Journal of Economics and Sustainable Development www.iiste.org
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.5, No.12, 2014

The Impact of Macroeconomic Aggregates on Private Sector Dynamics in Saudi Arabia

Othman Alwagdani*, *PhD*.
Department of Economics Imam Muhammad bin Saud Islamic University, Saudi Arabia.
* E-mail of the corresponding author: othman.w@gmail.com

Abstract

By applying a structural vector autoregressive (SVAR) approach, this paper investigates the sources of private sector fluctuations in the Saudi economy using annual data from 1973-2011. On the basis of variance decompositions and impulse response functions, the study finds that oil price shocks are the main source of private sector fluctuations. In addition, the results provide a strong support for one of the propositions of business-cycle theory in which supply shocks explain high fractions of private output. On the other hand, policy shocks, namely fiscal and monetary shocks seem to play a limited role in determining private sector dynamics. Last but not least, nominal shocks dominate real shocks in explaining the variability of inflation especially in the short term. In the long term, however, it is safe to conclude that oil prices are inflationary.

Keywords: SVAR, Private sector, Oil shocks, Saudi Arabia.

1. Introduction

Saudi economy is an oil-based economy where oil provides most of government's revenues and generates the bulk of foreign exchange earnings. The degree of dependence on oil comes from the fact that oil sector accounts for 89% of total exports, 44% of GDP, and constitutes 80% government revenues during the period 1973-2011. Consequently, oil price shocks seem to have a tremendous effect on macroeconomic activities which makes it hard for policymakers to shield such a vulnerable economy from fluctuations and uncertainty of a very unpredictable commodity. Oil market conditions and the associated oil prices can directly affect government revenues and subsequently affect government expenditures which have the power to determine the future of the whole economy including private sector. Technically speaking, development of private sector, as represented by private GDP, is closely linked to the movement of oil prices. The private GDP showed a positive trend during the period 1970-1982, and then it was characterized by a negative growth resulted from depreciated oil prices during the period 1983-1987. After that, the growth rates of private sector experienced a continuous positive trend similar to that of oil prices but with much less volatility (Figure 1).

This study tends to analyze and identify how much of private output variations can be explained by oil price shocks. Moreover, while assessing the significant role of oil prices shocks, it will shed light on the channels through which these shocks transmitted to private economic activity. The transmission mechanisms can be generally identified by supply and demand channels. The supply channels are determined through the effects of oil price fluctuations on oil production and overall oil revenues. On the other hand, the demand channels are recognized by relating oil price changes to government expenditures which directly transferred to consumption, investment and even economic policy decisions. To be more specific, the SVAR model of this study is designed to account for the following underlying shocks: exogenous oil price; fiscal (demand); supply (technology); monetary; and nominal shocks. Identification of the structural model is achieved by using long-run approach similar to Blanchard and Quah (1989). This methodology imposes long-run restrictions while the data are set to be free to determine the contemporaneous dynamics.

The importance of this paper arises from the following observations:

- It examines for the first time, to the best of my knowledge, the stochastic nature of private sector dynamics for Saudi Arabia by obtaining the relative importance of different types of shocks that derive the business cycle fluctuations of the sector.
- The study employs SVAR model with long-run restrictions. The advantages of this method are that it does not require any judgment about short-term rigidities which makes it applicable and flexible to examine and compare the vulnerability of Saudi economy to the potential innovations such as nominal vs real; policy vs non-policy; and external vs internal shocks .

On the basis of Variance Decompositions (VDs) and Impulse Response Functions (IRFs), the study confirms that: (1) real, supply and external shocks dominate nominal, demand, and domestic shocks in explaining real private output movements at all horizons; (2) oil price shocks are the most important source for private GDP and other endogenous variables fluctuations; (3) and money is neutral in affecting inflation whereas oil price shocks are inflationary.

The remainder of this paper is organized as follows. Section 2 briefly reviews the related literature. Section 3 describes the econometric methodology, followed by a section that introduces data. The main empirical results are reported in section 5, while section 6 concludes.

