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Kuwait's Macroeconomic Performance in the Global Context

Keywords

Growth, Oil Price, Equity Market, Spillover Effects, Kuwait, Global Vector Auto Regressive (GVAR).

Abstract

The ups and downs of Kuwait's economy since the 1970s are often viewed as driven by two main factors: domestic shocks and oil price shocks. While these two factors have been visibly important in shaping economic fluctuations and growth in Kuwait, their effects have been conditioned by and combined with influences from other domestic and global factors. In particular, GDP growth, inflation, interest rates, and equity prices in the rest of the world are likely to have direct or indirect impacts on Kuwait's economy, though little is known about the significance of such effects. Assessing the role of various factors on the Kuwait's macroeconomic process is important for understanding the trends and fluctuations in the economy and for forecasting and policy analysis. To this end we use a Global VAR (GVAR) model framework to disentangle the size and speed of the transmission of different global macroeconomic shocks originating from three systemic countries (China, Euro Area, and the US) to Kuwait, as well as looking at the implications of shocks to both global equity and oil markets for the Kuwaiti economy. Our approach uses a dynamic multi-country framework for the analysis of the international transmission. The framework comprises 28 country/region-specific models, These individual models are solved in a global setting where core macroeconomic variables of each economy are related to corresponding foreign variables. The model has both real and financial variables. This framework is able to account for various transmission channels, including not only trade relationships but also financial and commodity price linkages.

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Introduction

The ups and downs of Kuwait's economy since the 1970s are often viewed as driven by two main factors, namely, domestic political shocks and the price of oil as it is illustrated by figure1. While these two factors have been visibly important in shaping economic fluctuations and growth in Kuwait, their effects have been conditioned by and combined with influences from other domestic and global factors. In particular, shocks to gross domestic product (GDP) growth, inflation, interest rates, and equity prices in the rest of the world are likely to have direct and/ or indirect impacts on Kuwait's economy, although little is known about the significance of such effects. Assessing the role of various factors involved in the country's macroeconomic process is important to understand the trends and fluctuations in the economy and in forecasting and policy analysis.

To disentangle the size and speed of the transmission of different macro-economic shocks originating from different world regions as well as to examine implications of shocks to both equity and oil markets for the Kuwait's economy, this paper develops a global vector auto-regressive (GVAR) model that includes the Gulf Cooperation Council (GCC) countries(1). The approach uses a dynamic multi-country framework to analyze the international transmission of shocks that is based on the models developed in Cashin *et al.* (2014), Cashin *et al.* (2016a), Mohaddes and Pesaran (2016a), and Mohaddes and Raissi (2015). The framework includes 28 country/region-specific vector auto-regressive models with weakly exogenous foreign variables (VARX*), in which the individual country/region-specific VARX* models are solved in a global setting where core macroeconomic variables of each country/region are related to corresponding foreign variables. The model has both real and financial variables (real GDP, inflation, real equity price, real exchange rate, short and long-term interest rates, oil production, and the price of oil), and takes account of the various transmission channels, including not only trade relationships but also financial and commodity price linkages (Dees *et al.* 2007). While the country/region-specific VARX* models look at issues related to the long-run and allow investigation of the direct effects and the long-run role of different domestic and foreign variables on, for instance, the real output of an economy, the GVAR model permits investigation of spillover effects (both direct and indirect) on an economy originating from different countries/regions; while taking into account spillover effects, transmitted across economies via trade, financial, and commodity price linkages, and is mainly used for short-run analysis.

(1) The paper focuses on the economic shocks rather than country-specific political economy shocks which are not incorporated in the GVAR structure.

Estimating the GVAR model that includes the GCC countries over the period from 1979Q2 to 2013Q1, it is shown that US GDP, oil price, and equity market shocks have permanent and statistically significant long-run impacts on Kuwait's real output and oil production (taking account of both direct exposures of Kuwait to these shocks and indirect effects through third-markets). The results illustrate the importance of modeling Kuwait's economy in a global context, taking into account spillover effects from trading partners as well as global equity markets rather than just focusing on the oil market, which is what has traditionally been done.

