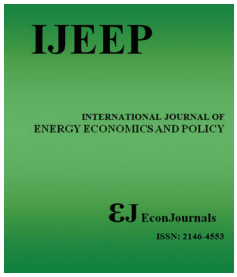

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Oil Prices Shocks and Government Expenditure

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ABSTRACT

This study employs the vector autoregressive model (VAR), impulse response function and variance decomposition to study the impact of oil price shocks on components of government spending on both oil-exporting and oil importing countries over the period from 1980 to 2018. While the vast majority of previous studies focused on the impact of oil price shocks on government spending, this study emphasized the impact of these shocks on the current and capital government expenditure. It was found that oil price shocks affect government current expenditure positively in the two groups of countries. While it affects government capital expenditure positively in oil-exporting countries and negatively in oil-importing countries.

Keywords: Oil-exporting Countries, Oil-importing Countries, Oil Price, VAR Model, Government Expenditures
JEL Classifications: H15, O13, Q43

1. INTRODUCTION

Since oil price fluctuations in 1973, the effect of shocks on oil prices and its impact on many macroeconomic factors has been an important area of economic research. Once again, the second oil shock triggered by the reduction in oil supplies in 1979 pointed out the importance of the sudden change in energy prices (Alekhina and Yoshino, 2018).

Crude oil prices always seem to be fluctuating over time, showing different degrees of ups and downs. The degree of the responsiveness of different countries to the volatility of oil prices typically varies according to economic conditions worldwide.

However, for both oil-importing and oil-exporting nations, oil continues to play a key position, because it is a critical energy source and one of the most exchanged product. In case of oil-consuming countries, the rise in oil prices is bad news as it affects production, investment decision and economic growth. A rise in oil prices will cause an increase in the cost of producing domestic products and this will affect production and output negatively. This will cause a shift of profits to oil exporters. At the same time, an increase in oil prices is often accompanied with an increase in economic and financial instability, which will affect the investment and spending decisions in any country. As a result, a rise in oil prices may cause an economic recession (Charfeddine and Barkat, 2020).

On the contrary, a rise in oil prices in oil exporting countries would result in an improvement in net exports and government revenues, which would lead to an improvement in the country's growth rate. The impact of oil price shocks is transmitted to the economy through two main channels, fiscal and export channels. Whenever there is an increase in oil prices, the country witnessed larger capital inflows, which leads to an appreciation of the domestic currency. The appreciation of the currency causes a decline in the price of the imported goods. Therefore, an increase in oil price will cause a decline in the general price level. The second channel is the government budget channel. The government will have a budget surplus resulting from taxes imposed on exports of oil at a higher price level. This could help the government to increase government spending which in turn affect gross domestic product (Alekhina and Yoshino, 2018).

The oil price shock is projected to have major impacts on the governments' spending and revenues. Therefore, the primary

objective of this study is to compare the impact of oil price shocks on components of government spending on both oil-importing and oil-exporting countries. In particular, the relationship between oil prices and government current and capital expenditures over the last three decades will be evaluated and compared between the oil-exporting countries and the oil-importing countries. The rest of this paper is classified into five main sections in addition to the introduction. Section 2 includes a concise overview of the literature. Section 3 provides a summary of the dataset, its sources and measurement. In addition to the econometric approach. Section 4 discusses the main findings of the VAR model, IRFs and variance decomposition. Finally, the analysis will be concluded in Section 5.

2. LITERATURE REVIEW

Narayan (2005) analyzed the causality between public spending and revenues in nine Asian countries. A Granger causality test has been conducted using a bounds testing approach to cointegration and the conventional F-test. The results indicate that for three out of the nine Asian countries, government spending and revenues are correlated. The tax-and-spend hypothesis found support in the short-run for Indonesia, Singapore and Sri Lanka while with respect to Nepal the hypothesis found support in both short-run and long-run. Moreover, the results indicate that in the long-run the spend-tax hypothesis is supported in Indonesia and Sri Lanka. While for all other countries, there is evidence for neutrality.

Farzanegan (2011) examined the impact of oil shocks on spending behavior of the Iranian government. The Impulse Response Function (IRF) and Variance Decomposition Analysis are used to examine the impact of oil price shocks on government spending, over the period from 1959 to 2007. The key findings of this study show that oil price shocks have positive significant impact on Iran's military and security expenditures and no significant impact on the different components of social spending.

