Revisiting the Impact of Oil Price Fluctuations on Government Spending: The Case of Saudi Arabia

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Abstract

The issue of oil price fluctuations have attracted the attention of many economists who attempted to explain the nature of the relationship between oil price fluctuations and government spending behavior. In this paper, we examined the impact of oil price fluctuations on Saudi government spending in some major sectors using annual data (1981-2016) to cover the main fluctuations' periods. The VAR (vector autoregressive) model was applied to investigate the long-run relationships between variables. The results suggest that, there is a significant and positively strong relationship between oil prices fluctuations and the government spending in the selected sectors in the long run.

Keywords. *Saudi Arabia Economy, Oil Price Fluctuations, Government Spending and VAR Model.*

JEL Classifications: E32, E37, H50, Q33, Q43.

1. Introduction

The declining oil price and its impact on output have attracted attention of many economists who sought to explain the nature of the relationship between oil price fluctuations and government expenditure behavior (Hamdi and Sbia, 2013). According to Keynesian theories, any reduction in public expenditure causes a fall in total demand, consumption and investment that will unfavorably affect economic growth (Keynes, 1936). In theory, when oil prices change, public spending, investment and economic growth will also change as a direct result of the spending effect multiplier.

However, the impact of oil price fluctuations on economic growth and government expenditure in oil-exporting countries are different from those in oil-importing countries.

Economically, the oil industrial sector is the main source of the Saudi economy; it represents the largest percentage of GDP compared to other economic sectors over the last fifty years. The GDP of Saudi Arabia was affected by most of the shocks of the historical oil prices. Based on the Saudi Arabia Monetary Agency (SAMA), the percentage of oil revenue contribution to GDP in 2014 amounted between 87.5% and 71.1% of total revenues and total exports and, respectively (SAMA, 2014). In other words, the Saudi oil sector contributed over 40 percent of the Kingdom's overall GDP (Algahtani et al., 2015).

Moreover, activity in the non-oil sector is related to oil prices through government spending during periods of fluctuation. Since Saudi Arabia is a large oil-exporting country, typically, its public spending policy is therefore directly linked to oil prices and its revenue accounts for a substantial part of its public budget. As a result, when oil prices change, the government accordingly adjusts its policy toward its expenditure.

Thus, in this perspective, the role of the government's fiscal policy is determined by the fluctuations in oil prices which is then transmitted to the entire national economy. Economists have analyzed oil price fluctuations in order to understand their economic impact. For a review of Saudi Arabia's historical oil price spikes of the 1970s, 1980s, 1990s and 2000s, see Table 1. Since the 1970s, empirical studies suggests that oil price fluctuations affect macroeconomic performance in different ways.

Although the experience of the 1970s continues to play a crucial role in debates of the nature of the relationship between oil prices and government spending, there have been a number of new “oil price shocks” since the 1970s as shown in Table 1. Of particular interest are the 1979, 1990 and 2007 booms and, more significantly, the 1986, 1997 and 2014 sharp slump in oil prices.

Table 1: The Major Crude Oil Shocks in the Past 40 Years

Shocks	Period of Shock	Average Oil Prices Change	Shock's Direction
1973	Aug 1973 - Mar 1974	$30 - $50	Price Increased
1979	Apr 1979 - Dec 1981	$64 - $117	Price Increased
1986	Feb 1986 - June 1990	$39 - $29	Price Decreased
1990	Aug 1990 - Oct 1990	$60 - $70	Price Increased
1997	June 1997 - Sep 1999	$30 - $16	Price Decreased
2006	June 2006 - May 2014	$74 - $154	Price Increased
2014	June 2014 -	$50 - $30	Price Decreased

Source: Calculated from 2016 Statistical Data, Kingdom of Saudi Arabia.

In this study we reinvestigate the nature of this relationship between oil price fluctuations and government spending in specific sectors of the Kingdom of Saudi Arabia. Specifically, we seek to address the essential question on how fluctuations in oil prices affect government spending in various sectors of the economy, and, in particular, which sectors are more likely to be affected. This paper is structured in four main sections, as follows: 1) a brief literature review; 2) the data and variables used in the model including methodology; 3) estimated results; and 4) discussion and conclusion are presented in the final section.

2. A Brief Literature Review

Three main themes are discussed here: 1) oil price fluctuations; 2) the effect of oil price fluctuations on government spending; and 3) Saudi national literature.

2.1 Oil Price Fluctuations

An enormous number of studies have investigated the link between oil prices fluctuations and macroeconomic variables (see, Hamilton, 1983, 1996, 2003 and 2009; Hamilton and Herrera, 2004, Hamilton and Wu CJ, 2013, Burbidge and Harrison, 1984; Bernanke et al., 1997; Papapetrou, 2001; Lee and Ni, 2002; Bernanke and Watson, 2004; Barsky and Kilian, 2004; Peersman, 2005; Blanchard and Gal, 2007; Kilian, 2008, 2009 and 2010; Peersman and Van Robays, 2009; Lombardi and Robays, 2011; Morana, 2013).

In his influential paper, Hamilton (1983) focused on the US economy and addressed one of the most important works on oil price effects on economic activities. He contends that there is an existence of a negative relationship between oil prices and the activities of macroeconomics and his finding became more widely accepted at the macroeconomics level.

His study shows that oil price fluctuations were an important explanation in all US recessions periods from 1949 to 1973. He suggests that changes in oil prices led changes in unemployment and GNP in the US economy during this period.

