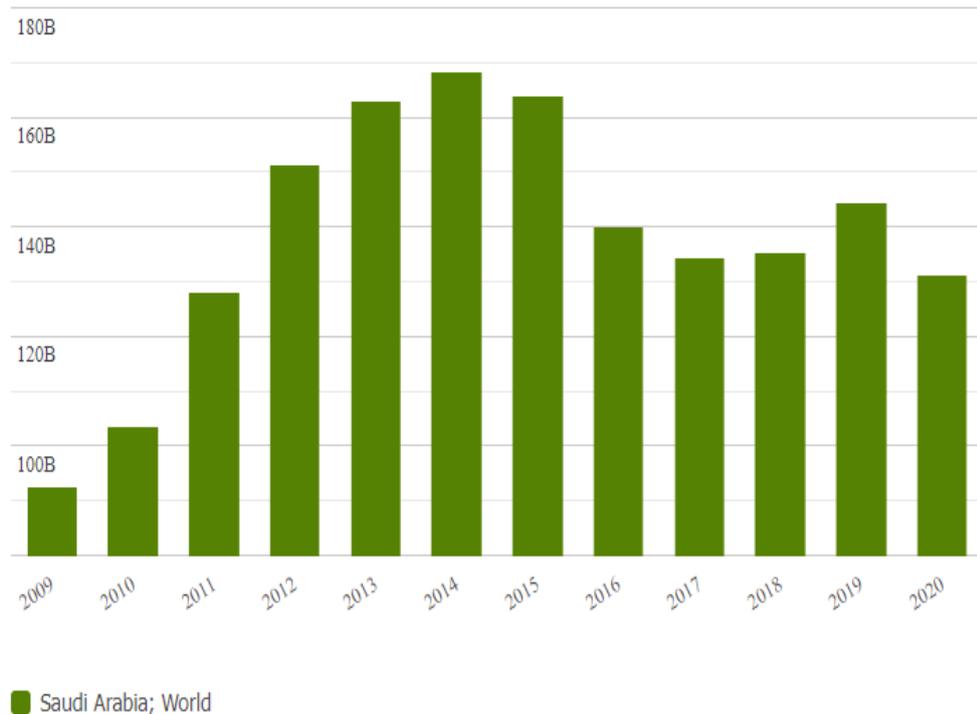
Sustainable development represents the need for the survival and progress of a country in the international market (Silvestre & Țîrcă, 2019). Sustainable development entails the achievement of human development goals while simultaneously preserving natural systems' ability to supply natural resources and ecosystem services that an economy and a society rely on (Dantas et al., 2021). The sustainable development goals presented in the UN 2030 Sustainability Agenda, are industry, innovation and infrastructure, high production level, reduction in poverty, good health and well-being, high-quality education, clean water and sanitation, affordable clean energy, and economic growth, reduced inequality, sustainable communities, accountable consumption, and climate action, etc. (Kwatra, Kumar, & Sharma, 2020). International trade is the exchange of goods and services among countries. The international market clears the ways among different countries and allows them to access goods and services which are not available domestically and can expand the markets for their own products and services (Belloumi & Alshehry, 2020). International trade is useful to gain high economic growth and high sustainability development for the country. On one hand, international trade, because of large competition assists in terms of access to energy resources, production resources, technologies, economic and social welfare patterns and formulas, and infrastructure from foreign countries at low costs. Thus, the social, and environmental problems besides the economic complexities can be overcome which ultimately leads to the achievement of sustainable development goals (Harrison, Barbu, Campling, Richardson, & Smith, 2019). On the other hand, for social wellbeing, a clean environment, healthy living beings including humans, and stability in the economic activities and economic growth country requires large funds, opportunities

and support which all are ensured with high trade openness (Ulucak, Khan, Baloch, & Li, 2020).

The present study focuses on the impacts of trade openness along with factors like real interest rate, FDI, inflation, and exchange rate on sustainable development in Saudi Arabia. Saudi Arabian economy is one of the top 20 economies across the world and the largest one in the Arab world and in the Middle East. Saudi Arabia is one of the G20 countries. Saudi Arabia is developing a higher-middle-income economy with an estimated gross domestic product (GDP) of \$843 billion in 2021 (Omri, Euchi, Hasaballah, & Al-Tit, 2019). Saudi Arabia is the world's 19th largest exporter and the world's 20th largest import market. All economic sectors are now contributing to exports. Petrochemicals, metal items, construction materials, plastics, and electrical appliances are some of the top exports to ninety countries (Waheed, Sarwar, & Dignah, 2020). The commercial sector in Saudi Arabia is expanding fast. This is mostly because of government incentives like long-term interest-free loans and other support facilities or services. Furthermore, in large towns and other areas, industry and chambers of commerce encourage business ventures. In the Kingdom, there are around 584,000 licensed businesses engaged in commercial operations. Their whole invested equity has a value of more than \$54 billion, according to estimates (Wu & Chen, 2017). The Saudi Arabian General Investment Authority (SAGIA) oversees the sector and provides free consultation and help to private entrepreneurs as well as a number of investment opportunities. SAGIA announced plans to create offices in foreign countries like China, the United Kingdom, the United States, and Germany in November 2005 as a way to encourage investment in infrastructure projects (Banafea & Ibnrubbian, 2018).