The rest of this paper is organized as follows. Section II provides a brief overview of the Kuwaiti economy. Section III outlines the GVAR methodology, while Section IV describes the modeling approach. The fifth section presents the empirical results, including estimates of the country-specific VARX* models as well as impulse responses of various shocks. Finally, Section VI offers some concluding remarks.

An Overview of Kuwait's Economy

Kuwait is one of the smaller countries in the world, but it is rich in hydrocarbon resources (mainly oil) and has one of the highest per capita incomes in the world. During the last four decades (i.e., between 1970 and 2014), the performance of the Kuwaiti economy, in terms of real GDP growth, has varied sharply (Figure 1). Some of the main factors to have influenced the growth are internal structural imbalances, exposure to global markets, and domestic and external shocks experienced over the years. As Figure 1 shows, some of the main shocks that have affected the Kuwaiti economy since 1970 have been the developments in the international oil market, the Iran-Iraq war (1980s), the domestic stock market crisis (Souk Al- Manakh, 1983), Iraqi invasion of Kuwait (August 1990), the oil price crash (early 1990s), and the global financial crisis (2007-08). These shocks have had a profound impact on the level and growth of economic activity in the country. The decline in GDP in the 1970s and early 1980s, is attributed to the oil price shocks of 1973 and 1979 that led to reductions in oil production following Organization of Petroleum Exporting Countries' (OPEC) imposition of a ceiling on production levels. The Iran-Iraq war (1980s) and Souk Al-Manakh crisis (1983) also contributed to the decline in economic activity during the 1980s. By disrupting the economic activity in the country, the Iraqi invasion in August 1990 and subsequent occupation further added to the decline, and by 1991, the country's nominal GDP was only 40% of its 1980s' level.

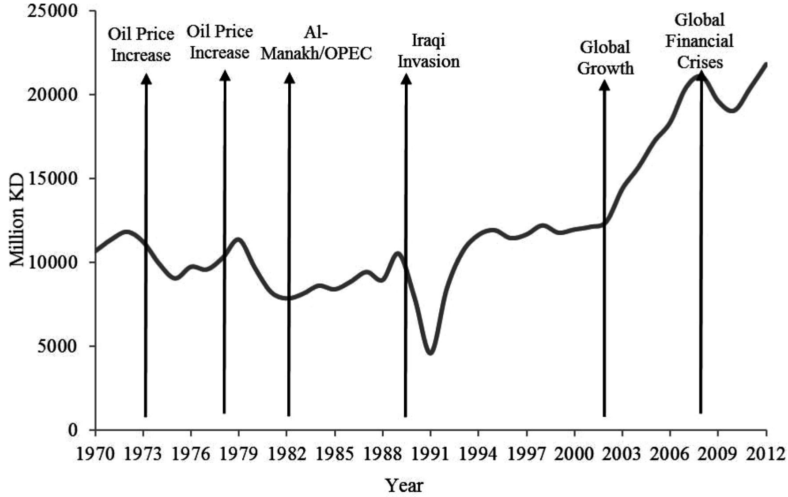

Figure 1
Kuwait's Real GDP (1970-2012).

Between 1991 and 2008, with the exception of few years, Kuwait's real GDP increased consistently, and the size of the economy more than doubled relative to its 1970s' level. The global financial crisis of 2007-08 negatively impacted real GDP and the size of the economy shrank by 10% relative to its 2008 level. However, in the last few years, as a result of the oil-price driven process, Kuwait's economy has enjoyed an impressive economic development, and the government experienced high levels of fiscal surpluses and managed to accumulate a significant portfolio of foreign assets. Significant as they may be, the positive developments (i.e., economic development, fiscal surpluses, and enlarged foreign assets) are not indicative of any sizeable productivity surge across different sectors of the economy and do not mask the structural problems that have been the key characteristics of Kuwait's economy for a long time. Indeed, Kuwait's economic performance is constrained by the existence and persistence of internal structural imbalances and exposure to global markets. The internal structural imbalances relate to the dominance of oil in terms of the shares in GDP and government revenues; dualistic labor market (nationals versus expatriates); a relatively large public sector; and a small non-oil production base. During the last three decades, the average share of oil in real GDP and government revenues was 44% and 80%, respectively. Similarly, the public sector accounted for 65% of the total GDP, and the contribution of non-oil production was only 3.5%. Finally, the nationals account for only 17% of the total labor force and 71% of the total employment in the public sector.