In theory, Lllien (1982) stated that fluctuations in oil price boost resource reallocation from productive to non-productive sectors which is costly for the economy. Sachs (1981) contends that oil price fluctuations of the early of 1970s have different effects on different economies. For instance, although it initially favored OPEC members, it caused increasing deficit in developed countries. However, Darby (1982) was filet to determine a significant link between oil price fluctuations and macroeconomic variables. By using long run data for the period 1948-1972, Hooker (1996) supported Hamilton's results that suggested oil price fluctuations are directly related to and influence GDP growth.

In addition, Hamilton's findings showed that oil price fluctuations have a strong causal and negative correlation with future real U.S. GNP growth. Pieschacon (2008, 2012) investigated how oil price fluctuations affect macro-economy behavior in an oil-exporting economy using DSGE model for two oil-rich countries, Mexico and Norway with different fiscal policy framework. He found that fiscal policy plays a crucial rule in transmitting the oil price fluctuations to the economy by affecting the output instability and growth. Therefore, when the prices of oil fall, the government cuts its expenditure. In this context, the role of fiscal policy might be a channel through which particular fluctuations in oil price

are transmitted to the entire national economy. By using different data and methodologies for the U.S., Burbidge and Harrison (1984) found a negative effect of oil and energy shocks on real U.S. economic activities .
The oil market has been described with unpredictable drive of oil price fluctuations since the 1970s. Baumeister and Peerman, (2009) stated that oil price fluctuations are not a new phenomenon; it has been a foremost feature in the oil market during the last three decades. There have been large and sharp fluctuations in the price of oil since its first collapse in 1986 (Sauter and Awerbuch, 2003). By using a sample of seven OECD countries, Norway and the Euro area, Jimenez-Rodriguez and Sanchez (2004) evaluate empirically the impacts of oil price fluctuations on the real economic activities of those economies.

In their findings, they argue that oil price declines have less effect on GDP growth than oil price increases. They contend that oil price rises have a mixed impact (positive and negative) on the economic activity for oil-exporting countries, while the relationship for oil-importing countries is negative. By using co-integrated VEC Model, Chang and Wong (2003) investigated the influence of oil price fluctuations on the economic growth of Singapore. Their findings suggest that oil price fluctuations only had a marginal effect on the performance of Singapore’s macroeconomic growth.

2.2 The Effect of Oil Price Fluctuations on Government Spending

According to Obadan (1983), a positive relationship between oil price fluctuations and government expenditure exists.

Moreover, he specified that this relationship is significant and linked to the rise of increasing oil revenues by the government to improve other sectors of the economy, such as agriculture, education, and infrastructure which are components of various government capital and expenditures.

In their study, Bleaney and Halland (2009) found that the instability of government consumption is defined by natural resource exports. Empirically, Fasano and Wang (2002) tested causality direction between revenue and total government spending for GCC countries, including Saudi Arabia, for the period of 1980-2000, using a co-integration and error-correction modelling framework. Their results indicate that an increase in revenue causes direct increase in government expenditure in the first period for GCC countries.

Furthermore, Akpan (2009) estimated the effect of oil prices on the Nigerian's economy by using a VAR approach. His findings show that any increase in oil prices lead to an increase in government expenditure, increase inflation and unexpectedly increase the industrial production growth. In another study, Talvi and Vegh (2000) found that the large flows in public capital expenditure during positive fluctuations periods are non-productive and have a very low return. Also, Delavari et al., (2008) stated that negative oil price fluctuations may cause decrease of economic growth than positive ones. Instead, a negative fluctuation typically fosters adjustments in government expenditures, which might be very costly. Dependability on cutting current expenditures is unsatisfactory because of its negative social consequences.

2.3 Saudi National Literature

In the national literature, a few studies have investigated the topic of economic growth in the Saudi economy, testing the key factors that might encourage economic activity. Based on Husain, Tazhibayeva, and Ter-Martirosyan (2008), government size and its fiscal policy, for example, plays a crucial role in explaining how oil prices affect the economy. In a recent study, Alghaith et al., (2015) found a positive and strong impact of oil prices on the government spending. Al Obaid (2004) empirically examined the relationship between government expenditures in some selected sectors and economic growth in Saudi Arabia during the period 1971-2001. His findings emphasize the importance of government expenditures in the Saudi economy in the long-run.

Tuwaijri (2001) also, evaluated the relationship between growth, government expenditures and exports in Saudi Arabia using the period 1969-1996. Significantly, his results show that a positive relationship exists between variables through government expenditures. Alkhathlan (2013) empirically examined the effect of oil production on economic growth of the Saudi economy during the period 1971-2010. His findings suggest a significant and positive relationship between oil production and economic growth for both the sort-run and long-run trends.

3. The Data and Variables Used in the Model including Methodology

This section contains two parts dealing with the data and variables and the methodology used.

