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The Impact of Global Oil Prices shocks on Economic Growth of the Kingdom of Saudi Arabia in The Light of Vision 2030

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ABSTRACT

This study investigates the impact of oil prices shocks on economic growth of KSA in the light of Vision 2030 using multivariate analysis of a combination of Vector Error Correction Model (VECM) and Autoregressive Distributed Lag (ARDL). It focuses on global oil prices, non- oil exports, total reserves, local net investment, foreign direct investment and balance of payments on economic growth from 1969-2019. The data are obtained from World Bank in the open data website. The results show among others that non-oil exports, foreign direct investment and total reserves affect economic growth in the short-run positively, while global oil prices, local investment and external balance of payments affect economic growth negatively in the short-run, where 63% of disequilibrium in short run is corrected in one year. It concludes that only non-oil exports have long-run significant positive relationship and impact on economic growth, while global oil prices, local investment and foreign direct investment affect economic growth negatively and significantly in the long-run, where non-oil exports positively affects economic growth significantly in the short-run as well as in the long run and the oil prices shocks and local investment negatively affect economic growth significantly in the short-run as well as in the long run. One of the recommendations is that policy makers should create policy framework that will effectively shrinkage the negative impacts of oil prices shocks on economic growth in long-run through economic diversification with focus on the non-oil exports, encouraging local investments that increase employment opportunities, increase production and productivity.

Keywords: *Oil Prices shocks, Economic Growth, KSA, Vision 2030, ARDL, VECM.*

INTRODUCTION

The importance of oil in the Kingdom of Saudi Arabia is essential by means of providing the necessary financial surpluses to finance economic and social development plans, where oil plays a vital role in determining the path and nature of development in the Kingdom of Saudi Arabia from the early 1970s to the present. In this regard, Yusif and Sayigh (1983) highlighted that the

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importance of oil came as a strategic commodity, as it is considered an essential product in the industry and has an effective impact on various economic sectors, such as financial and banking activity. However, oil is an important commodity in international trade and a major source of income for the Kingdom of Saudi Arabia, which leads to the accumulation of large financial surpluses that have had and still have a major impact on economic growth and development, particularly in the industry and services sectors.

The relationship between oil prices and economic growth has a long history. Therefore, the Kingdom of Saudi Arabia, like other countries affected by the shocks in world oil prices, has tried to avoid the negative effects on economic growth, especially in the long term through Vision 2030. The key focus for Vision 2030 is increasing an environment which reveals business opportunities, broadens the economic base, and creates jobs for all Saudis to achieve this, by leveraging Saudi Arabia's unique location and potential, attracting the best talent, and increasing foreign investment, launching promising sectors and to support promising sectors and foster their success so that they become new pillars of the economy in the manufacturing sector to work towards localizing renewable energy and industrial taking in priority diversifying the economy which is vital for its sustainability, although oil and gas are essential pillars of the economy, they have begun expanding the investments into additional sectors (https://vision2030.gov.sa/).

Khan and Hampton (1990) arguments were joint on the negative impact of oil price shocks on the economic growth of oil exporting countries through their impact on the financial surpluses required to finance economic and social development, and this leads to a weakening of the ability of some countries to meet their development obligations.

Brichs (2012) has shown that oil is still the most important resource and economic power that controls the development process in Arab countries in general and Saudi Arabia in particular. So, the development experiences in the past two decades have shown that Arab oil practiced and still uses direct and indirect effects on most of the factors that affect development in Arab countries and on incentives for economic integration among them, and that it contributes an effective contribution to economic development by providing it with the foreign currencies necessary to finance goods and services Consumerism and Capitalism, being a strategic product that can be used to build a large industrial base as one of the production elements needed for any industry. Also, Onyemelukwe (2015) has shown that the oil reserve is

considered one of the most important factors that affect economic development, as the abundance of oil reserves helps countries in setting their future development plans, achieving an increase and efficiency in the growth and development rates, and thus an increase in the per capita income through which society is richer.

However, there are many theories that focus on natural resources in general, the most important of which are oil. Classical theory according to Adam Smith, which consecrates economic growth and development in the scarcity of natural resources, as well as the new classical theory (Alfred Marshall, Fexel, Clark) that economic growth and development depend on the amount of production elements available in society (work, capital, land or natural resources). Likewise, the narcissist theory, where Narksis called for reliance on domestic natural resources in the first place for economic development, due to lack of confidence in foreign investment and foreign trade, because the terms of trade is in favor of developing countries (compiled from Barbier, 2014).

As mentioned above, there are many studies that have conducted this issue, some in Arab countries, some of which are global, examining the impact of oil price shocks on the economic growth of countries; the most important of these studies which we have listed as follows. IMF 2016 study found that the oil sector in Arab countries reliance on oil exposes revenues and output to fluctuations in oil prices exacerbate macroeconomic volatility and also it should to be considered an exhaustible resource. So, oil countries need to develop adequate non-oil sectors before their oil reserves to diversified economy through policies and additional strategies to develop domestic technological capabilities, enhance natural resource processing, and improve the competitiveness of non-oil exports. This study reflects that the recent drop in oil prices has also put pressure on government resources of oil countries, making the context of economic diversification difficult, but also more urgent; which recommends that the policy-makers should push simultaneously to protect financial sustainability while pushing forward to facilitate economic diversification.