2. Literature Review

Volatility of oil prices has encouraged many researchers to explore the dynamic interaction between oil prices and the macroeconomic activities. Most of these studies concentrated on the industrialized countries especially the United States, with little attention being paid to the oil-exporting countries. In a well-known paper, Hamilton (1983) initiates the examination of the role of linear oil prices for the US economy using VAR models. He showed that oil price shocks have negative impacts on real economic activity where large increases in the price of oil seemed to be followed by decreases of productivity and output. Hamilton's work has been extended by Mork (1989) who proposes a non-linear definition of oil prices to account for positive and negative shocks. Mork provides evidence that supports the existence of asymmetric effects of oil price shocks on macroeconomic variables where positive shocks have stronger impacts compares to the negative ones. However, the conclusion that oil price shocks have direct impacts on the economy remains controversial. For example, Hooker (1996) applies Granger causality tests to examine the oil price-macroeconomy relationship. He finds out that linear and non-linear oil price shocks do not Granger-cause most of macroeconomic variables in his study.

Recently, the study of Lee and Ni (2002) applies VAR models to examine the impacts of oil price shocks on different sectors of the US economy. The results indicate that oil price increases mainly reduce supply for industries with a large cost share of oil. Moreover, Elder and Serletis (2008) apply structural VAR models with GARCH-in-mean errors to analyze the impact of oil price shocks and their uncertainty on economic activities in the United States. The results confirm that uncertainty about oil price negatively affects the US economy especially for the period after 1975.

As summarized above concisely, most studies were devoted to developed oil-importing countries with less attention has been paid to developing oil-exporting countries. In this regard, Mehara and Mohaghegh (2011) investigate the sources of macroeconomic fluctuations in 17 developing oil-exporting countries. The study concludes that: (1) oil shocks are not inflationary but they significantly affect economic output and money supply, (2) money is not neutral in these countries and it is the main cause of macroeconomic fluctuations, (3) and domestic shocks are responsible for a reasonable portion of oil price variations.

Alotaibi (2006) uses SVAR models to examine the impacts of oil price shocks on real exchange rates and price levels in GCC economies for the period 1960-2004. He concludes that oil price shocks are found to be not only important but also persistent. In most countries, supply shocks play larger roles than do demand shocks. Nominal shocks have only short-run effects on the real exchange rate and the price level.

Thus, this study takes a humble step toward filling the above-mentioned gap by choosing a major oil exporting country such as Saudi Arabia and focusing on the vulnerability of the private sector which is usually neglected when analyzing overall macroeconomic fluctuations. I believe the outcomes of this study would elucidate the channels through which certain structural shocks could leak to the private sector. Knowing such channels would be insightful for policymakers to measure vulnerability and evaluate the performance of the Saudi private sector.

3. The Structural Model

As mentioned before, a structural VAR is designed to analyze the sources of fluctuations of private output. Identification of the structural model is achieved by using the long-run approach while temporary shocks are allowed to affect the macroeconomic variables in an unconstrained way. In this type of SVAR models, the long-term restrictions, combined with the orthogonality and the normalization assumptions of the covariance matrix of the original shocks, will be utilized to extract impulse responses and variance decompositions from the standard VAR models. Technically speaking, the following assumptions are employed empirically to identify structural shocks and to analyze the extent to which such shocks have driven macroeconomic fluctuations:

1- As a leading member in OPEC, Saudi Arabia has the capacity to adjust its oil production and fill the residual excess demand in the short run. However, the country strictly follows OPEC's quotas which restrict its oil production in the long run. Consequently, it would be logical to assume that oil prices are exogenous considering the fact that they are more related to external conditions than to domestic ones.

Thus, changes in oil prices (OP_t) are determined only by their own stochastic process (ε^{op}) as specified in the following equation:

$$\Delta OP_t = \sum_{k=0}^{\infty} c_{11}(k).\varepsilon_{t-k}^{op} \qquad (1)$$

2- Regarding the fluctuations of government capital expenditure (CE_t), it is safe to assume that government expenditures in Saudi Arabia are closely related to oil revenues (Ugo and Wang, 2002). Accordingly, the changes in government capital expenditure could be attributed partly to the accumulated oil price shocks and to its own fiscal (demand) shocks (ε^f),:

$$\Delta CE_t = \sum_{k=0}^{\infty} c_{21}(k).\varepsilon_{t-k}^{op} + \sum_{k=0}^{\infty} c_{22}(k).\varepsilon_{t-k}^{f} \qquad (2)$$