3.1 Data and Variables Used

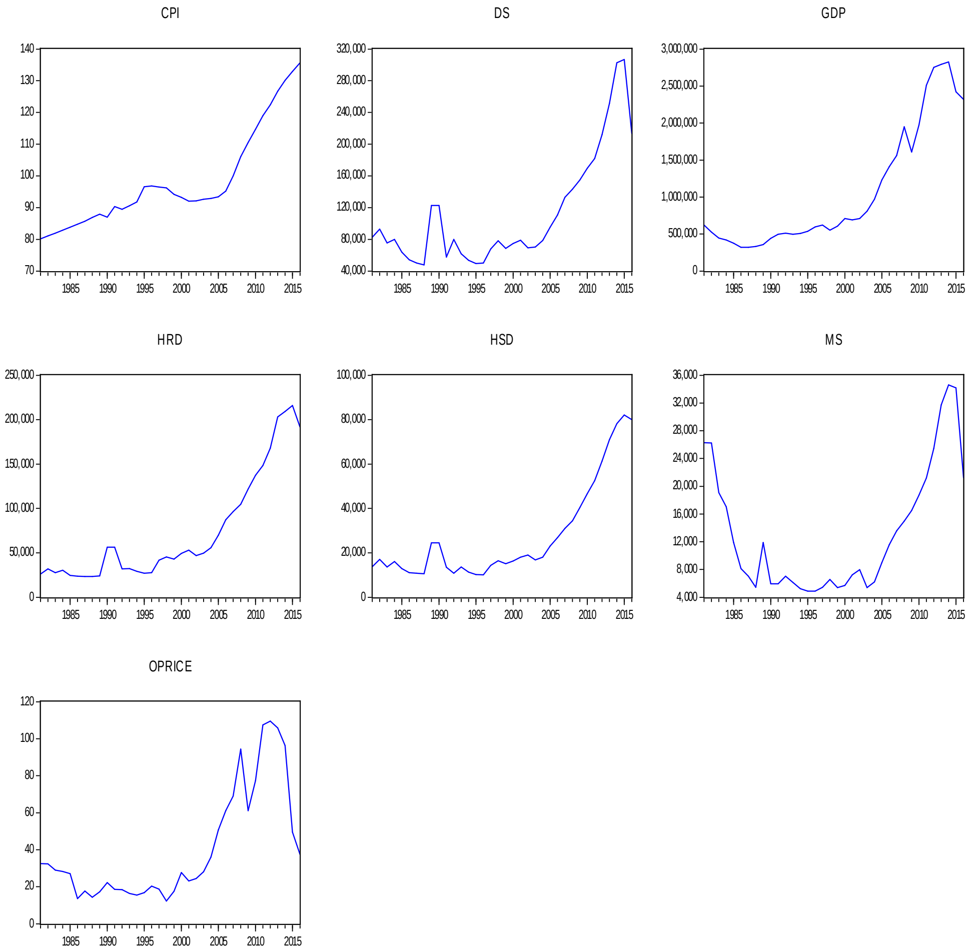
Data in this study was taken from SAMA, Annual Report

(2015) with estimated data for 2016 which is accessible from the official site of SAMA. The data covered the period, 1981-2016 and fully contains most oil price fluctuations, including the recent decline in oil prices since mid-2014. Annual series were chosen to avoid the shortcomings of interpolation process. The data is also converted into real terms by the GDP deflator (1999 = 100) and scaled using natural logarithm. The seven variables used in this study as shown in Figure 1 are as follows:

1. GDP: Real Gross Domestic Product.
2. GS (HSD): Real total government spending on Health and Social Development.
3. GS (HRD): Real total government spending on HRD (Including Education).
4. GE (DS): Real total government spending Defense and Security.
5. GS (MS): Real total government spending in Municipal Services.
6. CPI: Saudi Consumer Price Index.
7. ROPrice: Real Brent crude oil prices (US dollars).

The choice of these variables is justified in light of the research objectives.

Figure 1: Important Variables of the Study



3.2 Methodology

In order to examine the impacts of oil price fluctuations on different kinds of government spending on the Saudi economy, we use the VAR (vector autoregressive) model. It was originally developed by Sims (1980) as a linear multivariate model, consisting of n-variables for n-equations, where the current value of each variable is described by its lagged values plus current and lagged values of the other (n-1) variables. This simple econometric model has been used commonly in empirical applications to estimate the dynamic effects of fluctuations in oil prices on the economy (Burbidge and Harrison, 1984 and Hooker, 1996). The VAR model helps researchers to understand interrelationships among economic variables (Enders, 1996). In his empirical study, Raguidin and Rayes (2005) using an unrestricted vector autoregressive model (VAR) examined the effect of oil price fluctuations on the Philippines' economy from 1981 to 2003. El-Anashasy (2006) examined the relation between oil price fluctuations and government consumption spending on Venezuela's economic performance over the period of 1950-2001 by employing the VAR and VECM models. His findings show that oil price fluctuations and investment are the main determinants of GDP level in the long run and oil price fluctuations may have a secondary, indirect effect on the level of output. Moreover, he found that this relationship is important also for short-term fluctuations.

4. Estimated Results

Four specific test results are examined here: 1) unit root test; 2) co-integration test; 3) Granger causality test; and 4) the estimation of statistical significance of the parameter.

4.1 Unit Root Test

The unit root tests are done to test whether variables of the model are stationary or not. To do so, an Augmented Dickey-Fuller (ADF) unit root test is carried out on the time series in levels and differenced forms. We used E-views software package to test stationarity of variables to guarantee its non-stationarity for examining the long-run relationship. In general, the augmented Dickey-Fuller test was developed to check whether the specified variable is stationary or not, assuming that the error term is uncorrelated. In this study, ADF (Dickey and Fuller, 1981) test has been used in order to establish the order of integration of the variables in different forms, as shown in Equations below.

$\Delta Y = \alpha_1 + \alpha_2 \Delta Y_{2\text{-}1} + ʎ_{t\text{-}1} + \mu$ (1)
Intercept (constant) only

$\Delta Y = \alpha_1 + \alpha_{2\text{-}t} + \alpha_3 \Delta Y_{2\text{-}1} + ʎ_{t\text{-}1} + \mu$ (2) Trend and intercept (constant)

$\Delta Y = \Delta Y_{2\text{-}1} + ʎ_{t\text{-}1} + \mu$ (3) No trend and no intercept (constant)

In this case, the test includes a constant but not a time-trend (Equation 1) has been chosen as recommended by Dickey and Fuller (1979). As shown in Table 2, all of the variables are non-stationary in their levels and in some variables in 1st difference.