Zied, et.al, 2016 examined the degree of interdependence between oil prices and economic activity growth for four major countries (United Arab Emirates, Kuwait, Saudi Arabia, and Venezuela) in the Organization of the Petroleum Exporting Countries (OPEC) over the period from 3 September 2000 to 3 December 2010 in short-run and medium-run and long-run; have

shown that oil price shocks in periods during period of fluctuations in the global business cycle and/or financial turmoil affect the relationship between oil and economic growth in OPEC countries. Also, Sayed 2016 discusses the impact of oil prices on the economic growth and development in the Middle East and North Africa (MENA) countries; highlighted that volatilities in oil prices have considerable effects on macro economy of both developed and developing countries. So, these volatilities can affect economic growth through affecting cost of production, consumer spending, and exchange rate that is in turn affect international trade. whereas MENA region is sensitive to changes in oil prices simply because some member countries are major producers and exporters who likely to hardly hit by lower oil prices as a great portion of their revenues come from oil exports and hence effecting negatively on the economic growth and socioeconomic development of these countries.

Khan, Khalid, Ali K., Ali S. and Kiran (2017) investigate the effect of crude oil prices on economic growth in the presence of controlled variables remittances, political instability and household consumption in case of Pakistan, analyzed the effect of both pre and post oil prices hike of 2008 and its impact on economic growth in case of Pakistan economy, uses Structural Break Point Unit root test to check the structural break and Structural Break Dummy variables to analyze the effect of both pre and post oil prices hype on Pakistan economic growth. The empirical results of this study indicate that the exists negative relationship between crude oil prices and economic growth. So, structural break dummy verifies a visible change in economic growth, both pre and post oil prices hype, and also verified positive relationship between remittances inflow and economic growth with exist negative relationship between political instability and economic growth of Pakistan.

Yousif and Alsultan (2018) study the relationship between oil price and some macroeconomic indicators of Saudi Arabia used the co-integration test and VECM of data from (1970-2016); has shown that there is a long run relationship between oil prices and real GDP with weak short run interactions, where rising of oil prices are negatively correlated with real GDP in the long run and rising of oil prices may lead to a lower demand for oil in the long run, which will negatively affect government revenue and real GDP growth. So, the short run results suggest a positive relation between oil prices and real GDP. Also, highlighted the rising demand in the short run will increase returns from oil export for the exporting countries. where, the oil price shocks have significant impact on real GDP in Saudi Arabia, which means the economy of

Saudi Arabia will become highly volatile if depends on oil revenue as a major source of income. So, diversifying sources of income is highly required in this case.

The study of Mukhtarov, Aliyev and Zeynalov (2020) investigates the impact of oil prices on economic growth, export, inflation and exchange rate in Azerbaijan, employing Johansen cointegration and VECM methods to the data spanning from January, 2005 to January, 2019. The results of this study has shown that, from the Johansen cointegration method confirm the presence of a long-run relationship among the variables; where from impulse-response and variance decomposition tests reveal that there is a positive and statistically significant impact of oil prices on economic growth, export and inflation for the Azerbaijani case. Also, found that oil prices have a negative impact on exchange rate. So, recommends policy makers to comprehend the role of oil price shocks on economy in the case of Azerbaijan and other developing oil-rich countries.

Kamiar and Niranjana, (2020) develop a quarterly macro-econometric model for the Saudi economy over the period 1981Q2- 2018Q2 and integrate it within a compact model of the world economy (including the global oil market). Where, this framework enables us to disentangle the size and speed of the transmission of growth shocks originating from the United States, China and the world economy to Saudi Arabia, as well as study the implications of stress in global financial markets, low oil prices and domestic fiscal adjustment on the Saudi economy. The results of this study show that Saudi Arabia's economy is more sensitive to developments in China than to shocks in the United States-in line with the direction of evolving trade patterns and China's growing role in the global oil market. Also, illustrate that a 10 percent lower oil prices and stress in global financial markets could both have a negative effect on the Saudi economy, but given the prevailing social contract in Saudi Arabia, their impact is countered by fiscal easing. So, they argue that a domestic fiscal adjustment in Saudi Arabia does not show a negative impact on economic growth in the data; were the impact on growth would depend upon the quality of fiscal adjustment and whether it is complemented with structural reforms or not.

The distinguishes of this study from previous studies is that it combined of using multivariate a comparison of VECM and ARDL analysis. In addition to that it examined the impact of oil on economic growth with the impact of other factors affecting economic growth in the Kingdom of Saudi Arabia in

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the light of Vision 2030, which the vision believes is one of the most important alternatives instead of oil to maintain and continue economic growth and socioeconomic development, which foreign direct investment (FDI) and non-oil exports (NOX). However, this study agreed with all studies reviewed (Sayed 2016, IMF 2016, and Zied, *et.al*, 2016; Khan, *et al*, 2017; Yousif and Alsultan, 2018; Mukhtarov, Aliyev and Zeynalov, 2020) that the oil prices shocks affecting economic growth negatively in long run. Which requires from policymakers to diversified economy through policies and additional strategies to develop domestic technological capabilities, enhance natural resource processing, and improve the competitiveness of non-oil exports.

The approach in this study is to analyze the impact of oil prices shocks and other macroeconomic variables on economic growth in Saudi Arabia, which consider the data from 1969 to2019 in the light of vision 2030. In line with above, the question remains as to whether oil prices shocks have permanent effect on economic growth. Moreover, do non-oil exports, foreign direct investment, local investment, capital formation and balance of payments have a respectable deviations policies let the economic growth un effecting negatively by oil prices shocks, so as the vision 2030 contemplate.

