AR&P sciendo

SocioEconomic Challenges, Volume 7, Issue 4, 2023
ISSN (print) – 2520-6621, ISSN (online) – 2520-6214

Sumy State University

IMPACT OF OIL EXPORTS AND NON-OIL EXPORTS ON ECONOMIC GROWTH IN SAUDI ARABIA: AN ECONOMETRIC STUDY USING ARDL APPROACH

Dekkiche Djamal, ORCID: https://orcid.org/0000-0002-1463-4413

Oran Graduate School of Economics, Algeria

Laila Oulad Brahim, **ORCID:** https://orcid.org/0009-0008-6259-4840

Ghardaia University of economic, Ghardaia, Algeria

Hadj. Khelifa, ORCID: https://orcid.org/0000-0002-3303-122

Mostaganem University of Economics, Mostaganem, Algeria

Corresponding author: Dekkiche Djamal, E-mail: dekkiche.djamal@ese-oran.dz

Type of manuscript: review paper

Abstract: *This study's primary goal is to examine Saudi Arabia's performance from 2000 to 2022. In order to accomplish this, the Autoregressive Distributed Lag (ARDL) model was employed along with a limits test. The study's findings indicate that oil exports impact short-term and long-term outcomes during the specified study period. On the other hand, non-oil exports initially contribute positively to the country's domestic product in the short term, but this contribution diminishes quickly and becomes negative and statistically insignificant in the long term. As a result, Saudi Arabia is dependent on the export of a single commodity, making it vulnerable to the effects of market volatility on the price of oil.*

To escape the excessive dependence of Saudi Arabia on oil and encourage non-oil export activities in order to stimulate long-term economic growth, the research recommends expanding into other productive sectors, such as agriculture and industry. These two sectors are vital for economic diversification, to obtain improved growth, and to limit the ramifications of the negative effects caused by international changes in oil prices. It is essential to take this strategy to prevent excessive reliance on this one-of-a-kind resource, this diversification is crucial for promoting exports beyond hydrocarbons and reducing reliance on oil. improve its level of investment in its thriving domestic sectors and take steps to lower the country's high production costs by constructing infrastructure that would enable the growth of non-oil exports, especially because Saudi Arabia will become a member of the BRICS group of countries beginning in January 2024.

Keywords: Autoregressive Distributed Lag Model, Domestic product, Economic Diversification, Long run, Short run.

JEL Classification: F43, L25, C5.

Received: 17.08.2023 **Accepted:** 27.09.2023 **Published:** 31.12.2023

Funding: There is no funding for this research.

Publisher: Academic Research and Publishing UG, Germany.

Founder: Academic Research and Publishing UG, Germany; Sumy State University, Ukraine.

Cite as: Dekkiche, D., Laila, B.L., Hadj, K. (2023). Impact of Oil Exports and Non-Oil Exports on Economic Growth in Saudi Arabia: An Econometric Study Using ARDL Approach. *SocioEconomic Challenges*, *7*(4), 110-119. https://doi.org/10.61093/sec.7(4).110-119.2023.

1. Introduction

Promoting oil exports holds great strategic importance for developing oil-exporting nations today. This is because it drives growth by positively impacting trade balance, balance of payments, and total income, and serving as the country's primary foreign currency source. Take Saudi Arabia as an example, a developing nation on oil, which constitutes 85% of its total exports. This heavy dependence on markets and the volatility of oil prices puts its economy at risk. We can see this vulnerability during the oil crisis in 1986 when there was a decline in oil prices, leading to a decrease in export volume and causing a trade deficit. Recognizing that oil is a finite resource, Saudi Arabia swiftly implemented financial, tax, customs, and trade incentives while establishing an institutional framework to support and encourage domestic entities to engage in international markets. The goal is to promote and diversify oil exports while moving away from over-reliance on oil exports alone, thereby achieving robust growth rates.

The significance and originality of our research are apparent in the fact that it is one of the initial investigations of its kind to examine the relative importance of non-oil exports to the Saudi Arabian economy from 2000 to 2022. The Kingdom of Saudi Arabia was selected due to its status as the third-largest global oil producer and its second-largest confirmed crude oil reserves ($326.16 billion in 2022, up from $202.05 billion in 2021). In light of the fact that the Saudi Arabian economy is largely oil-dependent, the purpose of this study is to compare the contribution of oil and non-oil exports to the country's economic growth. We shall make extensive use of the Autoregressive Distributed Lag (ARDL) model in this research paper.

