International Business Research; Vol. 17, No. 3; 2024
ISSN 1913-9004 E-ISSN 1913-9012
Published by Canadian Center of Science and Education

The Impact of Non-Oil Exports on the Economic Growth in Saudi Arabia: An Empirical Analysis

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Received: March 24, 2024 Accepted: April 28, 2024 Online Published: May 20, 2024

doi:10.5539/ibr.v17n3p89 URL: https://doi.org/10.5539/ibr.v17n3p89

Abstract

This study aims to investigate the impact of non-oil exports on the economic growth of Saudi Arabia during the period 2000-2022. Since Saudi Arabia targets to transform their economy from dependence to the diversification of economic resources, it is important to evaluate the impact of non-oil exports on the gross domestic product (GDP) in the long run. This study used multivariate time series analysis, including Johansen-Juselius co-integration and Vector Error Correction Model to determine the long-run relationship between them. The findings of the study revealed that non-oil exports have a statistically significant impact on economic growth in the long run. However, oil exports have a negative relationship with economic growth in the long run. Moreover, it also observed that a real effective exchange rate negatively affects economic growth while gross capital formation has a positive impact on economic growth in the long run. It is recommended that the non-oil sectors should be considered as a prime concern regarding infrastructural development due to their instant return to the country and should provide loans at minimal or zero interest to support them in the effective production of non-oil exports. Moreover, also makes legislation in the favor of domestic and foreign stakeholders so that they can encourage them to invest in non-oil exports and expand the non-oil sector.

Keywords: non-oil exports, economic growth, real effective exchange rate, vector error correction model (VECM)

1. Introduction

It has been acknowledged for a long time that exports are a leading driver for sustainable economic growth (environmental and social sustainability to a certain level) by boosting the rate of employment, encouraging investment particularly, foreign direct investment, and advanced technologies, producing positive externalities for other sectors. Nonetheless, all these factors are pivotal for sustainable inclusive economic development as they can contribute to the augmentation of economic activity, a rise in the level of income, and poverty alleviation (Hasanov et al., 2022).

The economic framework of Saudi Arabia has accelerated considerable improvement in the human development indicators of the Kingdom and has rendered physical infrastructure efficiently, however, it is heavily dependent on oil revenues. Across the world, Saudi Arabia is counted as the second largest country considering natural resources, with a total worth of $35 trillion and generating 1.2 million barrels per day having around 16.2% of global total reserves of oil (Raid et al., 2024). The prime factors of the Kingdom's economy such as fiscal revenues, economic activity, foreign exchange, and export earnings are directly linked to the hydrocarbon industry. Based on the annual statistics report (2023) by the Saudi Arabian Monetary Authority (SAMA), the oil sector of Saudi Arabia lonely contribute 37 percent to its gross domestic product (GDP) in 2022. However, the share of the non-oil sector has also risen gradually in total GDP over the years, but still hydrocarbon sector records a significant proportion of the GDP of Saudi Arabia. Similarly, the exports of Saudi are also ruled by the oil sector. The gradual growth in oil exports has been observed since 2002 due to an increase in international demand and a rise in oil prices globally. The only unprecedented periods for this gradual growth are the oil price collapse (2014) and the global financial crisis. Consequently, previous studies by Horschig (2016) and Mobarak and Karshenasan (2012) argued that the economies may experience challenges, in the long run, to maintain a

particular level of economic growth if they have a significant part in a single source of revenues. In addition, Fattouh and Sen (2021) advocated that the growth of oil demand is probably to be slow over the years. Challenges can be internal (i.e, rise in population with raising in the demand for energy, development of petroleum-related, and energy-intensive sectors) and external (i.e, technological advancement, energy effectiveness, increasing proportion of renewable energy, processes to lessen climatic changes, electric vehicles and modification in the preferences of the society), can lead to depleting exports of oil.

Since over-reliance on one sector can expose difficulties for long-term economic growth, economic diversification has emerged as a pivotal development target among oil-dependent nations. Economic diversification not only creates employment opportunities but also improves the quality of institutions by coping with corruption (Jouili & Khemissi, 2019; Albassam, 2015). Furthermore, Le et al. (2020) discussed that export diversification can facilitate the economy with a meagre basket of exports experiencing instability in exports due to fluctuation in global demand. Therefore, export diversification has become a considerable strategy for oil-dependent nations such as, Saudi Arabia.