METHOD

This study investigates in the light of Vision 2030 the impact of oil prices shocks on economic growth in KSA. More prissily, the study aims to investigate the impact of global oil prices (OPG), non-oil exports (NOX), total reserves (TRS), local net investment (LVS), foreign direct investment (FDI) and balance of payments (BOP) and its impact of economic growth (GDP) from the period of 1969-2019 by combing of the VECM and ARDL model using Eviews 9 software for computation where the data are obtained from World Bank in the open data website. The empirical specification for the model can be quantified as:

$$GDP = \hat{a}_0 + \hat{a}_1 OPG + \hat{a}_2 NOX + \hat{a}_3 FDI + \hat{a}_4 LVS + \hat{a}_5 TRS + \hat{a}_6 BoP + £ \quad —(1)$$

Where:

GDP: GDP (constant 2010 US$).
OPG: OPIC average crude global oil prices (Barrel/$).
NOX: Non- Oil Exports (current US$).

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FDI: Foreign direct investment, net inflows (BoP, current US$)
LVS: Portfolio investment, net (BoP, current US$).
TRS: Total reserves (current US$).
BoP: Net trade in goods (BoP, current US$).
â$_s$: Parameters.
£: Standard Error.using data from 1969-2019.
VECM:

$$\left[\Delta GDP = \alpha + \sum_{i=1}^{m} \beta_i \Delta OPG_{t-i} + \sum_{k=1}^{0} \delta \Delta FDI + \sum_{l=1}^{p} \zeta \Delta NOX + LVS_t + \zeta \Delta TRS + \zeta \Delta BOP - i + \theta Z_{t-1} + \varepsilon\right]$$

RESULTS AND DISCUSSION

Unit root test

Performing unit root test is vital in minimizing spurious regression since it ensures that variables used in regression are stationary by differencing them and estimating the equation of interest through the stationary process (Mahadeva and Robinson 2004), where the study using Augmented Dicky Fuller and Philips- Peron tests shown as following in Table 1.

Table 1: Results of Unit-Root Test (ADF) & Philips-Peron

Variables	ADF		PP	
	Level	First Difference	Level	First Difference
GDP	-0.368020	-5.529617**	-0.592419	-5.528140**
OPG	-1.520349	-6.618173**	-1.562194	-6.605328**
NOX	-0.973997	-6.069253**	-0.835099	-6.066531**
FDI	-2.341659	-5.404374**	-2.117289	-5.399395**
TRS	-0.843090	-3.764934*	-0.481995	-3.749109**
LVS	-4.540488**	-	-4.629102**	-
BOP	-3.634527**	-	-3.520943*	-

**, ** Denotes rejection at 5% and 1% levels, respectively.*

Results of ADF unit root and Philips-Peron tests shown in Table 1, indicate that the hypothesis that all-time series, with exception of LLVS and LBOP all other time series LGDP, LOPG, LNOX, LFDI and LTRS are nonstationary in levels and in the first difference can be accepted. Relying on the results of the conducted unit root tests, we conclude that the studied time

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series are in different order of integration. According to the results of the ADF and PP tests, with exception of LVS and BOP all other variables (GDP, OPG, NOX, FDI and TRS) are stationary in the first difference I (0) and has the order of integration I (1) based on the results of the ADF and Philips-Peron tests.

Lag selection for vector error correction model

After performing unit root tests the next step is to identify the optimal lag length for the VEC model. Vector auto regression (VAR) lag order selection criteria are used to select the optimal lag length to the test of cointegration in the research analysis. Table 2 shows VAR log order selection criteria four lags are employed in this multivariate model because the sequential modified likelihood-ratio test statistic (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criteria (HQ) select 4 as the optimal lag length as indicated by (*) in Table 2.

Table (2): VAR Lag Order Selection Criteria
Endogenous variables: GDP3 OPG FDI NOX BOP LVS TRS

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7312.719	NA	4.4e+126	311.4774	311.7529	311.5811
1	-7020.892	484.3080	1.5e+122	301.1443	303.3488*	301.9739
2	-6967.271	73.01522	1.4e+122	300.9477	305.0810	302.5031
3	-6902.545	68.85757	1.1e+122	300.2785	306.3407	302.5598
4	-6746.538	119.4951*	2.7e+120*	295.7250*	303.7161	298.7321*

*indicates lag order selected by the criterion
LR = sequential modified
LR = test statistic (each test at 5% level)
FPE = Final prediction error
AIC = Akaike information criterion
SC = Schwarz information criterion
HQ = Hannan-Quinn information criterion