Mehrara et al. (2011) intended to examine government revenue-expenditure relationship in 40 Asian countries over the period from 1995 to 2008, using the panel cointegation test and the panel Granger causality test. The study shows that there is a bi-directional causal relationship between government revenues and government expenditure in the short-run and in the long-run. In this situation, the Government of such countries that suffer from budget deficit have to take the decisions of revenue and spending simultaneously. This means that the government should increase taxes and decrease spending in order to manage their budget deficits.

Bekhet and Yusoff (2013) seek to analyze the symmetrical effect of oil price shocks on a number of macroeconomic factors and to identify how fiscal policy is reacting to it. A vector autoregressive model, Impulse Response Function and Variance Decomposition have been employed for a sample of annual data from 1980 to 2010. The results show that the oil price shocks has a significant and direct effect on oil revenues, government spending and GDP while its impact on real GDP is weak in the short term only. Such findings will suggest that fiscal policy is the main policy that can be used to reduce the negative impact on the economy of oil price shocks.

Dizaji (2014) aimed to examine the dynamic relationship between Iranian government revenues and spending. In addition, this paper focuses on determining how oil price shocks will affect this relationship. The Impulse Response Functions and the Variance Decomposition have been employed for a quarterly data for the period 1990:2–2009:1. The results show that oil revenue shocks contribute more to government spending compared to the oil price shocks. In addition, the results of the causality test indicate that the direction moves from government revenue to government spending. There is a weak evidence for the reverse causality.

Pazouki and Pazouki (2014) investigated the effect of oil price shocks in the government expenditure in the Iranian economy over the period from 1965 to 2011 using a vector autoregressive model. The main findings of this study indicate that fluctuations in oil prices have a significant impact on public expenditure as oil revenues are considered to be the source of finance for different types of government expenditure such as social security, employment, and health care. It can also be concluded that oil price shocks do not have statistically significant impact on social expenditure.

Aworinde and Ogundipe (2015) assessed the government expenditure and revenues nexus in Nigeria using a dynamic Threshold model over the period from 1960 to 2012. The results indicate that there is an asymmetric relationship between government expenditures and government revenues. It also shows that bidirectional causal relationship between government revenue and spending is observable in the short term. While in the long-run, government revenue and spending respond to budgetary disequilibrium.

Alley (2016) investigated the long-run and short-run relationship between fluctuations of oil price and fiscal policy using a vector error correction model for 18 oil-exporting countries over the period from 1990 to 2013. The fiscal policy is proxied by the net of government revenues and expenditures. The results indicate that, in the short term, fluctuations of oil prices reduced primary fiscal balance (PFB). However, in the long-term, PFB expands in response to oil price fluctuations.

Rahma et al. (2016) explored the impact of oil prices volatility on the key factors of the Sudan's government budget using vector autoregressive model for a sample of quarterly data over the period from 2000: q1 to 2011: q2. The main findings of this study indicate that a decrease in oil prices has a significant impact on energy revenues, current spending and budget deficits. The results indicate also that a change in oil prices does not Granger cause a change in government budget. An asymmetric relationship is found between oil prices and government budget.

Koh (2017) examined the macroeconomic implications of the downward oil price shock in 40 crude-exporting countries under various exchange rate systems and fiscal policy structures over the period from 1973 to 2010 using PVAR techniques. The findings indicate that government output and demand declined because of the fall in oil prices. Nevertheless, in countries with flexible currency regimes, the production reaction is considerably smaller

and simpler due to a larger, instant reduction of real exchange rates. Contractionary fiscal policy is also less required as depreciation of the currency plays an effective damping function.

Gbatu et al. (2017) evaluated the related literature on oil price impacts and then applied bootstrap distribution strategy to study different oil price shocks and to determine their effects on many macroeconomic variables such as employment, exchange rate and GDP in Liberia over the period from 1980 to 2015. The study finds that the fall of oil prices do not have any significant impact on economic development in the short term, but the increase in oil prices appear to boost the Liberian economy.

Abdel-Latif et al. (2018) explored the impact of fluctuations in oil prices on government spending on health and educational system in Saudi Arabia, using a non-linear ARDL model using a quarterly data over the period from 1990 to 2017. The study found that there is a non-linear relationship between oil prices and government investment in Saudi Arabia, where a negative oil price shock has a greater statistically significant impact on the long-term compared with a positive shock.