The private sector plays a key role in driving the economy, accounting for about half of the country's \$248.82 billion GDP. They produce, distribute, and market products that are made in the United States (Al-Abdulkader, Al-Namazi, AlTurki, Al-Khuraish, & Al-Dakhil, 2018). The majority of consumer goods and industrial products' imports, as well as the majority of non-oil exports, are handled by private enterprises. Saudi Arabia is one of the world's largest twenty export and import markets, with non-oil exports to 90 countries averaging roughly 6 billion dollars annually. In addition, in the Kingdom, foreign investment is increasing. Investors from the whole world are forming joint ventures with Saudi partners, drawn by the Kingdom's political, social and economic stability, as well as its sophisticated infrastructure, low-cost energy supply, and key geographic location (Hasanov, Liddle, & Mikayilov, 2018). Saudi Arabia, on 11 April 2000, created easiness for international investors in the Kingdom, when it passed a new law granting foreign investors the same rights, incentives, and assurances as Saudi citizens and enterprises. It also allows foreigners to own real estate and property (Elimam, 2017). The commercial sector has a bright future. Saudi Arabia's membership in the World Trade Organization (WTO) stimulates business activities and expands the market for Saudi products around the world. Another encouraging development is Saudi Arabia's creation of free-trade zones with numerous bordering

countries (Jiang & Guan, 2017). In addition, some statistics related to the international trade of Saudi Arabia are highlighted in Figure 1 below:



■ Saudi Arabia; World
Figure 1: International Trade of Saudi Arabia

Though Saudi Arabia is a high-income developing country, still the consistency in economic growth is under threat because of the increase in the population, visit of foreigners, developing industry, and transportation (Sweidan & Elbargathi, 2022). It requires initiatives from the government, and economists to enhance sustainable development within the country (Han, Chen, & Li, 2018). Hence, our study tries to turn the attention of the readers and authorities towards the need for sustainable development within the country. The aim of the study is to examine the relationship of international trade with sustainable development. Its objective is to explore the impacts of trade openness along with factors like real interest rate, FDI, inflation, and exchange rate on sustainable development. Sustainable development has been the subject of many studies but the current study gives a more in-depth attention to sustainable development by removing literary gaps. 1) Usually trade openness alone has been discussed as a determinant of sustainable development in previously conducted research studies. This is for the first time that researchers analyze trade openness along with factors like real interest rate, FDI, inflation, and exchange rate to determine sustainable development. 2) The nexus between international trades with sustainable development has been the research subject for many authors and different measurements like exports, imports, the balance of trade, and foreign exchange. Only limited attention has been given to trade as a measurement of international trade; therefore, our study uses trade openness as a measurement of international trade while examining its impact on sustainable development. 3) Though, the analysis of trade openness, real interest rate,

FDI, inflation, and exchange rate and their impact on sustainable development has been made in various regions of the country, no detailed study has been conducted to examine nexus among the understudy constructs in Saudi Arabia. The current study seeks to initiate the process of generating evidence for results from Saudi Arabia.

The present study consists of five parts: After the introduction, the second part analyzes the impacts of trade openness along with factors like real interest rate, FDI, inflation, and exchange rate on sustainable development in light of authors' reviews. In the third part, it is described how data regarding the constructs relationship with sustainable development has been acquired and the method used to analyze data is described. The results are extracted and compared to the results of previously conducted researches. Subsequently, after highlighting the study implications, study conclusions along with limitations are given.

Literature Review

For economic growth, all production factors (capital, land, labor, and entrepreneurship) of a high quality are required. Although, at present, these essential factors of production can be arranged with consistent use, they are likely to collapse (Xu, Baloch, Meng, Zhang, & Mahmood, 2018). Moreover, the decrease in the quality of factors of production due to environmental degradation and vulnerable social communities becomes a hurdle to inconsistent economic development. Sustainable development refers to the social, environmental, and economic development of the country (Zhao et al., 2019). International trade assures the raising of funds, exchange of sustainable development plans, and access to resources required to ensure the social welfare, environmental protection, and stable economic development of the country. Trade openness does not alone affect sustainable development, but factors like real interest rate, FDI, inflation, and exchange rate also influence sustainable development. For this reason, the study examines the impacts of trade openness along with factors like real interest rate, FDI, inflation, and exchange rate on sustainable development in line with the recommendations of authors put forth in past literary works/arguments.