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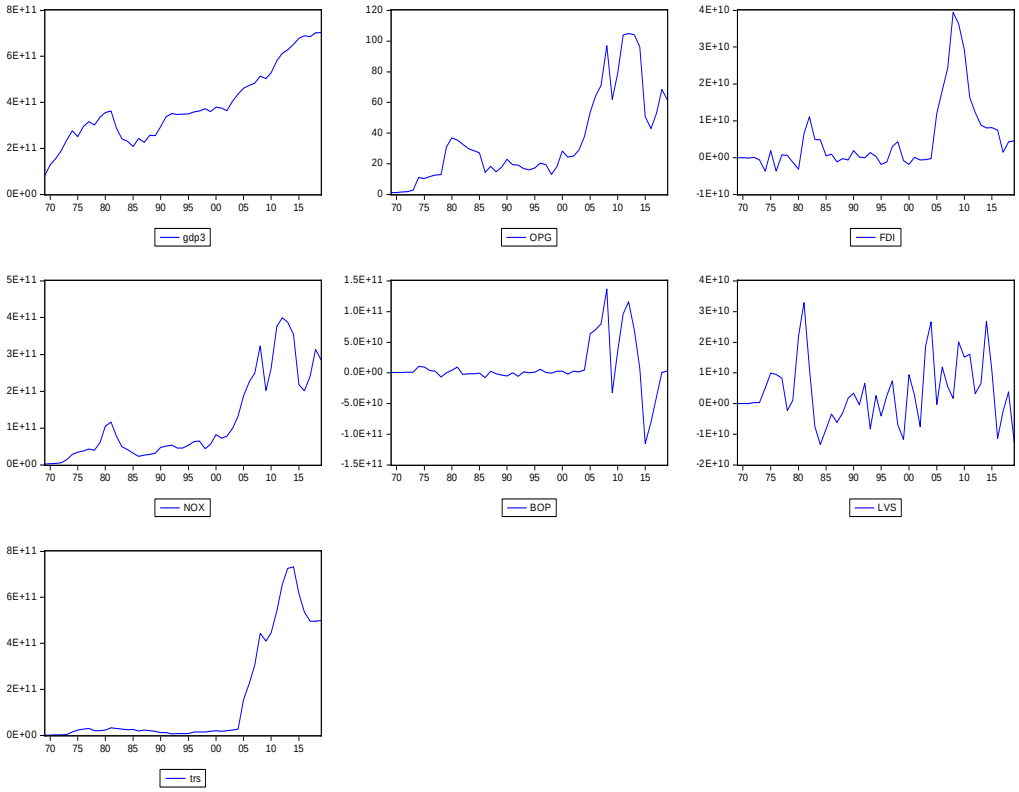
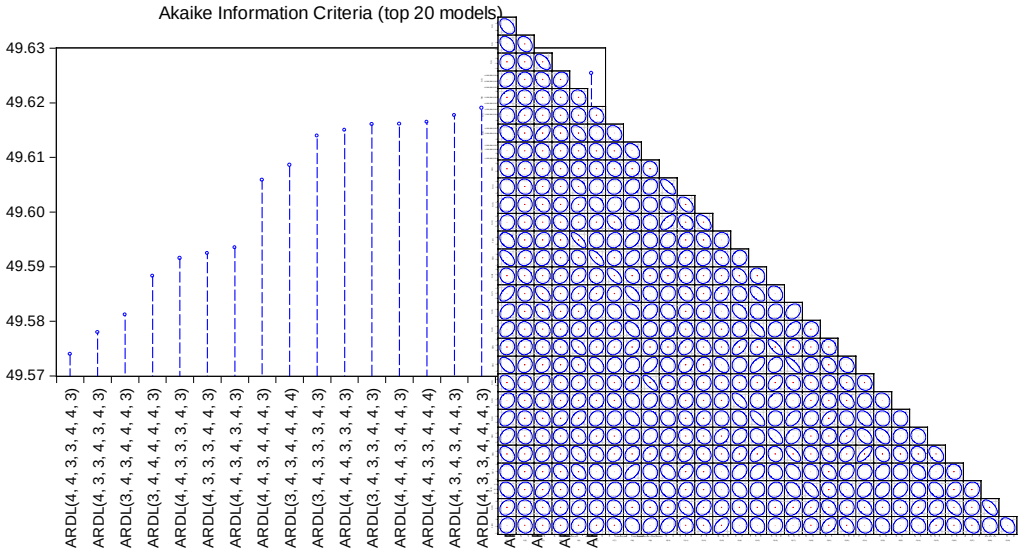
Figures 1: Endogenous variables Diagrams



Figures 2: Akaike Information Criteria (top 20 models)



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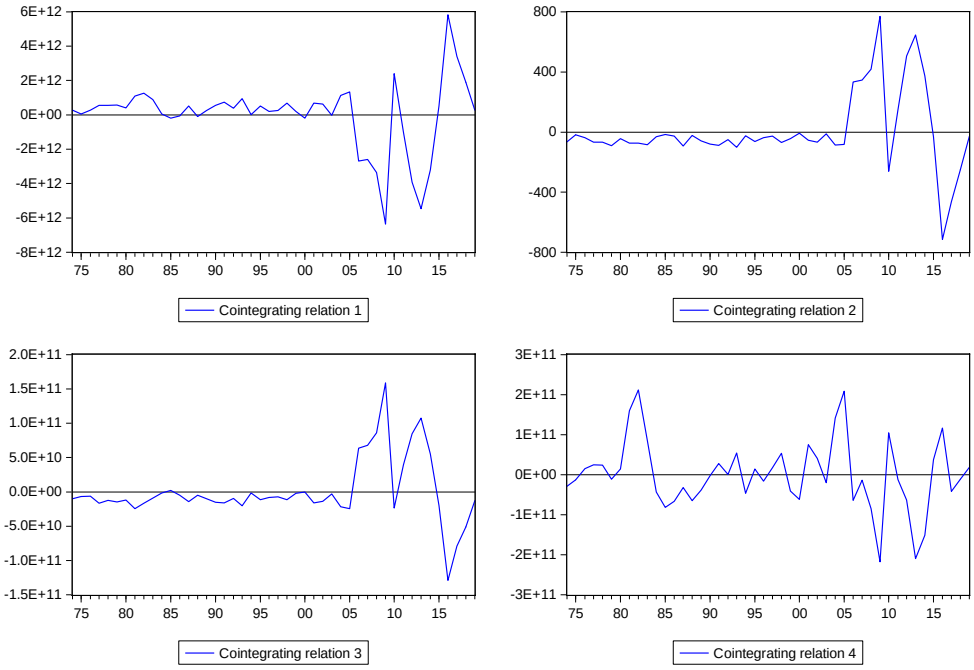
Co-integration test and vector error correction model