To acknowledge the aforementioned problems, the government of Saudi Arabia introduced Saudi Vision 2030 in 2016, the target of the strategic reform is to decrease the reliance on oil and diversify the economic resources. Kingdom's primary aim is to diversification of non-oil exports particularly aims to raise the proportion of non-exports in gross domestic product from 16% in 2016 to 50% in 2030. To execute this aim, the government has announced numerous initiatives to build the capacities of Saudi enterprises, boost their effectiveness, and magnify their international coverage. Meanwhile, The Saudi Export Development Authority and the Saudi Export-Import Bank (EXIM) also supported this strategic goal by promoting the diversity, development, and effectiveness of the Kingdom's exports and providing finances for exports, guarantees, and insurance of export credit with competitive advantages.

Non-oil exports are a vital element of the Kingdom's economic diversification and through four principal passages, they significantly contributed to sustainable inclusive economic growth. Firstly, the instability in the total exports will decrease through non-oil exports, as oil is vulnerable to global price fluctuations. Second, the rise in non-oil exports in Saudi Arabia will expand the private sector which will lead to generating job opportunities for younger and mounting labor force. Third, an influential spillover effect will occur due to the growth in non-oil exports and will increase the demand for other non-tradeable and tradeable goods. Fourth, improvement in exports has also contributed to appealing to foreign investors regarding foreign direct investment, which increases the efficiency in growth and productivity by transferring advanced technologies and creating positive externalities in the whole economy (Hasanov et al., 2022). Despite this, the empirical research in the literature does not give comprehensive prospects on the importance of non-oil exports in Saudi Arabia. Past research in the literature has mainly concentrated on investigating the association between economic growth and oil price shocks. Recently, the shift towards the diversification of the economy urged the desire to research the non-oil sector and the impact of its exports on the long-term economic growth of Saudi Arabia. Therefore, this study aimed to investigate whether there is a long-run association between non-oil exports and the economic growth of Saudi Arabia during the period 2000-2022 by employing the Johansen-Juselius co-integration and Vector Error Correction Model. This paper is structured into five parts, section 2 discusses the literature review, section 3 provides data and methodology, section 4 and 5 discusses the empirical results of the study and section 6 provides conclusive remarks and recommendations.

2. Literature Review

The strategic plan of Saudi Arabia's Vision 2030 aspires to dissociate the nation's economy from its dependence on revenues from the oil sector by executing different social and economic initiatives. The prime economic target of Vision 2030 introduced in 2016 incorporates raising the contribution of the private sector to the economic growth from 40% to 65%, increasing the proportion of non-oil exports in non-oil gross domestic product from 16% to 60%, and depleting the unemployment rate from 11.6% to 7% by 2030. Several previous studies in the literature have been organized to observe the linkage between non-oil exports and economic growth. The findings of these past studies differ from one to another, due to the use of different methodological approaches, time frames, and also the parameters taken in the framework.

The predominantly reliance on petroleum-based products and oil resources may incur numerous externalities and difficulties for the economies amidst the era of crisis, recession, and the oil price collapse in the foreign market. Raid et al. (2024) investigated the impact of non-oil institutional sectors on the economic growth of Saudi Arabia from 1970 to 2020 by employing Vector Auto-Regressive (VAR) and variance decomposition and they found that the growth of the oil sector is highly susceptible to shocks and negatively affecting the economic growth

while the growth of non-oil sector had more stability and reduces the adverse shocks on GDP. Similarly, Hasanov et al. (2022) examined the role of non-oil exports on the economy of Saudi Arabia by using the co-integration technique over the time frame 1983-2018. The findings of their study supported the concept of export-led growth while they didn't find any evidence of the Dutch disease.

Parvin Hosseini and Tang (2014) analyzed the effect of oil exports and non-oil exports on the GDP of Iran by applying multivariate co-integration and Granger Causality test and used annual data from 1970 to 2018. They concluded that oil exports have adversely affected economic growth, indicating an increase in non-oil activities. Consequently, they also reveal a unidirectional causal relationship between non-oil exports and economic growth. In addition, Adeniyi Aladejare and Saidi (2014) advocated that the influence of economic crises across the world urgently requires economic diversification in the Nigerian economy and their study found the substantial influence of non-oil exports in the short-run as well as in the long run through using bound test method. On the other hand, Aderemi et al. (2019) revealed that significant long-term association between oil exports and FDI in Nigeria by employing the Vector Error Correction Model (VECM) during the period 1990-2016.