A research survey conducted by Park, Meng, and Baloch (2018), yields an investigation into the influences of financial development, ICT, trade openness, and economic growth on CO2 emissions and sustainable development in certain European Union (EU) states. Pooled mean group (PMG) estimator was employed to collect panel data for 2001-2014 from EU countries. The study findings reveal that under high trade openness, the country can import energy-efficient resources like clean energy sources, clean production formulas, and energy-efficient technologies. The use of the imported energy-efficient resources minimizes economic negative environmental impacts like CO2 emissions and protects the natural resources not only for current use but also for meeting future development requirements. Trade openness has a positive association with sustainable development. In their article, Ali, Yusop, Kaliappan, and Chin (2020) sought

to explore the impact of FDI, trade openness, and institutional performance on the ecological footprint (environmental quality) and sustainable development level in OIC countries. The novel econometric technique Dynamic Common Correlated Effects (DCCE) was applied to examine cross-sectional dependence among the study variables. As per the estimation by DCCE, trade openness has a positive and significant association with ecological footprint and sustainable development. The countries which are open to international trade at a large scale, are able to employ green technology and other green resources and have green production in the form of clean natural resources and ecological friendly industry products leading to high levels of sustainable development.

A study was formed by [Destek and Sinha \(2020\)](#), to integrate the relationship of trade openness, renewable, non-renewable energy consumption, and economic growth with ecological footprint and sustainable development for 24 OECD countries. The period for 1980-2014 was investigated with 2nd generation panel data techniques showing cross-sectional dependence among states. Group-Mean results showed a positive association between trade openness and sustainable development. Under high trade openness, the country has a large number of foreign exchanges which leads to the financial strength of the country to afford ecologically friendly projects for enhancing environmental quality, social welfare, and economic development. High trade openness creates sustainable development. An empirical investigation was conducted by [Le \(2020\)](#) to investigate the role of government expenditures, institutions, financial development, and trade openness in energy consumption patterns and sustainable development. Panel data was acquired from 46 EMDEs from 1990-2014. Cross-sectional dependence and slope heterogeneity were controlled which determine the nature of the relationship between the constructs and sustainable development. The study concluded that trade openness has a positive impact on sustainable development as through imports and exports, the sustainable development goals like industry, innovation and infrastructure, high production level, reduction in poverty, good health and well-being, high-quality education, clean water and sanitation, affordable clean energy, and economic growth, are likely to be achieved.

The literary workout of [Hdom and Fuinhas \(2020\)](#), was an investigation of the impacts of trade openness and energy production on CO₂ emissions and sustainable development. Co-integration regression methods, DOLS (dynamic ordinary least square) and FMOLS (fully modified ordinary least square) were applied and trade opening, electricity production (natural gas and renewables), GDP, CO₂ emissions, and sustainable development goals were used to establish nexus. It was found that trade liberalization, electricity generation, and GDP have both positive and negative impacts on the sustainable development of Brazil. The study implies that trade liberalization enhances the production and consumption of clean and renewable energy sources which keep the environment free from pollutants like CO₂ emissions. It improves the health of living beings, sustains resources' availability, and ensures the social and economic

welfare of the country. Hence, trade opening has a positive association with sustainable development. [Murshed \(2018\)](#), wrote an article about the nexus among trade openness, renewable energy transition, and sustainable development with empirical evidence from Bangladesh, Sri Lanka, India, Pakistan, and Nepal. Annual panel data were acquired from 2000-2017 and the two-stage least squares (2SLS) panel data estimation was applied. Findings reveal that with the imports of clean energy sources, trade openness has a positive impact on renewable energy transition. International trade assists in the use and development of energy sources, formulas, and technologies which are helpful in the transition in energy consumption patterns from traditional unclean energy resources to renewable and clean energy resources.