Kuwait's exposure to global markets comes through production of oil and the fact that the price of oil is determined in the international markets. Most of the country's annual crude oil output and its products are exported, and the necessary capital and consumer items are imported. In 2015, approximately 95% of the country's crude oil was exported, and commodity trade accounted for around 75% of the country's GDP. The high proportion of commodity trade in the GDP makes the country vulnerable to economic growth and inflationary pressures from its major trading partners, as was witnessed by the surge in the inflation rate between 2003 and 2010.

At the same time, barring two years following liberation (i.e., 1991 and 1992), during the last four decades, the country has experienced a surplus in its current account balance. Between 2004 and 2012, the annual current account surplus increased sharply almost consistently. In 2005, the current account surplus as a percentage of GDP was as high as 43%, but in recent years, has declined and in 2015, was only 7%. The decline in the current account balance is linked to the price of crude oil in the international markets, which has dropped substantially since June 2014 (Figure 2), and points to Kuwait's vulnerabilities to developments in the oil market(2). The surplus in the current account has led to a capital outflow, and consequently, a large proportion of the country's public and private capital is invested abroad.

It may be noted that as a result of high oil prices, the government has been experiencing a surplus in the annual budget for most of the years since 1970. By law, any surplus in the annual budget is transferred to the General Reserve Fund (GRF), which is used to finance any deficits in the annual budget. In addition, considering rights of future generations to the country's oil resources, in 1976, Kuwait established a Future Generation Fund (FGF). Under the law, each year, 10% of the States revenues is transferred to the FGF, and no outlays or expenditures are spent from either the assets of the fund or the annual income from its assets. The resources under both the FGF and GRF have been invested in domestic and foreign assets. According to the Sovereign Wealth Fund Institute's estimates, in June 2015, Kuwait's holdings, which is the oldest and the fifth largest sovereign wealth fund in the world, stood at US $548 billion. Over the years, Kuwait's annual income from assets held abroad has fluctuated sharply and is

(2) The figure shows that crude oil price is extermely volatile, increasing sharply in 1979 to about $41 then hiting a low of $10 in 1998. The volatility intensity incresed during the last 10 years as the price reached a high of above $130 in 2008 and fluctuated widely until it decreased to about $45 in 2016.

linked to trends in the international capital markets (Figure 3), which is reflected by the correlation coefficient between NASDAQ price index and FGF and GRF estimated to be 0.72 and 0.58, respectively.

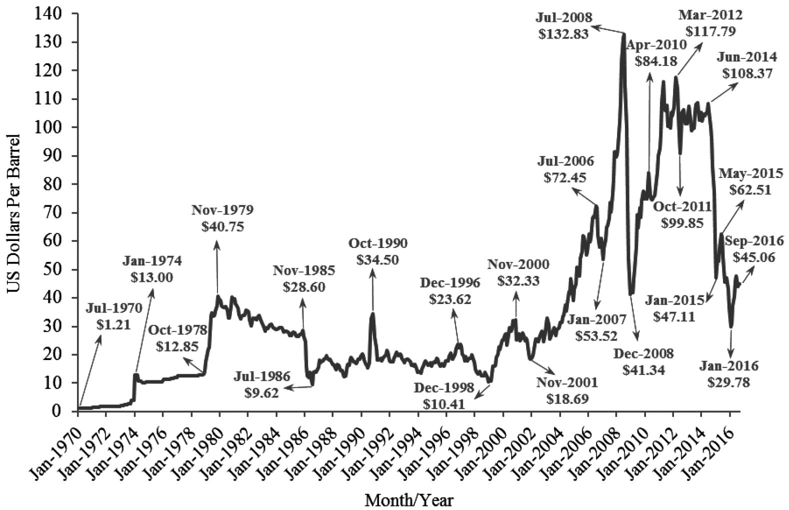

Figure 2
International Crude Oil Prices (1970-2016).