Alam and Haque (2017) the factors of economic growth in Saudi Arabia and used the error correction model from 1985 to 2014. Their study found gross capital formation, public expenditure, imports, and exports are significant contributors to the economic growth of Saudi Arabia in the long run. However, Elneel, and AlMulhim (2022) investigated the impact of oil price shock on economic growth by using Auto Regressive Distributed Lag (ARDL) approach and revealed that oil price shock had an adverse impact on the economic growth during the period 1969-2019, which urge the need of economic diversification for the oil-dependent countries and meet the objectives of vision 2030. Furthermore, Waheed et al. (2022) used the ARDL bound test over the quarterly data from 1980q1 to 2017q4 and found tourism, capital formation, and renewable energy have long-term integrating relationship with the economic growth of Saudi Arabia. Similarly, Nwodo and Asogwa (2017) also revealed a positive long-run association between non-oil exports and the economic growth of Nigeria while a negative significant impact of trade openness on the Nigerian economy by using the ARDL approach. Correspondingly, Mathew et al. (2017) also discovered a positive and significant long-run connection between economic growth and non-oil exports in Nigeria. Moreover, Manikandan and Rajarathinam (2019) provided evidence of export-led growth by highlighting the bi-directional causality between economic growth and exports. However, Ekwunife et al (2021) employed the Ordinary Least Square (OLS) procedure to test the impact of non-oil exports on the economy of Nigeria and they discovered that non-oil exports insignificantly affected the economic growth of Nigeria during the period 1986 to 2018. Thus, their study suggested that the financial services for non-oil exporters should be moderate and provided at affordable cost.

3. Data and Methodology

This study employed secondary data sources. The data were obtained from the annual statistics reports published by the Saudi Arabia Monetary Authority for the period 2000 to 2022. This study incorporates six variables such as growth rates of gross domestic product (GDPgrowth), non-oil exports (NOX), growth rate of gross capital formation (GCF), real effective exchange rates (REER), and oil exports (OX). To conduct a time series analysis, the chosen study period is long enough for drawing valid statistical inferences. Log transformation of all the variables is used in the study to eliminate the heteroscedasticity problem.

3.1 Model Specification

The model for this study is specified in the functional form as follows;

$$GDP = f(NOX, REER, OX, GCF)$$

To analyze the influence of non-oil exports on the economic growth of Saudi Arabia, the econometric model of the study is specified as,

$$lnGDPgrowth_t = \alpha_0 + \beta_1 lnNOX_t + \beta_2 lnGCF_t + \beta_3 lnOX_t + \beta_4 lnREER_t + \varepsilon_t \quad (1)$$

Where;

$lnGDPgrowth_t$ indicates the log of gross domestic product,

$lnNOX_t$ represents the log of non-oil exports,

$lnGCF_t$ shows the log of gross capital formation, $lnOX_t$ denotes the log of oil exports,

$lnREER_t$ infers the log of the real exchange rate at time t. and,

ε_t stochastic error term.

The log of growth of GDP (lnGDP growth) is the dependent variable of the study while the log of non-oil

exports (lnNOX), gross capital formation (lnGCF), oil exports (lnOX), and real exchange rate (lnREER) are the explanatory variables. This study incorporated exports (non-oil exports and oil exports) based on the export-led growth hypothesis that posits exports drive growth. It is expected that non-oil exports (comprising manufacturing and agricultural exports) have a positive and significant impact on economic growth (Okoh, 2004). Moreover, oil exports are also expected to encourage economic growth as it is a source of foreign exchange that supports the import of essential products and promotes economic growth (Sultan and Haque, 2018). The theory of endogenous growth postulates that capital is among the most important determinants of economic growth particularly, in emerging nations. Thus, gross capital formation is used as a proxy for capital investment in the economy (including spending on land improvement, machinery, plant, and equipment) and it is expected to foster growth and productivity by providing incentives for technological innovation. Meanwhile, the real exchange rate is used as a measure of competitiveness and is expected to have a positive long-run relationship with GDP if it depreciates (and vice versa) (Hasanov et. al, 2022).

To determine the long-run relationship between the variables we need to select between employing the Vector Error Correction Model (VECM) and the Vector Auto Regressive Model (VAR). When all the variables are stationary at levels (order of integration of 0) and co-integration is not present between the variables, then the VAR model is the most suitable while, when each variables have unit roots at levels and becomes stationary after first differencing [I (1)] and also co-integration present between them, thus indicating that VECM model is the appropriate model to be employed. Thus, the study used time series data, directly running the regression analysis and examining the R-square, t, and F-statistics to predict the validity of the estimated model can result in unbiased results. Therefore, the stationarity test is a prerequisite before employing the VAR or VECM model to check the stationarity of each series. So, this study conducted Augmented Dicky Fuller (ADF) unit root test by considering the aforementioned restriction with time series data. ADF test is employed to test the stationary of each variable incorporated in the analysis in the form of a natural log.

