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The Dynamic Effects of Oil Price Shocks on the Economies of the Twelve Major Oil Exporting Countries from 1970-2013: The Role of Political Economy Factors

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ABSTRACT

Purpose:
This paper examines whether the economies of oil-exporting countries respond to oil shocks differently, depending on the country's political economy factors, such as regional economic alliance, stage of economic development, and the exchange rate regime, using a structural Vector Error Correction Model (VECM). The sample countries covered in this study include all the major twelve oil exporters: the GCC countries (Bahrain, Kuwait, Oman, Saudi Arabia, UAE, and Qatar)1 and the non-GCC oil exporters (Iran, Nigeria, Norway, Canada, Russia and Venezuela) for the 1970-2013 period.

Design/methodology/approach:
To achieve the above, this paper employs a four-variable restricted structural Vector Error Correction Model (VECM) with oil prices (exogenous) and a set of endogenous variables, including GDP, M2, and Inflation for the 1970-2013 period, with a co-integrating relationship that varies from 1 to 2. Both Johansen Cointegration Test and Granger Causality Tests have been applied. To eliminate the effects of a contemporaneous correlation of the residuals with the regressors, the errors are orthogonalized by a Choleski decomposition.

Finding:
The political economy characteristics of countries explain why the economies of oil exporters either with fixed or managed floating exchange rates behave differently than those economies with floating exchange rates. Money is endogenous in oil-exporting countries with fixed or managed floating exchange rates, but not in oil-exporting countries with floating exchange rates. The evidence found in this paper suggests that the fixed exchange rate regime of the GCC countries is not effective in tamping down inflationary pressures, as planned. There is a strong positive effect of oil price shocks on the foreign exchange reserves of the GCC countries, whereas the effect of oil price shocks on foreign exchange reserves has been rather non-existent for the non-GCC oil exporters with floating exchange rates.

Research limitations/implications:
The data span is restricted by data availability, the study could ensure for more robustness and better confidence with quarterly data, but most of the variables for countries are reported annually, except for Canada, Russia, and Norway.

Originality/value:
This paper separates oil exporters into two distinct categories, the GCC countries and the non-GCC oil exporters. To my knowledge, this has not been done before in the academic literature. Unlike the GCC countries, the non-GCC oil exporters do not participate in a common political alliance or an economic union. Their economies are diversified and less dependent on oil exports. This study shows that the political economy characteristics play a large role in explaining why the economies of oil exporters with either fixed or managed floating exchange rates behave differently than the oil exporters with floating exchange rates.

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[1] The currencies of the GCC countries, other than that of Kuwait, are formally pegged to the US dollar.

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1. Introduction

The economies of the oil-exporting countries respond differently to oil shocks depending on the political economic factors, such as regional economic alliance, stage of economic development, and the exchange rate regime. The purpose of this paper is to explore whether political economy factors is a reason why the macroeconomic variables of oil exporters behave differently in response to oil shocks. I am particularly interested in understanding the behaviour of economic variables, such as real government spending, real output, real exchange rates, foreign exchange reserves, reserve money, and the money supply, in response to oil price shocks.

Recent papers focused on advanced economies, which are importers of oil rather than on countries that export oil. Unlike the papers that focus primarily on industrialized economies, here the focus is entirely on a group of oil exporters. This paper focuses on the macroeconomic responses of all twelve major oil exporters to oil price shocks, rather than focusing on the macroeconomic response of a select few oil exporters or advanced economies that import oil, and separates the major oil exporters into two distinct categories, the GCC countries and the non-GCC oil exporters. To my knowledge this has not been done before in the academic literature. This categorization of oil exporters is important, since the GCC countries share a political and economic alliance and their economies are largely oil dependent, with currencies (other than that of Kuwait) formally pegged to the US dollar. Unlike the GCC countries, the non-GCC oil exporters do not participate in a common political alliance or an economic union. Their economies are diversified and less dependent on oil exports. The GCC countries and non-GCC oil exporters combined are known to account for more than 50 percent of the global oil reserves and exports, according to the US Energy Information Administration (EIA).

This paper aims to address the following set of policy questions for all the twelve major oil exporters, in response to oil price shocks, explaining in the context of political economy factors, as mentioned above:

Are fiscal policies of oil exporters pro-cyclical or countercyclical? Is money endogenous for oil exporters? Do real oil price shocks have an impact on the real exchange rates of oil-exporting countries, and if so, does a real exchange rate appreciation come in the form of an increase in the price level or an appreciation of the nominal exchange rate? Do foreign exchange reserve shocks (through the transmission of oil prices) have a positive effect on reserve money and subsequently the money supply?

These are questions of key importance and have important policy relevance for the twelve major oil-exporting countries.

Oil-exporting countries do not form a homogenous group. There is a significant variation in the extent of a country's oil dependence. In some countries, oil accounts for majority of exports, while in other countries oil plays a less significant role.

The economic intuition suggests that oil is an international commodity, whose price is determined by the global supply and demand conditions. Thus, small economies such as the ones I study in this paper are unlikely to affect the price of oil on their own, possibly except for Saudi Arabia, which is a leading member of OPEC that influences the price of oil.

The identification of oil as an exogenous variable would be incorrect if economic developments in the country under consideration would affect the world price of oil contemporaneously, but the countries examined in this paper are all oil exporters and not the advanced economies that would normally affect the price of oil. (Blanchard and Gali, 2007).

The importance of oil in each economy varies widely across the sample of oil exporters. In relation to an overall GDP, the share of oil exports ranges from about 4 percent in Canada, 11 percent in Norway and Russia, and nearly to 50 percent in the case of Bahrain, Kuwait, and Oman.

I make several other contributions to this paper. I treat real oil shocks as exogenous, as substantiated by Granger causality test results and the interpretation of variance decomposition results from the Vector Error Correction Models, such a treatment not previously reported in the academic literature results in a significantly high R2 for all the structural VECM equations. I would like to add that the literature of this paper, which explores similar macroeconomic questions, treats oil as endogenous. (See, Bernanke, Gertler and Watson (1997), Blanchard and Gali (2007), Kilian (2009), and Kilian (2010)). Second, this paper complements the existing large literature on fiscal shocks being exogenous with respect to output, (see, Monacelli and Perotti (2006), Ravn. et al. (2012), Enders et. al (2011)), with results that are virtually the same when there is a change in the order of variables and that lags of real output do not Granger-cause real government spending. Similarly, lags of M2 do not Granger-cause GDP for any of the oil exporters and the results are insensitive to a change in the order of variables, which suggest that the existing order of variables from GDP to M2 to Inflation remains correct for the twelve major oil exporters of this paper. This is not something which has been done before in academic literature.

Some of the main highlights of this paper are discussed below and the rest of the findings are discussed in Section 2. The findings of this paper are reasonably close to the findings of empirical literature, also discussed in Section 2.

The literature survey suggests that the effects of fiscal policy shocks on output or the effects of output shocks (through the transmission of oil prices) on fiscal policy have not been studied together for the major oil-exporting countries. I aim to contribute to this part of the literature.

First, this paper explores whether the fiscal spending shocks affect output, since the structural VECMs show that there is not a positive estimated response of real economic activity to real government spending shocks in eight out of the ten oil exporters (out of the ten countries with available government spending data), except for Iran and

Canada, which means that there is not a countercyclical fiscal policy response in most the twelve-major oil-exporting countries. The non-existence of a response of real economic activity to real fiscal spending shock is not surprising, but rather consistent with findings from academic literature that the fiscal policies of developing countries tend not to be countercyclical, but rather they are pro-cyclical, as is shown to be the case here for Saudi Arabia, Oman, Bahrain, and Venezuela.

Second, the literature survey also suggests that the effects of real oil prices on real exchange rates have been studied relatively little. I aim to contribute to this part of the literature.

Since oil constitutes a large portion of the revenues of oil exporters, especially of the GCC countries examined here, real oil prices affect their real exchange rates. There is no real exchange rate appreciation from real oil shocks in any of the non-GCC oil exporters, except for Venezuela, which may be because oil accounts for a small share of output, or simply that these countries may have more monetary policy options available under a floating/managed floating exchange rate regime than those available under a fixed exchange rate regime.

Later, I investigate the effect of real oil shocks on the real exchange rates of oil exporters, where I determine whether the real exchange rate appreciation takes the form of inflation or a nominal exchange rate appreciation, which sharply differentiates this paper from earlier studies. The theory predicts that a real exchange rate appreciation under fixed exchange rate regimes comes primarily in the form of inflation instead of a nominal exchange rate appreciation. This paper concludes that a real exchange rate appreciation from real oil price shocks in the GCC countries and Venezuela, with fixed/managed floating exchange rates, comes in the form of a rise in the price level, with virtually no change in their nominal exchange rates consistent with economic theory.

The real exchange rate appreciation from real oil price shocks could have broad policy implications for oil exporters, since a real exchange rate appreciation can deteriorate the countries' trade and current account balances, which may adversely affect their non-oil sector and make the non-oil sector become less competitive in global markets.

Third, this paper discusses the presence of endogenous money, which goes from economic activity to money supply. This paper shows that money is endogenous in oil-exporting countries with fixed or managed floating exchange rates, including the GCC countries, Venezuela, and Iran, but money is not endogenous in countries with floating exchange rates, such as Canada, Norway, and Nigeria1, since it is the exchange rate that responds to an external shock, such as GDP, rather than the money supply.

Fourth, this paper shows that foreign exchange reserve shocks (through the transmission of oil prices) have a strong positive effect on the reserve money of the GCC countries and in Venezuela, Nigeria, and Iran, countries with either fixed or managed floating exchange rates. In Canada, Norway, and Nigeria, with a purely floating exchange rate regime, the response of reserve money to foreign exchange shocks has been mostly non-existent, either with weak or no impact of foreign exchange reserves on reserve money, consistent with economic reasoning.

Sixth, this paper suggests that there is a positive effect of the changes in oil prices on the money supply (M2) of Oman, Nigeria2, Venezuela, and Russia, either with fixed or a managed floating exchange rate, but there is no change in the money supply (M2) to changes in the oil prices for oil-exporting countries with floating exchange rates, such as Canada and Norway.