2. Previous Studies on the Subject

Developmental researchers have recently become interested in the correlation between oil exports and exports of items other than oil and economic growth. This analysis focuses on the effects of Saudi Arabia's oil exports on the country's economy. Researchers believe that non-petroleum exports have empirical implications for Saudi Arabia's growth (Waheed et al., 2020). The author analyzed data from 1980Q1 to 2017Q4, employing the ARDL test and the Johansen technique to examine cointegration. The empirical findings indicate that exports of goods more than oil and tourism contribute positively to expansion. Moreover, diversifying exports away from oil is viewed as a long-term strategy for achieving sustained economic growth.

In Saudi Arabia, where the economy relies heavily on oil, the nation's overall economic well-being is closely linked to oil prices. A significant portion of government revenue derives from oil exports, which play a role in acquiring currency required for meeting import demands. Therefore, any instability or unpredictability in this sector could have far-reaching consequences on Saudi Arabia's economic framework (Sultan & Haque, 2018). This study uses Johansen's cointegration methodology to draw a link between long-term GDP growth, oil exports, imports, and government spending. Expansion, oil exports, and government spending were all linked in the study. Furthermore, a consistent link was discovered between imports and GDP expansion. Based on these results, the research suggests that the government should regulate imports and actively seek out industries to buy from to strengthen the economy's base.

This analysis uses cointegration analysis and Granger's causality test to investigate the effect of oil and non-product exports on economic growth in Iran. 2014 (Parvin Hosseini & Tang, 2014). Dates from 1970 to 2008 were used for analysis. According to the study's findings, these factors are interwoven, with the Granger causality test showing that exports of oil and non-oil products contribute to economic growth.

From 1985 to 2015, scientists in the Republic of the Congo (Ndzila et al., 2020) looked into the impact exports had on the growth of the country's oil industry. The study used analytical methods and economic evaluations to get its conclusions. The study's findings imply that exporting goods other than oil significantly affects economic expansion.

By contrast, the study "Utilizing an Econometric Model for the Analysis of Time Series" (Onodugo et al., 2013) aimed to investigate the connection between Nigeria's oil exports and GDP growth. Data from 1981-2012 was used for the study, and Johansen's cointegration technique was implemented. The study shows that Nigeria's non-oil exports considerably impact GDP growth.

While oil is recognized as a driver of growth, relying solely on it may not lead to sustainable development in the long run. It is evident that diversifying away from oil is necessary to achieve sustainability. A study conducted {Formatting

Citation} explored oil factors influencing Saudi Arabia's economy between 1970 and 2011. Their findings demonstrated that all variables analyzed significantly contributed to Saudi Arabia's growth except for oil exports, which had an insignificant impact on economic expansion.

The World Bank website provided data on the growth rate from 2000 to 2022, specifically focusing on the economy. We extracted information on oil and non-exports from the General Authority for Statistics (Alzyadat & Almuslamani, 2021), with values given in millions of Saudi Riyals. The growth rate progression can be seen in Figure 1, while Figure 2 illustrates the changes in oil and non-oil exports. Additionally, Table 1 analyses the variables examined in this study.

Among the years, the highest growth rate occurred in 2003 at 11.24%, whereas the lowest was 4.34% in 2020 due to the impact of the coronavirus crisis, particularly affecting Saudi Arabia's economy. Figure 1 highlights that there was a growth rate observed in 2009 following the repercussions of the crisis that took place in 2008. However, it was followed by an increase of 10.99% in 2011 due to a surge in oil prices, reaching $113.39/barrel (WTI Crude Oil Prices 10 Year Daily Chart | MacroTrends, n.d.).

Moreover, it is evident from (Figure 2), that 84% of exports stem from oil exports alone. This indicates that Saudi Arabia's economy heavily relies on mono exports and is susceptible to fluctuations occurring within oil markets.