Table 2: Unit Root-ADF Test

Variable	**Level**	**1st Difference**	**I (1)**
LGDP	0.485195	-4.090128	I (1)*
LHRD	0.112084	-3.557551	I (1)**
LHSD	0.599008	-2.598225	I (1)***
LDS	-1.03447	-5.905078	I (1)*
LCPI	0.718043	3.068374	I (1)**
LOPRICE	-1.78812	-5.428028	I (1)*
LMS	-1.42784	-5.84194	I (1)*

Note. *, ** and *** denote significance at Level and 1st difference; I(1).

According to ADF test statistics at level, we have enough evidence to conclude the trend of null hypothesis and its alternative hypothesis is as follows:

- ***H_o:*** There is no significant relationship between oil price fluctuations and government spending in the selected sectors in Saudi Arabia (null hypothesis).
- ***H_1:*** There is a significant relationship between oil price fluctuations and government spending in the selected sectors in Saudi Arabia (alternative hypothesis).

Based on stationarity analysis in Table 2, the results show that we cannot reject the null hypothesis of unit roots for all variables in level form. However, the null hypothesis is rejected when the ADF test is applied to the first differences of LGDP, LDS, LMS, LOPRICE. Following the previous results, this study examines long-run relationship among the variables using VAR according to Johnson and Juselius (1990). Since oil prices, GDP, spending on health and spending on social development, spending on human resources development, spending on defense and security, spending on municipal services and CPI contain unit root at level test but some of them stationary at first difference, the study would now conduct co-integration test as suggested by Johnson and Juselius to examine whether if there is a common relationship among variables.

4.2 Co-integration Test

After testing variables and found them non-stationary in their levels, we checked for the long-run relationship between variables by comparing Trace statistic values with critical values Table 3 and Maximum Eigenvalue Table 4. Therefore, this allows us to conduct co-integration test among the variables.

Table 3: Unrestricted Co-integration Rank Test (Trace)				
No. of CE(s)	**Eigenvalue**	**T-Statistic at 5% level**	**Critical Value**	**Prob.****
None *	0.88933	180.4349	125.6154	0.0000
At most 1 *	0.655569	105.5938	95.75366	0.0089
At most 2	0.500722	69.35451	69.81889	0.0544
At most 3	0.456458	45.73834	47.85613	0.078
At most 4	0.368412	25.01033	29.79707	0.1611
At most 5	0.189945	9.38671	15.49471	0.3308
At most 6	0.063332	2.224515	3.841466	0.1358

Notes: * and ** denote rejection of the hypothesis at 1% and 5% levels.

According to trace statistic values in Table 3, we conclude that we must reject the null hypothesis of no co-integration in the six variables with respect to oil prices fluctuations because Trace Statistic values are greater than critical values at 5% levels. The results indicate enough evidence that the oil price fluctuations and other variables including government spending on selected sectors (human resources development, health and social development, defense and security and municipal Services) are subject to an equilibrium relationship in the long-run.

Table 4: Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value 5%	Prob.**
None *	0.892755	75.90966	47.07897	0
At most 1	0.660835	40.9568	36.7631	0.1376
At most 2	0.504949	34.80587	23.90521	0.5289
At most 3	0.4584	28.58808	20.84973	0.3499
At most 4	0.412231	22.29962	18.06831	0.1759
At most 5	0.356856	15.8921	15.00714	0.0684
At most 6	0.149669	9.164546	5.512398	0.2319

Notes: * and ** denote rejection of the hypothesis at 1% and 5% levels.

From the results of Table 4, since Max-Eigen Stats > Critical value at 5% in all variables, therefore, we cannot reject the null hypothesis of no co-integration and it exists in the current lag.

4.3 Granger Causality Test

The concept of Granger-causality test was introduced by Granger (1969) and Sims (1972) and is widely used to determine the importance of the interaction between two series. Granger's original work in 1969 of the definition of noncausality (Granger (1969) has attracted an attention in economics that it hardly needs any introduction. The simplest meaning of causality was provided by the Granger (1980, p. 334): "X (time series) variable X causes Y, if the probability of Y conditional on its own past history and the past history of X does not equal the probability of Y conditional on its own past history alone.

Testing Granger causality typically uses the same lags for all variables. However, when two variables are co-integrated then Granger causality exists in at least one direction. The results of Granger causality test due to Granger (1969) procedure are displayed in Table 5 (a and b) and can be summarized as follows. First, there is no bidirectional relationship between the different variables.

Table 5a: Granger Casuality Test

Null Hypotheses	Obs	F-Statistic	Prob.
OPRICE does not Granger Cause HRD	34	10.7919	0.0003
HRD does not Granger Cause OPRICE		0.91572	0.4115
OPRICE does not Granger Cause HSD	34	6.58234	0.0044
HSD does not Granger Cause OPRICE		1.35796	0.2731
OPRICE does not Granger Cause MS	34	23.0528	0.0001
MS does not Granger Cause OPRICE		1.97354	0.1572
OPRICE does not Granger Cause DS	34	14.6489	0.0004
DS does not Granger Cause OPRICE		1.57001	0.2252

Furthermore, results illustrate that there is no causal relationship running from government spending to oil price fluctuations, but there are causal relationships running from oil price fluctuations to different government spending sectors (human resources development, health and social development, defense and security and municipal services).

Tables 5 (a and b) reveal that there is a unidirectional relationship between oil price fluctuations and government spending in some selected sectors in Saudi Arabia.