3- The changes in the growth rate of real private GDP (PY_t) are derived from the elements of the sector's production function. These elements include external shocks as represented by oil price shocks (ε^{op}), government subsidies to the private sector or fiscal shocks (ε^f), and its own technological (supply) innovations (ε^{as}):

$$\Delta PY_t = \sum_{k=0}^{\infty} c_{31}(k).\varepsilon_{t-k}^{op} + \sum_{k=0}^{\infty} c_{32}(k).\varepsilon_{t-k}^{f} + \sum_{k=0}^{\infty} c_{33}(k).\varepsilon_{t-k}^{as} \qquad (3)$$

4- The following equation is obtained from a basic version of money demand equation with unitary income elasticity. In such equations, the fluctuations of real money balance can be influenced by permanent shocks to oil prices, fiscal policy, aggregate supply, and monetary shocks (ε^m). However, money supply variable is not the best candidate to represent the above monetary function since Saudi Arabia has a fixed exchange rate regime and follows a passive monetary policy. Instead, I will choose bank credit to private sector (BC_t) because it is very important tool that has been used to reflect domestic monetary policy and steer it in the desired direction (Alhamidy, 2004). The long-term equation will be as follows:

$$\Delta BC_t = \sum_{k=0}^{\infty} c_{41}(k).\varepsilon_{t-k}^{op} + \sum_{k=0}^{\infty} c_{42}(k).\varepsilon_{t-k}^{f} + \sum_{k=0}^{\infty} c_{43}(k).\varepsilon_{t-k}^{as} + \sum_{k=0}^{\infty} c_{44}(k).\varepsilon_{t-k}^{m} \qquad (4)$$

5- Last but not least, I followed the work of Clarida and Gali (1994), Prasad (1999), Ahmed and Park (1994), and others by assuming that inflation is a function of all underlying shocks in the model including its own nominal shocks (ε^n):

$$\Delta P_t = \sum_{k=0}^{\infty} c_{51}(k).\varepsilon_{t-k}^{op} + \sum_{k=0}^{\infty} c_{52}(k).\varepsilon_{t-k}^{f} + \sum_{k=0}^{\infty} c_{53}(k).\varepsilon_{t-k}^{as} + \sum_{k=0}^{\infty} c_{54}(k).\varepsilon_{t-k}^{m} + \sum_{k=0}^{\infty} c_{55}(k).\varepsilon_{t-k}^{n} \qquad (5)$$

With the above assumptions as a guideline, the economy is described by the following structural form equation:

$$\boldsymbol{X_t = C(L).\varepsilon_t} \qquad (6)$$

where $\boldsymbol{C(L)}$ is a matrix of polynomial in the lag operator $\boldsymbol{L}$, $X_t = [\Delta OP_t, \Delta CE_t, \Delta PY_t, \Delta BC_t, \Delta P_t]^{`}$, and $\boldsymbol{\varepsilon_t}$ is a vector of structural disturbances $\boldsymbol{\varepsilon_t = [\varepsilon_t^{op}, \varepsilon_t^{f}, \varepsilon_t^{as}, \varepsilon_t^{m}, \varepsilon_t^{n}]^{`}}$.

To identify the structural shocks, one can follow Blanchard-Quah (1989)'s approach to impose the following long-term restrictions on the structural VAR model:

$$\begin{bmatrix} \Delta OP_t \\ \Delta CE_t \\ \Delta PY_t \\ \Delta M_t \\ \Delta P_t \end{bmatrix} = \begin{bmatrix} c_{11}(L) & 0 & 0 & 0 & 0 \\ c_{21}(L) & c_{22}(L) & 0 & 0 & 0 \\ c_{31}(L) & c_{32}(L) & c_{33}(L) & 0 & 0 \\ c_{41}(L) & c_{42}(L) & c_{43}(L) & c_{44}(L) & 0 \\ c_{51}(L) & c_{52}(L) & c_{53}(L) & c_{54}(L) & c_{55}(L) \end{bmatrix} . \begin{bmatrix} \epsilon_t^{op} \\ \epsilon_t^{f} \\ \epsilon_t^{as} \\ \epsilon_t^{m} \\ \epsilon_t^{n} \end{bmatrix} \qquad (7)$$

The structural model in equation (6) cannot be estimated directly because there are unobserved components in the structural shocks ε_t. Thus, we need to obtain the following reduced-from equation:

$X_t = A_0 + A(L).X_{t-1} + e_t$ (8)