The highest recorded value was in 2022, reaching 1,226,277,157,613 million Riyals. On the other hand, the lowest value was observed back in 2001 at 223,532 million Riyals. On average, Saudi Arabia's oil exports amounted to 223,532 million Riyals.

It is worth noting that non-oil exports make up 15% of the exports. Among these oil exports, petrochemicals and chemical products hold significant importance, contributing around 65% to Saudi Arabia's overall non-oil export figures. Throughout the study period, the standard deviation ranged from 0.70 to 1.23 units. To gain insights into how both non-oil and oil exports impacted Saudi Arabia's economy during this study period, we referred to research conducted by (Owan et al., 2020) on Nigeria's economy. It is worth mentioning that Nigeria also relies heavily on oil as its export commodity. Which is also an oil economy and mono-export:

$$lnGDP_t = \alpha_0 + \alpha_1 lnOILEXPORT_t + \alpha_2 lnNONOILEXPORT_t + \varepsilon_t$$

where:

$GDPt$: Represents the gross domestic product rate %

$OILEXPORTt$: Oil exports valued in a million Saudi Riyals

$NONOILEXPORTt$: Non-oil exports valued in a million Riyal

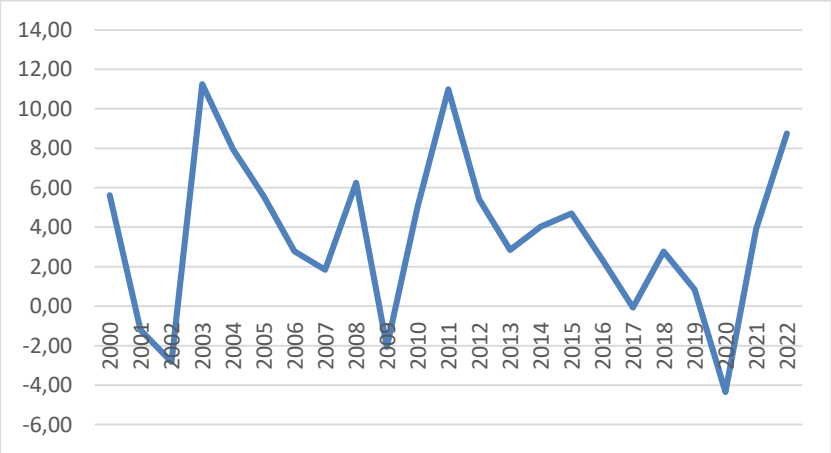

Figure 1. Development of Growth Rates in Saudi Arabia During the Study Period

Source: (GDP (Current US$) - Saudi Arabia | Data, n.d.) ،(Annual Reports, n.d.).

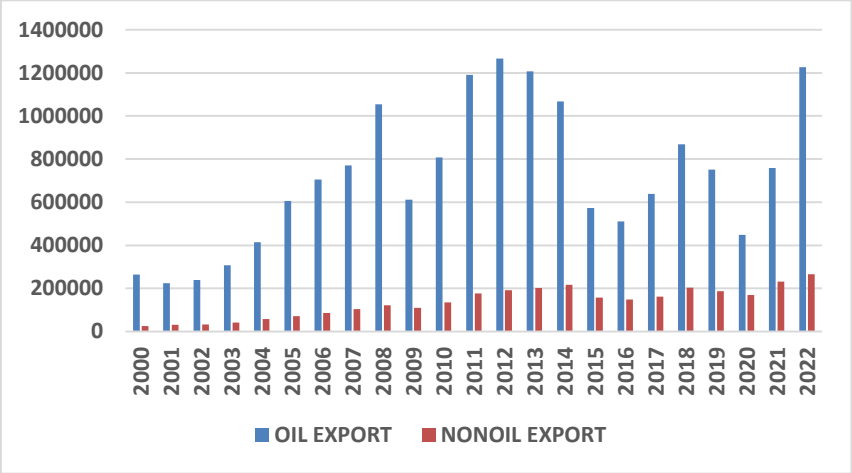

Figure 2. Position of Oil and Non-Oil Exports in the Saudi Economy

Source:(GDP (Current US$) - Saudi Arabia | Data, n.d.) ،(Annual Reports, n.d.).