3.2 Augmented Dickey-Fuller Test

The ADF test was applied to check the unit roots on each series and for this purpose, the model is as follows,

$$\Delta y_t = \alpha_0 + \delta Y_{t-1} + \sum_{i=1}^{m} \gamma_i \Delta Y_{t-i} + \mu_t \quad (2)$$

Where:

y_t represents the series of y in time t,

α_0 is the constant term,

μ_t is the white noise term.

The null hypothesis of the ADF unit root test; H_0: $\delta = 0$, indicates that if the absolute value of t-statistics is greater than the critical value at the preferred level of significance, we can discard the null hypothesis which demonstrates that the series under examination are stationary.

3.3 Johansen Co-Integration Test

The co-integration test proposed by Johansen (1995) is the most usual procedure to compute co-integration between the variables of time series data. For n variables with order of integration 1 to be represented together, they may have an n-1 co-integrating association which is known as rank. The null hypothesis (r=0) is to be tested against the alternative hypothesis ($r \geq 1$), for evaluating rank 1 of co-integration. On the failure to reject (r=0), infers that there is no co-integration association among the variables, further examination entails the VAR model. On the other hand, the dismissal of the null hypothesis (r=0), implies that the existence of a co-integration association, VECM is to be estimated for further analysis.

The procedure of the Johansen co-integration test employs trace (λ_{trace}) and maximum (λ_{max}) eigenvalues statistics to examine the number of co-integrating vectors. The null hypothesis of no co-integration for the trace (λ_{trace}) test statistics is rejected if the calculated trace statistics exceed the critical values. Trace statistics are specified as follows,

$$\lambda_{trace}(r) = -T \sum \ln[1 - \lambda i] \quad (3)$$

Where;

T is the number of observations,

λi is the eigenvalues.

The maximum eigenvalues statistics are given by the following,

$$\lambda_{max}\,(r, r+1) = -\,T \ln [1- \lambda_{r+1}\ ] \quad (4)$$

The H_0 of maximum statistics implies that the number of co-integrating vectors (r) is in contradiction of H_1 which states that there are r +1 co-integrating vectors, implying that if maximum eigenvalues exceed the critical values at 5%, co-integration exists between the variables.

3.4 Vector Error Correction Model (VECM)

If the co-integrating relationship is observed through the Johansen Co-integration test, then it exhibits a presence of long-run equilibrium association among the variables. VECM is used to examine the both long-run and short-run association among the variables. However, if there is no co-integration present between the series, then VECM is an abridged form of the VAR model. The VECM model in a regression equation form is given as,

$$\Delta lnGDPgrowth_t = \alpha_1 + \sum_{i=0}^{n} \beta_i\, \Delta lnGDPgrowth_{t-i} + \sum_{i=0}^{n} \delta_i \Delta lnNOX_{t-i} + \sum_{i=0}^{n} \theta_i \Delta lnGCF_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta lnREER_{t-i} + + + \sum_{i=1}^{n} \vartheta_i \Delta lnOX_{t-i} + \lambda_1\, ECT_{t-1} + \mu_{1t} \quad (5)$$

$$\Delta lnNOX_t = \alpha_2 + \sum_{i=0}^{n} \beta_i\, \Delta lnGDPgrowth_{t-i} + \sum_{i=0}^{n} \delta_i \Delta lnNOX_{t-i} + \sum_{i=0}^{n} \theta_i \Delta lnGCF_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta lnREER_{t-i} + + + \sum_{i=1}^{n} \vartheta_i \Delta lnOX_{t-i} + \lambda_2\, ECT_{t-1} + \mu_{2t} \quad (6)$$

$$\Delta lnGCF_t = \alpha_3 + \sum_{i=0}^{n} \beta_i\, \Delta lnGDPgrowth_{t-i} + \sum_{i=0}^{n} \delta_i \Delta lnNOX_{t-i} + \sum_{i=0}^{n} \theta_i \Delta lnGCF_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta lnREER_{t-i} + + + \sum_{i=1}^{n} \vartheta_i \Delta lnOX_{t-i} + \lambda_3\, ECT_{t-1} + \mu_{3t} \quad (7)$$