Or in a matrix form:

$$\begin{bmatrix}\Delta OP_t\\ \Delta CE_t\\ \Delta PY_t\\ \Delta M_t\\ \Delta P_t\end{bmatrix} = \begin{bmatrix}A_0^{op}\\ A_0^{f}\\ A_0^{as}\\ A_0^{m}\\ A_0^{n}\end{bmatrix} + \begin{bmatrix}A_{11}(L) & A_{12}(L) & A_{13}(L) & . & .\\ A_{21}(L) & A_{22}(L) & . & . & .\\ A_{31}(L) & . & . & . & .\\ . & . & . & . & .\\ . & . & . & . & A_{55}(L)\end{bmatrix} . \begin{bmatrix}\Delta OP_{t-1}\\ \Delta CE_{t-1}\\ \Delta PY_{t-1}\\ \Delta M_{t-1}\\ \Delta P_{t-1}\end{bmatrix} + \begin{bmatrix}e_t^{op}\\ e_t^{f}\\ e_t^{as}\\ e_t^{m}\\ e_t^{n}\end{bmatrix} \quad \textbf{(9)}$$

where $\boldsymbol{A(L)}$ is a matrix of polynomial in lag operator $\boldsymbol{L}$, and $\boldsymbol{e_t}$ is a vector of VAR residuals.

Since equation (6) and (8) have the same stationary endogenous, it is a straightforward process to connect both types of structural and VAR shocks:

$e_t = C(0).\varepsilon_t$ (10)

Arranging equation (8) by eliminating the constant term yields:

$X_t = A(L)L.X_t + e_t$ (11)

Or, $X_t = [I - A(L)L]^{-1}.e_t$ (12)

Or, $X_t = \Lambda(L).e_t$ (13)

Therefore, combining equation (10) with equation (13) yields:

$X_t = \Lambda(L).C(0).\varepsilon_t$ (14)

Thus, from equation (6):

$C(L) = \Lambda(L).C(0)$ (15)

Hence, it is now possible to calculate $C(L)$ if $C(0)$ is unique. Therefore, the long-term restrictions, combined with the orthogonality and the normalization assumptions of the covariance matrix will be necessary and sufficient to solve the model and extract VDs and IRFs.

4. The Data

The data considered for this study are annual growth rates, expressed in log form, covering the period 1973-2011. There are five variables: real oil prices; real government capital expenditures; real private GDP, real bank credit to private sector; and domestic prices measured by Consumer Price Index (CPI). All nominal variables and their corresponding deflators are collected from various issues of Annual Bulletins of the Saudi Arabian Monetary Agency (SAMA).

To prepare the data for VAR estimations, I need to examine the presence of unit roots in all variables of this study. In this regards, Augmented Dickey- Fuller (ADF) and Phillips-Perron (PP) statistical tests are employed and the result are shown in table (1). Both tests indicate that unit roots for all variables in level forms cannot be rejected at different significance levels. However, the results reject the presence of unit roots in the variables when using the first differences. Thus, it is appropriate to employ the VAR model in the first-difference form.

5. Empirical Results

In this section, the focus will be on the estimation of dynamics reactions of the macroeconomic variables (Real oil prices; real government capital expenditure; real private GDP; real bank credit to private sector; and inflation) to the corresponding structural shocks (oil price; fiscal (demand); supply (technology); monetary; and nominal shocks). Then, some related relationships will be evaluated within the context of variance decompositions (VDs) and impulse response functions (IRFs).

The VAR estimations apply OLS technique to obtain the metrics of long-term effects $C(L)$and contemporaneous effects **C(0)** and the results are as follows:

$$\boldsymbol{C(L)} = \begin{bmatrix} 0.279 & 0 & 0 & 0 & 0 \\ 0.338 & 0.343 & 0 & 0 & 0 \\ 0.171 & -0.029 & 0.150 & o & 0 \\ 0.149 & -0.032 & 0.069 & 0.077 & 0 \\ 0.090 & -0.019 & 0.088 & -0.002 & 0.033 \end{bmatrix}$$

$$\boldsymbol{C(0)} = \begin{bmatrix} 0.225 & -0.018 & -0.113 & -0.073 & 0.008 \\ 0.351 & 0.661 & -0.066 & 0.164 & -0.036 \\ 0.073 & -0.015 & 0.028 & 0.001 & -0.009 \\ 0.116 & -0.032 & 0.009 & 0.095 & 0.005 \\ 0.006 & -0.0002 & 0.003 & -0.0007 & 0.022 \end{bmatrix}$$

Generally speaking, the signs and magnitudes of the coefficients of both long-term and short-term effects are reasonable and consistent with the economic theory and common sense criteria.