Table 1. Descriptive Analysis of Study Variables

	LNGDP	LNOILEXPORT	LNNONOILEXPORT
Mean	1.008218	13.36329	11.62967
Median	1.393183	13.46710	11.90396
Maximum	2.419662	14.05102	12.48997
Minimum	-2.659200	12.31731	10.11880
Std. Dev.	1.231847	0.531340	0.704933
Skewness	-1.394566	-0.567863	-0.891972
Kurtosis	4.618088	2.340712	2.543158
Jarque-Bera	9.964238	1.652681	3.249862
Probability	0.006860	0.437648	0.196925
Sum	23.18902	307.3556	267.4823
Sum Sq. Dev.	33.38382	6.211092	10.93248
Observations	23	23	23

Source: Prepared by the researcher based on the outputs of E-views 10.

Table 2 displays the correlation matrix between the variables, and it would appear that all of them positively affect the lnGDP dependent variable. These findings provide a foundation for understanding the final model's revelation of the nature of the link between the independent variables (lnOILEXPORT, lnNONOILEXPORT) and the dependent variable (lnGDP).

Table 2. Correlation Matrix between Variables

	LNGDP	LNOILEXPORT	LNNONOILEXPORT
LNGDP	1	0.3618	0.3618
LNOILEXPORT	0.3618	1	0.9998
LNNONOILEXPORT	0.3618	0.9998	1

Source: Prepared by the researcher based on the outputs of E-views 10.

3. Results of the Econometric Study

The ADF and PP tests are computed for each series to assess the variables' consistency and integration across time.

The Unit Root test is employed to ascertain the degree of reliance variables exhibit on their respective levels and initial differences. The Augmented Dickey-Fuller (ADF) test and the Phillip-Perron (PP) test are frequently

utilised in situations where the sample size is limited since they have been found to possess improved reliability in producing accurate results. The findings are provided in—table.

Table 3. Time Series Stability Test Using ADF and PP Tests

			LNGDP	LNOILEXPORT	LNNONOILEXPORT
ADF test	Level	T-Stat	-4.3269	-1.7306	-2.3033
		Prob	***0.0029****	***0.4029***	***0.1796***
	First Diff	T-Stat	-7.1434	-3.8053	-3.5615
		Prob	***0.0000****	***0.0096****	***0.0162****
PP test	Level	T-Stat	-4.3269	-1.5266	-2.9173
		Prob	0.0029**	0.5018	0.0594
	First Diff	T-Stat	-11.4666	-3.7064	-3.5147
		Prob	0.0000**	0.0119**	0.0179**
Order of integration			1	1	1
Optimal Lag lenght[1]			1	1	1
Note: (**) significant at 5%					
[1]Optimal Lag length selections follow the Akaike Information Criteria AIC					

Source: Prepared by the researcher based on the outputs of E-views 10.

Through the results of Table 4, all variables are not stable at the level considering the acceptance probability at a 5% significance level, but they stabilise after performing the first difference, meaning they are integrated at the first difference. This leads us to apply the Autoregressive Distributed Lag (ARDL) model.

3.1 Bound test for ARDL Time Series Gaps Model

Testing for cointegration was first proposed in a paper by Pesaran, Shin, and Smith (Pesaran et al., 2001). This method can be used whether the variables in question are I(0) or I(1) predictors. Cohesive with each other. Implementing a Wald or F stat test within a Dickey-Fuller regression is crucial. In an unconstrained error correction regression model, this test aids in identifying the importance of the lagged variables.

The Bound Test offers two sets of estimated critical values for two scenarios: one assuming that all regressions are integrated of order 1 (I(1)) and the other assuming that they are integrated of order 0 (I(0)).

Bound Test results using the STATA package are summarised in Table 4 above.

Table 4. Bound Test

Significance Level	Critical Value F-statistic ((I_0), (I_1))	Interpretation F-statistic	Critical Value t-statistic ((I_0), (I_1))	Interpretation t-statistic
10%	2.12, 3.23	Reject Null (Cointegration)	-2.57, -4.04	Reject Null (Cointegration)
5%	2.45, 3.61	Reject Null (Cointegration)	-2.86, -4.38	Reject Null (Cointegration)
2.5%	2.75, 3.99	Reject Null (Cointegration)	-3.13, -4.66	Reject Null (Cointegration)
1%	3.15, 4.43	Inconclusive	-3.43, -4.99	Reject Null (Cointegration)

Source: Prepared by the researcher based on STATA17.