This paper proceeds as follows: Section 2 provides a literature survey. Section 3 presents the basic facts. Section 4 presents the methodology. Section 5 discusses the response of real output from real government shocks, the response of real exchange rates to real oil shocks, the response of reserve money to foreign exchange reserve shocks, and finally, the response of money supply to changes in oil prices. Section 6 concludes.

2. Literature Review

This paper relates to several strands of literature.

This paper contributes to the dearth of academic literature on the effect of fiscal shocks on output in the developing countries, from the perspective of oil exporting countries.

In contrast to the logic and approach used by Bernanke and Mihov (1998) on monetary policy using the structural VAR model, where identification is achieved by assuming that variables like GDP and interest rates do not react to policy variables such as fiscal policy contemporaneously, this paper follows the same logic proposed by Blanchard and Perotti (2002), which uses a structural VECM method with exogenous fiscal shocks and traces their dynamic effects on real GDP, a method better suited to the study of fiscal policy than perhaps for monetary policy.

Both the Keynesian and standard neoclassical models predict that an increase in government spending has a positive effect on output. Several authors have assessed the effects of fiscal shocks on economic activity, including Rotemberg and Woodford (1992), Fatas and Mihov (2001), Eichenbaum et. al (2003), Blanchard and Perotti (2002), Burnside et al. (2004), Perotti (2005), and Mountford and Uhlig (2008), who discuss the countercyclical nature of fiscal policy of advanced economies, where fiscal policy is exogenous with respect to output and has a positive effect on output.

[1] Nigeria adopted a floating exchange rate in 1986.

2 Nigeria had a fixed exchange rate regime from 1970-1985, with naira pegged to the dollar, and in 1986, the country adopted a flexible exchange rate.

As in Anshasy (2014), the structural VECM models show that the effects of fiscal policy on the economic activity of oil exporters are from an increase in oil revenues, and for a group of highly oil-dependent countries, fiscal spending is tied to oil revenues, which has a significant positive effect on economic growth, but there is no fiscal spending from oil revenues in less oil-dependent economies.

More generally, this paper builds on the vast literature related to the effects of fiscal spending shocks on output, similar to that of Rotemberg and Woodford (1992), Fatas and Mihov (2001), Eichenbaum et. al (2003), Blanchard and Perotti (2002), Burnside et al. (2004), Perotti (2005), and Mountford and Uhlig (2008), who treat government spending exogenous with respect to output. This paper differentiates itself from other papers, since the four-variable structural VECM results are largely insensitive to the ordering and Granger causality test results suggest that real economic activity changes do not predict real government spending and GDP does not predict M2.

Close to the analysis of this paper on real exchange rates, there are several other papers looking at the effects of real oil price shocks on the real exchange rates, with an investigation into the behavior of real exchange rates under a fixed exchange rate regime and a floating exchange rate.

Methodologically, the empirical strategy of this paper is similar to that of Mussa (1976) and Frankel (2010), with an investigation into the behavior of real exchange rates under two different exchange rate regimes: fixed exchange rate regime, where the nominal exchange rate between the two countries is kept fixed or within narrow bands, and a floating exchange rate regime where market forces are allowed significant latitude to move the nominal exchange rate on a continual basis. Mussa (1976) and Frankel (2010) show that there are substantial and systematic differences in the behavior of real exchange rates under two different exchange rate regimes, and the increased variability of real exchange rates under floating exchange rate regimes is largely accounted for by an increased variability of nominal exchange rates, with little or no contribution from changes in the variability of ratios of national price levels. On the other hand, the variability of real exchange rates under fixed exchange rate regimes has to do with strictly the variability of ratios of price levels.

Many papers discuss the presence of endogenous money, where economic activity affects the money supply. One of the contributions of this paper is to show how output shocks affect the money supply through the Vector Error Correction Models. Marx (1907), Nell (1967), and Minsky (1990) study the effects of output on the money supply, including how money supply depends on profit seeking activity, i.e., money is endogenous, how nominal aggregate demand determines money, and how money correlates with the preferred measure of aggregate demand.

This paper complements the existing literature on the effects of a commodity boom on foreign exchange reserves and base money, with an emphasis given to the role of an exchange rate, fixed vs. floating. Here, I am interested in oil-exporting countries and the paper focuses on the impact of oil price shocks on foreign exchange reserves and reserve money using structural Vector Error Correction Models.

The results of this paper are much like that of Cuddington (1989) and Krugman and Obstfeld (2006), who assert that the central bank's foreign reserves surge at the outset of a commodity boom. Unless the monetary authority uses effective mechanisms for sterilizing the monetary impact, the inflow in foreign exchange reserves will cause the domestic monetary base and the broader monetary aggregates to expand.

In countries with fixed or managed floating exchange rates, an increase in foreign exchange reserves leads to an equal amount of an increase in the money supply, whereas a decrease in foreign exchange reserves leads to a decline in the money supply. In countries with floating exchange rates, foreign exchange reserves do not affect reserve money, consistent with the economic intuition.

More generally, there is vast literature out there on the possible effects of external shocks, such as GDP on the money supply; however, here the focus is entirely on the effect of oil shocks on the money supply, which vary depending on the exchange rate, fixed vs. flexible.

The results of this paper are similar to that of Mundell (1963) and Cuddington (1989), who discuss the economic effects of a fixed exchange regime, where an exogenous increase in GDP or any other external shock forces the monetary authority to supply the market with local currency to keep the exchange rate unchanged. Under a floating exchange rate, however, any exogenous changes in GDP or any oil price changes are offset by changes to the exchange rate. The results of this paper are also similar to that of Mussa (1976), who argues that when the demand for money rises relative to the supply of money, either the domestic credit component of the money supply expands, the exchange rate appreciates, or else, there is a combination of these effects, depending on the exchange rate regime, fixed vs. flexible.

3. Data and Methodology

3.1. Data

This paper studies the world's top twelve oil exporters. The oil exporters studied in this paper account for more than 50 percent of the global oil reserves and exports, according to the US Energy Information Administration (EIA). Unlike the GCC countries that are part of a political and economic alliance, the rest of the six oil exporters do not have any common regional and economic ties.

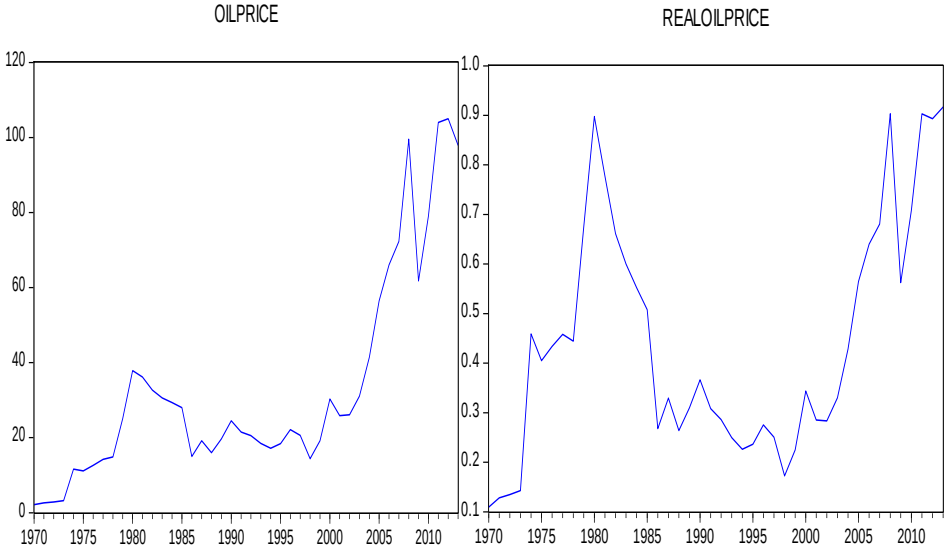
Figure 1 below illustrates the trend in oil prices from 1970 to 2013 on an annual basis. More specifically, it shows the annual price of a barrel of oil, measured in US dollars. Figure 1 shows a trend for real oil prices for the same period. As Figure 1 shows, changes in real oil prices in log levels have been very large and concentrated over the 1978-1980 and 2000-2008 periods, the latter period known as the most recent run-up in oil prices, with oil prices

that reach their peak in 2008. Oil prices dropped from $37 to $19 from 1980 to 1999 then continued their rise from $30 to $99 for the 2000-2008 period, following a decline in oil prices to $61 in 2009, due to the financial crisis, and a sudden increase in oil prices to $105 in 2012, levelling off at $97 in 2013. The real US dollar price of oil has been calculated using crude oil prices in US dollars deflated by the US consumer price index, in log levels and first differences.

The countries represented in this paper are from a list of top oil exporters for 2013 by US EIA, which consists of Saudi Arabia, Russia, UAE, Kuwait, Iraq, Nigeria, Venezuela, Qatar, Angola, and Canada, and to this list of oil exporters, Oman, Bahrain, Norway, Iran have been added, while Angola and Iraq have been removed, without the complete economic data.

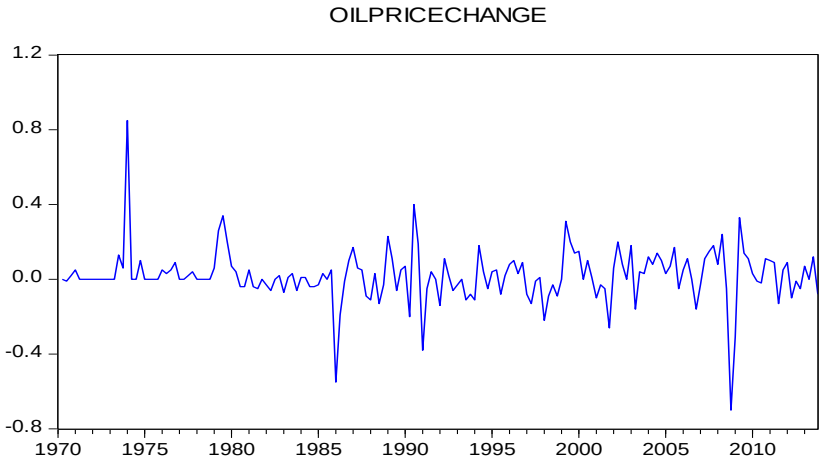
Based on US EIA's report on top world oil net exporters for 2013, (in thousands of barrels per day), Saudi Arabia exported the largest volume of oil around 11,000 barrels, Russia is the world's second-largest exporter of oil (after Saudi Arabia) with an export of around 10,000 barrels of oil, Canada ranks third with an export of 4,000 barrels of oil, UAE is the world's fourth largest exporter of oil, with an export of oil of about 3,400 barrels of oil, Iran is the world's fifth largest exporter of oil, with 3,000 barrels of oil, Kuwait is the world's sixth largest exporter of oil, with an export of 2,800 barrels of oil, Venezuela is considered the world's seventh-largest oil exporter, with an export of 2,700 barrels of oil, Qatar ranks eighth with an export of 2,000 barrels of oil, Nigeria ranks ninth with an export of oil of around 2,300 barrels of oil, and Norway, Europe's largest oil producer, and the world's tenth exporter of oil, export 1,845 barrels of oil, and lastly, Oman and Bahrain take the eleventh and twelfth spots in a list of major oil exporters, with an export of oil of 945 and 61 barrels of oil per day, respectively.