Using the optimal lag length selected by information criteria tests, Johansons method of cointegration is estimated. Table 3 presents the summary of Johanson cointegration test (Johanson 1995) by max-eigenvalue and trace method. Based on 5% significance level in the results shown in Table 3, we strongly reject the null hypotheses of no cointegration and fail to reject the null hypotheses of at most four cointegration equations. Thus, we accept the null hypotheses that there are four cointegration equations in multivariate model.

Table 3: Unrestricted Cointegration Rank Test (Trace) Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.945614	444.0928	125.6154	0.0001	133.9355	0.945614	133.9355	46.23142	0.0000
At most 1 *	0.909947	310.1573	95.75366	0.0000	110.7387	0.909947	110.7387	40.07757	0.0000
At most 2 *	0.868282	199.4186	69.81889	0.0000	93.24637	0.868282	93.24637	33.87687	0.0000
At most 3 *	0.802727	106.1722	47.85613	0.0000	74.66558	0.802727	74.66558	27.58434	0.0000
At most 4 *	0.410247	31.50666	29.79707	0.0315	24.29037	0.410247	24.29037	21.13162	0.0173
At most 5	0.141213	7.216287	15.49471	0.5527	7.002789	0.141213	7.002789	14.26460	0.4888
At most 6	0.004631	0.213498	3.841466	0.6440	0.213498	0.004631	0.213498	3.841466	0.6440

Figures 4: Co-integration equations diagrams



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ARDL Co-integration test, long-run and model selection

The study estimates the ARDL model since no evidence of long-run causality was established by VEC model. As proposed by Pesaran, Shin and Smith (2001), ARDL has desirable small sample properties and provide unbiased long-run estimation, even when some endogenous variables behave as regressions (Adom and Bekoe 2012). The ARDL cointegration test based on equation is expressed as:

$$Cointeq = GDP - (-559.86*OPG - 5.56*FDI + 3.06*NOX + 1.62*BOP - 3.55*LVS - 0.21*TRS + 278.02)$$

The situation in which the possibility of a different order of integration is present, it is possible to do ARDL modelling and to develop a VECM model and Granger causality test procedure. The main assumption of the ARDL model is that the variables are not integrated at I (2), as the calculation of the F statistics will be invalid in decision making on existing the long run relation. The ARDL testing approach can be implemented if variables have order of integration I (1), I (0) or are mutually integrated. Therefore, the previous procedure applied three different unit root tests.

Table 4: ARDL Cointegrating and Long Run Form
Selected Model: ARDL(4, 4, 3, 3, 4, 4, 3)

Cointegrating Form

Variables	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.401417	0.157435	-2.549728	0.0222
D(GDP(-2))	-0.176978	0.145159	-1.219196	0.2416
D(GDP(-3))	0.133258	0.115784	1.150917	0.2678
D(OPG)	-545.40	98.890	0.000000	0.0000
D(OPG(-1))	-179.53	97.49	0.000000	0.0000
D(OPG(-2))	-214.8	100.58	0.000000	0.0000
D(OPG(-3))	-606.79	624.70	0.000000	0.0000
D(FDI)	-1.419822	0.770224	-1.843389	0.0851
D(FDI(-1))	-0.920463	1.069401	-0.860728	0.4029
D(FDI(-2))	4.596663	1.127069	4.078421	0.0010
D(NOX)	2.594873	0.428753	6.052143	0.0000
D(NOX(-1))	1.186271	0.554229	2.140396	0.0492
D(NOX(-2))	2.094814	0.534165	3.921663	0.0014
D(BOP)	-1.271511	0.389795	-3.262000	0.0053

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D(BOP(-1))	-1.558130	0.558164	-2.791526	0.0137
D(BOP(-2))	-1.856484	0.403346	-4.602706	0.0003
D(BOP(-3))	-0.172235	0.178651	-0.964087	0.3503
D(LVS)	-1.276214	0.458533	-2.783254	0.0139
D(LVS(-1))	0.712873	0.628413	1.134402	0.2744
D(LVS(-2))	-1.474113	0.540829	-2.725657	0.0156
D(LVS(-3))	-0.971806	0.387667	-2.506807	0.0242
D(TRS)	0.436158	0.325306	1.340762	0.2000
D(TRS(-1))	0.871364	0.417128	2.088960	0.0542
D(TRS(-2))	-1.214203	0.366549	-3.312525	0.0047
CointEq(-1)	-0.536549	0.127485	-4.208740	0.0008