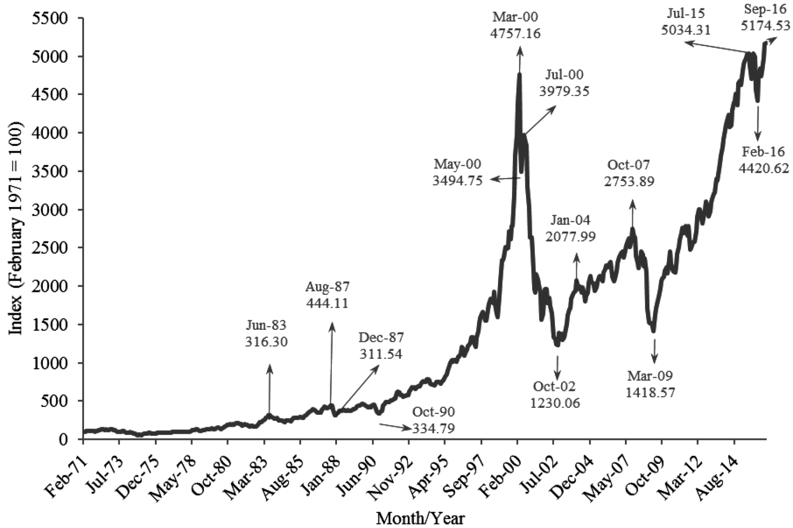

Figure 3
NASDAQ Price Index (1971-2014).

The GVAR Methodology

In order to investigate spillover effects from different countries and regions on the Kuwaiti economy while taking into account spillovers that are transmitted across economies via trade, financial, and commodity price linkages, we use a compact model of the global economy, known as the Global VAR (GVAR) model. Note that this modeling approach is a two-step process, whereby we first estimate the 28 country-specific vector autoregressive models with foreign variables (VARX* models) over the period 1979Q2 to 2013Q1 separately and then combine these models into a Global VAR model by stacking the individual country models using the link (or weight) matrix; making all variables endogenous to the system as a whole. We provide a detailed exposition of this modeling approach below.

Consider a global economy of N countries, indexed by $i = 1, ..., N$. With the exception of the United States, all other $N - 1$ countries are modelled as small open economies. A set of individual country-specific VARX* models is used to build the GVAR framework. Following Pesaran (2004) and Dees *et al.* (2007), a VARX* (p_i, q_i) model for the ith country relates to a $k_i \times 1$ vector of domestic macroeconomic variables (treated as endogenous), x_{it}, to a $k_i^* \times 1$ vector of country-specific foreign variables (taken to be weakly exogenous), x_{it}^*

$$\Phi_i(L, p_i)x_{it} = \mathrm{a}_{i0} + \mathrm{a}_{i1}t + \Lambda_i(L, q_i)\,\mathrm{x}_{it}^* + \mathrm{u}_{it} \quad (1)$$

for $t = 1, 2, ..., T$, where a_{i0} and a_{i1} are $k_i \times 1$ vectors of fixed intercepts and coefficients on the deterministic time trends, respectively, and u_{it} is a $k_i \times 1$ vector of country-specific shocks, which are assumed to be serially uncorrelated with zero mean and a non-singular covariance matrix, $\sum_{ii}$, namely $u_{it} \sim i.i.d.(0, \sum_{ii})$. For algebraic simplicity, we abstract from observed global factors in the country-specific VARX* models. Furthermore, $\Phi_i(L, P_i) = I - \sum_{i=1}^{p_i} \Phi_i L^i$ and $\Lambda_i(L, q_i) = \sum_{i=0}^{q_i} \Lambda_i L^i$ is the matrix of the coefficients of the polynomial associated with the lagged domestic and foreign variables, respectively. As the lag orders for these variables, p_i and q_i are selected on a country-by-country basis, $\Phi_i(L, p_i)$ and $\Lambda_i(L, q_i)$ are explicitly allowed to differ across countries.