Figure 1: Oil Prices in US $ (1970-2013)



Source: IMF (IFS) database, 2014, Crude Oil (Petroleum), US Dollars per Barrel; US Consumer Prices, Index 2005=100.

Figure 2: Nominal Oil Prices % Change (1970-2103)



In Figure 2 above, changes in the nominal price of oil are based on the quarterly data and in log difference.

The exchange rate regimes of the GCC countries and non-GCC oil exporters of this paper are as follows:

The currencies of the GCC countries have been formally pegged to the US dollar. The fixed exchange rates (USD to Local Currency) for Saudi Arabia, Bahrain, and Oman have been fixed at 3.75, 0.38, and 0.38 for one US $, respectively, from 1986-2013. For Qatar and UAE, their currencies have been fixed at 3.64 and 3.67, respectively, from 1980-2013. Kuwait's currency has been pegged to a weighted currency basket from 1975-2003, and from 2003-2007, their peg has been switched to 0.29 for one US $, and since 2007, the country's currency has been pegged to a basket of currencies.

Both Canada and Norway have purely floating exchange rates. Since 1999, Russia has implemented a policy of a managed floating exchange rate. The Venezuelan Bolivar is pegged to the U.S. dollar and has been supported by foreign exchange restrictions. Nigeria had a fixed exchange rate regime from 1970-1985, as Nigeria's naira has been pegged to the dollar, and in 1986, the country adopted a flexible exchange rate. Iran's official exchange rate is fixed and officially determined by the government authorities.

Unlike the non-GCC oil exporters, the GCC economies are highly dependent on oil. In the GCC countries, the value of oil exports account on average for 40 percent of the GCC countries' GDP and oil exports range from approximately 36 to 45 percent of GDP for the 1980-20113 period. For the non-GCC oil exporters, oil exports account for approximately 16 percent of GDP for the same period, although their oil exports range from as low as 4 to 11 percent of GDP for Canada, Norway, and Russia, and as high as 39 percent of GDP for Nigeria.

3.2 Methodology

This paper presents a four-variable restricted structural Vector Error Correction Model (VECM) with real oil prices (exogenous) and a set of endogenous variables, including real GDP, real government expenditures, and real exchange rates:

For each of the six countries of the GCC and non-GCC oil exporters, a restricted structural VECM is estimated using four macroeconomic variables: the real US dollar price of oil (in log-differences), real GDP (in log differences), real government expenditures (in log differences), and real exchange rates (in log differences). Each equation in the structural VECM of countries has one lag of the three (endogenous) variables as listed above, contemporaneous real oil prices, affecting each equation, and a constant, using annual data or quarterly data, depending on the availability of data. (See, Enders (2008) for a discussion on VECM method).

In order to eliminate the effects of contemporaneous correlation of the residuals with the regressors, the errors are orthogonalized by Choleski decomposition. (See, Hamilton (1994) and Lutkepohl, H. (2005)). In a Choleski decomposition, all endogenous variables affect each other with lags, with a contemporaneous effect of other endogenous variables, depending on the ordering of variables. Sims (1980), Bernanke (1986), Bernanke and Blinder (1992), Blanchard and Quah (1989) proposed this particular ordering of the innovations in their own structural VAR analysis.

The structural VAR models or VECMs are constructed using quarterly or even monthly data in advanced economies. However, macroeconomic data for the GCC and non-GCC oil exporters exist mostly on an annual frequency, except for Canada, Russia, and Norway, with the available quarterly data. The period covered in this paper is from 1970-2013.

However, this study has some limitations, including the frequency of the data for the oil exporters which is limited to an annual basis for most countries, except for Canada, Russia, and Norway.

The annual data on nominal GDP and Government Expenditures come from the World Development Indicators database (2014) and the data on nominal exchange rates and a country-specific CPI come from IMF's IFS database (2014). For UAE, Oman, and Venezuela, there is no complete CPI data, so GDP deflator (base year varies by country) has been used instead. For Oman, UAE, and Russia, there is no complete data on government spending, which means there is no analysis for these countries.

Real US dollar price of oil is calculated using crude oil prices in US dollars deflated by the US consumer price index. This simple measure reflects yearly changes in crude oil prices. The real government expenditures are calculated from a country's government expenditures deflated by a country's CPI. The Real GDP is calculated from a country's nominal GDP deflated by a country's CPI in log differences. The Real Exchange Rate for each country is calculated using the formula, as discussed below.

The estimated one standard deviation of real oil price innovation is equivalent to 28 percent, using yearly data, and the estimated one standard deviation of real oil price innovation is equivalent approximately to 14 percent, using quarterly data.

The nominal exchange rate, E, reported by IMF IFS data (2014) is (local currency per US dollar), then the definition of a real exchange rate can be expressed as:

$$RER = (P/E)/P^*)) \qquad (1.2)$$

That is, E, Nominal Exchange Rate (the price of a unit of foreign currency in terms of local currency) P (the domestic price level)/ P* (the foreign price level), in log differences.

[3]The data for the value of oil exports are not available prior to 1980 for the GCC countries.

Consumer Price Indices (CPIs) are used to measure national price levels, because reliable data for such price indices are generally available on a yearly and sometimes on a quarterly basis for all the oil exporters covered in this paper for the period studied.

Under this definition, an appreciation of the real exchange rate (an increase in RER) has the same meaning as an increase in the real value of domestic goods in terms of foreign goods.

The structural VECMs, using annual data, is estimated with one lag, given the limited size of the panel data, which is approximately 44 observations for all countries from 1970-2013.

For Russia, Canada, and Norway, countries with quarterly data, Akaike Information Criterion (AIC) and Schwartz Information Criterion (SIC) have been used to determine the number of lags in their structural VECMs. The lag length of the VECM in log levels that minimizes the information criteria are chosen to be three for these three advanced economies.

This paper tests for co-integration of variables using the Johansen co-integration test (1992). Johansen (1988) developed maximum likelihood estimators co-integrating vectors, which provides a rank test to determine the number of co-integrating vectors, r.

For all the oil exporters, there is exogenous oil and a set of endogenous variables, including real government expenditures, real GDP, and real exchange rates, with a co-integrated I (1) process, there is a reduced rank, and a co-integrating relationship that varies from 1 to 2 for each of the vector error correction models of these countries. (See, Engle and Granger (1987)).

Sims (1980), Sims (1986), and Sims, Stock, and Watson (1990) recommend against differencing, since differencing leads to throwing away of information concerning the co-movements in data, when there are co-integrating relationships.

This paper also tests whether lags of real GDP Granger-causes real government spending, based on VEC Granger Causality/Block-Exogeneity Wald Tests and Pairwise Granger Causality Tests. (see, Granger and Newbold (1977)).

Second, this paper presents a four-variable restricted structural Vector Error Correction Model (VECM) with oil prices (exogenous) and a set of endogenous variables, including GDP, M2, and Inflation:

For each of the GCC and non-GCC oil exporters, a restricted structural VECM is estimated using four macroeconomic variables: the nominal US dollar price of oil (in log-differences), nominal GDP (in log differences), M2 (in log differences), and consumer prices (in log differences). Each equation in the structural VECM of countries has one lag of the three (endogenous) variables as listed above, contemporaneous oil prices, affecting each equation, and a constant, using annual or quarterly data, depending on the availability of data. (See, Enders (2008)).

To eliminate the effects of a contemporaneous correlation of the residuals with the regressors, the errors are orthogonalized by a Choleski decomposition. (See, Hamilton (1994) and Lutkepohl, H. (2005)).

The annual data on GDP, M2, and Consumer Price Index are from IMF's IFS database (2014) and World Bank's World Development Indicators database (2014). The quarterly data on GDP, M2, and CPI are from International Monetary Fund's International Financial Statistics (IFS), 2014. For UAE, Oman, and Venezuela, the GDP deflator has been used instead since there is no data available on consumer prices.

The structural VECMs of oil exporters, using annual data, is estimated with one lag given the limited size of panel data, which is of approximately 44 observations from 1970-2013 for these countries.

For Russia, Canada, and Norway, using quarterly data, Akaike Information Criterion (AIC) and Schwartz Information Criterion (SIC) have been used to determine the number of lags in a structural VECM. The lag length of the VECMs in log levels that minimizes the information criteria varies from 1 to 3 for these countries.

For each of the twelve oil exporters, there is exogenous oil prices, and a group of endogenous variables including GDP, M2, and CPI, with a co-integrated I(1) process, where there is a reduced rank, and the co-integrating relationships vary from 1 to 2, and therefore there exists a vector error correction model. (See, Engle and Granger (1987)).

This paper also tests whether lags of M2 Granger-causes GDP, using the VEC Granger Causality/Block-Exogeneity Wald Tests and Pairwise Granger Causality Tests. (See, Granger and Newbold (1977)).

Third, this paper presents a two-variable restricted structural Vector Error Correction Models (VECM) for each of the following set of equations: a). oil prices and real exchange rates. b). oil prices and foreign exchange reserves, c). foreign exchange reserves and reserve money, d). oil prices and inflation.

For each of the twelve oil exporters, the restricted structural VECMs are estimated using oil prices (in log-differences), real exchange rates (in log differences), foreign exchange reserves (in log differences), reserve money (in log differences), and inflation (in log-differences).