$$\Delta lnREER_t = \alpha_4 + \sum_{i=0}^{n} \beta_i\, \Delta lnGDPgrowth_{t-i} + \sum_{i=0}^{n} \delta_i \Delta lnNOX_{t-i} + \sum_{i=0}^{n} \theta_i \Delta lnGCF_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta lnreer_{t-i} + + + \sum_{i=1}^{n} \vartheta_i \Delta lnox_{t-i} + \lambda_4\, ECT_{t-1} + \mu_{4t} \quad (8)$$

$$\Delta lnOX_t = \alpha_5 + \sum_{i=0}^{n} \beta_i\, \Delta lnGDPgrowth_{t-i} + \sum_{i=0}^{n} \delta_i \Delta lnNOX_{t-i} + \sum_{i=0}^{n} \theta_i \Delta lnGCF_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta lnREER_{t-i} + + + \sum_{i=1}^{n} \vartheta_i \Delta lnOX_{t-i} + \lambda_5\, ECT_{t-1} + \mu_{5t} \quad (9)$$

The above equations show the error correction term (ECT_{t-1}) in addition to the study variables, which implies the lagged value of the previous value computed from co-integrating vectors. The significant value of ECT_{t-1} demonstrates the rate of adjustment of the variables toward long-run equilibrium after fluctuation among the variables in the short run. μ_{it} is the normally distributed and serially uncorrelated residual term.

4. Empirical Results

This section demonstrated the empirical analysis to examine the association between the non-oil exports and economic growth of Saudi Arabia during the period 2000 to 2022. Table 1 presents the descriptive statistics of the study variables. To test the stationarity of the time series data, a preliminary examination of data is performed through the Augmented Dickey-Fuller (ADF) test. Furthermore, the Johansen Co-integration test is applied to establish the most suitable model for observed time series variables. Meanwhile, the findings of the VECM model are interpreted and specified, and then post-estimation analysis is also used to check the serial correlation, heterogeneity, and normality distribution.

Table 1. Descriptive Statistics

Variables	Mean	Standard Deviation	Min	Max
GDPgrowth	2062.522	1006.714	21.49	4155.6
NOX	149075	83395.3	24809	315663
REER	103.3391	13.29738	78.5	123.2
OX	717948.3	330016.5	224205	1265550
GCF	25.07087	4.948367	18.2	35.1

4.1 Testing for Stationarity

To check whether the variables have unit roots or are stationary, the Augmented Dickey-Fuller (ADF) test was employed. Table 2 presents the findings of the ADF test, indicating that all variables have unit roots (non-stationary) at levels which means that the first differencing of the series has to be used to acquire the stationarity in the variables. After, the first differencing, it observed that all variables become stationary, inferring that all variables have an order of integration 1 [I (0)]. When all the variables are integrated at 1, this indicates that the series may proceed toward the long-run equilibrium, however, they can substantially diverge from the equilibrium in the short-run. An analysis of long-run association among the variables is elementary to observe

the co-integration among the series.

Table 2. ADF Unit Root Test

Variables	Level	First Difference
lnGDPgrowth	-1.675	-9.379
	(0.4438)	(0.0000)
lnNOX	-1.959	-3.016
	(0.3048)	(0.0334)
lnREER	-1.250	-3.385
	(0.6519)	(0.0115)
lnGCF	-1.725	-3.362
	(0.4181)	(0.0123)
lnOX	-2.401	-3.721
	(0.1415)	(0.0038)

Note: Values in brackets indicate the p-values

4.2 Co-integration Test

The analysis of co-integration observed if the series have similar long-run co-integrating rank or they are integrated. In other words, co-integration associations are elucidated as the long-run equilibrium association among the series. To examine the long-term co-integration between economic growth and non-oil exports, the study followed the Johansen Co-integration test (1991). This co-integration test is a multivariate abstraction from the ADF test, which permits to examination of a linear combination of non-stationary variables and the establishment of various co-integration associations among the variables. The selection of lag length is demonstrated in Table 3. To select the optimal lag order, we examine the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQ), and the Final Prediction Error (FPE). The findings of Table 3 indicated that all the above-mentioned criteria (except FPE) imply an optimal lag length of 3, the model is then to be employed of order 3 for further analysis.

Table 3. Lag-Order Selection Criteria

Lags	LL	LR	p	FPE	AIC	HQIC	SBIC
0	41.8502			6.0e-11	-6.51822	-6.65503	-6.30118
1	506.159	928.62	0.000	3.6e-44*	-84.3926	-85.3503	-82.8734
2	2117.38	3222.4	0.000	..	-372.978	-374.483	-370.591
3	2158.03	81.299*	0.000	..	-380.369*	-381.874*	-377.982*
5	2146.92	-22.212	..	..	-378.35	-379.855	-375.962

Tables 4 and 5 provide the findings of the Johansen Co-integration test based on trace and maximum eigenvalues statistics respectively. Both these statistics verify the presence of five co-integrating vectors among the variables, indicating the presence of long-term association between the series. This result reveals that a suitable model to fit in the data is the Vector Error Correction Model.