Cointeq = GDP - (-559.86*OPG -5.56*FDI + 3.06*NOX + 1.62*BOP -3.55*LVS -0.21*TRS + 2784.02)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPG	-55.86	137.35	-4.062163	0.0010
FDI	-5.56	2.28	-2.438828	0.0276
NOX	3.06	0.548	5.592073	0.0001
BOP	1.62	1.450	1.121912	0.2795
LVS	-3.55	1.322	-2.687599	0.0169
TRS	-0.21	0.20	-1.026020	0.3211
C	27.02	25.75	10.89873	0.0000

With existence of co-integration, the next step is to select the optimal model for the long-run equilibrium relationship estimation. In Figure.3, the Akaike information criterion model selection is given. Akaike information criterion was used to select the best model with the specification: ARDL (4, 4, 3, 3, 4, 4, 3). From equilibrium relationships were estimated using ARDL bounds test. using ARDL bounds test for the long-run estimation is presented in Table 7. The bounds cointegration test shows that the estimated *F*- statistic lies above the upper bound at 10,5, and 2.5% significance level. Based on 5% significance level, the null hypotheses of no long-run equilibrium relationship between variables is rejected.

Maximum 4 lag is used to carry out the find cointegration relationship between variables. Minimum Akaike Information Criteria (AIC) and Schwarz Bayesian Information Criteria (SBC) are used to determine optimal lag length. ARDL (4, 4, 3, 3, 4, 4, 3) is the optimal model for the cointegration analysis, and there is no autocorrelation problem in this estimated model. Besides, the calculated F-statistic of the model is founded as 8.715461 as shown in Table 5 of bound test.

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Table 5: ARDL Bounds Test

Test Statistic	**Value**	**k**	
F-statistic	8.715461	6	
	Critical Value Bounds		
Significance	I0 Bound	I1 Bound	
10%	2.12	3.23	
5%	2.45	3.61	
2.5%	2.75	3.99	
1%	3.15	4.43	
R-squared	0.918864	Mean dependent var	1.09E+10
Adjusted R-squared	0.751184	S.D. dependent var	2.53E+10
S.E. of regression	1.26E+10	Akaike info criterion	49.57399
Sum squared resid	2.39E+21	Schwarz criterion	50.83366
Log likelihood	-1132.989	Hannan-Quinn criter.	50.04801
F-statistic	5.479858	Durbin-Watson stat	2.289852
Prob(F-statistic)	0.000542		

According to table 4 Policymakers should focus on non- oil exports (NOX) to avoid the negative impact of oil prices shocks in long run, which the vision 2030 is conducted. While, they should not focus on foreign direct investment (FDI) because it has negative impact on economic growth in long run, where indifferent of vision 2030 prospected, as well as policymakers should create some effective policies to shrinkage the negative impacts of oil prices shocks on local investment and balance of payments in (LVS and BOP) in long run.

After estimating the long-run model, an VECM should be estimated. ARDL (4, 4, 3, 3, 4, 4, 3) is the optimal lag lengths for the VECM, and its short-run estimation results are displayed in Table (4). This model also passed all the diagnostic tests such as autocorrelation, heteroskedasticity, and normality. According to results, NOX affects GDP in the current year and 2nd lags positively as expected, while OPG, LVS, TRS and BOP are effect GDP negatively in the current year and 2nd lags. The coefficient of ECT is estimated as -0.536, it is negative and statistically significant as expected. This result indicates that 54% of disequilibrium is corrected in one year. The results show that NOX has long run relationship with OPG, FDI and LVS. Further, OPG, TRS, LVS and BOP are affected GDP negatively and significantly in the short-run and FDI effect GDP positively and significantly, where NOX is positively effects GDP and significantly in the short run as well as in the long run.

Table 6 shows the long -run multivariate causality of the error correction model. Findings from the analysis show one long-run multivariate causality

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exist GDP and the other endogenous variables. However, short-run causality test (Granger 1988). Table 6 presents summary of Pairwise Granger Causality Wald Test. The null hypotheses that GDP does not Granger cause OPG, does not Granger cause NOX, does not Granger cause FDI, does not Granger cause LVS, does not Granger cause TRS, does not Granger cause BOP, is accepted at the 5% significance level.

Table 6: VEC Granger Causality/Block Exogeneity Wald Tests
Dependent variable: D(GDP)

Excluded	**Chi-sq**	**df**	**Prob.**
D(OPG)	2.023402	4	0.7315
D(FDI)	6.083539	4	0.1930
D(NOX)	7.109195	4	0.1302
D(BOP)	6.316015	4	0.1768
D(LVS)	5.175459	4	0.2698
D(TRS)	2.823148	4	0.5878
All	26.85489	24	0.3113

However, short-run causality test (Granger 1988). Table 7 presents summary of Pairwise Granger Causality Wald Test. The null hypotheses that OPG does not Granger cause GDP, does not Granger cause OPG, does not Granger cause NOX, does not Granger cause LVS, does not Granger cause TRS, does not Granger cause BOP, is accepted at the 5% significance level. In other words, only FDI does not Granger cause GDP emissions.