For Case 3, the computed Statistical Significance Test (Fs) of 4.722 is larger than the Upper Bound Critical Value (I1) of 3.22. All of this points to cointegration, or *H1*, and away from its absence, or *H0*. In addition, the value of the test statistic Ts was 5.354, which is larger than the significance criteria I1 of 4.04. This case's results indicate

that, at the 10% significance level, the claim that no cointegration exists between the variables investigated is false.

At a 10% confidence level, the results from Case 3 show that the observed value of Fs, 4.722, is more than the critical value for the upper bound I1, which is 3.22. As a result, we might conclude that *H1*, which asserts that the variables are cointegrated, is more likely to be accurate than *H0*, which states that cointegration does not occur. Ts = 5.354, above the critical threshold I1 = 4.04, and satisfies the above criteria.

3.2 Optimal Lag Degree for the ARDL Model

The optimal lag degrees for the several research variables were chosen before testing the ARDL model, and the outcomes are summarised in the table below:

LAG LENGTH CRITERIA

matrix list e(lags)

e(lags)(1,7)

Table 5. Optimal Lag Degree for the ARDL Model

	LNGDP	LNOILEXPORT	LNNONOILEXPORT
LAG	1	1	1

Source: Prepared by the researcher using STATA 17

3.3 Short-Term and Long-Term Relationship Test for the ARDL Model

The ARDL model was tested to see what kind of link exists between growth rate and oil and non-oil exports in the Kingdom of Saudi Arabia, and the results are shown in **Table 6**.

Table 6. Short-Term and Long-Term Relationships

CODE STATA	ardl lngdp lnoilexport lnnonoilexport if tin(2000,2020), ec1 lags (1 1 1)					
D.lngdp	Coefficient	Std.err.	t	P>|t|	(95% conf	interval)
Error Correction Term						
lngdp .L1.	-1.092335	.2839068	-3.85	0.002	-1.701254	-.4834155
LONG RUN						
lnoilexport. L1	1.347248	1.37293	0.98	0.343	-1.597394	4.291891
lnnonoilexport. L1	-.5469059	1.226056	-0.45	0.662	-3.176534	2.082722
SHORT RUN						
lnoilexport.D1.	.2040046	2.356503	0.09	0.932	-4.850192	5.258201
lnnonoilexport. D1.	2.656641	5.078809	0.52	0.609	-8.23632	13.5496
_cons	-12.02249	9.687996	-1.24	0.235	-32.80118	8.756195
Number of obs		20	Adj R-squared			0.44
R-squared		0.59	Root MSE			1.3532

Source: Prepared by the researcher using STATA 17

- A long-term equilibrium relationship is indicated by a negative error correction coefficient (Winarno et al., 2021) and a method for short-term to long-term error correction with a coefficient of 1.0923.

- Oil exports, denoted as OILEXPORT, were found to influence short, positive, and long-term growth during the period. A short-term increase of one unit in oil exports results in a growth rate enhancement of 0.204 units, whereas in the long term, this increase is 1.347 units. This trend can be attributed to Saudi Arabia's dependence on oil for revenue generation and contribution to the Kingdom's overall budget. This outcome aligns with the research conclusions of (Mohsen, 2015) and (Khayati, 2019). However, it opposes the findings of Parvin Hosseini

& Tang (2014) and (Raheem & Raheem, 2016), who determined a negative correlation between oil exports and GDP growth rate. A similar positive relationship between an increase in oil exports and the GDP of all OPEC countries was identified by (Karamelikli et al., 2017), utilising the Common Correlated Effects (CCE) estimator.

- Non-oil exports (NONOILEXPORT) contribute positively to the GDP in the short term. However, this contribution quickly fades and becomes negative and non-significant in the long term (as found by (Dejpasand et al., 2012). This proves the insignificance of exports outside of fossil fuels compared to oil exports (15% of total exports), which is consistent with the findings of (Onodugo et al., 2013) in the case of the Nigerian economy and also (Aljebrin, 2017) and (Zoramawa et al., 2020) in the Nigerian economy during the period 1981-2019. Considering the role that non-oil exports should play as a source of revenue outside the oil sector (which is regarded as a mature commodity and is subject to various shocks affecting global markets), it has become necessary to pay attention to other productive sectors, such as industry and agriculture, to break away from excessive dependence on oil.