Table 4. Co-integration based on Trace of the Stochastic Matrix

Hypothesize no. of CE(s)	Eigenvalues	Trace Statistics	5% Critical values
None	.	766.2505*	68.52
At most 1	1.00000	114.6922*	47.21
At most 2	0.94711	55.9009*	29.68
At most 3	0.73087	29.6495*	15.41
At most 4	0.65422	8.4104*	3.76
At most 5	0.34329		

Note: * denotes rejection of the hypothesis at the 5% level, the trace test indicates five co-integration associations.

Table 5. Co-integration based on Maximum eigenvalues of the Stochastic Matrix

Hypothesize no. of CE(s)	Eigenvalues	Max-Eigenvalues	5% Critical values
None	.	651.5583*	33.46
At most 1	1.00000	58.7913*	27.07
At most 2	0.94711	26.2513*	20.97
At most 3	0.73087	21.2391*	14.07
At most 4	0.65422	8.4104*	3.76
At most 5	0.34329		

Note: * denotes rejection of the hypothesis at the 5% level, the maximal eigenvalues test indicates five co-integration associations.

4.3 Vector Error Correction Model (VECM)

The existence of co-integration between the variables implies that there is a long-term association between them. Therefore, the VECM approach is the most suitable for establishing the association between GDP growth, non-oil exports, real effective exchange rate, oil exports, and gross capital formation. In addition, VECM advocates both long-run and short-run relationships, and how those variables proceed toward long-term equilibrium after divergence. Table 6 demonstrates the results of a long-run relationship between the variables and indicates that all variables including, non-oil exports, real effective exchange rate, oil exports, and gross capital formation have highly significant long-term associations with economic growth. It was observed in the following table that non-oil exports have a positive long-term relationship with the economic growth of Saudi Arabia as a 1% increase in non-oil exports is probably increase economic growth by 1.9%, all else constant. Similarly, a 1% raise in gross capital formation increases GDP growth by 2.1%. On the other hand, the real effective exchange rate and oil exports exhibit a negative long-run association with the GDP growth rates as a 1% increase in the real effective exchange rate and oil exports leads to a decrease in GDP growth rates by 6.45% and 0.57% respectively, all else constant.

Table 6. Long-run Co-Integrating Relationship

Variables	Coefficient	Standard Error	z	P>|z|
lnNOX	-1.92509	.1080485	-17.82	0.000
lnREER	6.456891	.5053747	12.78	0.000
lnOX	.5791279	.1246722	4.65	0.000
lnGCF	-2.138161	.3574031	-5.98	0.000
_cons	-15.76357	.	.	.

The findings of discrete adjustment of the parameters towards the long-term equilibrium after the divergence in the short run are presented in Table 7. It is observed that GDP growth shows the fastest adjustment towards the long-term equilibrium (with the rate of 1.46%) than all other variables if the economy diverges from the equilibrium in the short run. Therefore, it is anticipated that GDP growth relies on the other indicators to accelerate so it should reciprocate swiftly than other independent variables. On the other hand, gross capital formation shows the lowest responding speed towards the long–run equilibrium with a rate of 0.1%.

Table 7. Short-run Adjustment Parameters

Error Correction	Coefficient	Standard Error	z	P>|z|
D_lnGDPgrowth _ce1 L1.	-1.467887	.2163241	-6.79	0.000
D_lnNOX _ce1 L1.	-.0923083	.0689455	-1.34	0.181
D_lnREER _ce1 L1.	.0746736	.0316395	-2.36	0.018
D_lnOX _ce1 L1.	-.1886936	.1760862	-1.07	0.284
D_lnGCF _ce1 L1.	.0113449	.0540029	0.21	0.834

4.4 Post-estimation Analysis

The robustness of the model was checked by performing a post-estimation analysis of the model to establish the between the observed variables. The autocorrelation in the error term in the vector error correction model (VECM) is tested by employing the Lagrange Multiplier test and the findings are demonstrated in Table 8. The findings of the Lagrange multiplier test for serial autocorrelation reveal that the model has no autocorrelation as the p-value exceeds 5% which indicates the acceptance of the null hypothesis of no autocorrelation. Therefore, the model was well-defined regarding the number of lags and had finite-sample biases in the estimation of the variables.