Adedokun (2018) analyzed the impact of oil price shocks on the relationship between government revenue and government spending in Nigeria over the period from 1981 to 2014. It also studied how these shocks transmit impact on main macroeconomic variables using VARs, unrestricted VAR and VEC Models. The findings of SVAR indicate that fluctuations in oil price do not predictive power in government spending in the short term, whereas oil revenue shocks have a predictive power both in the short run and in the long run.

Qwader (2018) studied the effect of fluctuations in oil prices on a number of factors of the Jordanian budget using ordinary least squares using annual data over the period from 1992 to 2015. The main results indicate that oil price shocks have statistically significant positive impact on government and tax receipts, foreign grants and government spending. While with respect to the effect on budget deficits, oil price shocks have statistically significant negative impact. The study also suggests that Jordanian government will direct its oil tax revenues to spending in key sectors, such as agriculture and manufacturing, in order to increase the sources of income and to maximize it.

3. DATA AND METHODOLOGY

3.1. Data Sources and Measurement

The main objective of this paper is to compare the impact of oil price shocks on the components of government expenditure in two groups of countries; oil exporting and oil importing countries. To achieve this objective, yearly observations on real GDP growth rate (GDPG), current government expenditure (Cons) which is measured as general government final consumption expenditure as a percentage of GDP, capital government expenditure (GFCF) which is measured as gross fixed capital formation as a percentage of GDP, inflation rate (infl) and exchange rate (exch) and oil price (Oil) are expressed in US dollars have been collected over the period from 1980 to 2018 for the countries under consideration. Data for GDP growth rate, inflation rate, exchange rate, current and capital government expenditure are collected from the world bank database. Oil prices data are collected from the OPEC.

3.2. Model

This study investigates the impact of oil prices shocks on components of government expenditures, current and capital expenditures. In addition, a comparison between the impact of oil price shocks between two different samples of countries, oil exporting and oil importing countries, over the period from 1980 to 2018 will be conducted. To achieve the main objective of this paper a vector autoregression model (VAR) will be used in addition to some other useful techniques such as impulse response functions (IRF) and variance decomposition.

The VAR model displays the dynamic relationship of a variety of time series variables. It assists in identifying the statistical relationship between these variables. (Adenomon, 2013 et al)

A PVAR model can be written as follows.

$$\log(X)_{it} = \propto_1 \log(X)_{1t-1} + \ldots\ldots\ldots\ldots\ldots\ldots + \propto_p \log(X)_{it-p} + \varepsilon_t \quad (1)$$

Where:

X_{it} is a n×1 vector of endogenous variables of the model at time t and for country i. α_i is the coefficient vector; i = 1, 2,…., p. ε_t is a n ×1 vector of uncorrelated structural innovations. The main objective is to estimate the impact of oil price shock on a number of main macroeconomic indicators, which are government current expenditures, government capital expenditures, real GDP growth rate, exchange rate and CPI inflation rate. Therefore, the vector X_{it} can be written as:

$$\log(X)_{it} = \left[\log(GDP), \log(GCF), \log(cons), \log(infl), \log(\text{ex})\right] \quad (2)$$

Where (GCF) is government capital expenditure which is measured by gross capital formation, (cons) is government current expenditures which is measured by government consumption expenditures. (Infl) is the rate of inflation and (ex) is the exchange rate which is domestic currency per US dollar.

4. EMPIRICAL ANALYSIS

4.1. Unit Root Test

The implementation of the VAR model requires that the time series data to be stationary or integrated of the same order. In order to examine the stability of the variables, a unit root test is always the initial part to be accomplished. (Li, 2001) Levin, Lin and Chu t (LLC) unit root test and Im, Pesaran and Shin W-stat have to be conducted to test the stationarity of the variables. Levin, Lin and chu test assumes that there is a common unit root process across all panels. It tests a null hypothesis of non-stationarity of variables against an alternative of no unit root exists (Levin et al., 2002)

Im, Pesaran and Shin W-stat is only concerned with balanced panel data as the test assumes that T is the same for all cross-section units.

Im, Pesaran and Shin W-stat deals with the N cross section units individually instead of pooling the data (Maddala and Wu, 1999).

Based on the stationarity tests results, illustrated in Table 1, the null hypothesis of unit roots is rejected for all variables using LLC and IPS for both oil exporting and oil importing countries which means that all variables are stationary at level.