This paper uses data on a quarterly basis and when quarterly data are not available, the annual data are used. The period covered in this paper is from 1970-2013. The quarterly and annual data on oil prices, foreign exchange reserves, and reserve money come from IMF's IFS database (2014).

The estimated one standard deviation of oil price innovation is equivalent to 14 percent, using quarterly data, and the estimated one standard deviation of real oil price innovation is equivalent to 28 percent, using yearly data. The estimated one standard deviation of foreign exchange reserve innovation and one standard deviation of reserve money innovation both vary from country-to-country.

Akaike Information Criterion (AIC) and Schwartz Information Criterion (SIC) have been used to determine the number of lags for structural VECMs, which vary from one to three lags, for the equation on oil prices and inflation.

For each of the twelve oil exporters, the oil prices and the endogenous variables including foreign exchange reserves, reserve money, inflation, and real exchange rates, are a co-integrated I(1) process, where there is a reduced rank, and the co-integrating relationships vary from 1 to 2, so there exists a vector error correction model for each equation. (See, Engle and Granger (1987)).

4. The Structural Vector Error Correction Models

4.1 The Impulse Response and Variance Decompositions

Once a restricted structural VECM has been estimated, it can be used as a forecasting tool. In order to investigate the relationships among macroeconomic variables, the impulse response functions (IRFs) are estimated.

The impulse response functions of the restricted structural VECMs illustrate the effect of a temporary shock (a 1-standard deviation) in an endogenous variable, including real government spending, real GDP, and real exchange rates through the dynamic structure of a (VECM) model, while holding all other shocks constant and errors as uncorrelated across variables (Blanchard and Gali, 2007). To understand the importance of a shock in one variable contributing to the variation of another macroeconomic variable, the variance decompositions of each macroeconomic variable are examined.

The variance decompositions are estimated using the Monte Carlo integration methods of 100 replications.

The variance decompositions address the following questions for each oil-exporting country in this paper: How important are real government spending (through the transmission of real oil prices) shocks in accounting for the fluctuations in real output? How important are the real output (through the transmission of real oil prices) shocks in accounting for the fluctuations in real government spending? How important are the real oil price shocks in accounting for the fluctuations in real exchange rates? How important are the output shocks in accounting for the fluctuations of M2? How important are oil shocks in accounting for the fluctuations in foreign exchange reserves, and subsequently, what is the role of foreign exchange reserve shocks in accounting for the fluctuations in reserve money?

The estimated variance decompositions are reported for the sample period of 1970-2013, either over a horizon of ten years or ten quarters, depending on the availability of data.

4.1.1. The Response of Real GDP to Real Government Spending Shocks

This section investigates the effects of a Real Government Spending Shock on Real GDP, where the results vary depending on whether the country is considered a developing or an advanced economy. The fiscal spending shocks are unrelated to unanticipated output shocks, which means that the real government spending shocks are uncorrelated to real output shocks in the structural VECMs. Therefore, the impulse response functions of this paper here capture the direct impact of fiscal spending shocks on real output.

The standard neoclassical, Keynesian, and real business cycle models all predict that an increase in government spending generally has an expansionary effect on economic activity that raises output. The structural VECM results of this paper show that there is no effect of real government spending shocks on real economic activity in eight out of the ten oil exporters, countries with the available data, which means that countercyclical fiscal policy is not employed in any of these countries, except for Iran and Canada.

The non-existence of a response of real economic activity to a fiscal spending shock for majority of the oil exporters is not surprising and consistent with findings from the academic literature that fiscal policies of developing countries tend to be pro-cyclical rather than countercyclical, with ten out of the twelve major oil exporters considered as developing countries.

The structural VECM results here suggest that fiscal spending is countercyclical in both Canada and Iran, since real government spending shocks have a positive effect on real output. The positive response of real output to a real government spending shock in Canada is in line with economic intuition that the fiscal policy response of advanced economies tend to be countercyclical rather than pro-cyclical, in common with Kaminsky, Reinhart, and Vegh (2004) and Lane (2003), who argue that causality runs from fiscal policy to output.

In Iran, there is a strong positive and persistent effect of a real government spending shock on real economic activity. In Canada, there is a relatively small positive effect of a real government spending shock on real economic activity, which are in common with Rotemberg and Woodford (1992), Fatas and Mihov (2001), Blanchard and Perotti (2002), Burnside et al. (2004), and Mountford and Uhlig (2008), who argue that government spending shocks have a positive effect on the economic activity of advanced economies.

In Iran, a real government spending shock leads to a substantial and a persistent rise in real GDP, which accounts for a sizeable 90 percent of the fluctuations in real GDP, whose fiscal policy response is countercyclical. (See, Table 1). The trends in data suggest that there is an inverse relationship between the oil prices and government spending, which highlights the use of a countercyclical fiscal policy employed by the government authorities in Iran.

In Canada, the response of real GDP to a real government spending shock is positive but relatively smaller, with a real government spending shock that accounts for a relatively small 10 percent of the fluctuations in real GDP. (See, Table 1). The positive response of real economic activity to a real government spending shock in Canada is consistent with the conventional wisdom that advanced economies tend to have countercyclical fiscal policies, rather than a pro-cyclical fiscal policy response.

It is important to mention that Canada's economy is similar to that of the US, where there is not a large social safety net and the government has to rely on automatic stabilizers to offset the decline in aggregate demand during times of economic recession.

The fiscal policy response of Saudi Arabia, Oman, Bahrain, Venezuela, whose economies are largely dependent on oil, including Norway, are pro-cyclical, since real government spending responds positively to a real output shock in these countries, where oil prices drive output, and later the econometric causality goes from output to fiscal spending.

Table 1: Variance Decompositions[4] (Real Government Spending, Real GDP, and Real Exchange Rates Shocks and Responses)

Saudi Arabia				**Kuwait**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	39%	52%	9%	**Real Govt**	93%	6%	1%
Real GDP	2%	98%	0%	**Real GDP**	8%	65%	27%
Real Exch	9%	61%	30%	**Real Exch**	16%	13%	71%
No. Obs:		42		**No Obs:**		40	
Period:		1972-2013		**Period:**		1974-2013	
Oman				**Bahrain**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	21%	28%	51%	**Real Govt**	26%	60%	4%
Real GDP	14%	24%	62%	**Real GDP**	5%	90%	5%
Real Exch	16%	41%	42%	**Real Exch**	26%	2%	72%
No. Obs:		41		**No. Obs:**		31	
Period:		1972-2013		**Period:**		1982-2012	
Qatar				**UAE**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	NA	NA	NA	**Real Govt**	NA	NA	NA
Real GDP	NA	84%	16%	**Real GDP**	NA	96%	4%
Real Exch	NA	26%	74%	**Real Exch**	NA	7%	93%
No. Obs:		33		**No Obs:**		37	
Period:		1981-2013		**Period:**		1977-2013	
Canada				**Norway**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	59%	8%	33%	**Real Govt**	37%	50%	13%
Real GDP	11%	34%	55%	**Real GDP**	5%	76%	19%
Real Exch	7%	3%	90%	**Real Exch**	5%	7%	88%
No Obs:		42		**No Obs:**		42	
Period:		1972-2013		**Period:**		1972-2013	
Venezuela				**Iran**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	17%	13%	70%	**Real Govt**	95%	5%	NA
Real GDP	4%	65%	31%	**Real GDP**	92%	8%	NA
Real Exch	7%	20%	73%	**Real Exch**	NA	NA	NA
No Obs:		42		**No Obs:**		35	
Period:		1972-2013		**Period:**		1973-2007	
Nigeria				**Russia**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	82%	3%	15%	**Real Govt**	NA	NA	NA
Real GDP	0%	96%	4%	**Real GDP**	NA	93%	7%
Real Exch	58%	14%	28%	**Real Exch**	NA	0%	100%
No Obs:		31		**No Obs:**		76	
Period:		1983-2013		**Period:**		1995Q1-2013Q4	

4.1.2. The Response of Real Exchange Rates to Real Oil Shocks

This section of the paper first investigates whether there is a real exchange rate appreciation from real oil shocks in all the oil exporters, then later explores whether real exchange rate appreciation in the GCC countries takes

[4]The reported variations are for the 10th period. The shocks are horizontal and the variables that are affected from these shocks are listed vertically.

the form of inflation, since a real exchange rate appreciation under fixed exchange rates is expected to be primarily based on the behavior of domestic price levels, with no contribution of nominal exchange rate to a real exchange rate appreciation, except maybe for sharp changes associated with the official parities, which may affect the real exchange rates, see, Mussa (1976) and Frankel (2010).

The real exchange rate analyses for all the oil exporters are done using quarterly data, except for Oman, Qatar, UAE, and Venezuela, using annual data. For Iran, the real exchange rates are calculated to be zero, so there is no analysis done for the calculation of real exchange rates.

The real oil prices and real exchange rates of the GCC countries and the non-GCC oil exporters are a co-integrated I (1) process, where there is a reduced rank, with one co-integrating relation between real oil prices and the real exchange rates, and therefore there exists a vector error correction model (VECM) for each of the twelve major oil exporters for the 1970-2013 period. (See, Engle and Granger (1987)).

Since oil constitutes a large portion of the GCC countries' revenues, oil prices affect the real exchange rates, particularly in the GCC countries. The real price of oil has been quite volatile in recent decades, so large macroeconomic effects from oil price changes are to occur in the economies of the GCC countries.

There is a real exchange rate appreciation from real oil shocks in the GCC countries, where oil accounts for approximately 40 percent of their economies. (See, Table 2). The real exchange rate appreciation from real oil price shocks in the GCC countries and Venezuela come in the form of a rise in the price level with virtually no change in their exchange rates. The real exchange rate appreciation in these countries from oil price shocks can have broad implications on their trade and current account balances since the non-oil sectors of these countries can become less competitive in the global markets.

The GCC countries instituted a fixed exchange rate regime in 1986, which anchors monetary policy and helps central bank to achieve low-inflation credibility. (See, Frankel (2010)). However, the structural VECM results show that the GCC countries were not able to accomplish their intended objective of lower inflation, which defeats the purpose of having a fixed exchange rate regime.