A study was conducted by [S. A. R. Khan, Sharif, Golpîra, and Kumar \(2019\)](#), which examines trade openness, trade infrastructure and green logistics' impact on social, environmental, and economic development (sustainable development) in the context of the Asian emerging economies. DOLS (dynamic ordinary least square) and FMOLS (fully modified ordinary least square), were adopted to examine the concerned hypothesis, handling the issue of endogeneity and serial correlation. The study implies that trade openness assists in getting and applying green logistics and green trade infrastructure within the country for social and economic purposes. Logistics and trade infrastructure is a great source of greenhouse gases that pollute the environment and affect future development on account of the depletion of quality natural resources. As trade openness removes this issue, it improves economic development along with social and environmental development. Similarly, the study presented by [Sikder, Inekwe, and Bhattacharya \(2019\)](#), analyzed the relationship among trade openness, energy mix, research & development and sustainable development for G20 countries. Panel estimation technique was adopted for analyzing cross-sectional dependence and heterogeneity across countries like Argentina, Germany, the Russian Federation, Indonesia, Italy, the United States, Australia, Brazil, Canada, South Korea, France, Japan, and Mexico. The study findings reveal that trade openness has a positive link with the sustainable development of a country. The study implies that trade openness triggers research and development programs and energy transition within the country with the provision of essential resources and this all helps in ensuring and achieving the higher level or degree of sustainability in the country's development.

[Lagoarde-Segot \(2020\)](#), study the role of the real interest rate in financing a country's sustainable development goals. Data were collected from the European Central Bank. The alternative endogenous money theory was applied with an accounting and theoretical framework. It helped to address financing mechanism which bridges the budget gap for sustainable development goals. The study implies that when the real interest rate is high, the financial institutions do not feel hesitant to grant loans or make an investment for carrying on different green projects and social welfare programs that improve both social welfare and sustainable economic development levels of the country. Similarly, the research conducted by

[Mehrotra and Sergeyeu \(2021\)](#) focuses on real interest rates as green financing and determinant to sustainable development. The study implies that when interest is maintained in line with the country's inflation rate, investors and creditors do not have to face the loss on money invested or lent; as a result, money is not put in reserve without benefiting from it, and money creation remains stable, resulting in long-term development.

FDI is the act of foreign individuals or institutions putting their savings in domestic companies and projects with an intention to earn profits ([Fan & Hao, 2020](#)). As FDI is a great source of business capital, it is considered a key contributing force in driving a country's welfare and development process. FDI creates jobs for domestic workers, enhances public living standard, removes poverty, encourages atmospheric and environmental improvements, and economic stability. Thus, an increase in FDI ensures the achievement of sustainable development goals that are inextricably linked to the planet, people, and prosperity ([Zafar et al., 2019](#)). A literary article written by [Ayamba, Haibo, Abdul-Rahaman, Serwaa, and Osei-Agyemang \(2020\)](#), examines FDI and its impact on sustainable development for China. Based on imposed response function model, panel data were acquired from China for 1996-2016. The study states that high FDI in enterprises engaged in economic activities related to the production, processing, and exploitation of natural resources such as agriculture, forests, cattle, fossil fuels, and metals contributes to the economy's long-term sustainability by ensuring natural resource availability.

Inflation is the increase in the prices of goods and services within the country for a specific time period ([Athari, Alola, Ghasemi, & Alola, 2021](#)). During a period of inflation, more amount of currency is under circulation within the country which determines the productivity, consumers' demand, consumption level, and employment rate and these are all the predictors of sustainable development goals ([Ikpesu, 2021](#)). An article [M. Khan and Hanif \(2020\)](#), analyzes the inflation impacts on economic development and determine it as a driver of sustainable development. The system GMM approach and threshold model were applied using panel data from 113 countries for the period of 1981-2015. According to the study results, even though inflation itself refers to an increase in the country's overall price level, it boosts the productivity of goods and services with an assurance of profitability for the owners. This increases the number of resources available and promotes the welfare of the people in the country, showing long-term development goals.

A relative price of one currency represented in terms of another currency is known as an exchange rate (or group of currencies). The exchange rate is an important economic determinant for economies that engage in international trade - [Guzman, Ocampo, and Stiglitz \(2018\)](#). The high worth of a country's currency increases the exports of the country and encourages investment within the country, its social welfare, environment protection, and economic development. Research by [Akadiri and Akadiri \(2021\)](#), highlights that when there is an increase in the exchange rate, the country can earn more foreign exchange by exporting goods. This raises the country's production and financial strength, both of which are required for

achieving long-term development goals. The study of [Barbosa, Jayme Jr, and Missio \(2018\)](#), highlights that for the achievement of sustainable development goals like innovation, infrastructure improvement, industry progress, high production level, reduction in poverty, good health and well-being, high-quality education, clean water and sanitation, affordable clean energy, and economic growth, large funds are required. As an increased exchange rate is a major source of increased funds and investment, it leads to sustainable economic development.