Table 8. Lagrange Multiplier for Autocorrelation

Lags	chi2	Prob > chi2
1	16.5240	0.89833
2	24.9518	0.46508

H0: no autocorrelation at lag order

The findings of the Jarque-Bera test are shown in Table 9, implying that the overall probability value of the Jarque-Bera test exceeds 5%, indicating that residuals because of the VECM model are normally distributed. This test also shows the desirable quality of the model.

Table 9. Jarque-Bera test for Normality

Equations	chi2	Prob > chi2
D_lnGDPgrowth	0.561	0.75531
D_lnNOX	0.260	0.87788
D_lnREER	0.029	0.98561
D_lnOX	2.472	0.29059
D_lnGCF	0.805	0.66861
	4.127	0.94141

To analyze the number of co-integrating equations that are appropriately identified, the study tests the stability condition of the stated VECM. Therefore, the results of Table 10 revealed that the modulus of each eigenvalue is rigorously less than 1, implying that the estimated VECM is stable.

Table 10. Stability Condition for VECM Estimates

Eigenvalues	Modulus
1	1
1	1
1	1
1	1
-.388815 + .462992i	.604598
-.388815 - .462992i	.604598
-.2214903 + .5116233i	.557509
-.2214903 - .5116233i	.557509
.3678916 + .3056237i	.478278
.3678916 - .3056237i	.478278

The stability of the long-term estimators is examined through short-run dynamics and it is anticipated that the macroeconomic data of Saudi Arabia may be subject to structural break. Therefore, the stability of the computed short-run and long-term parameters is examined through cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) tests proposed by Brown et. al (1975). Chow test for stability needs preceding information on structural breaks in the period of estimation while CUSUM and CUSUMSQ tests do not need preceding information on the occurrence of the structural break (Ozturk and Acaravci, 2013). Figures 1 and 2 plot the statistics of the CUSUM and CUSUMSQ tests. The outcome reveals that estimated parameters are stable over the period 2000-2022, as the statistics of the CUSUM and CUSUMSQ test fall within the critical bound of a 5% significance level.

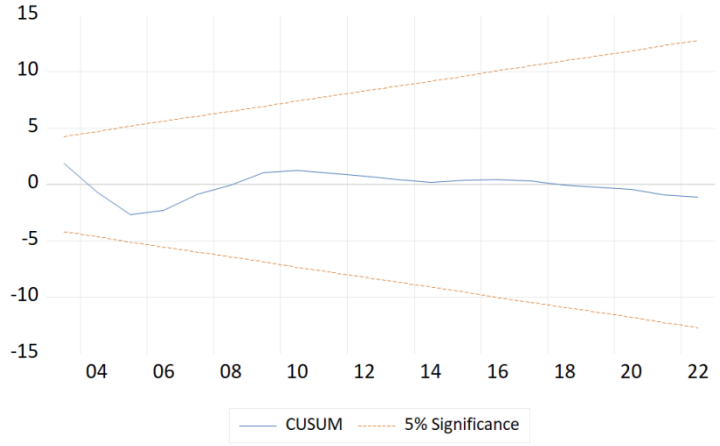

Figure 1. Plots of stability tests of recursive estimates (OLS) using the CUSUM test

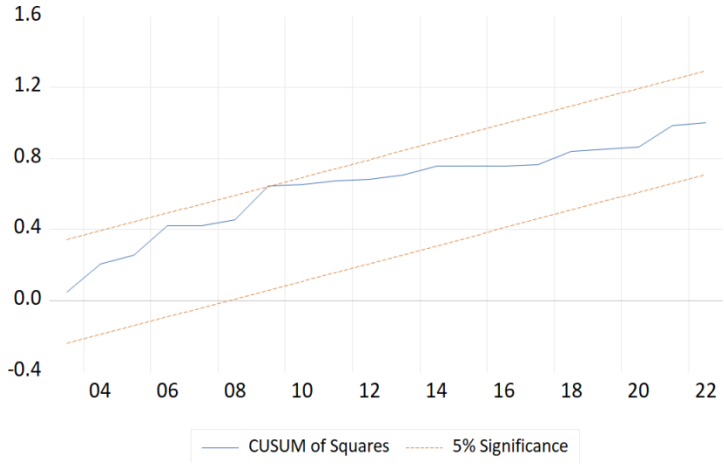

Figure 2. Plots of stability tests of recursive estimates (OLS) using the CUSUM of Squares test