Table 5b: Granger Causality Test			
Null Hypotheses	**Obs**	**Decision**	**Direction**
OPRICE does not Granger Cause HRD	34	Reject the Null	Unidirectional
HRD does not Granger Cause OPRICE		Accept the Null	
OPRICE does not Granger Cause HSD	34	Reject the Null	Unidirectional
HSD does not Granger Cause OPRICE		Accept the Null	
OPRICE does not Granger Cause MS	34	Reject the Null	Unidirectional
MS does not Granger Cause OPRICE		Accept the Null	
OPRICE does not Granger Cause DS	34	Reject the Null	Unidirectional
DS does not Granger Cause OPRICE		Accept the Null	

Based on Table 4, the F-value of 10.79 is statistically significant at 1 percent level of probability. Consequently, the null hypothesis that oil price does (OPRICE) not “Granger cause” HRD is rejected. However, the null hypothesis that HRD does not “Granger cause” OPRICE is accepted as judged by the low F-value of 0.916 Hence, the Granger causality test confirms a unidirectional causality from OPRICE to HRD.

Also, the null hypothesis that oil price does (OPRICE) not “Granger cause” HSD is rejected where F-value of 6.58 is statistically significant at 1 percent level of probability. However, the null hypothesis that HSD does not “Granger cause” OPRICE is accepted as judged by the low F-value of 1.358. In this case, the Granger causality test confirms a unidirectional causality from OPRICE to HSD. Similarly, the null hypothesis that oil price does (OPRICE) not “Granger cause” DS is rejected where F-value of 14.65 is statistically significant at 1 percent level of probability.

Though, the null hypothesis that DS does not “Granger cause” OPRICE is accepted as judged by the low F-value of 1.57. In this case, the Granger causality test confirms a unidirectional causality from OPRICE to DS. Finally, the null hypothesis that oil price does (OPRICE) not “Granger cause” MS is rejected where F-value of 23.05 is statistically significant at 1 percent level of probability. Though, the null hypothesis that MS does not “Granger cause” OPRICE is accepted as judged by the low F-value of 1.97. In this case, the Granger causality test confirms a unidirectional causality from OPRICE to DS. Generally, the Granger causality test results confirm that oil price fluctuations have an important positive impact on selected government spending in Saudi Arabia.

4.4 The Estimation of Statistical Significance of the Parameter

Further analyses are were also conducted in order to test the statistical significance of the parameter in the effects of price fluctuations on government spending behavior, as shown in Tables 6a and b.

Dependent variable: LGDP

Method: Least Squares

Date: 1/18/2017 Time: 11:19

Sample: 1981- 2016; Included Observations: 36.

Table 6a: The Estimation of Statistical Significance of the Parameter

Variable	Coefficient	Std. Error	t-Statistic	Prob
LHSD	0.120849	0.169236	0.714086	0.4807
LHRD	0.441983	0.140044	3.156035	0.0036
LSD	-0.396877	0.172482	-2.300982	0.0285
LMS	0.005984	0.076550	0.078168	0.9382
LCPI	2.111978	0.269211	7.845052	0.0000
LOPRICE	0.475739	0.077111	6.169578	0.0000
R-squared		0.971292	Mean dependent var.	13.61544
Adjusted R-squared		0.966507	S.D. dependent var.	0.714545
S.E. of regression		0.130769	Akaike info criterion	-1.079753
Sum squared resid.		0.513018	Schwarz criterion	-0.815834
Log Likelihood		25.43556	Hannan-Quinn criter.	-0.987638
Durbin-Watson stst.		0.700561		

As shown in Tables 6a and b, the statistical significance of the estimated parameters can be shown by the correlation coefficient of the estimated parameter, the F-statistics test and the Durbin Watson Statistics and the adjusted R-square (R^2), Adjusted R-square (R^2) value for this model is very high and is pegged at 0.966507 which suggests that oil price fluctuations, real government spending on health and social development, real government spending on human resources development, real government spending on defense and security, real government spending on municipal services CPI explained about 97 % systemic variations on the real gross domestic product. Only 3 % could be attributed to some other variables affecting real gross domestic product outside the model.