4.2. Lag Order Selection

Then, the number of lags that will be included in the VAR model will be determined using AIC, the number of lags in case of oil exporting countries will be one; whereas in oil importing countries will be eight lags, as shown in Table 2.

4.3. Impulse Response Functions

This section shows the results of the impulse response functions which is used to illustrate the results of the dynamics of the VAR model. The system of linear equations of the model has been solved using Cholesky decomposition technique. Impulse response functions (IRFs) captures the short-run dynamics of the model through showing the response of a shock in a variable on current and future values of the variables (Hamdi and Sbia, 2013).

Figure 1: Accumulated response to Cholesky one S.D. innovations ± 2 S.E

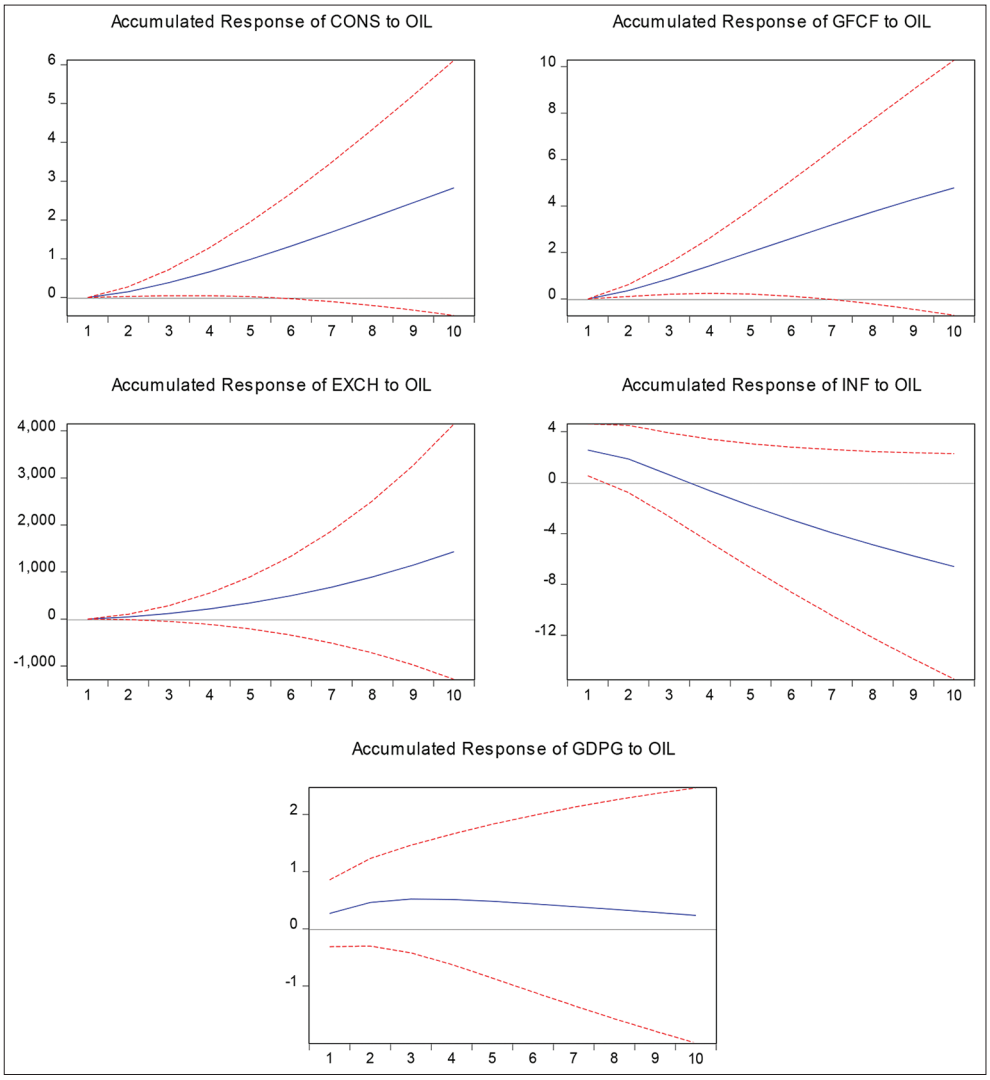


Table 1: Unit root test

Variable	Oil Exporting countries				Oil Importing countries			
	Levin, Lin and Chu t.	Prob	Im, Pesaran and Shin W-stat	Prob	Levin, Lin and Chu t.	Prob	Im, Pesaran and Shin W-stat	Prob
Cons	−2.6586	0.0039	−2.82668	0.0024	−1.618***	0.0528	−2.0780	0.019**
Oil	−4.8104	0.0000	−4.53980	0.0000	−4.81038*	0.0000	−4.5398	0.0000*
GDPG	−8.6959	0.0000	−9.13946	0.0000	−8.65885*	0.0000	−8.2527	0.0000*
GFCF	−3.2647	0.0005	−2.84075	0.0023	−1.323***	0.0930	−2.0339	0.0210*
Exch	−14.409	0.0000	−3.71223	0.0001	−1.49***	0.0681	−1.627	0.05***
Inf	−6.7548	0.0000	−9.98140	0.0000	−8.38596*	0.0000	−8.7816	0.0000*

* Significant at a 1% level; ** Significant at a 5% level; *** Significant at 10% level