Methodology

The article investigates the impact of international trade, interest rate, FDI, exchange rate and inflation on sustainable development in Saudi Arabia. This study has used secondary sources of data collection such as sustainable development reports and WDI from 1986 to 2020. This study has used the ARDL model to test the association among its constructs. The study equation is given as below:

$$SD_t = \alpha_0 + \beta_1 TO_t + \beta_2 RIR_t + \beta_3 FDI_t + \beta_4 INF_t + \beta_5 ER_t + e_t \quad (1)$$

Where;

- SD = Sustainable Development
- t = Time Period
- TO = Trade
- RIR = Openness
- FDI = Real Interest Rate
- INF = Foreign Direct Investment
- ER = Inflation

The current study has used sustainable development (SD) as the dependent variable and measured it through the Sustainable Development Goal (SDG) Index.

Table 1: Variables with Measurements

S#	Variables	Measurement	Sources
01	Sustainable Development	SDG Index	Sustainable Development Reports
02	Trade Openness	(Import + Export) / Gross domestic product	WDI
03	Real Interest Rate	Interest rate (%)	WDI
04	Foreign Direct Investment	Foreign direct investment, net (% of GDP)	WDI
05	Inflation	Inflation (consumer prices annual percentage)	WDI
06	Exchange Rate	Real effective exchange rate index (2010 = 100)	WDI

In addition, the current article has also used international trade as the independent variable measured in terms of trade openness ((Import + Export) / Gross domestic product). Moreover, the study has also used four control variables which are interest rate, FDI, inflation, and exchange rate. [Table 1](#) highlights the measurements of all the constructs used by the study.

Furthermore, this article also run the variance inflation factor (VIF) that exposed the multicollinearity among predictors used in the article. The equations regarding VIF are mentioned below:

$$R^2_Y \rightarrow Y_{it} = \alpha_0 + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + e_{it} \quad (2)$$

$$j = R^2_Y, R^2_{X1}, R^2_{X2}, R^2_{X3}, R^2_{X4}, R^2_{X5} \quad (3)$$

$$Tolerance = 1 - R_j^2 \quad VIF = \frac{1}{Tolerance} \quad (4)$$

In addition, the stationarity of the variables is also checked to examine the appropriateness of the model. The stationarity of the constructs has been examined using the Augmented Dickey-Fuller (ADF) test. The equation for ADF is mentioned below:

$$d(Y_t) = \alpha_0 + \beta t + \gamma Y_{t-1} + d(Y_t(-1)) + \epsilon_t \quad (5)$$

The basic characteristic of the ADF test is that it checks the stationarity of the understudy constructs individually. Thus, the equation of ADF for individual construct is given as under:

Sustainable Development

$$d(SD_t) = \alpha_0 + \beta t + \gamma SD_{t-1} + d(SD_t(-1)) + \epsilon_t \quad (6)$$

Trade Openness

$$d(TO_t) = \alpha_0 + \beta t + \gamma TO_{t-1} + d(TO_t(-1)) + \epsilon_t \quad (7)$$

Real Interest Rate

$$d(RIR_t) = \alpha_0 + \beta t + \gamma RIR_{t-1} + d(RIR_t(-1)) + \epsilon_t \quad (8)$$

Foreign Direct Investment

$$d(FDI_t) = \alpha_0 + \beta t + \gamma FDI_{t-1} + d(FDI_t(-1)) + \epsilon_t \quad (9)$$

Inflation

$$d(INF_t) = \alpha_0 + \beta t + \gamma INF_{t-1} + d(INF_t(-1)) + \epsilon_t \quad (10)$$

Exchange Rate

$$d(ER_t) = \alpha_0 + \beta t + \gamma ER_{t-1} + d(ER_t(-1)) + \epsilon_t \quad (11)$$

Moreover, the first assumption to apply the ARDL model is that some constructs should be stationary at I(0) and some variables should be stationary at I(1). In addition, the second assumption to apply the ARDL model is that there should be co-integration exist among variables. After checking both the assumptions, the researchers run the ARDL model, and the equation is given as under:

$$\Delta SD_t = \alpha_0 + \sum \delta_1 \Delta SD_{t-1} + \sum \delta_2 \Delta TO_{t-1} + \sum \delta_3 \Delta RIR_{t-1} + \sum \delta_4 \Delta FDI_{t-1} + \sum \delta_5 \Delta INF_{t-1} + \sum \delta_6 \Delta ER_{t-1} + \varphi_1 SD_{t-1} + \varphi_2 TO_{t-1} + \varphi_3 RIR_{t-1} + \varphi_4 FDI_{t-1} + \varphi_5 INF_{t-1} + \varphi_6 ER_{t-1} + \varepsilon_1 \quad (12)$$