3.4 Model Diagnostic Tests

To gauge the robustness and integrity of the model, a series of the following tests were conducted:

3.4.1 Test for Autocorrelation of Errors

According to the data presented in Figure 3, the Durbin-Watson statistic exhibits a range of values from 0 to 4. Positive serial correlation is indicated by a number ranging from zero to dl. The identification of serial correlation is not feasible for values falling between the range of dl and du, as well as between 4-du and 4-l. The acceptance of the null hypothesis, which states that there is no correlation between the mistakes within a range of values between du and 4-du, indicates a lack of link between the errors. In conclusion, when the value falls within the range of -4dl to -4, there is a 95% probability that the data demonstrates a negative serial correlation.

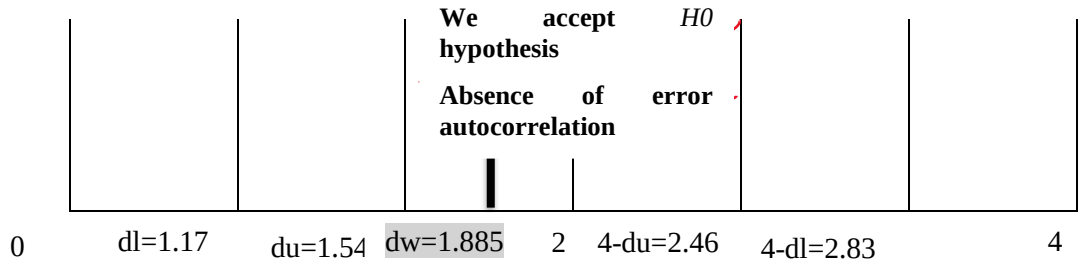

Figure 3. DW Test for Error Autocorrelation

Source: Prepared by the researcher and results of STATA 17.

From Figure 3 above, it is clear that:

The computed value of dw = 1.88, which falls between du = 1.54 and 2, thus falls into the domain of accepting the null hypothesis HO, so it can be said that the errors are not correlated among themselves.

3.4.2 Test of Homoscedasticity of Errors

The p-value obtained from the LM test is bigger than the significance level of 0.05, suggesting insufficient evidence to reject the null hypothesis, which states the absence of an ARCH effect. Hence, the model lacks the presence of ARC**.**

3.4.3 Breusch–Godfrey Test for Error Autocorrelation

The Breusch-Godfrey LM test holds certain advantages over the traditional Durbin-Watson test. While the Durbin-Watson test is contingent on the premise that the residuals follow a normal distribution, the Breusch-Godfrey LM test does not have this sensitivity, making it more adaptable. Another merit of the Breusch-Godfrey test is that it permits researchers to examine serial correlation through multiple and one lags. Specifically, it allows for the analysis of the correlation between the residuals over time t and t−k (where k represents the number of lag

periods), as opposed to the Durbin-Watson test, which only allows for the examination of the correlation between t and t−1. Thus, when k equals 1, the outcomes of both the Breusch-Godfrey and Durbin-Watson tests would align.

Table 7. Test for Error Autocorrelation

estat dwatson
Durbin–Watson d-statistic (6, 20) = 1.885468

Source: Prepared by the researcher using STATA 17

The Table 8 presents results from the LM test checking for Autoregressive Conditional Heteroskedasticity (ARCH) effects. Command Used in STATA: estat archlm

Table 8. Test for Homoscedasticity of Errors

Hypothesis Descriptions		Details	
Null Hypothesis (H0):		No effects due to ARCH	
Alternative Hypothesis (H1):		Disturbance follows ARCH(p)	
Lags (p)	Chi-Squared Statistic	Degrees of Freedom (df)	Probability Value
1	0.339	1	0.5603

Source: Prepared by the researcher using STATA 17

Through the results of Table 7, it is evident that the value of Prob>chi**2**>**0.05** thus the null hypothesis will be accepted. In other words, the model does not correlate with error series**.**

3.4.4 Breusch–Pagan Test for Homoscedasticity of Errors

The Breusch-Pagan test is utilised to determine which hypothesis is more plausible, the null or the alternative. Under the null hypothesis, it is assumed that the error variances are homoscedastic or uniform. The counter-hypothesis proposes that heteroscedasticity exists, in which the error variances are not constant but rather a multiplicative function of one or more variables.