It can be noticed from the impulse response functions that, in case of oil exporting countries, the government current and capital expenditures and GDP growth rate response positively to shocks in oil prices as the government will direct revenues generated from oil to increase government consumption and investment which in turn affect the growth rate of the country. The exchange rate is expected to appreciate due to oil price shocks when the prices of non-tradable goods increase relative to tradables but according to IRFs, it can be remarked that oil price shock has a positive impact on exchange rate which mean that the domestic currency witnessed a depreciation in its value and this depends on the oil intensity of the tradable and non-tradable sectors of the countries under consideration. While with respect to inflation rate, its response to oil price shocks is positive at the beginning of the period and then it responds negatively to shocks in oil prices after the third period.

Table 2: VAR lag order selection criteria

Endogenous variables: CONS GFCF EXCH OIL INF GDPG		
Sample: 1980 2018		
Lag	AIC Oil exporting countries	AIC Oil importing countries
0	23.30643	41.36873
1	13.91913*	27.96127
2	13.94760	27.63801
3	14.09596	27.68942
4	14.24051	27.61448
5	14.29093	27.78683
6	14.23522	27.49715
7	14.38137	27.50892
8	14.47529	27.32801*

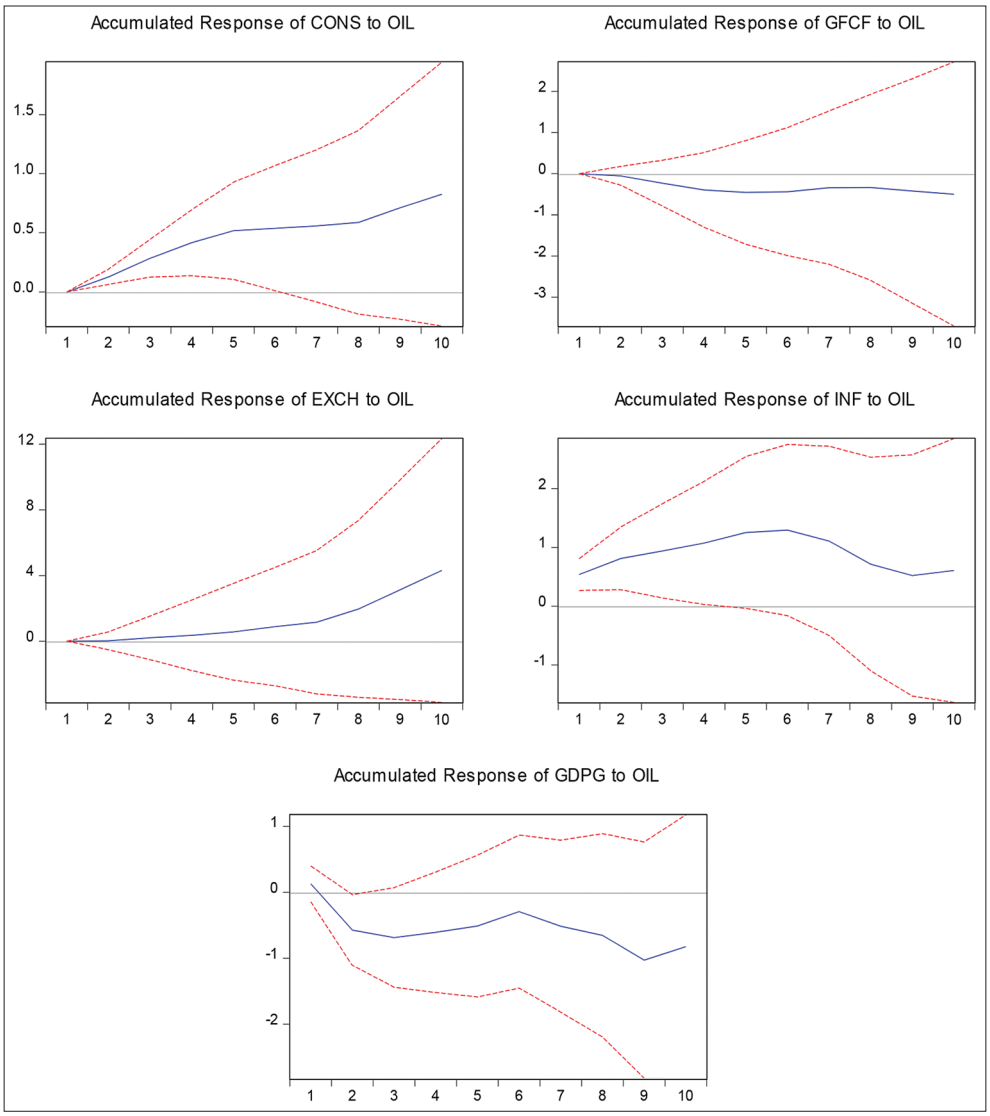
*indicates lag order that has been selected based on Akaike information criterion