The ARDL equation shows the, δ_1 , δ_2 , δ_3 , δ_4 , & δ_5 which signify the “coefficients for short-term nexus” among constructs. In contrast, the ARDL equation also shows the φ_1 , φ_2 , φ_3 , φ_4 , φ_5 , & ε_1 that signifies the “coefficients of long-term nexus” and “error term”. Finally, the current article also checks the cause-and-effect relationships among the constructs using the Granger causality test that exposed bidirectional, unidirectional and no association among the variables. The equations are mentioned below:

$$Y_t = \beta_0 + \sum_{j=1} \beta_{1j} Y_{t-1} + \sum_{h=1} \beta_{2h} Y_{t-p} + \varepsilon_t \quad (13)$$

$$X_t = \alpha_0 + \sum_{s=1} \alpha_{1s} Y_{t-s} + \sum_{t=1} \alpha_{2t} X_{t-m} + \varepsilon_t \quad (14)$$

Research Findings

The current study uses descriptive statistics that highlight the minimum and maximum values of the constructs. In addition, it also shows the mean and standard deviation along with the observation used in the study. The results indicate that the mean value of SD is 66.029 per cent while the average value of TO is 5.302 per cent. Moreover, the results also reveal that the mean value of RIR is 3.093 per cent while the average value of FDI is 3.028 per cent. Finally, the figures show that the mean value of INF was 5.203 per cent while the average value of ER was 102.532 per cent. [Table 2](#) highlights these figures of descriptive statistics.

Table 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
SD	35	66.029	2.123	59.218	69.091
TO	35	5.302	2.843	3.929	8.028
RIR	35	3.093	0.392	2.973	5.403
FDI	35	3.028	1.021	2.254	7.201
INF	35	5.203	1.729	3.294	8.092
ER	35	102.532	6.320	96.392	170.492

Moreover, the present study used the matrix of correlation to examine the association between understudy constructs that provides the directional association but not the significance. The figures exposed that all the

predictors such as TO, RIR, FDI, INF and ER have a positive association with SD. [Table 3](#) highlights these figures of correlation among variables.

Table 3: Matrix of correlations

Variables	SD	TO	RIR	FDI	INF	ER
SD	1.000					
TO	0.620	1.000				
RIR	0.611	0.409	1.000			
FDI	0.593	0.402	-0.433	1.000		
INF	0.409	0.382	-0.329	-0.509	1.000	
ER	0.492	-0.333	0.322	0.322	0.699	1.000

Furthermore, this article also run the VIF that exposed the multicollinearity among predictors used in the article. The figures highlight that the statistics are lower than five and have no multicollinearity issue in predictors. [Table 4](#) highlights the results of VIF.

Table 4: Variance inflation factor

	VIF	1/VIF
TO	4.920	0.203
RIR	3.233	0.309
FDI	3.923	0.255
INF	4.021	0.249
ER	3.210	0.312
Mean VIF	3.861	.

In addition, the stationarity of the variables is also checked to examine the appropriateness of the model. The stationarity of the constructs has been examined using the ADF test. The figures show that TO, RIR and INF are stationary at a level while SD and, FDI and ER are stationary at first difference. Thus, the ARDL model is deemed suitable for the purposes of the current study. [Table 5](#) highlights these figures of the ADF test.

Table 5: Unit Root Test

Augmented Test (ADF)	Dickey-Fuller	Level	t-statistics	p-values
SD		I(1)	-5.932	0.000
TO		I(0)	-4.110	0.002
RIR		I(0)	-2.991	0.049
FDI		I(1)	-3.013	0.033
INF		I(0)	-5.022	0.000
ER		I(1)	-4.299	0.001

The second assumption to apply the ARDL model is that there should be co-integration exist among the variables. Thus, the ARDL bound test has been run to check the co-integration and the results show that co-integration exists in the model because the calculated f statistics (6.820)

are higher than critical values at five and ten per cent level of significance. [Table 6](#) highlights the results of the ARDL bound test.

Table 6: ARDL Bound Test

Model	F-statistics	Lag	Level of Significance	Bound test critical values	
				I(0)	I(1)
SD/ (TO, RIR, FDI, INF, ER)	6.82	4	1%	7.33	7.92
			5%	6.09	6.55
			10%	5.53	5.98

The results of the ARDL model revealed that trade openness, interest rate, FDI, exchange rate and inflation have a positive and significant relationship with sustainable development in Saudi Arabia in the short run. The results also exposed that 49.02 per cent changes in SD are due to all the predictors adopted in the study. [Table 7](#) highlights these figures of short-run association among variables.

Table 7: Short Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TO)	3.820126	1.028630	3.713799	0.0034
D(RIR)	2.710822	0.504328	5.375117	0.0000
D(FDI)	3.292012	1.209372	2.722084	0.0409
D(INF)	4.293653	1.623083	2.645369	0.0432
D(ER)	2.423093	0.520291	4.657188	0.0000
CointEq(-1)*	-2.563012	1.120292	-2.287807	0.0444
R-squared	0.490281	Mean dependent var		-0.039222
Adjusted R-squared	0.479202	S.D. dependent var		2.540142

The results of the ARDL model also revealed that trade openness, interest rate, FDI, exchange rate and inflation have positive and significant linkages with sustainable development in Saudi Arabia in the long run. [Table 8](#) highlights these figures representing the long-run nexus among the understudy variables.