The country-specific foreign variables are constructed as cross-sectional averages of the domestic variables using data on bilateral trade as the weights, ω_{ij}

$$X_{it}^* = \sum_{j=1}^{N} \omega_{ij} x_{jt} \quad (2)$$

where, $j = 1, 2, ..., N, \omega_{ii} = 0$, and $\sum_{j=1}^{N} \omega_{ij} = 1$. For empirical application, the trade weights are computed as three-year averages:

$$\omega_{ij} = \frac{T_{ij,2006} + T_{ij,2007} + T_{ij,2008}}{T_{i,2006} + T_{i,2007} + T_{i,2008}} \tag{3}$$

where T_{ijt} is the bilateral trade of country i with country j during a given year t and is calculated as the average of exports and imports of country i with j, and $T_{it} = \sum_{j=1}^{N} T_{ijt}$ (the total trade of country i) for $t = 2006, 2007$, and 2008, in the case of all countries. As argued by Baxter and Kouparitsas (2005), the main justification for using bilateral trade weights, as opposed to financial weights, is that the former have been shown to be the most important determinants of national business cycle co-movements(3).

Although estimation is done on a country-by-country basis, the GVAR model is solved for the world as a whole, taking into account the fact that all variables are endogenous to the system as a whole. After estimating each country VARX* (p_i, q_i) model separately, all the $k = \sum_{i=1}^{N} k_i$ endogenous variables, collected in the $k \times 1$ vector $x_t = (x'_{1t}, x'_{2t}, \dots \dots, x'_{Nt})'$, need to be solved simultaneously using the link matrix defined in terms of the country-specific weights. To see this, the VARX* model in equation (1) can be written more compactly as:

$$A_i(L, p_i, q_i) z_{it} = \varphi_{it} \tag{4}$$

for $i = 1, ..., N$ where $A_i(L, p_i, q_i) = [\Phi_i(L, p_i) - \Lambda_i(L, q_i)], z_{it} = (x'_{it}, x'^{*}_{it})'$, and $\varphi_{it} = \mathrm{a}_{io} + \mathrm{a}_{i1}t + u_{it}$, It is worth noting that given equation (2), z_{it} can be written as:

$$z_{it} = W_i x_t \tag{5}$$

where, $W_i = (W_{i1}, W_{i2}, ..., W_{iN})$, with $W_{ii} = 0$, is the $(K_i + K_i^*) \times 1$ weight matrix for country i defined by the country-specific weights, ω_{ij}. Using (6) equation (4) can be written as;

$$A_i(L, p) W_i x_t = \varphi_{it} \tag{6}$$

(3) See also Cashin *et al.* (2016b), who demonstrate that the choice of weights is of second-order importance when the underlying variables are sufficiently correlated, and that usin trade, financial, or mixed wrights produces very similar results.

where, $A_i(L,p)$ is constructed from $A_i(L,p_i,q_i)$ by setting $p=\max(p_1,p_2,...,p_N,q_1,q_2,...q_N)$ and augmenting the $p-p_i$ or $p-q_i$ additional terms in the power of the lag operator by zeros. Stacking equation (7), the Global VAR(p) model is obtained in domestic variables only:

$$G(L,p)x_t=\varphi_t \tag{7}$$

where,

$$G(L,p)=\begin{pmatrix} A_1(L,p)W_1 \\ A_2(L,p)W_2 \\ \vdots \\ A_N(L,p)W_N \end{pmatrix}, \varphi_t=\begin{pmatrix} \varphi_{it} \\ \varphi_{2t} \\ \vdots \\ \varphi_{Nt} \end{pmatrix} \tag{8}$$

See Pesaran (2004) for an early illustration of the solution of the GVAR model, using a VARX*(1,1) model and Chudik and Pesaran (2016) for an extensive survey of the latest developments in GVAR modeling, both the theoretical foundations of the approach and its numerous empirical applications.

The GVAR(p) model in equation (7) can be solved recursively and used for a number of purposes, such as forecasting or impulse response analysis.