Table 7: Pairwise Granger Causality Tests

Null Hypothesis:	Wald test statistic	P-value
D(GDP) does not Cause D(OPG)	1.14278	0.3282
D(OPG) does not Cause D(GDP)	0.22359	0.8005
D(GDP) does not Cause D(NOX)	2.09826	0.1348
D(NOX) does not Cause D(GDP)	0.41020	0.6660
D(GDP) does not Cause D(FDI)	1.19428	0.3126
D(FDI) does not Cause D(GDP)	3.70469	0.0326
D(GDP) does not Cause D(LVS)	0.91488	0.4080
D(LVS) does not Cause D(GDP)	0.90389	0.4124
D(GDP) does not Cause D(TRS)	1.58797	0.2158
D(TRS) does not Cause D(GDP)	1.63052	0.2074
D(GDP) does not Cause D(BOP)	0.00285	0.9972
D(BOP) does not Cause D(GDP)	0.17030	0.8440

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Diagnostic test for VECM and ARDL model

In order to avoid misleading statistical inferences, the study verified and validated the model through diagnostic and stability checks. VECM was subjected to several diagnostic test as presented in Table 8. VEC residual serial correlation was tested using Lagrange-multiplier test based on null hypotheses: no serial correlation at lag order. Residuals from the test shows that the null hypotheses cannot be rejected at the 5% significance level, meaning that no serial correlation exist at lag order. VEC residual normally was tested using Jarque-Bera test based on null hypotheses: residuals are multivariate normal. Residuals from the test shows that the null hypotheses cannot be rejected at the 5% significance level, meaning that residuals are multivariate normally distribution. In the same vein, ARDL was subjected to several diagnostic tests as presented in Table 8. Results from the test shows that the null hypotheses cannot be rejected at the 5% significance level, meaning that no autocorrelation at lag order exists in the model (Breusch-Pagan-Godfery Test). The equations are in their correct functional form (Ramsey RESET Test), no serial correlation exists at lag order in the model (Lagrange- multiplier Test) and residuals are multivariate normally distributed. However, using the optimal lag length and the number of co-integration equations, the study estimates the vector error correction model.

Robustness of VECM and ARDL model

As mentioned, checking the stability of the model is also beneficial before making statistical inferences. Figure 3 shows the root characteristic Polynomial. The root characteristic Polynomial is used to check the stability of the short-run causality among endogenous variables in VECM (Table 8). VEC specification imposes one-unit root and VAR stability condition check does not present a root outside the unit circle (the eigenvalues of the respective matrix actually one or less), besides the first unit root of 1. Therefore, since the model satisfied VAR stability conditions, the VEC model is acceptable in statistical since to make inferences.

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Table (8): Ramsey RESET Test, Heteroskedasticity Test: Breusch-Pagan-Godfrey and Breusch-Godfrey Serial Correlation LM Test

ARDL

Ramsey RESET Test

	Value	**df**	**Probability**
t-statistic	0.815862	14	0.4282
F-statistic	0.665631	(1, 14)	0.4282
F-test summary:			
	Sum of Sq.	df	
Test SSR	1.08E+20	1	
Restricted SSR	2.39E+21	15	
Unrestricted SSR	2.28E+21	14	

*Note: p-values and any subsequent tests do not account for model selection.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.063867	Prob. F(31,15)	0.4661
Obs*R-squared	32.30634	Prob. Chi-Square(31)	0.4020
Scaled explained SS	3.397382	Prob. Chi-Square(31)	1.0000
F-statistic	1.063867	Durbin-Watson stat	2.159

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.914563	Prob. F(2,13)	0.4250
Obs*R-squared	5.797300	Prob. Chi-Square(2)	0.0551

VECM

VEC Residual Serial Correlation LM Tests

Lags	LM-Stat	df	Prob
1	59.85425	24	0.1377

VEC Residual Normality Tests- Jarque-Bera

Joint	13.44278	14	0.4920

Figure 5 shows the CUSUM of squares, CUSUM, and Recursive Residuals tests for the parameter instable from ARDL model. The CUSUM of square as, CUSUM, and Recursive Residuals tests are used to a certain the parameter instability of the equation employed in the ARDL model. Since the plots in the CUSUM of square, CUSUM, and Recursive Residuals tests lie within the 5% significance level or ± S.E, the parameter of the equation is stable enough to estimate the long-run and short-run causality in the study.

The long-run co-integration relationship between GDP, FDI, OPG, NOX, TRS, LVS and BOP exists. So, the long-run coefficients of the model should be estimated. ARDL (3,4,3,4,3,1,1) is the optimal lag lengths for the long run model, and its estimation results are showed in Table (4). There is no autocorrelation, heteroskedasticity and normality problem in the long-run estimation.

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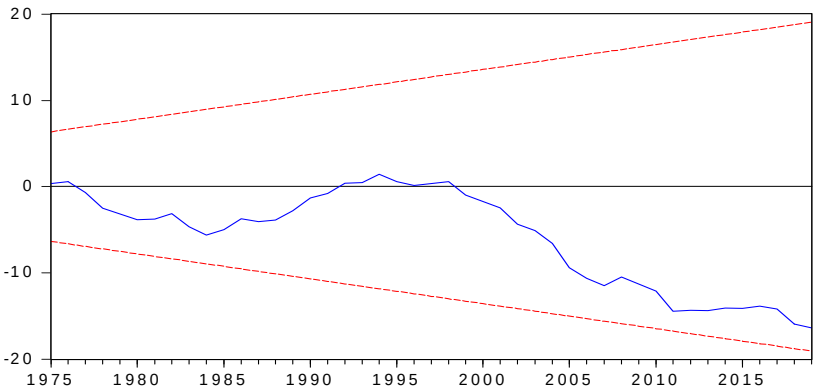