Table 8: Long Term Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TO	3.820182	1.289352	2.962869	0.0183
RIR	4.208832	2.089302	2.014467	0.0430
FDI	2.992023	1.142938	2.617835	0.0033
INF	3.028772	1.493029	2.028609	0.0411
ER	3.099223	1.202911	2.576436	0.0043
C	1.920282	0.787262	2.439191	0.0066

Finally, the current article also checks the cause-and-effect relationships among the constructs using the Granger causality test that exposed the bidirectional, unidirectional and lack of associations among the variables. The figures reveal that no association between SD and ER while unidirectional association between RIR and SD, and FDI and SD and bidirectional association among TO and SD and INF and SD. [Table 9](#) highlights these figures of the Granger causality test.

Table 9: Granger Causality Test

Null Hypothesis	F-Statistic	Prob.	Decision
TO does not Granger Cause SD	5.37392	0.0021	Bidirectional
SD does not Granger Cause TO	4.83912	0.0032	
RIR does not Granger Cause SD	4.93836	0.0019	Unidirectional
SD does not Granger Cause RIR	0.03029	0.3039	
FDI does not Granger Cause SD	5.09282	0.0023	
SD does not Granger Cause FDI	1.02983	0.2029	Unidirectional
INF does not Granger Cause SD	4.33981	0.0034	
SD does not Granger Cause INF	5.02188	0.0024	Bidirectional
ER does not Granger Cause SD	0.9287	0.9932	
SD does not Granger Cause ER	0.8363	0.8927	No

Discussions

The study results have indicated that trade openness has a positive link with sustainable development. These results are in line with the previous study of [Raghutla \(2020\)](#), which shows that in high trade openness, trade with a large number of foreign countries is possible, so goods or services needed can be imported. Thus, sustainable development goals like industry, innovation and infrastructure, high production level, reduction in poverty, good health and well-being, high-quality education, clean water and sanitation, affordable clean energy, and economic growth. These results are also in line with the past study [Saleem and Shabbir \(2020\)](#) which examines how trade openness is effective in promoting high sustainable development of a country. Sustainable development includes consistent development in different areas of the country like society, environment, and economy and the sustainable development goals can easily be achieved in case the country is highly open to international trade. These results are supported by the past study of [Banday, Murugan, and Maryam \(2021\)](#) which focuses on when a country is free to the largest possible extent, to trade within the boundaries of the state and trade at the international level as well. As a result, the scope of the economy increases which leads to job creation, availability of basic needs of life to public, and reduction in poverty which lead to the sustainable development of the country. Likewise, the previous study of [Udeagha and Ngepah \(2021\)](#), also supports these results. This study examines the role of trade openness role vis-à-vis sustainable development goals. The study reveals that high trade openness assures the availability of resources (physical or human

resources), which are required to increase the production capacity of domestic companies, and help them maintain the rate of development as well as their share to the country's sustainable development.

The study results have also indicated that the real interest rate has a positive link with the sustainable development of a country. These results are supported by the previous study of [Basheer, Ahmad, and Hassan \(2019\)](#), which reveals that real interest rate enhances the chances for sustainable economic development and thus, the welfare of individuals and society improves, as the high real interest rate encourages investors or creditors to invest more amount or lend to business enterprises so that they can achieve sustainable performance which includes environmental, social, and economic development side by side. These results are also supported by the previous study of [Pirouz, Shaffiee Haghshenas, Shaffiee Haghshenas, and Piro \(2020\)](#), which states that when interest is maintained according to the inflation rate within the country, the investors or creditors do not have to bear the loss on the money invested or lent, thus, the money is not mostly kept saved without benefiting from them and the creation of money remains consistent which leads to sustainable development within the country.

The study results have also revealed that FDI has a positive link with the sustainable development of a country. These results are in line with the study of [Ridzuan, Ismail, and Che Hamat \(2017\)](#), which states that a country wherein many companies are operational, foreign countries take more interest by making investments, as a result of which companies can adopt innovation, and expand their business scope. This provides employment to the majority of people within the country and enhances the number and quality of resources. Consistency in the development of the country depends on sustainable resources which not only fulfil the present needs but also assure the fulfilment of future needs as possible under high FDI. These results are also in line with the recent article of [Sarkodie and Strezov \(2019\)](#), which indicates that a high FDI in the firms which are engaged in economic activities related to production and extraction of natural resources like crops, forests, livestock, fossil fuels, and metals, steers the economy towards sustainable development by making the availability of natural resources consistent and dependable.