In case of oil importing countries, as shown in Figure 2, government current expenditure responds positively to shocks in oil prices. An increase in oil prices will cause a decline in the country's trade balance which in turn cause a depreciation of the local currency and the exchange rate responds positively to changes in oil price shocks. Government capital expenditures and GDP growth rate respond negatively to shocks in oil prices. Inflation rate responds positively to shocks in oil prices but the impact will deteriorate starting from period 7.

4.4 Variance Decomposition

Variance decomposition shows the share of the forecast error variance of a variable that is traced to its own self-shocks and those of other variables. In fact, a self-shock explains much of the

Figure 2: Accumulated response to Cholesky One S.D. Innovations ± 2 S.E



variation in the variable. The larger the percent of the variation, the more important that variable compared to other variables in the model (Farzanegan, 2011; Iwayemi and Fowowe, 2011).

The variance decomposition in case of the oil exporting countries suggests that the main drivers of the variation of the government current expenditure are oil prices and government capital expenditure (Table 3). Oil prices accounted for about 3 percent of the variance at some point in the 10-quarter horizon, while government capital expenditure accounted for just above 1.5 percent. None of the variables has an immediate impact on variability of the government current expenditure.

In case of oil importing countries, the variance decomposition shows that the leading drivers of the variation of the government current expenditure are oil prices and inflation rate (Table 4). Oil prices accounted for about 3 percent of the variance at some point in the 10-quarter horizon, while inflation rate accounted for about

Table 3: Variance decomposition of the components of government expenditure in case of oil exporting countries

Variance Decomposition of CONS:							
Period	**S.E.**	**CONS**	**GFCF**	**EXCH**	**OIL**	**INF**	**GDPG**
1	2.197726	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.954124	98.91318	0.058935	0.005381	0.271636	0.608928	0.141936
3	3.480064	97.92795	0.186596	0.020743	0.639790	0.999184	0.225735
4	3.886189	97.08508	0.366046	0.046699	1.040532	1.199472	0.262173
5	4.215339	96.31164	0.580930	0.083190	1.454088	1.295928	0.274224
6	4.489850	95.57122	0.817536	0.130250	1.869112	1.337405	0.274478
7	4.723224	94.85169	1.064952	0.188224	2.276991	1.348986	0.269154
8	4.924385	94.15120	1.314746	0.257844	2.670986	1.343870	0.261355
9	5.099609	93.47115	1.560560	0.340289	3.046009	1.329328	0.252667
10	5.253526	92.81321	1.797723	0.437232	3.398399	1.309525	0.243908
Variance Decomposition of GFCF:							
Period	**S.E.**	**CONS**	**GFCF**	**EXCH**	**OIL**	**INF**	**GDPG**
1	4.189127	1.080691	98.91931	0.000000	0.000000	0.000000	0.000000
2	5.625151	0.600055	96.44633	0.014526	0.414712	0.918329	1.606047
3	6.523283	0.507792	94.31061	0.053384	0.904295	1.582047	2.641870
4	7.123355	0.516825	92.80935	0.121642	1.383790	1.952230	3.216166
5	7.539926	0.559120	91.68622	0.224284	1.841186	2.148142	3.541045
6	7.837695	0.613691	90.77060	0.366813	2.271188	2.247528	3.730184
7	8.055997	0.671738	89.97104	0.555733	2.668165	2.292517	3.840806
8	8.220059	0.728507	89.23675	0.798969	3.026788	2.305908	3.903078
9	8.346788	0.781042	88.53537	1.106276	3.342912	2.300504	3.933894
10	8.447955	0.827417	87.84200	1.489700	3.613929	2.283772	3.943178