A GVAR Model Including Kuwait

Countries/Regions and Variables of the Model

The version of the GVAR model used in this paper covers 39 countries as opposed to the "standard" 33 country set-up used in the literature (Smith and Galesi, 2014), and extends the coverage both in terms of major oil exporters and also by including an important region of the world when it comes to oil supply, the GCC region (see Table 1). Of the 39 countries included in our sample, 14 are classified as major commodity exporters, as primary commodities constitute more than 40% of their exports (denoted by * in Table 1). Moreover, eleven are net oil exporters, of which five are current members of the OPEC (denoted by l in Table 1), and one is a former member (Indonesia left OPEC in January 2009)[(4)]. The sample also includes three major oil exporters (Canada, Mexico and Norway) from the Organization for Economic Cooperation and Development (OECD) and the UK,

(4) Russia, Angola, Iraq and the rest of OPEC members were not included due to insufficient time series data.

which had remained a net oil exporter for the majority of the sample (until 2006). These 39 countries together cover over 90% of world's GDP, 85% of worlds oil consumption, and 75% of world's proven oil reserves; thus, our sample is rather comprehensive.

For empirical application, we create two regions: one of which comprises five of the six GCC countries; and the other the Euro Area block, comprising 8 of the 11 countries that initially joined the Euro on January 1, 1999 as shown in Table 1. The time-series data for the GCC5 block and the Euro Area block were constructed as cross-sectionally weighted averages of the domestic variables, using Purchasing Power Parity GDP weights, averaged over the 2007-2009 period. Thus, as displayed in Table 1, the GVAR model included 28 country/region-specific VARX* models.

Table 1
Countries and Regions in the GVAR Model

Systemic Countries	**MENA Countries**	**Rest of the World**
China	GCC5	Australia
Euro Area	*Bahrain**	Canada
Austria	*Oman**	New Zealand
Belgium	*Qatar*1*	Norway*
Finland	*Saudi Arabia*1*	South Africa*
France	*UAE*1*	Sweden
Germany	Kuwait*1	Switzerland
Italy	Iran*1	
Netherland	Turkey	
Spain		**Southeast Asia**
India	**Latin America**	Indonesia*
Japan	Argentina	Korea
United Kingdom	Brazil*	Malaysia
United States	Chile*	Philippines
	Mexico	Singapore
	Peru*	Thailand

Notes: GCC is the Gulf Cooperation Council Countries and MENA refers to the countries in the Middle East and North Africa region. *indicates that the country is a commodity exporter; countries are classified as commodity exporters if primary commodities constitute more than 40 percent of their exports. The members of the Organization of the Petroleum Exporting Countries (OPEC) are denoted by superscript 1.

Making one region out of 5 GCC countries is not without economic reasoning. These countries have in recent decades implemented a number of policies and initiatives to foster economic and financial integration in the region, with a view to establishing a monetary union. The states of the GCC5 are relatively similar in structure; although in the short-term, they may face some difficulties in meeting the convergence criteria they have set for economic integration. Inflation rates vary significantly across these countries and fiscal deficits, which have improved since the start of the oil boom in 2003, and are about to reemerge in some countries. However, these economies already peg their currencies to the US dollar and are accustomed to outsourcing their interest-rate policy. They also have relatively open capital accounts; and hence, it is reasonable to group these countries as one region.

Construction of Variables and Data Sources

The GVAR model includes: logarithm of real gross domestic product (y_{it}), the rate of inflation (π_{it}), short-term interest rate r^s_{it}, long-term interest rate (r^L_{it}), the logarithm of deflated exchange rate (ep_{it}), and logarithm of real equity prices (eq_{it}). These variables were constructed as follows:

$$y_{it} = \ln(GDP_{it}) \tag{9}$$

$$\pi_{it} = p_{it} - p_{it-1} \tag{10}$$

$$p_{it} = \ln(CPI_{it}) \tag{11}$$

$$ep_{it} = \ln(E_{it}/CPI_{it}) \tag{12}$$

$$r^s_{it} = 0.25 * \ln(1 + R^S_{it}/100) \tag{13}$$

$$r^L_{it} = 0.25 * \ln(1 + R^L_{it}/100) \tag{14}$$

$$eq_{it} = \ln(EQ_{it}/CPI_{it}) \tag{15}$$

where, GDP_{it} is the real gross domestic product (GDP) at time t for country i; CPI_{it} is the consumer price index; E_{it} is the nominal exchange rate in terms of

US dollar; EQ_{it} is the nominal equity price index; and R_{it}^{S} and R_{it}^{L} are short-term and long-term interest rates, respectively. In addition to the aforementioned variables, the logarithm of oil prices (p_t^0) and the logarithm of oil production (q_t^0) were also added to the data set.