The Table 9 depicts the Breusch–Godfrey LM test results for detecting autocorrelation.

STATA Command: estat bgodfrey

Table 9. Breusch–Godfrey Test for Error Autocorrelation

Hypothesis Descriptions		Details	
Null Hypothesis (*H0*):		Absence of serial correlation	
Lags (p)	Chi-Squared Value	Degrees of Freedom (df)	Probability
1	0.067	1	0.7959

Source: Prepared by the researcher using STATA 17

Table 9 above means that the chi-square statistic has a probability greater than 0.05. Because of this, we cannot reject the constant variance null hypothesis with a 5% confidence level. This indicates that the residuals are homoscedastic.

3.4.5 Test for Normal Distribution of Residuals

The skewness is regularly distributed (the probability value for skewness > 0.05), as shown by the "sktest" for residual correlation, which also displays the number of observations (22). P (Kurtosis) > 0.05 similarly shows that kurtosis is approximately distributed. Last, the Prob>chi2 is 0.0764, larger than 0.05 and statistically significant

at the 5% level. Therefore, it is not possible to reject the null hypothesis. That's why we get a normal distribution in the residuals.

The Table 10 outlines the results of the skewness and kurtosis tests conducted to evaluate the normality of residuals.

STATA Command: sktestresid

Table 11. Test for Normal Distribution of Residuals

Variable (Residuals)	Number of Observations	Probability of Skewness	Probability of Kurtosis	Adjusted Chi-Squared (2 Degrees of Freedom)	Probability of Chi-Squared Test
resid	22	0.0571	0.2003	5.14	0.0764

Source: Prepared by the researcher using STATA 17

4. Conclusion

The research aimed to compare the impact of oil and non-oil exports on Saudi Arabia's GDP growth from 2000 to 2022. Longitudinal and cross-sectional associations between the variables were calculated using the ARDL model and BOUND test to meet the study's aims. The following findings are drawn from the analysis. Short-term non-oil exports boost economic growth in Saudi Arabia throughout the research period, whereas long-term, they have a negative and insignificant impact. Considering the favourable benefits of oil exports on economic growth, non-oil exports only account for 15% of overall exports, which suggests that they do not significantly contribute to Saudi Arabia's GDP. As a result, Saudi Arabia is dependent on the export of a single commodity, making it vulnerable to the effects of market volatility on the price of oil**.**

The research concluded that Saudi Arabia should prioritise non-oil exports and work to increase the competitiveness of non-oil exports on global markets. With all else being equal, the study found that boosting the quality of Saudi Arabia's non-oil exports would raise demand for the country's products. To further promote production with an eye towards export, the Saudi government should institute norms of good governance over domestic industry**.**

Finally, the Saudi government must enhance investment in burgeoning domestic industries and diminish the nation's elevated production expenses by constructing infrastructure that will support the development of non-oil exports, thereby reducing their production costs. This encompasses providing a dependable energy supply, cost-effective transportation methods, and other vital components. The Saudi government should also thoroughly reassess the conventional commercial terms and conditions within its international trade agreements. This action aims to augment the country's receptivity to foreign trade and potentially boost economic growth**.**

To avoid or enrich such work, there are a set of suggestions that could be a research project in the same context, such as choosing a longer study period and adding other explanatory variables like exchange rate, degree of trade openness, investment volume, etc., along with employing more accurate econometric models that align with the study data and period.

Author Contributions: conceptualization: D.D.; methodology: D.D.; software: D.D.; validation: D.D.; formal analysis: D.D.; investigation: Djamal Dekkiche; resources: D.D.; writing-original: D.D.; draft preparation: D.D.; writing-review and editing: D.D.; visualization: D.D.; supervision: D.D.

Conflicts of Interest: The author declares no conflict of interest.

Data Availability Statement: Not applicable.

Informed Consent Statement: Not applicable.

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