Regarding oil prices, positive oil price shocks have positive impacts on government expenditure; private output; bank credit; and inflation in both the short and long-term. With regards to the fluctuations of private GDP, expansionary fiscal shocks have negative impacts on private output in both terms. These negative responses could be attributed to a reallocation of sources from private to government sector resulted from oil price increases (Cologni and Manera, 2011). Meanwhile, positive technology shocks stimulate private output causing positive impacts on private GDP growth. For inflation, oil price shocks have the largest impacts on inflation in the short-run, but nominal shocks seem to be the largest in the long-term.

Since the above results are acceptable, one can proceed to the core tools of the SVAR models represented by VDs and IRFs. Needless to say, VDs show the relative importance and the proportion of the forecast error variance in one variable explained by shocks of its own and other variables. IRFs, in turn, provide visual analysis of the impacts of the underlying shocks on the endogenous variables. The results of VDs are summarized in table 2-6:

5.1 Government Capital Expenditure Fluctuations(CE_t)*:*

The variance decompositions of $\boldsymbol{CE_t}$ suggests that its own fiscal (demand) shock is the most important determinant among the five structural shocks (table3). At all horizons, fiscal shocks explain 62-74% of $\boldsymbol{CE_t}$ variations. The roles of other shocks vary significantly. Oil price shocks, as expected, seem to play a significant role in explaining $\boldsymbol{CE_t}$ fluctuations. It starts with about 20% in the first year, and then decreases slowly to reach 16.6% in the last year. Intuitively, any improvement in oil prices will be accompanied by an increase in oil revenues. Then, government expenditures will be directly increased confirming the pro-cyclical characteristic of fiscal policy in Saudi Arabia (Ugo and Wang, 2002). Furthermore, monetary shocks have a considerable share in explaining the forecast error variance of $\boldsymbol{CE_t}$ with 16.8% in the fifth year supporting the importance of policy-oriented shocks on government expenditures and providing empirical evidence on the ongoing coordination between both fiscal and monetary policies. Other shocks, namely supply and nominal innovations seem to have negligible impacts on the variations of capital expenditure at all time horizon with less than 5% for both of them in the fifth year.

5.2 Real Private GDP Fluctuations(RPY_t)*:*

The variance decompositions of the impacts of the structural shocks on real private GDP growth are shown in table (4). Oil price shocks are the most important source of fluctuations for the growth rate of real private GDP contributing about 82.6% of the variations over a one-year horizon. This contribution decreases gradually over a longer forecast error horizon to account for 62% in the fifth year. Moreover, supply shocks come in the second place as a very important disturbance in explaining $R\boldsymbol{P}Y_t$ fluctuations. These shocks appear to be marginally limited in the first year (12%), but their effects appear to gain momentum over time reaching about 26.5% of overall variations in the last year. The results above are logical because in an oil-based economy any increase in oil prices will create more funds for the government which may cause positive wealth effects that improve private sector conditions. On the other hand, fiscal shocks do not have sizeable impacts on fluctuations of RPY_t, neither in the short nor the long term. According to Looney (2004) government expenditures gave the high priority to social and defense spending which decrease the effectiveness of fiscal policy in stimulating private sector activity. Last but not least, monetary shocks have modest impacts on RPY_tfluctuations confirming the neutrality role of money.

5.3 Bank Credit to Private Sector Fluctuations$(RBCP_t)$:

The corresponding variance decompositions (table 5) suggest that shocks to oil prices explain the majority of the fluctuations of $\boldsymbol{RBCP_t}$ in both short and long terms, with 82% in the first year and 62% in the last year. That is to say, positive oil shocks create expansionary government expenditures which lift up the optimism level and encourage more employment, and eventually accelerate the growth of banks' loans. Moreover, a sizeable amount of $\boldsymbol{RBCP_t}$ variations attributed to monetary shocks and supply shock, with 35% and 9% in the last year, respectively. The results also suggest that fiscal and nominal shocks play small roles in explaining the variations of bank credits, combining less than 5% in the last year.