The positive effect of oil shocks on the inflation of the GCC countries (see, Table 3), as shown in the structural VECMs, lend empirical support to the view that a real exchange rate appreciation of the GCC countries, under fixed exchange rate regimes, comes primarily in the form of inflation and not as a nominal exchange rate appreciation, in common with Mussa (1976) and Frankel (2010). Moreover, there is a full breakdown of the components of a real exchange appreciation for the GCC countries, see Appendix.

The positive effect of the oil shocks on the real exchange rates of the GCC countries are supported by the OLS estimates, which suggest that nominal exchange rates of the GCC countries do not respond to changes in the oil prices, when oil prices are regressed against nominal exchange rates (in log, first differences), and therefore a real exchange rate appreciation in the GCC countries does not take the form of a nominal exchange rate appreciation, other than for sharp devaluations related to the official parities of Saudi Arabia and Oman, which is in common with Mussa (1976) and Frankel (2010). (See, Appendix). The nominal exchange rate graphs for the GCC countries support the OLS estimates, where there have been no significant changes to the nominal exchange rates of the GCC countries, with currencies pegged to the US $ since 1986, except for Kuwait.

There is no real exchange rate appreciation in response to real oil shocks for any of the non-GCC oil exporters, except for Venezuela. (See, Table 2). For the non-GCC oil exporters, the non-existence in the response of real exchange rates to real oil shocks can be explained by a relatively small share of oil in output, an average of 18 percent from 1970-2011. The nominal exchange rate graphs of the non-GCC oil exporters suggest that the VECM results in countries with managed floating exchange rates, such as Venezuela, Iran, Nigeria, and Russia experience far less volatility in their currencies than that of Norway and Canada, but more volatility than that of the GCC countries, with fixed exchange rates. The volatility of the exchange rates of the GCC countries seems to coincide with either financial or political crises, or else with sudden changes in their nominal exchange rates.

Table 2: Variance Decompositions[5] (Real Oil and Real Exchange Rates Shocks and their Responses)

Saudi Arabia			Kuwait		
10th Quarter Variation	**Real Oil**	**Real Exch**	*10th Quarter Variation*	**Real Oil**	**Real Exch**
Real Oil	99%	1%	**Real Oil**	94%	6%
Real Exch	16%	84%	**RealExch**	4%	96%
No Obs:	164		**No Obs:**	159	
Period:	1972Q4-2013Q3		**Period:**	1974Q1-2013Q3	
Oman			**Bahrain**		
10th Quarter Variation	**Real Oil**	**Rea lExch**	*10th Quarter Variation*	**Real Oil**	**Real Exch**
Real Oil	93%	51%	**Real Oil**	95%	5%
Real Exch	87%	13%	**RealExch**	18%	82%
No Obs:	41		**No Obs:**	31	
Period:	1972-2012		**Period:**	1982-2012	
Qatar			**UAE**		
10th Quarter Variation	**Real Oil**	**Real Exch**	*10th Quarter Variation*	**Real Oil**	**Real Exch**
Real Oil	85%	15%	**Real Oil**	84%	16%
RealExch	77%	23%	**RealExch**	71%	29%
No Obs:	33		**No Obs:**	37	
Period:	1981-2013		**Period:**	1977-2013	
Canada			**Norway**		
10th Quarter Variation	**Real Oil**	**Real Exch**	*10th Quarter Variation*	**Real Oil**	**Real Exch**
Real Oil	91%	9%	**Real Oil**	100%	0%
Real Exch	4%	96%	**RealExch**	6%	94%
No Obs:	172		**No Obs:**	174	
Period:	1971Q1-2013Q4		**Period:**	1970Q1-2013Q4	

Venezuela			Russia		
10th Quarter Variation	**Real Oil**	**Real Exch**	*10th Quarter Variation*	**Real Oil**	**Real Exch**
Real Oil	60%	40%	**Real Govt**	99%	1.00%
Real Exch	28%	72%	**Real Exch**	6%	94%
No Obs:	42		**No Obs:**	84	
Period:	1972-2013		**Period:**	1992Q4-2013Q3	
Nigeria			**Iran**		
10th Quarter Variation	**Real Oil**	**Real Exch**	*10th Quarter Variation*	**Real Oil**	**Real Exch**
Real Oil	93%	7%	**Real Oil**	NA	NA
Real Exch	4%	96%	**Real Exch**	NA	NA
No Obs:	31		**No Obs:**		
Period:	1970Q1-2013Q4		**Period:**	1970Q12013Q4	

[1]The reported variations are for the 10th period. The shocks are horizontal and the variables that are affected from these shocks are listed vertically.

Table 3: Variance Decompositions (Oil and Inflation Shocks and their Impulse Responses)

Saudi Arabia					
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	98%	2%	**Oil**	99%	1%
Inflation	28%	72%	**Inflation**	27%	73%
No Obs:	172		**No Obs:**	142	
Period:	1971Q1-2013Q4		**Period:**	1978Q3-2013Q4	
Bahrain					
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	98%	2%	**Oil**	99%	1%
Inflation	7%	93%	**Inflation**	37%	63%
No Obs:	170		**No Obs:**	157	
Period:	1970Q1-2013Q4		**Period:**	1979Q1-2013Q4	
Kuwait					
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	94%	6%	**Oil**	98%	2%
Inflation	30%	70%	**Inflation**	20%	80%
No Obs:	161		**No Obs:**	119	
Period:	1970Q1-2013Q4		**Period:**	1983Q2-2009Q3	
Oman			**Qatar**		
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	94%	6%	**Oil**	91%	9%
Inflation	96%	4%	**Inflation**	45%	55%
No Obs:	36		**No Obs:**	33	
Period:	1977-2013		**Period:**	1981-2013	
UAE			**Russia**		
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	100%	0%	**Oil**	76%	24%
Inflation	85%	15%	**Inflation**	9%	91%
No Obs:	36		**No Obs:**	85	
Period:	1977-2013		**Period:**	1992Q2-2013Q4	

Canada					
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	70%	30%	**Oil**	88%	12%
Inflation	15%	85%	**Inflation**	30%	70%
No Obs:	82		**No Obs:**	87	
Period:	1970Q1-1991Q1		**Period:**	1991Q2-2013Q4	
Norway					
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	90%	0%	**Oil**	87%	13%
Inflation	9%	91%	**Inflation**	9%	91%
No Obs:	71		**No Obs:**	91	
Period:	1970Q1-1988Q2		**Period:**	1988Q3-2013Q4	
Iran			**Nigeria**		
10th Quarter Variation	**Oil**	**Inflation**	*10th Quarter Variation*	**Oil**	**Inflation**
Oil	99%	1%	**Oil**	99%	1%
Inflation	1%	99%	**Inflation**	1%	99%
No Obs:	173		**No Obs:**	138	
Period:	1970Q1-2013Q4		**Period:**	1970Q1-2013Q4	
Venezuela					
10th Quarter Variation	**Oil**	**Inflation**			
Oil	96%	4%			
Inflation	1%	99%			
No Obs:	42				
Period:	1972-2013				

4.1.3. The Response of Real GDP to Real Government Spending Shocks

This section investigates the effects of a Real Government Spending Shock on Real GDP, where the results vary depending on whether the country is considered a developing or an advanced economy.

The fiscal spending shocks are unrelated to unanticipated output shocks, which means that the real government spending shocks are uncorrelated to real output shocks in the structural VECMs. Therefore, the impulse response functions of this paper here capture the direct impact of fiscal spending shocks on real output.

The standard neoclassical, Keynesian, and real business cycle models all predict that an increase in government spending generally has an expansionary effect on economic activity that raises output. The structural VECM results of this paper show that there is no effect of real government spending shocks on real economic activity in eight out of the ten oil exporters, countries with the available data, which means that countercyclical fiscal policy is not employed in any of these countries, except for Iran and Canada.

The non-existence of a response of real economic activity to a fiscal spending shock for majority of the oil exporters is not surprising and consistent with findings from the academic literature that fiscal policies of developing countries tend to be pro-cyclical rather than countercyclical, with ten out of the twelve major oil exporters considered as developing countries.

The structural VECM results here suggest that fiscal spending is countercyclical in both Canada and Iran, since real government spending shocks have a positive effect on real output. The positive response of real output to a real government spending shock in Canada is in line with economic intuition that the fiscal policy response of advanced economies tend to be countercyclical rather than pro-cyclical, in common with Kaminsky, Reinhart, and Vegh (2004) and Lane (2003), who argue that causality runs from fiscal policy to output.

In Iran, there is a strong positive and persistent effect of a real government spending shock on real economic activity. In Canada, there is a relatively small positive effect of a real government spending shock on real economic activity, which are in common with Rotemberg and Woodford (1992), Fatas and Mihov (2001), Blanchard and Perotti (2002), Burnside et al. (2004), and Mountford and Uhlig (2008), who argue that government spending shocks have a positive effect on the economic activity of advanced economies.

In Iran, a real government spending shock leads to a substantial and a persistent rise in real GDP, which accounts for a sizeable 90 percent of the fluctuations in real GDP, whose fiscal policy response is countercyclical. (See, Table 1). The trends in data suggest that there is an inverse relationship between the oil prices and government spending, which highlights the use of a countercyclical fiscal policy employed by the government authorities in Iran.

In Canada, the response of real GDP to a real government spending shock is positive but relatively smaller, with a real government spending shock that accounts for a relatively small 10 percent of the fluctuations in real GDP. (See, Table 4). The positive response of real economic activity to a real government spending shock in Canada is consistent with the conventional wisdom that advanced economies tend to have countercyclical fiscal policies, rather than a pro-cyclical fiscal policy response.

It is important to mention that Canada's economy is similar to that of the US, where there is not a large social safety net and the government has to rely on automatic stabilizers to offset the decline in aggregate demand during times of economic recession.

The fiscal policy response of Saudi Arabia, Oman, Bahrain, Venezuela, whose economies are largely dependent on oil, including Norway, are pro-cyclical, since real government spending responds positively to a real output shock in these countries, where oil prices drive output, and later the econometric causality goes from output to fiscal spending. (See, Table 4).