5. Discussion and Conclusion

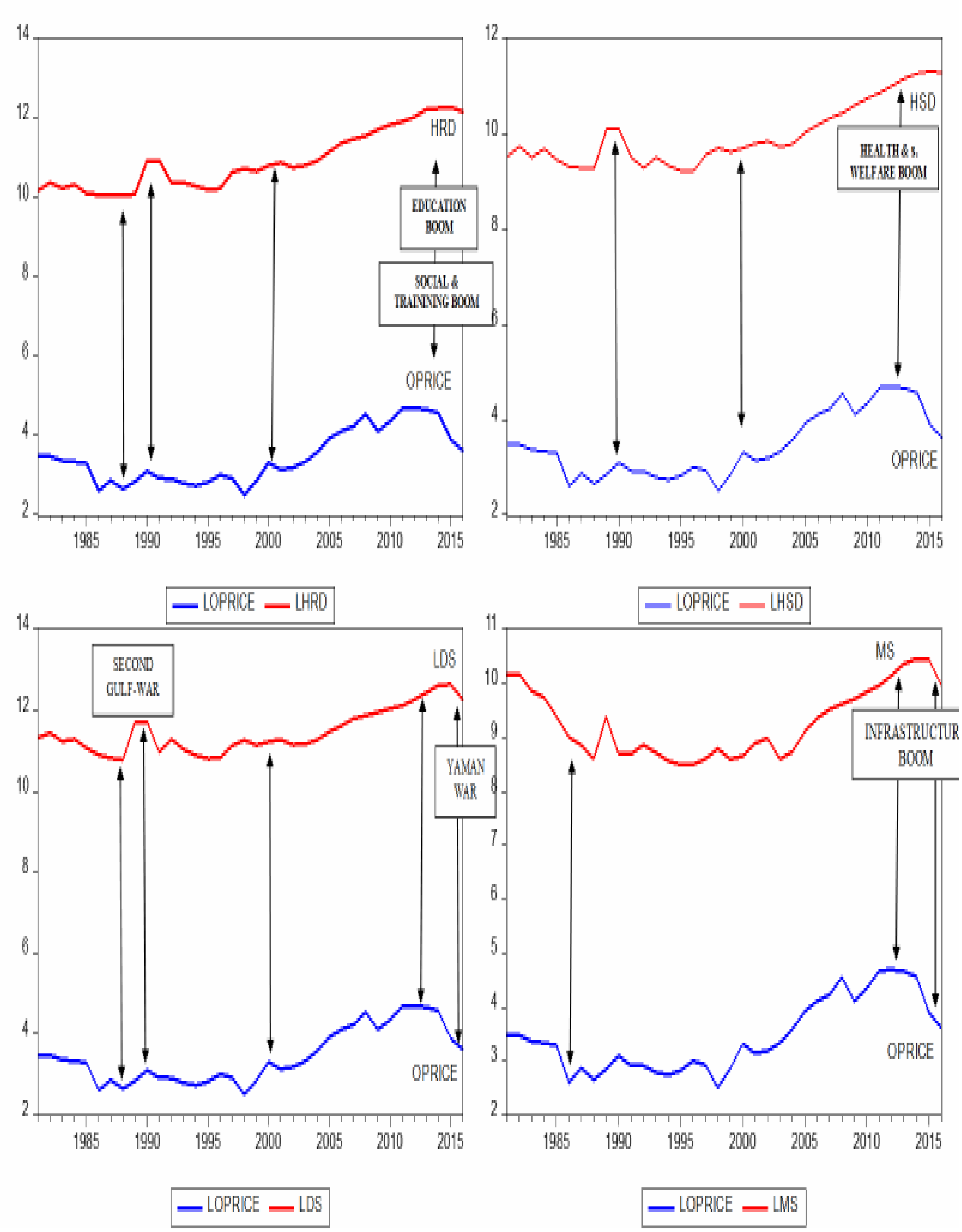
The results from the modelling showed that the Saudi government spending in the four major sectors has been significantly and economically affected by oil price fluctuations in the last four decades. Several important perceptions appear from our analysis. We find that, since the mid-1970s, oil price fluctuations have effected Saudi Arabia spending in specific sectors. Considering the results that shown above, we estimate the response of government spending in some selected sectors (HRD, HSD, DS and MS) to oil price fluctuations. We can say that there is a statistical significant relationship between dependent and independent variables from the model. Thus, we accept the alternative hypothesis which states that there is a significant relationship between oil price fluctuations and government spending in the selected sectors.

In general, results in this study are consistent with Obadan (1983) findings which indicate that a positive relationship between oil price fluctuations and government expenditure exists. Certainly, the four selected sectors of the government spending relate to public services of various forms, transfers, subsidies and wages, to which it is, in the main, committed. However, a country such as Saudi Arabia with huge output would require higher government spending to assure sustainability of growth. Given the substantial dependence of the Saudi's economy on oil revenues and the accumulated physical capital, the data shows that historically any changes in oil prices were consistently followed by changes in all four government sectors that have been selected.

In these circumstances, government spending is not financed by other than oil revenue. Thus, increasing revenues and injected them into the specific sectors lead to increased financing risks in times of slump oil prices. In this case, there is no government funding restrictions and this might not be justified economically and therefore only increase government spending. However, while government revenue is driven by oil sales which has accounted for an average of 80% of the total government revenue in the past 40 years, spending is not adjusted to target a particular fiscal deficit or surplus. Instead, the fiscal position is an outcome of fluctuating oil-based revenue and spending items that are undertaken without reference to annual changes in the oil price.

Base on the study, the results indicate that the most important and statistically significant responses to oil price fluctuations are observed in the spending on defense and security (DS), health and social development (HSD) and human resources development (HRD). Table 6 shows that there has been a strong correlation where R2 = 0.97129 which concludes that the oil price fluctuations were a key determinant of the government's spending position in the past four decades. This relationship was less pronounced in the early 1990s, due to second gulf-war and in later years, due to the massive government spending especially in these four sectors.

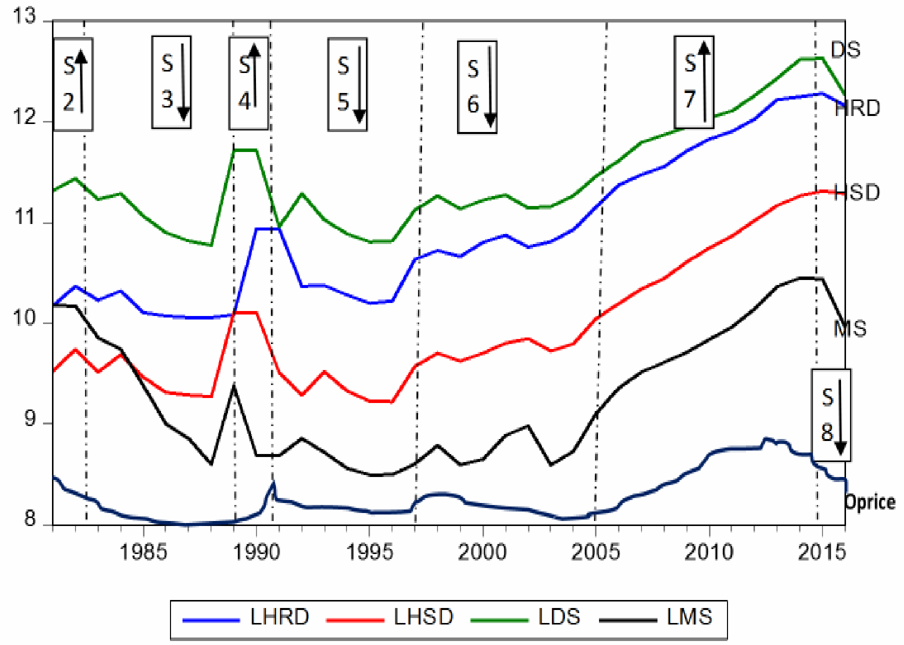
Figure 2: The relationship between Oil prices and Selected Sectors