5.4 Inflation Rate Fluctuations(CPI_t):

Variance decompositions of inflation (table 6) reveal several interesting results. First of all, nominal shocks are the most important sources of inflation fluctuations in the short term with more that 89% in the first year. However, the effects of nominal shocks decrease considerably over time giving up the lead to oil price shocks which explain almost 53% of the variations of $\boldsymbol{CPI_t}$ in the fifth year. This is reasonable since positive oil shocks could negatively affect Saudi trading partners' growth and leads to higher imported inflation (Hasan and Alogeel, 2008). Second of all, monetary shocks do not have significant impacts on inflation rate showing less than 4% in the last year. Last but not least, supply shocks came initially in the third place explaining 2% of the inflation, but they take the second place afterwards explaining almost 25% of $\boldsymbol{CPI_t}$ variations in the last year. Most notably, it seems that the sources of inflation fluctuations are not policy-oriented as fiscal and monetary shocks explain less that 1% in the first year and almost 7% in the fifth year.

In the following section, I present the key results of the generated IRFs. In particular, I discuss the impacts of oil price shocks on all endogenous variables in the SVAR model. Then, I move to explain the responses of real private GDP to all structural shocks. By doing so, I capture the main objectives that help to determine the relative importance of oil shocks along with the dynamic reactions of real private GDP to the underlying innovations.

5.5 Effects of Exogenous Oil Price Shocks

Figures 2a-2e show the responses of the endogenous variables to oil price shocks. It seems that a positive innovation shock to oil prices lead to an immediate increase in government capital expenditure (figure 2.b). This is due to the fact that an improvement in oil prices causes an instantaneous increase in oil revenues which directly transferred to stimulate spending especially on infrastructure programs (Fasano-Filho and Iqbal, 2003).

Moreover, the private output is the main beneficial from commodity booms. Figure (2.c) shows that a one-standard deviation to oil price shocks lead to more than 7% in the growth of private output in the first year. Similarly, the results suggest that improvement in oil market leads to more accumulation of capital by private sector especially in the short run. That is, commercial banks act very optimistically during economic booming as a one-standard deviation to oil innovations increase bank credit to private sector by almost 11% in the first year (figure 2.d). Similarly, a positive oil price shocks increase inflation momentarily to reach 0.5 % in the first year.

In the long run, however, oil price shocks seem to fade away slowly as time horizon expands. Oil price shocks reduce productivity of private sector (figure 2.c) and discourage bank credit (figure 2.d) gradually over time. This phenomenon is known as "natural resource curse" which usually affect oil-abundant economies (Eifert, Gelb, and Tallroth, 2003).

5.6 Responses of Real Private GDP to Various Shocks:

IRFs of real private GDP are shown in figure 3 indicating the responses to oil price; fiscal (demand); supply (technology); monetary; and nominal shocks. All shocks seem to be temporary in nature as they diminish slowly over time before converging to long term equilibria. The most important influences are oil prices and supply shocks as they have the power to create positive wealth effects during the first year. In the long term, the picture is different due to crowding out effects that may cause a possible shift of productivity factors towards government sector. On the other hand, it appears that there are limited effects of fiscal and monetary shocks in stimulating private sector. This mainly could be explained by the fact that most government expenditures are devoted to social and defense spending along with adopting a passive monetary policy due to a fixed-exchange rate regime.

6. Conclusion

This paper has used a SVAR model to investigate the sources of private output movement in the Saudi economy.

The model contains five variables: real oil prices; real government capital expenditure; real private GDP; real bank credit to private sector; and inflation. These variables are exposed to five different types of structural innovation: oil price; fiscal (demand); supply (technology); monetary; and nominal shocks. Based on VDs and IRFS, the econometric findings demonstrate that real shocks are more important that nominal shocks in explaining the variations of private sector growth. By the same token, supply shocks dominate demand shocks in stimulating private sector activities. In addition, the study concludes that oil price shocks are the most important source of fluctuations for the private GDP growth; monetary shocks are neutral; and oil shocks are inflationary. The findings of this study have strong policy implications for Saudi economy. Policymakers need to foster the process of economic diversification through reducing dependence on oil and adopting an efficient coordination between fiscal and monetary policies. This, in turn, will create more job opportunities in the private sector and reduce vulnerability to external shocks. the study, also, can be generalized by including other oil-based economies with similar structures such as Gulf Cooperation Council Countries.

Acknowledgement:
Financial support from Sheikh Mohammed Al-Fouzan Macroeconomic Forecasting Chair (SMFChair) is gratefully acknowledged.

References

Alhamidy, A. (2004), "Monetary Policy in Saudi Arabia", *BIS* paper **67**.