Table 4: Variance Decompositions6 (Real Government Spending, Real GDP, and Real Exchange Rates Shocks and their Responses)

Saudi Arabia				**Kuwait**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	39%	52%	9%	**Real Govt**	93%	6%	1%
Real GDP	2%	98%	0%	**Real GDP**	8%	65%	27%
Real Exch	9%	61%	30%	**Real Exch**	16%	13%	71%
No Obs:		42		**No Obs:**		40	
Period:		1972-2013		**Period:**		1974-2013	
Oman				**Bahrain**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	21%	28%	51%	**Real Govt**	26%	60%	4%
Rea lGDP	14%	24%	62%	**Real GDP**	5%	90%	5%
Real Exch	16%	41%	42%	**Real Exch**	26%	2%	72%
No Obs:		41		**No Obs:**		31	
Period:		1972-2013		**Period:**		1982-2012	
Qatar				**UAE**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	NA	NA	NA	**Real Govt**	NA	NA	NA
Real GDP	NA	84%	16%	**Real GDP**	NA	96%	4%
Real Exch	NA	26%	74%	**Real Exch**	NA	7%	93%
No Obs:		33		**No Obs:**		37	
Period:		1981-2013		**Period:**		1977-2013	
Canada				**Norway**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	59%	8%	33%	**Real Govt**	37%	50%	13%
Real GDP	11%	34%	55%	**Real GDP**	5%	76%	19%
Real Exch	7%	3%	90%	**Real Exch**	5%	7%	88%
No Obs:		42		**No Obs:**		42	
Period:		1972-2013		**Period:**		1972-2013	
Venezuela				**Iran**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	17%	13%	70%	**Real Govt**	95%	5%	NA
Real GDP	4%	65%	31%	**Real GDP**	92%	8%	NA
Real Exch	7%	20%	73%	**Real Exch**	NA	NA	NA
No Obs:		42		**No Obs:**		35	
Period:	1972-2013			**Period:**		1973-2007	
Nigeria				**Russia**			
10th Quarter Variation	**Real Govt**	**Real GDP**	**Real Exch**	*10th Quarter Variation*	**Real Govt**	**Real GDP**	**Real Exch**
Real Govt	82%	3%	15%	**Real Govt**	NA	NA	NA
Real GDP	0%	96%	4%	**Real GDP**	NA	93%	7%
Real Exch	58%	14%	28%	**Real Exch**	NA	0%	100%
No Obs:		31		**No Obs:**		76	
Period:	1983-2013			**Period:**		1995Q1-2013Q4	

[6]The reported variations are for the 10th period. The shocks are horizontal and the variables that are affected from these shocks are listed vertically.

4.1.4. The Responses of M2 to a GDP Shock

This section investigates the effects of a GDP shock on M2, where the results vary depending on the exchange rate regime. The money is endogenous for oil exporters, either with fixed or managed floating exchange rates, as shown in the structural VECMs of oil-exporting countries.

For the GCC countries, the GDP shock leads to an immediate increase in M2. In the GCC countries, M2 gradually increases from a GDP shock, whose effect becomes relatively large in the second year. The GDP shocks explain on average from 59-85 percent of the fluctuations in M2 for over a period of ten year.

Table 5: Variance Decompositions7 (GDP, M2, and CPI Shocks and their Impulse Responses)

Saudi Arabia				**Kuwait**			
10th Quarter Variation	**GDP**	**M2**	**CPI**	**10th Quarter Variation**	**GDP**	**M2**	**CPI**
GDP	81%	2%	17%	**GDP**	99%	1%	0%
M2	60%	10%	30%	**M2**	85%	14%	1%
CPI	36%	1%	63%	**CPI**	10%	6%	84%
No. Obs:		42		**No. Obs:**		40	
Period:	1972-2013			**Period:**		1974-2013	
Bahrain				**Oman**			
10th Quarter Variation	**GDP**	**M2**	**CPI**	**10th Quarter Variation**	**GDP**	**M2**	**CPI**
GDP	99%	0%	0%	**GDP**	87%	12%	1%
M2	76%	20%	4%	**M2**	85%	14%	1%
CPI	80%	8%	12%	**CPI**	29%	8%	64%
No. Obs:		37		**No. Obs:**		39	
Period:	1977-2013			**Period:**		1974-2012	
Qatar				**UAE**			
10th Quarter Variation	**GDP**	**M2**	**CPI**	**10th Quarter Variation**	**GDP**	**M2**	**CPI**
GDP	92%	5%	3%	**GDP**	92%	6.%	2%
M2	53%	33%	14%	**M2**	75%	18%	6%
CPI	11%	55%	34%	**CPI**	49%	12%	39%
No Obs:		30		**No. Obs:**		37	
Period:	1984-2013			**Period:**		1977-2013	
Canada				**Norway**			
10th Quarter Variation	**GDP**	**M2**	**CPI**	**10th Quarter Variation**	**GDP**	**M2**	**CPI**
GDP	97%	3%	0%	**GDP**	96%	0%	4.%
M2	3%	96%	1%	**M2**	23%	74%	3%
CPI	26%	2%	72%	**CPI**	14%	3%	83%
No. Obs:		170		**No. Obs:**		149	
Period:	1971Q3-2013Q3			**Period:**		1971Q3-2008Q3	
Venezuela				**Iran**			
10th Quarter Variation	**GDP**	**M2**	**CPI**	**10th Quarter Variation**	**GDP**	**M2**	**CPI**
GDP	96%	1%	3%	**GDP**	78%	22%	0%
M2	59%	40%	1%	**M2**	41%	46%	13%
CPI	97%	0%	3%	**CPI**	15%	7%	78%
No. Obs:		40		**No. Obs:**		42	
Period:	1970-2013			**Period:**		1972-2013	
Nigeria				**Russia**			
10th Quarter Variation	**GDP**	**M2**	**CPI**	**10th Quarter Variation**	**GDP**	**M2**	**CPI**
GDP	38%	58%	4%	**GDP**	16%	2%	82%
M2	5%	93%	2%	**M2**	5%	36%	60%
CPI	23%	37%	40%	**CPI**	0%	1%	98%
No. Obs:		42		**No. Obs:**		138	
Period:	1972-2013			**Period:**		1996-2013	

For Iran and Venezuela, M2 also shifts up immediately from a GDP shock. For Iran and Venezuela, the GDP shocks explain a large amount of the fluctuations in M2. Under a fixed or managed floating exchange rate, M2 responds to a

[7]The reported variations are for the 10th period. The shocks are horizontal and the variables affected from those shocks are listed vertically.

GDP shock, whereas there is either a no response or a muted response of M2 to a GDP shock under a floating exchange rate for Canada and Nigeria8, consistent with Mundell (1963) and Mussa (1976), who argue that it is the exchange rate that reacts to an external shock, such as a GDP shock, under a floating exchange rate. In countries with fixed/managed floating exchange rates, the monetary authorities are expected to expand the money supply, which in turn can lead to an increase in output.

The positive responses of M2 to a GDP shock for the GCC countries, Iran, and Venezuela are consistent with Marx (1907), Nell (1967), Nell (2004), who argue that the transaction demand for money from an increase in GDP is met through an increased circulation of money, and similar to that of Minsky (1990), who argues that money supply depends on a profit seeking activity, i.e., money is endogenous.

4.1.5. The Response of Foreign Exchange Reserves to Oil Price Shocks

This section focuses on the effect of oil shocks on foreign exchange reserves.

The restricted structural VECMs have been used for all the twelve oil exporters, with one co-integrating relation between the oil prices and foreign exchange reserves for the 1970-2013 period, and additional VECMs for Qatar and Venezuela have been used, given the structural breaks in the foreign exchange reserves data.

A one standard deviation shock in the oil price (approximately of 14 percent) leads to an immediate shift in foreign exchange reserves for the GCC countries, except for Oman and UAE. For the GCC countries, foreign exchange reserves exhibit a substantial increase from oil price shocks, including for Bahrain, Kuwait, Qatar, and Saudi Arabia, based on the restrictions of a fixed exchange rate regime and given the conditions of a Mundell-Fleming model, which requires central banks to trade domestic currency for foreign currency at a predetermined price, to keep the exchange rate at its preannounced rate.

An oil shock accounts for a large amount of the fluctuations in the foreign exchange reserves of the GCC countries, except for Oman and UAE. The oil shocks account for half of the fluctuations in the foreign exchange reserves of Bahrain and Kuwait, which explain 75 percent of the fluctuations in foreign exchange reserves of Saudi Arabia and Qatar. (See, Table 6).

In Oman and UAE, there is a muted response of foreign exchange reserves to oil shocks, which can be explained by their foreign exchange policies, based on how some of the foreign exchange reserves have been used to purchase foreign securities, where local banks deposit some of their foreign exchange reserves with foreign banks or institutions, or foreign currency reserves are invested in other assets, as shown in their central bank statements.

In contrast to that of the GCC countries, the response of foreign exchange reserves to oil shocks is muted for many of the non-GCC oil exporters, since they have greater leeway for investing their foreign exchange reserves, in the absence of restrictions typically found under a fixed exchange rate regime, except for Nigeria (1970-1983). (See, Table 6).

For the non-GCC oil exporters, including Norway, Nigeria (1984-2009), Russia, Iran, and Venezuela, there is a muted response of foreign exchange reserves to oil shocks. In the absence of any restrictions under a fixed exchange rate regime, these countries are able to use their foreign exchange reserves to purchase foreign securities, deposit some of their foreign exchange reserves with foreign banks or institutions, or else invest their foreign exchange reserves in other assets, including in a money market portfolio, as is the case here for Norway.

In Nigeria (1970-1983), the foreign exchange reserves shift up immediately and stay positive for 10 quarters. An unanticipated shock in oil reserves for Nigeria accounts for more than half of the fluctuations in foreign exchange reserves. In contrast to the 1970-1983 period, the impact of oil prices on foreign exchange reserves is virtually non-existent for the 1984-2009 period. The IRF-based findings on the muted response of foreign exchange reserves to oil shocks are consistent with Kuijs (1998), who argues that the oil production in Nigeria has increased from the 1970s until the early 1980s, thereafter oil prices and oil production both declined.

[8]Nigeria adopted a floating exchange rate in 1986.