However, current government spending includes these four essential sectors cover spending on services such as wage bills of government employees, employer contribution including social security and pensions, subsidies and all other payments which relate to the management of government functions in military, health, education, cultural, and social activities. The government invests and generates new capacities in infrastructure services and public goods through the capital or development spending. Obviously, over the long term and as a result of oil price fluctuations, higher oil revenue has supported increased government spending, but this is not the case between 1997 and 2006 as shown in Figure 2, where government decisions change in spending appear to be unrelated to annual changes in the average oil price.

The findings of the impulse response function for the VAR model in this study show that the government spending on these four sectors to GDP ratio responds positively and statistically significantly to fluctuations in oil price fluctuations in general. According to the results of the impulse response functions for the VAR model, although oil price fluctuations have positive and significant effect on the government spending, the findings show that there is strong unidirectional causality from oil price fluctuations to government spending on human resources development, health and social development, defense and security and municipal services. This result is consistent with the emphasis in Kilian (2009) and related studies on including enough lags in modelling long cycles in commodity prices.

Figure 3: The main shocks in the last 35 years



Currently, the decline in oil prices since mid-2014 was one of the main declines in oil price history. Since mid-2014, crude oil prices have decreased precipitously. After averaging more than $100 P/B in the first half of year 2014, oil price intermediate has fallen to less than $48 per barrel at year's end, about a 50% drop and has created an important impact on the world economy. Regionally, oil price decline affected most oil producing countries, especially the GCC region (Mehrara, 2008). Nationally, Saudi Arabia, the major oil exporting country, was not an exception in this effect. Over the past years, Saudi Arabia has been one of the strongest growing economies in the G-20. In global oil market, Saudi Arabia has approximately 20% of the world reserve and became the world’s largest production capacity, and the world’s largest exporter of the net oil (USEIA, 2016). However, in general, this dramatic decline in oil prices had a significant impact on the Saudi Economy. Between June 2014 and March 2016, the monthly average price of Brent crude oil fell around 70% from $112 to $32 (USEIA, 2016). As a result, Saudi Arabia has started to tighten its government spending to deal with the current drop in oil prices. It has shown a clear committed of moving away from expansionary budget that was a key feature of its economy during the past five decades. Nevertheless, Saudi government is clearly attempting to reduce its role in the economy, but this is not easy in the near future, and public spending will remain the key determinant of economic activity in the future.

However, with oil prices dropping sharply, current budgets announced by Saudi Arabia have shown a decline in overall spending levels. Since 2015, the Saudi government spending was cut for the first time since 2002 and it expected to have a further cut in spending until 2020 as the government wrestles with the effect of the shift in the price of oil on both the fiscal position and balance of payments. According to IMF (2016), the government lowered its budgeted spending for 2016 by about 14%, compared to the actual spending in 2015. Nevertheless, regarding reductions in overall expenditure, the Saudi economy has continued its focus on the main sectors such as defense, security, social welfare, education and healthcare, indicating the government’s efforts to select spending on important sectors. The 2016’s budget continues to reflect the government's focus on long-term sustainable development that requires investment in infrastructure, education, health care, and social and economic development projects. As expected, education and training continued to be central to the aforementioned strategy, receiving 22.8% of total allocations، with health accounting for 12.5% of the budget NCB (2016).