5. Discussion

This research demonstrates the significance of exports to economic growth, as advocated through existing empirical evidence and theory. The oil sector and its impact are substantially dominant in the economy of Saudi Arabia. It is observable that when the country has been distinguished into two parts (oil and non-oil) their estimated findings suggested that the oil sector has a large contribution towards the growth of the economy. However, oil sectors are more vulnerable to price shocks and the stability in the growth rates of the non-oil sector can reduce the vulnerability of the economies to undesirable shocks. Throughout the seventies era, because of the increase in oil prices in the international market, the sales of oil increased and the production of oil in Saudi also increased. This has derived the dominancy of the oil sector in Saudi Arabia and the economy has experienced the risks of complete reliance on the oil sector (Raid et al, 2024). However, all consecutive roadmaps target the diversification of economic resources by expanding the influence of other dynamic sectors on sustainable economic growth.

Based on the empirical results, we found that all the variables have unit roots at their log level whereas, they are stationary at the first order of integration I (0), Thus, the stationarity of the variables indicates that they have a common stochastic trend and they have long-run association. The results of the vector error correction model demonstrate that all variables including, non-oil exports, real effective exchange rate, gross capital formation, and oil exports have a highly statistically significant long-run relationship with economic growth. Furthermore, non-oil exports have a positive significant impact on economic growth and the findings of our study were consistent with the previous studies (Fadol, 2020; Hasanov et al., 2022; Raid et al., 2024). It signifies that diversification of the economic resources apart from oil resources is progressively attaining beneficial outcomes in Saudi Arabia. However, the study of Raheen & Busari (2013) and Ekwunife et al. (2021) did not support our result as they found a negative and insignificant impact on non-oil exports and economic growth. On the other hand, we found a negative long-run association between oil exports and economic growth. This outcome of our study is supported by the study of Parvin Hosseini and Tang (2014) as they highlighted that oil export and economic growth are inversely related in Iran due to revenue from these natural resources is commonly mishandled and is not channelized into useful sectors that can effectively encourage economic growth. Moreover, a real effective exchange rate also has a negative impact on economic growth as the effect of the exchange rate is based on the openness of financial trading and exchange rate regime. Jamil et al., 2023 also found a negative impact of exchange rates on the economic growth of developing nations. On the other hand, gross capital formation has a positive long-run association with the economic growth of Saudi Arabia. However, the short-run estimation of the VECM approach indicated a significant short-run association of economic growth with only real effective exchange rates. Moreover, the post-diagnostic estimation demonstrated the study framework of the VECM model. It is observed that our study model has no autocorrelation, is normally distributed, and has stable conditions.

6. Conclusion and Recommendations

The Saudi Vision 2030 targets economic diversification as reliance on one source of revenue can impose difficulties for long-term economic growth. However, this study examined the role of non-oil exports in achieving long-term economic growth in Saudi Arabia. To conduct the study, we used the Johansen-Juselius

co-integration approach and Vector Error Correction Model for the period 2000-2022. The test of Johansen-Juselius co-integration reveals that economic growth, non-oil exports, real effective exchange rate, oil exports, and gross capital formation all are co-integrated. This signifies the long-run stable association between them. Thus, the vector error correction model is employed to establish a long-term relationship between the variables. indicating the appropriate model for further analysis is VECM. The findings of the VECM approach discovered that non-oil exports and gross capital formation have a positive impact on economic growth. Whereas, real effective exchange rates and oil exports have a significant negative impact on economic growth long-run.

6.1 Policy Recommendation

Based on the findings of the research, it is important to suggest policies to the policymakers and regulators to pay more attention to diversifying the economy by expanding non-oil sectors in such a manner that they can effectively play their role in exportation and attract more foreign exchange to support the growth and development of the economy. Following are the ways that they can adopt to expand non-oil exports.

i. To keep the competitiveness of the non-oil exports, the government should appropriately manage the interest rate and exchange rate as a beneficial interest rate would decrease the production cost for producers in the non-oil sectors similarly a good stable exchange rate would favorably compete in the foreign market.
ii. Through the control of monetary policy, support the producers of non-oil sectors by providing loans at minimal interest rates.
iii. Makes and implements favorable regulations and laws for domestic and international stakeholders so that they can easily participate in the non-oil sectors such as manufacturing, agriculture, and solid materials.
iv. The sub-components of non-oil sectors (agriculture, services, SMEs, and mining) should be considered as prime concerns regarding infrastructural development due to their instant return to the country.

Acknowledgments

Not applicable

Authors contributions

This is a single author paper, Dr S.S.K contributed in all aspects

Funding

This research is not funded by any resource.

Competing interests

Not applicable

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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