Table 6: Variance Decomposition Table 9(Oil, Foreign Exchange Reserves Shocks, and their Impulse Responses)

Qatar					
10th Quarter Variation	**Oil**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Oil**	**Foreign Exch. Reserves**
Oil	95%	5%	**Oil**	99%	1%
Foreign Exch. Reserves	6.00%	94%	**Foreign Exch. Reserves**	76%	24%
No. Obs:	97		**No. Obs:**	44	
Period:	1974Q1-1998Q3		**Break: 1998Q4**	1998Q4-2009Q3	
Bahrain			**Kuwait**		
10th Quarter Variation	**Oil**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Oil**	**Foreign Exch. Reserves**
Oil	98%	2%	**Oil**	99%	1%
Foreign Exch. Reserves	34%	66%	**Foreign Exch. Reserves**	42%	58%
No. Obs:	173		**No. Obs:**	156	
Period:	1970Q1-2013Q4		**Period:**	1970Q1-2009Q3	
S. Arabia			**Oman**		
10th Quarter Variation	**Oil**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Oil**	**Foreign Exch. Reserves**
Oil	100%	0%	**Oil**	99%	1%
Foreign Exch. Reserves	78%	22%	**Foreign Exch. Reserves**	5%	95%
No Obs:	148		**No. Obs:**	136	
Period:	1971Q1-2013Q4		**Period:**	1972Q1-2009Q2	
UAE			**Norway**		
10th Quarter Variation	**Oil**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Oil**	**Foreign Exch. Reserves**
Oil	98%	2%	**Oil**	99%	1%
Foreign Exch. Reserves	3%	97%	**Foreign Exch. Reserves**	1%	99%
No. Obs:	152		**No. Obs:**	114	
Period:	1974Q1-2009Q3		**Period:**	1970Q1-2001Q3	
Russia			**Canada**		
10th Quarter Variation	**Oil**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Oil**	**Foreign Exch. Reserves**
Oil	57%	43%	**Oil**	N/A	N/A
Foreign Exch. Reserves	6%	94%	**Foreign Exch. Reserves**	N/A	N/A
No Obs:	50		**No Obs:**		
Period:	1993Q1-2008Q4		**Period:**	1970Q1-2006Q4	
Nigeria					
10th Quarter Variation	**Oil**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Oil**	**Foreign Exch. Reserves**
Oil	99%	1%	**Oil**	96%	4%
Foreign Exch. Reserves	53%	47%	**Foreign Exch. Reserves**	4%	96%
No Obs:	52		**No Obs:**	133	
Period:	1970Q1-1983Q3		**Break: 1983Q4**	1983Q4-2009Q2	
Iran			**Venezuela**		
10th Quarter Variation	**Oil**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Oil**	**Foreign Exch. Reserves**
Oil	97%	3%	**Oil**	99%	1%
Foreign Exch. Reserves	2%	98%	**Foreign Exch. Reserves**	7%	93%
No Obs:	141		**No Obs:**	95	
Period:	1970Q1-2011Q1		**Period:**	1970Q1-2013Q4	

[9]The reported variations are for the 10th period. The shocks are horizontal and the variables that are affected from those shocks are listed vertically.

4.1.6. The Response of Reserve Money to Foreign Exchange Reserve Shocks

This section analyses the effect of foreign exchange reserve shocks on reserve money, where results vary depending on the exchange rate regime. At first, this paper identifies the structural breakpoints in the foreign exchange reserves data, using the OLS method.

In the GCC countries, the reserve money exhibits a strong increase from foreign exchange reserve shocks, most notably for Saudi Arabia and Kuwait, consistent with the economic intuition. (See, Table 7).

The trends in data for foreign exchange reserves and reserve money show that reserve money has been consistently below foreign exchange reserves for the 1970-2013 period, which means that only a part of the foreign exchange reserves of the GCC countries has eventually made its way into the reserve money. A part of the foreign exchange reserves in the GCC countries has not been used for internal macroeconomic purposes, i.e., currency or bank deposits, since the government authorities used some of its foreign exchange reserves to either purchase gold, retained some of the foreign exchange reserves as government deposits at the central bank, purchased foreign securities, or local banks deposited some of the foreign exchange reserves with foreign banks or institutions.

The foreign exchange shocks account for about a quarter of the fluctuations in reserve money for Bahrain, Oman, Qatar, and UAE, for the entire 1970-2013 period, and about half of the fluctuations in reserve money for Kuwait and Saudi Arabia from 1999-2013. (See, Table 7).

In support of the VECM results from above, Saudi Arabia's central bank balance statement for 2013 shows that an increase in foreign exchange reserves partially transmits to an increase in broad money, M3, and the rest of the foreign exchange reserves stay as government deposits at the central bank.

In support of the VECM results from above, Kuwait's central bank balance statement for 2013 shows that an increase in foreign exchange reserves partially transmits to an increase in currency and bank deposits, with the rest of the increase in foreign exchange reserves that stays as government deposits. The central bank of Kuwait issues bonds for the remainder of the foreign exchange reserves, which effectively enables the central bank to withdraw liquidity from the financial markets.

There is a positive response of reserve money to foreign exchange reserve shocks for Iran, Venezuela, Russia, and Nigeria, with a managed floating exchange rate, like that of the GCC countries, with fixed exchange rates. (See, Table 6).

The reserve money of Iran, Venezuela, Russia, and Nigeria (1970-1982) shifts immediately from a shock in foreign exchange reserves, where the reserve money remains positive for a protracted period, with half of the foreign exchange reserves of Iran and more than three quarters of the foreign exchange inflows of Venezuela, Russia, and Nigeria (1970-1982) transfer into reserve money. (See, Table 7).

It is important to note that Nigeria had a managed floating exchange rate from 1970-1985, thereafter its exchange rate has been freely floating. With the adoption of a floating exchange rate in 1986, Nigeria's naira has been allowed to devaluate strongly. In 1995, the devaluation was sufficiently large, which subsequently led to a liberalization of the foreign exchange market. For Canada, there has been a loss of foreign exchange reserves from 1979-1999, which explains why there has not been a structural VECM, given the negative values.

The central bank statement for Iran for 2013 support the VECM results from above, which shows that an increase in foreign exchange reserves partially transmits to an increase in currency and bank deposits, where part of the increase in foreign exchange reserves stays as government deposits at the central bank. Iran issues government bonds for the remainder of the currency reserves, which effectively enables the central bank to withdraw liquidity from the financial markets.

The central bank statement for Russia for 2013 support the VECM results from above, which shows that an increase in foreign exchange reserves partially transmits to an increase in currency and bank deposits, and the rest of the increase in foreign exchange reserves transfer into government deposits.

In Norway and Nigeria (from 1983-2009), with floating exchange rates, reserve money hardly changes in response to shocks from foreign exchange reserves, consistent with the economic intuition. In Norway and Nigeria (from 1983-2009), the foreign exchange reserves do not transfer into reserve money, in accord with Mussa (1976) and Mundell (1963), who argue that it is the exchange rate which fluctuates from an external shock, such as oil, and not the base money or the money supply.

Norway invests some of its foreign exchange reserves in an investment fund, which explains why there has not been a positive response of reserve money to foreign exchange reserve shocks. Norway used some of its foreign exchange reserves for internal macroeconomic purposes, i.e., currency or bank deposits, and the rest of its currency reserves has been invested in a global government pension fund, which is a sovereign wealth fund, instead of allowing the foreign exchange reserves to be transmitted to local currency or bank deposits.

In Nigeria, the estimated negative response of foreign exchange reserves to reserve money for the 1983-2009 period may be related to a devaluation at first, and later to a depreciation of the currency, which is associated with a loss of foreign exchange reserves.

Table 7: Variance Decomposition Table10 (Foreign Exchange Reserves, Reserve Money Shocks, and their Responses).

Saudi Arabia					
10th Quarter Variation	Reserve Money	Foreign Exch. Reserves	10th Quarter Variation	Reserve Money	Foreign Exch. Reserves
Reserve Money	74%	26%	Reserve Money	43%	56%
Foreign Exch. Reserves	1%	99%	Foreign Exch. Reserves	1%	99%
No Obs:	172		No Obs:	58	
Period (full):	1971Q1-2013Q3		Break: 1999Q3	1999Q3-2013Q4	
Bahrain			Kuwait		
10th Quarter Variation	Reserve Money	Foreign Exch. Reserves	10th Quarter Variation	Reserve Money	Foreign Exch. Reserves
Reserve Money	89%	23%	Reserve Money	1%	57%
Foreign Exch. Reserves	1%	99%	Foreign Exch. Reserves	43%	99%
No Obs:	174		No Obs:	157	
Period:	1970Q1-2013Q4		Period:	1970Q1-2009Q3	
Qatar			Oman		
10th Quarter Variation	Reserve Money	Foreign Exch. Reserves	10th Quarter Variation	Reserve Money	Foreign Exch. Reserves
Reserve Money	84%	16%	Reserve Money	76%	24%
Foreign Exch. Reserves	3%	97%	Foreign Exch. Reserves	12%	92%
No Obs:	141		No Obs:	127	
Period:	1971Q1-2013Q4		Period:	1972Q1-2009Q2	
UAE			Canada		
10th Quarter Variation	Reserve Money	Foreign Exch. Reserves	10th Quarter Variation	Reserve Money	Foreign Exch. Reserves
Reserve Money	90%	10%	Reserve Money	N/A	N/A
Foreign Exch. Reserves	3%	97%	Foreign Exch. Reserves	N/A	N/A
No Obs:	152		No Obs:		
Period:	1974Q1-2009Q3		Period:	1970Q3-2008Q4	

[10]The reported variations are for the 10th period. The shocks are horizontal and the variables, which are affected from these shocks, are listed vertically.

Table 7: Variance Decomposition Table11 (Foreign Exchange Reserves, Reserve Money Shocks, and their Responses) cont'd…

Venezuela					
10th Quarter Variation	**Reserve Money**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Reserve Money**	**Foreign Exch. Reserves**
Reserve Money	57%	43%	**Reserve Money**	70%	30%
Foreign Exch. Reserves	6%	94%	**Foreign Exch. Reserves**	4%	96%
No Obs:	67		**No Obs:**	95	
Period:	1970Q1-1987Q4			1988Q1-2013Q4	
Nigeria					
10th Quarter Variation	**Reserve Money**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Reserve Money**	**Foreign Exch. Reserves**
Reserve Money	15%	85%	**Reserve Money**	86%	14%
Foreign Exch. Reserves	7%	93%	**Foreign Exchange Reserves**	17%	83%
No Obs:	47		**No Obs:**	103	
Period:	1970Q1-1982Q1		**Break: 1982Q2**	1982Q2-2009Q2	
Norway			**Iran**		
10th Quarter Variation	**Reserve Money**	**Foreign Exch. Reserves**	*10th Quarter Variation*	**Reserve Money**	**Foreign Exch. Reserves**
Reserve Money	87%	13%	**Reserve Money**	54%	46%
Foreign Exch. Reserves	1%	99%	**Foreign Exch. Reserves**	2%	98%
No Obs:	112		**No Obs:**	138	
Period:	1970Q1-2006Q4		**Period:**	1970Q1-2010Q4	
Russia					
10th Quarter Variation	**Reserve Money**	**Foreign Exch. Reserves**			
Reserve Money	99%	1%			
Foreign Exch. Reserves	90%	10%			
No Obs:	50				
Period:	1994Q1-2008Q4				

[11]The reported variations are for the 10th period. The shocks are horizontal and the variables, which are affected from these shocks, are listed vertically.