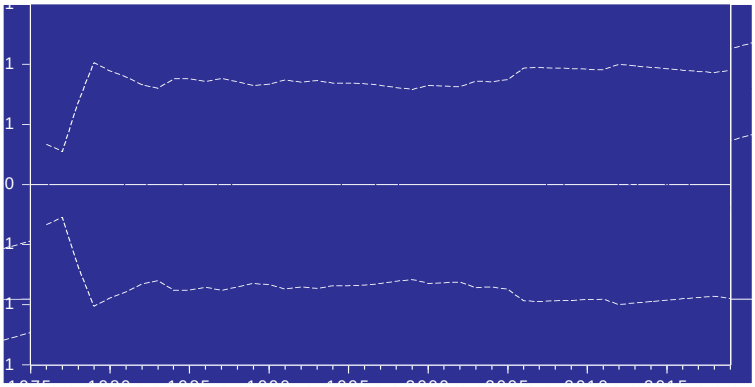

Figures 5: Recursive residuals

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Figures 6: Inverse root of AR characteristic polynomial

CONCLUSION AND RECOMMENDATIONS

The study investigates in the light of Vision 2030 the impact of oil prices shocks on economic growth in KSA. More prissily, the study aims to investigate the impact of global oil prices (OPG), non- oil exports (NOX), total reserves (TRS), local net investment (LVS), foreign direct investment (FDI) and balance of payments (BOP) and its impact of economic growth (GDP) from the period of 1969-2019. Using a combination of ARDL and VECM method, where the data are obtained from World Bank in the open data website.

The results of the ADF and PP tests shows, with exception of LVS and BOP all other variables have (GDP, OPG, NOX, FDI and TRS) are stationary in the first difference I (0) and has the order of integration I (1) based on the results of the ADF tests. The optimal lags of ARDL model is (3,4,3,4,3,1,1) for the cointegration analysis, and there is no autocorrelation problem in this estimated model. The long-run co-integration relationship between GDP, OPG, NOX, FDI, TRS, LVS and BOP exists. So, the long-run coefficients of the model should be estimated of ARDL lags (3,4,3,4,3,1,1) is the optimal lag lengths for the long run model, and its estimation results showed no autocorrelation, heteroskedasticity and normality problem in the long-run

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estimation. The short-run of ARDL model and VECM should be estimated of lags (3,4,3,4,3,1,1) is the optimal lag lengths for the VECM for this model also passed all the diagnostic tests such as autocorrelation, heteroskedasticity, and normality. According to results, NOX and FDI affect GDP in the short-run positively as expected, while OPG, LVS, TRS and BOP are effect GDP negatively in the short-run, where the coefficient of ECT is estimated as-0.629, it is negative and statistically significant as expected, which indicates that 63% of disequilibrium is corrected in one year.

The results of long-run show that NOX, OPG, FDI and LVS have long run relationship with GDP. Further, OPG, and LVS are affected GDP negatively and significantly in the long-run, where NOX is positively effects GDP and significantly in the short run as well as in the long run. However, FDI in long run has negative impact on GDP and significant at 5%. Where NOX is positively effects GDP and significantly in the short run as well as in the long run, and LVS is negatively effects GDP and significantly in the short run as well as in the long run.

Policy makers should focus on non- oil exports (NOX) to avoid the negative impact of oil prices shocks and maintaining economic growth in long run, which the vision 2030 is conducted. While, they should not focus on foreign direct investment (FDI) because it has insignificant impact on economic growth in long run, where indifferent of vision 2030 prospected, as well as policymakers should create some effective policies to shrinkage the negative impacts of oil prices shocks on local investment and balance of payments in (LVS and BOP) in long run.

Due to political factors and conflicts in the Middle Eastern region, 2018 to 2020 have witnessed a significant decline in global oil prices, which has caused a sharp drop in oil revenues for the Kingdom of Saudi Arabia, despite the fact that, the Kingdom has achieved great returns in previous years which helped in developing other economic sectors, especially the agricultural, service, and industrial sectors, infrastructure and human resources, the development of education, health, the foreign trade sector, the increase in non-oil exports and the import substitution industry through vision 2030, which came to support this trend with increasing rates of local investment and diversification of the production base. Consequently, the vision should seek to achieve higher economic growth in long run via the role of non-oil exports through:

a) Economic production diversifications with focus on non-oil exports to avoid the negative impact of oil prices shocks in long-run.

b) Encouraging local investment to increases employment opportunities.

c) Increasing production and productivity and reduce unemployment, which the vision emerged in the axis of governance and community by applying rational governance, accountability, justice, good governance and transparency, which helps for creativity and initiative, and linking the learning outcomes in universities to the requirements of the Saudi labor market through the development of universities according to the vision of 2030, so many universities rushed towards updating and developing their curricula to obtain an international accreditations.

d) Maintaining the economic balance in external payments and diversifying global markets, enhancing competitiveness, and a geographical trend towards Arab, African and Asian markets, and towards economic integration in these countries, avoiding deterioration in the budget deficit, exchange rate stability and reducing inflation rates.

e) A policy implication of this study is that non-oil exports can be considered to be the best policy variable to predict economic growth in KSA. If policy-makers want to maintain sustainable economic growth, they must focus on building non-oil exports in the economy in the longer term. Such a policy could be also supported by infrastructure policy restructuring, especially in the non-oil exports sector.

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