Cholesky Ordering: CONS GFCF EXCH OIL INF GDPG

Table 4: Variance decomposition of the components of government expenditure in case of oil Importing countries

Variance Decomposition of CONS:							
Period	**S.E.**	**CONS**	**GFCF**	**EXCH**	**OIL**	**INF**	**GDPG**
1	0.435247	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.736871	95.84455	0.956516	0.133935	2.963107	0.007703	0.094194
3	1.027347	94.57007	1.037705	0.093719	3.892233	0.336158	0.070117
4	1.246925	93.24218	1.240800	0.067208	3.750014	1.648990	0.050804
5	1.404842	92.85395	1.078368	0.090033	3.475877	2.458271	0.043499
6	1.525360	92.96388	0.914760	0.232798	2.968093	2.776345	0.144128
7	1.618030	92.67208	0.946718	0.341355	2.652472	2.682706	0.704669
8	1.697312	92.47338	1.071302	0.398485	2.439833	2.544583	1.072417
9	1.771739	91.74485	1.292147	0.401403	2.729485	2.493119	1.338994
10	1.846086	91.34584	1.341735	0.444171	2.907430	2.499946	1.460875
Variance Decomposition of GFCF:							
Period	**S.E.**	**CONS**	**GFCF**	**EXCH**	**OIL**	**INF**	**GDPG**
1	1.528288	0.366847	99.63315	0.000000	0.000000	0.000000	0.000000
2	2.470884	1.773409	95.38654	0.030411	0.044325	0.008146	2.757169
3	3.144797	4.840502	87.25125	0.020698	0.344207	0.014098	7.529243
4	3.617185	9.082602	78.81488	0.141764	0.468652	0.052256	11.43984
5	3.972435	13.55776	70.77220	0.207804	0.410618	0.047562	15.00406
6	4.318130	19.67250	63.81554	0.325834	0.349157	0.056192	15.78077
7	4.635790	24.65033	58.30911	0.559128	0.346774	0.301900	15.83276
8	4.891307	28.27288	53.44784	1.044758	0.311646	0.432384	16.49049
9	5.159564	30.48298	48.32920	1.692546	0.307936	0.459861	18.72748
10	5.422520	31.22772	43.84063	2.097088	0.298124	0.796382	21.74006

Cholesky Ordering: CONS GFCF EXCH OIL INF GDPG

2.5 percent. None of the variables has an immediate impact on variability of the government current expenditure.

5. CONCLUSION

Oil revenue has played an important role in the annual government budgets of many countries around the globe. There is no doubt that government decisions to spend on consumption or investment is highly affected by changes in oil prices. This paper investigates the impact of oil price shocks on the main components of government expenditures (current and capital expenditures) in both oil exporting and oil importing countries over the period from 1980 to 2018 using a vector autoregression model, impulse response function and variance decomposition methods. Although the overwhelming majority of previous studies have focused on the impacts of oil price shocks on government spending, this study focuses on the impact of the two main components of government spending.

The results indicate that in oil exporting countries, revenues generated from increasing oil prices helps to increase countries' growth rate and enhance current and capital expenditure or in another words the government will use this revenue to spend and invest more. While in case of oil importing countries, the increase in oil prices will affect growth rate in two different ways as it affects the fund available to import the materials needed for the production process and at the same time restricted the funds necessary to invest. This in turn will cause a reduction in capital expenditure. At the same time, increase in oil prices will shift government funds from investing to increase spending on consumption (current expenditure).

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