4.2. The Oil Prices and M2 (reduced form OLS estimates)

This last section explores the effects of a change in oil prices on the money supply, where the results vary depending on the exchange rate regime.

The (reduced-form) OLS estimates of the restricted structural VECM suggest that there is a strong positive and statistically significant relationship between the oil prices and money supply for Oman, Nigeria, Venezuela, and Russia, with fixed/managed floating exchange rates. The positive response of reserve money from foreign exchange reserve shocks eventually make their way into the money supply for Oman, Russia, Nigeria, and Venezuela, which the reduced-form OLS estimates suggest.

Basically, oil exports affect the money supply of Oman, Nigeria, Venezuela, and Russia through bank reserves (see, Section 5.1.5), in common with Mundell (1963), Mussa (1976), Cuddington (1989), and Edwards (1986), who argue that foreign exchange reserve inflows from commodity booms will cause an expansion of the domestic monetary base and broader monetary aggregates (M2) in countries where there is either a fixed or a managed floating exchange rate. In Saudi Arabia, Kuwait, Qatar, Bahrain, and Iran, there is not a positive and a statistically significant relationship between the oil prices and M2, despite an increase in reserve money from foreign exchange reserves, which could be explained by some form of sterilization, in accord with Cuddington (1986), who argues that sterilization can reduce the money multiplier, and its larger effect on broader monetary aggregates.

In Canada and Norway, there is not a positive response of money supply to changes in oil prices, in common with Mundell (1963) and Mussa (1976), who argue that the money supply does not respond to an external shock, such as the oil prices, rather only does the exchange rate.

4.3. Order Dependence of Variables in the Structural VECMs

Are the VECM results order-dependent and robust?

A Structural VECM with Real Government Spending, Real GDP, Real Exchange Rates, and Real Oil (exogenous):

When the order of variable is changed from Real Government Spending, Real GDP, and Real Exchange Rates to Real GDP, Real Government Spending, and Real Exchange Rates, the results are insensitive to ordering for most of the oil exporters, except for Oman and Iran[12], for the reasons discussed below.

The new ordering of variables for Oman is counterintuitive to economic intuition, which shows that the government spending shock has a strong positive effect on output, in contrast to the more commonly observed and anticipated pro-cyclical fiscal policy response for the developing countries. (See, Kaminsky, Reinhart, and Vegh (2004)).

For Iran, the new ordering makes a clear difference to the policy outcome, with a positive effect of a real output shock on real government spending, which is more consistent with a pro-cyclical fiscal policy stance of developing countries, whereas before there was not a positive response of real government spending to a real output shock, with the initial order of variables.

The existing order of variables remains reasonable for a group of oil exporters. Under the Choleski decomposition, the order of variables goes from Real Government Spending to Real Output in the structural VECM equations of each country, where fiscal shocks are exogenous with respect to output, in common with Rotemberg and Woodford (1992), Fatas and Mihov (2001), Blanchard and Perotti (2002), Burnside et al. (2004) and Mountford and Uhlig (2008), who use the same order of variables in their VAR models.

A Structural VECM with GDP, M2, Inflation, and Oil (exogenous):

With a change in variables from GDP-M2-INF to M2-GDP-INF, the results are virtually the same, which allows me to conclude that the existing order of variables remains the most reasonable for all twelve oil exporters examined in this paper, in common with Bernanke and Blinder (1992), Bernanke and Mihov (1995), Christiano, Eichenbaum, and Evans (1994b), who assume the results are relatively insensitive to the ordering.

Next, I seek to find out whether a variable such as an economic activity is exogenous with respect to M2. For a variable to be exogenous, the variable cannot be affected either by contemporaneous or past values of any other endogenous variable, shown in the variance decomposition results. If one or more variables explain a significant portion of the forecast error variance decompositions of a variable at all forecast horizons, then the order of variables may not be correct, which may mean that GDP is not entirely exogenous with respect to M2. For UAE, Oman, Iran, and Nigeria, M2 shocks explain only a small amount of the fluctuations in GDP, which makes GDP exogenous.

Lastly, this paper tests for three key assumptions in the ordering of the endogenous variables, which has not been done before in the academic literature: a). policymakers have contemporaneous information about non-policy variables, such as GDP and CPI, whereas a policy variable, such as M2, is ordered last, with the equation ordered from GDP-CPI-M2, b). policymakers know only the lagged values of non-policy variables, with the order of variables that goes from M2-GDP-CPI, and c). policymakers have contemporaneous information about a non-policy variable

[12]The restricted VECM results with a new order of variables from real GDP to real government spending and real exchange rates are available upon request.

such as GDP, but a monetary aggregate, such as M2, predicts another non-policy variable CPI (implying that CPI is ordered last), with the order of variables that goes from GDP-M2-CPI, which is known as the existing order of variables.

Bernanke and Blinder (1992), Bernanke and Mihov (1995), Christiano, Eichenbaum, and Evans (1994b) use "assumption a" from above, where the non-policy macroeconomic variables, such as GDP and CPI, are ordered first before any other policy variable, such as a monetary aggregate, M2. The non-policy variables, GDP and CPI, affect M2 contemporaneously and through their lagged values, whereas only the lagged values of a policy variable, such as M2, affect the non-policy variables, such as GDP and CPI. The assumption here is that the policy shocks, such as the federal funds rate, total bank reserves, or the money supply do not affect any of the macroeconomic variables contemporaneously, but only with a lag. This identification scheme has been widely used in the developing countries.

I obtained relatively similar results under all three assumptions. However, the original ordering of variables (GDP-M2-INF) makes the most sense for a group of twelve major oil exporters.

5. Conclusion

The economies of oil-exporting countries may respond to oil shocks differently, depending on their political economic systems, including their regional economic alliance, stage of economic development, and the exchange rate regime. This paper tracks a vector of macroeconomic variables (real government spending, real output, real exchange rates, inflation, foreign exchange reserves, reserve money, and money supply), in response to oil price shocks, and analyzes whether any of these macroeconomic variables behave differently given the political economy factors. This paper concludes that the political economy factors explain why the economic indicators of the twelve major oil exporters to behave differently.

Most importantly, the focus of this paper is entirely on a group of oil exporters, unlike many other papers that focus on industrialized economies, which import oil. This paper separates oil exporters into two distinct categories, the GCC countries and the non-GCC oil exporters. This categorization of oil exporters is important, since the GCC countries share a political and economic alliance and their economies are largely oil dependent, with currencies (other than that of Kuwait) formally pegged to the US dollar. Unlike the GCC countries, the non-GCC oil exporters do not participate in any common political alliance or an economic union. Their economies are diversified and less dependent on oil exports. To my knowledge this type of categorization for oil exporters has not been done before in the academic literature.

I treat real oil as exogenous in the four-variable restricted structural VECMs of this paper, since no country influences the price of oil, maybe other than for Saudi Arabia. Such a treatment not reported in the academic literature results in a significantly high R2. I would like to add that other academic literature treats oil as endogenous[13].

This paper has reached several conclusions supported by economic reasoning and empirical evidence.

First, there is not a positive estimated response of real economic activity to real government spending shocks for eight out of the ten oil exporters (out of the ten countries with available government spending data), which suggests that countercyclical fiscal policy does not play a role in determining output for most the oil-exporting countries, except for Iran and Canada. These results are consistent with the economic reasoning that fiscal policies of developing countries tend to be pro-cyclical rather than countercyclical.

Some recommendation for future research would include whether there was any countercyclical fiscal policy implemented by developing oil-exporting countries for the 1970-2013 period, other than for Norway and Canada.

Second, real oil prices affect the real exchange rates of the GCC countries, but a real exchange rate appreciation for these countries with fixed exchange rate regime comes primarily in the form of inflation, rather than a nominal exchange rate appreciation. Contrary to the purpose of achieving low inflation under a fixed exchange rate regime, the GCC countries experienced significant inflation for the 1970-2013 period.

Third, money is endogenous in oil-exporting countries with fixed or managed floating exchange rates, including the GCC countries, Iran, and Venezuela; however, money is not endogenous in oil-exporting countries with floating exchange rates, such as Canada, Norway, and Nigeria.

Further research might extend the VAR analysis and empirical research to other countries with fixed or managed floating exchange rate regimes to find out whether money is endogenous for these countries and not for countries with floating exchange rates.

Fourth, there is a strong positive effect of oil price shocks on the foreign exchange reserves of the GCC countries, consistent with the restrictions of a fixed exchange rate regime under the conditions of a Mundell-Fleming model, whereas the effect of oil price shocks on foreign exchange reserves has been almost non-existent for the non-GCC oil exporters (except for Nigeria). This maybe because the non-GCC oil exporters (with flexible exchange rates) have significant leeway in investing their foreign exchange reserves.

Lastly, the foreign exchange reserves have a strong positive effect on the reserve money of the GCC countries, Venezuela, and Iran, which are countries with either fixed or managed floating exchange rates, whereas in countries with a purely floating exchange rate regime, such as that of Canada, Norway, and Nigeria[14], the response of reserve

[13]See, Bernanke B., Gertler M., and Watson M. (1997), Blanchard and Gali (2007), Kilian (2009), and Kilian (2010) for use of endogenous oil prices.

[14]Nigeria adopted a floating exchange rate in 1986.

money to a foreign exchange shock has been almost non-existent, either due to weak or no impact of foreign exchange reserves on reserve money.

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