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Appendix 1: VAR Estimation

Vector Autoregression Estimates
Date: 12/24/16 Time: 14:13
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGDP	LHRD	LHSD	LMS	LDS	LCPI	LOPRICE
LGDP(-1)	0.940749	0.193432	0.605683	0.671316	0.615438	0.017512	1.195397
	(0.47889)	(0.48061)	(0.85105)	(0.91394)	(0.97628)	(0.07083)	(1.17848)
	[1.96445]	[0.40247]	[0.71169]	[0.73453]	[0.63039]	[0.24724]	[1.01436]
LGDP(-2)	0.274775	0.271645	-0.971086	-1.195917	-1.116681	0.006612	-0.216843
	(0.41446)	(0.41596)	(0.73656)	(0.79099)	(0.84494)	(0.06130)	(1.01994)
	[0.66297]	[0.65306]	[-1.31841]	[-1.51192]	[-1.32161]	[0.10786]	[-0.21260]
LHRD(-1)	-0.126067	-0.204529	-0.021063	0.896104	0.272272	-0.022582	0.049835
	(0.26705)	(0.26802)	(0.47459)	(0.50967)	(0.54443)	(0.03950)	(0.65719)
	[-0.47206]	[-0.76312]	[-0.04438]	[1.75822]	[0.50011]	[-0.57172]	[0.07583]
LHRD(-2)	0.068759	-0.191767	0.424934	-0.146560	0.153908	0.001455	0.207577
	(0.19020)	(0.19089)	(0.33802)	(0.36300)	(0.38776)	(0.02813)	(0.46807)
	[0.36150]	[-1.00460]	[1.25712]	[-0.40375]	[0.39692]	[0.05172]	[0.44347]
LHSD(-1)	0.550423	0.575341	0.987418	-0.490171	0.482392	0.001429	1.061916
	(0.25111)	(0.25202)	(0.44627)	(0.47924)	(0.51193)	(0.03714)	(0.61796)
	[2.19193]	[2.28293]	[2.21262]	[-1.02280]	[0.94230]	[0.03846]	[1.71842]
LHSD(-2)	0.297005	0.410365	-0.156479	-0.125051	0.092097	-0.001131	0.415982
	(0.29641)	(0.29748)	(0.52676)	(0.56569)	(0.60427)	(0.04384)	(0.72942)
	[1.00202]	[1.37949]	[-0.29706]	[-0.22106]	[0.15241]	[-0.02579]	[0.57029]
LMS(-1)	-0.188983	-0.215196	-0.041056	0.783243	0.421844	-0.049591	0.001525
	(0.17169)	(0.17230)	(0.30511)	(0.32766)	(0.35000)	(0.02539)	(0.42250)
	[-1.10075]	[-1.24894]	[-0.13456]	[2.39044]	[1.20526]	[-1.95291]	[0.00361]
LMS(-2)	0.003578	-0.270069	0.207376	0.222456	-0.114013	0.026667	0.217940
	(0.16967)	(0.17028)	(0.30152)	(0.32380)	(0.34589)	(0.02509)	(0.41753)
	[0.02109]	[-1.58606]	[0.68777]	[0.68701]	[-0.32962]	[1.06267]	[0.52198]
LDS(-1)	-0.192397	0.367539	-0.189876	-0.259292	-0.238047	0.040070	-0.695676
	(0.21059)	(0.21135)	(0.37425)	(0.40191)	(0.42932)	(0.03115)	(0.51824)
	[-0.91360]	[1.73900]	[-0.50735]	[-0.64515]	[-0.55447]	[1.28644]	[-1.34238]
LDS(-2)	-0.336140	-0.189162	-0.769923	-0.445180	-0.618984	-0.003385	-0.962154
	(0.25134)	(0.25224)	(0.44667)	(0.47967)	(0.51239)	(0.03717)	(0.61851)
	[-1.33740]	[-0.74992]	[-1.72371]	[-0.92809]	[-1.20803]	[-0.09107]	[-1.55559]
LCPI(-1)	1.141520	-1.550500	-0.883170	-0.920490	1.360211	1.287575	1.983957
	(1.48234)	(1.48768)	(2.63434)	(2.82902)	(3.02197)	(0.21925)	(3.64787)
	[0.77008]	[-1.04222]	[-0.33525]	[-0.32537]	[0.45011]	[5.87269]	[0.54387]
LCPI(-2)	-2.382567	1.824276	2.480461	2.371494	0.174140	-0.397574	-5.936019
	(1.59778)	(1.60354)	(2.83950)	(3.04933)	(3.25731)	(0.23632)	(3.93195)
	[-1.49117]	[1.13766]	[0.87356]	[0.77771]	[0.05346]	[-1.68234]	[-1.50969]
LOPRICE(-1)	-0.079052	0.248778	-0.063967	0.071836	-0.053814	0.004305	0.060508
	(0.19565)	(0.19635)	(0.34769)	(0.37339)	(0.39885)	(0.02894)	(0.48146)
	[-0.40405]	[1.26701]	[-0.18398]	[0.19239]	[-0.13492]	[0.14876]	[0.12568]
LOPRICE(-2)	-0.132720	0.036735	0.510312	0.557791	0.412938	0.016267	-0.106109
	(0.16742)	(0.16802)	(0.29753)	(0.31952)	(0.34131)	(0.02476)	(0.41200)
	[-0.79274]	[0.21863]	[1.71517]	[1.74574]	[1.20987]	[0.65691]	[-0.25755]
C	3.450887	-0.619669	2.893935	4.243141	6.586407	0.132745	7.715990
	(1.77672)	(1.78312)	(3.15749)	(3.39083)	(3.62210)	(0.26279)	(4.37230)
	[1.94228]	[-0.34752]	[0.91653]	[1.25136]	[1.81840]	[0.50514]	[1.76475]
R-squared	0.987242	0.987521	0.952461	0.937143	0.907066	0.992875	0.913645
Adj. R-squared	0.977842	0.978325	0.917432	0.890827	0.838589	0.987626	0.850016
Sum sq. resids	0.224334	0.225953	0.708502	0.817087	0.932344	0.004908	1.358548
S.E. equation	0.108660	0.109052	0.193105	0.207375	0.221519	0.016072	0.267400
F-statistic	105.0194	107.3935	27.19078	20.23366	13.24620	189.1280	14.35877
Log likelihood	37.11276	36.99051	17.56245	15.13839	12.89513	102.0928	6.495133
Akaike AIC	-1.300751	-1.293559	-0.150732	-0.008141	0.123816	-5.123105	0.500286
Schwarz SC	-0.627356	-0.620165	0.522662	0.665254	0.797211	-4.449711	1.173681
Mean dependent	13.63651	10.95434	9.998708	9.223909	11.47061	4.586586	3.458143
S.D. dependent	0.729962	0.740722	0.672029	0.627623	0.551372	0.144476	0.690459

Determinant resid covariance (dof adj.)	4.03E-16
Determinant resid covariance	6.86E-18
Log likelihood	334.1372
Akaike information criterion	-13.47866
Schwarz criterion	-8.764901