Ahmed, S. & Park, J. (1994), "Sources of Macroeconomic Fluctuations in Small Open Economies," *Journal of Macroeconomics* **16**(1), 1-36.

Alotaibi, B. (2006), "Oil Price Fluctuations and the Gulf Cooperation Council (GCC) Countries:1960 -2004", *PhD Dissertation*, Southern Illinois University Carbondale.

Blancchard, O. & Quah, J. (1989), "The Dynamic Effects of Aggregate Demand and Supply Disturbances", *The American Economic Review*, 655-673.

Clarida, R. & Gali, J. (1994), "Sources of Real Exchange Rate Fluctuations How Important Are Nominal Shocks?", NBER **4658**, 1-56.

Cologni, A. & Manera, M. (2011), "Exogenous Oil Shocks, Fiscal Policy and Sector Reallocations in Oil Producing Countries", *Energy Economics* **35**, 42-57.

Eifert, B., Gelb, A., & Boje Tallroth, N. (2003), "The Political Economy of Fiscal Policy and Economic Management in Oil Exporting Countries, In: J.Davis , R. Ossowski, A. Fedelino (Eds.), Fiscal Policy Formulation and Implication in Oil Producing Countries, *IMF*.

Elder,J. & Serletis, A. (2010), "Oil Price Uncertainty," *Journal of Money, Credit and Banking* **42**(6), 1137-1159.

Fasano-Filho, U., & Igbal, Z. (2003), "GCC Countries: From Oil Dependence to Diversification, *IMF* Working Paper, 9424.

Hamilton, J. (1983), "Oil and the Macroeconomy since World War II", *Journal of Political Economy* **91**, 228-248.

Hasan, M., & Alogeel, H. (2008), "Understanding the Inflationary Process in the GCC Region: the Case of Saudi Arabia and Kuwait", *IMF* Working Paper, WP/08/1992.

Hooker, M. (1996), "What Happened to the Oil Price Macroeconomy Relationship?", *Journal of Monetary Economics* **38**, 195-213.

Lee, K. & Ni, S. (2002), "On the Dynamic Effects of Oil Price Shocks: A Study Using Industry Level Data", *Journal of Monetary Economics* **49**(4), 823–852

Looney, R.E., (2004), "The Saudi Arabian Quandary: The Economy's Inability to Sustain Growth," *METU Studies in Development* **31**(1), 71-92.

Mehrara, M., & Mohaghegh, M. (2011), "Macroeconomic dynamics in the Oil Exporting Countries: A Panel VAR Study", *International Journal of Business and Social Science* **2**(21), 288–294.

Mehrara, M., & Oskoui, N. K. (2007), "The sources of macroeconomic fluctuations in oil exporting countries: A comparative study", *Economic Modelling* **24**, 365–379.

Mork, K. (1989) "Oil Shocks and the Macroeconomy when Prices Go Up and Down: An Extension of

Hamilton's Results", *Journal of Political Economy* **97**, 740-744.

Prasad, E. (1999), "International Trade and the Business Cycle", *IMF* Working Paper, WP/99/56.

Ugo, F. & Wang, Q. Wang. (2002), "Testing the Relationship between Government Spending and Revenue: Evidence from GCC countries", *IMF* Working Paper, WP/02/201.

APPENDIX

Table1: Unit Root Tests

	Level		**1st Difference**	
	ADF	**PP**	**ADF**	**PP**
OP_t	-0.657	-0.452	-6.083	-6.079
CAE_t	0.717	0.282	-4.480	-4.462
RPY_t	-0.024	-0.035	-5.700	-5.685
BCP_t	-0.168	2.849	-2.977	-3.718
CPI_t	1.134	-2.071	0.761	-1.815

Table 2: Variance Decomposition of Oil Prices

	Percent of forecast Error Variance attributable to				
Year	ε_t^{op}	ε_t^{f}	ε_t^{as}	ε_t^{m}	ε_t^{n}
1	73.13425	0.508841	18.51591	7.739575	0.101418
2	57.82432	3.740106	15.24823	22.71762	0.469730
3	53.98368	4.555273	18.64473	20.40407	2.412255
4	51.76472	6.237254	17.86528	21.17553	2.957215
5	50.30825	9.548823	17.24015	20.09574	2.807045