The study results have also indicated that inflation has a positive link with the sustainable development of a country. These results are supported by the previous study of [Tiwari, Olayeni, Olofin, and Chang \(2019\)](#), which states that though inflation represents a rise in the aggregate price level within the country, it also gives rise to the productivity of goods and services within the country by increasing the profitability for the owners. This enhances the number of resources and the welfare of the people indicating high sustainable development levels. These results also agree with the previous study of [Batayneh, Al Salamat, and Momani \(2021\)](#), which implies that as during inflation production of natural resources, manufacturing products, and services is high, the employment rate is high, and development activities are at peak, the interrelated sustainable development goals like Industry, Innovation and Infrastructure, high

production level, reduction in poverty, good health and well-being, high-quality education, clean water and sanitation, affordable clean energy, and economic growth, are more likely to be achieved.

The study results have also revealed that the exchange rate has a positive link with the sustainable development of a country. These results are in line with the study of [Ha and Hoang \(2020\)](#), which states that an increase in the exchange rate leads to an increase in the worth of a country's currency.

When a country's currency value is high, foreigners are interested in the country's companies or any economic initiatives for the sake of earning higher profits and the ensuing investment leads to high sustainable development. These results are supported by the previous study of [Habib, Mileva, and Stracca \(2017\)](#), which highlights that when the exchange rate is high, the country could earn more in the form of foreign exchange through exports. This enhances the productivity in the country and increases the financial strength of the country which is necessary to achieve sustainable development goals.

Theoretical and Empirical Implications

The current study has a key theoretical significance on account of its contribution to economic-based literature. This article throws light on sustainable development along with its fundamental goals and analyzes the role of international trade in the achievement of sustainable development. This study examines the influences of trade openness along with factors like real interest rate, FDI, inflation, and exchange rate on sustainable development. The study measures international trade with trade openness for determining sustainable development, while in most of the studies international trade has been measured in the form of exports, imports, the balance of trade, and foreign exchange. In this way, the current study makes a significant contribution to the literature. Trade openness, real interest rate, FDI, inflation, and exchange rate all have separately been analyzed as factors influencing sustainable development in existing literature, but this study marks the first time that the impacts of trade openness, real interest rate, FDI, inflation, and exchange rate on sustainable development are being explored. This study guides policymakers while formulating regulations related to sustainable development through international trade. This study has relevance for commercial enterprises, trade ministry, and government as it is identifying a set of guiding steps for them to formulate economic and monetary policy frameworks. This study highlights the ways to improve sustainable development. It shows that sustainable development goals can be achieved if there is high trade openness, real interest rate, FDI, inflation, and exchange rate.

Conclusion and Limitations

The motivation behind the research is to check the role of international trade in determining the rate of achieving of levels of high sustainable

development. The study seeks to examine the influences of trade openness along with factors like real interest rate, FDI, inflation, and exchange rate on sustainable development. Through a quantitative research technique, an empirical analysis is made about the nexus among trade openness, real interest rate, FDI, inflation, and exchange rate and sustainable development. According to the study results, trade openness, real interest rate, FDI, inflation, and exchange rate positively influence sustainable development. The study results show that trade openness helps achieve sustainable development as the country is open to trade at a large scale, and the inflow of exports and imports helps the country in achieving developmental goals like clean environment, abundant resources with quality, provision of healthy food, healthy and skilled human resources, social welfare, business innovation and growth, etc. The results also revealed that real interest rate saves the lenders or borrowers from exposing to loss exposures and therefore, provides a motivation for them to keep on making investment or lending money which is likely to be used on an ecological project, social programs, and for improving business processes. Hence, real interest rate enhances sustainable development. The results indicate that FDI enhances sustainable development as it boosts investment in natural resources production and manufacturing of industrial products which not only helps meet present needs but will also serve future needs. The results show that in inflation period, the productivity and innovation in almost all the economic sectors is likely to be seen, which helps to provide for needs of the future generations. Similarly, an increase in the exchange rate encourages exports and raises foreign exchange which in turn facilitates sustainable development. The study has several limitations which all can be overcome by future research work on the subject. The current study is comprehensive as compared to an ideal study since its focus is only on trade openness along with the factors like real interest rate, FDI, inflation, and exchange rate on sustainable development. For a more in-depth and comprehensive study, the authors in future must consider other additional factors in relation with the sustainable development. The economy of Saudi Arabia provides fewer comprehensive data which can be dubious because of the difference between the economic conditions and geographical states from other countries.

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