Table 3: Variance Decomposition of Government Capital Expenditure

	Percent of forecast Error Variance attributable to				
Year	ε_t^{op}	ε_t^{f}	ε_t^{as}	ε_t^{m}	ε_t^{n}
1	20.73640	73.72619	0.742398	4.566513	0.228495
2	17.57290	67.97306	0.603322	12.65091	1.199806
3	17.39992	69.19132	0.701359	11.39187	1.315536
4	15.44954	63.65428	1.841717	16.57263	2.481829
5	16.69754	62.24108	1.802145	16.81425	2.444982

Table 4: Variance Decomposition of Real Private GDP

	Percent of forecast Error Variance attributable to				
Year	ε_t^{op}	ε_t^{f}	ε_t^{as}	ε_t^{m}	ε_t^{n}
1	82.69507	3.535324	12.42911	0.036387	1.304108
2	74.97283	2.570916	13.75248	6.543694	2.160084
3	68.55756	2.110005	22.19357	5.353892	1.784966
4	64.17851	2.013566	25.38660	6.661924	1.759407
5	62.30600	1.963041	26.49064	7.465227	1.775089

Table 5: Variance Decomposition of Bank Credit to Private Sector

	Percent of forecast Error Variance attributable to				
Year	ε_t^{op}	ε_t^{f}	ε_t^{as}	ε_t^{m}	ε_t^{n}
1	57.08057	4.308021	0.380993	38.08261	0.147812
2	58.71337	5.792410	2.206940	32.46538	0.821904
3	56.46537	7.660955	3.498207	31.59205	0.783417
4	53.57723	8.228856	3.332258	33.91429	0.947368
5	52.31284	8.738229	3.238421	34.34983	1.360672

Table 6: Variance Decomposition of Inflation

	Percent of forecast Error Variance attributable to				
Year	ε_t^{op}	ε_t^{f}	ε_t^{as}	ε_t^{m}	ε_t^{n}
1	8.605138	0.006713	1.824470	0.102902	89.46078
2	41.39144	1.808812	15.79123	0.324298	40.68422
3	54.52001	4.391499	19.63705	3.197223	18.25422
4	55.20153	3.791216	24.66237	3.838877	12.50601
5	52.94303	3.411031	28.83726	3.556301	11.25238

Figure 1: Oil Prices (Arabian Light) and Private GDP

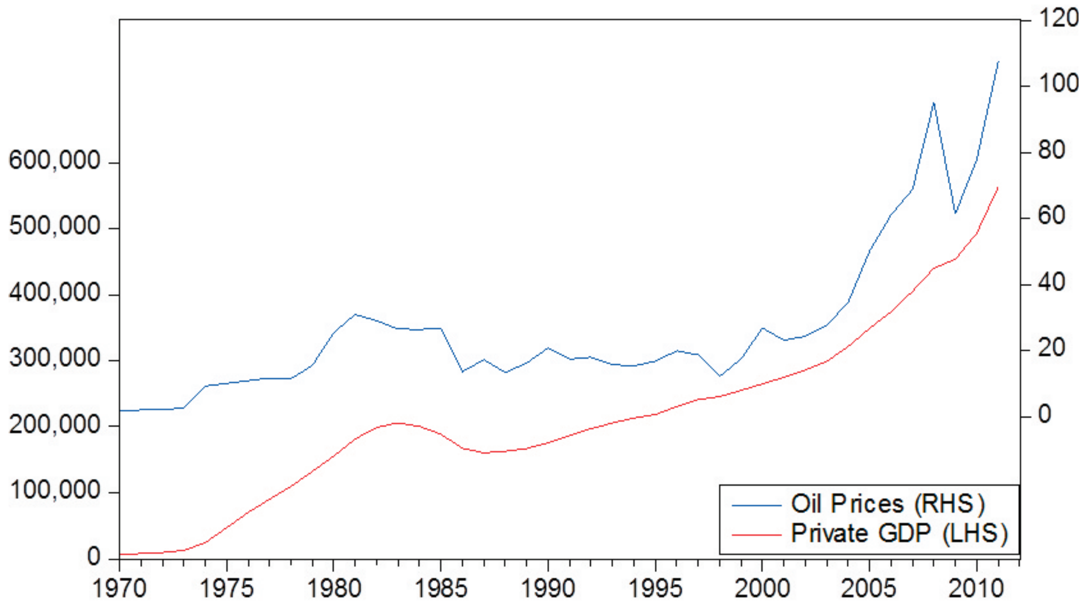

Figure 2: Responses to Oil Price Shocks

Figure 3: Responses of Real Private GDP to Structural Shocks