Instead of country-specific equity prices, a global equity price (eq_t) variable was included in the model, computed as a weighted average of country-specific equity indices (when available) as follows:

$$eq_t = \sum\nolimits_{i=1}^{N} \omega_i^{eq} eq_{it} \tag{16}$$

where, $\omega_i^{eq} \geq 0$ measures the importance of each country's equity market in the global economy, and $\sum_{i=1}^{N} \omega_i^{eq} = 1$. The weight ω_i^{eq} is set to zero in the case of countries without substantial equity markets. For countries with important equity markets, one possibility would be to use PPP-GDP weights. But using such weights would understate the importance of the US in the world equity markets, which is much more substantial than the 25% PPP-GDP weight of the US in the world's economy (Table 2). Therefore, to reflect the relative importance of the US financial markets, ω_{us}^{eq} was set to 0.5 (i.e., $\omega_{us}^{eq} = 0.50$), and the remaining 50% of the weight

Table 2

Country	PPP-GDP Weights (ω_i)	Global Equity Weights (ω_i^{eq})	CountryCountry	PPP-GDP Weights (ω_i)	Global Equity Weights (ω_i^{eq})
Argentina	0.98	1.03	Malaysia	0.66	0.69
Australia	1.41	1.48	Mexico	2.72	-
Brazil	3.41	-	Norway	0.48	0.50
Canada	2.22	2.33	New Zealand	0.22	0.23
China	14.34	-	Peru	0.42	-
Chile	0.42	0.44	Philippines	0.55	0.58
Euro Area	17.68	18.56	South Africa	0.87	0.91
GCC5	1.81	-	Singapore	0.43	0.46
India	6.09	6.39	Sweden	0.62	0.65
Indonesia	1.58	-	Switzerland	0.60	0.62
Iran	1.42	-	Thailand	0.94	0.98
Japan	7.39	7.76	Turkey	1.78	-
Korea	2.26	2.37	UK	3.83	4.02
Kuwait	0.23	-	USA	24.68	50.00

was allocated to the remaining countries using PPP-GDP weights. The resultant weights (ω_i^{eq}) are summarized in Table 2.

The main source of data was Smith and Galesi (2014), who provide quarterly observations for the majority of the macro variables. We augment their database with quarterly observations for all six GCC countries, Iran, and for oil production. For the GCC countries, the International Monetary Funds (IMFs) *International Financial Statistics* (IFS), series BVPZF and B..ZF, and the World Economic Outlook (WEO) databases were used to compile the GDP data. The seasonally adjusted quarterly observations on the CPI for the six countries was obtained from IMF's IFS database. For the E_{it}, we used the IFS series AE.ZF; while the main source of data for the R_{it}^S was either the IFS deposit rate (60L..ZF series), the three-month interbank deposit rate, or the money market rate (60B..ZF series).

The data on CPI, GDP, and the exchange rate for Iran for the period 1979Q1-2006Q4 were from Esfahani *et al.* (2014). These series were updated using the Central Bank of Iran's (CBI) online database as well as several volumes of the CBI's Economic Report and Balance Sheets and Monthly CPI Workbook. The data on Iranian GDP and exchange rate data were updated using IMFs IFS and WEO databases. Data on the free market rate were available from the IMF between only 1979Q1 and 2011Q3. Therefore, data from online traders, such as Eranico (www.eranico.com), were used to complete the series until 2013Q1. For Iran alone, as in Esfahani *et al.* (2013), ep_{it} was constructed as a geometrically weighted average of the logarithm of the free $(ep_{Iran,t})$ and the official $(ep_{IranOF,t})$ exchange rates as follows:

$$ep_{Iran,t} = \delta ep_{Iran,t} + (1-\delta) ep_{IranOF,t} \tag{17}$$

where, $\delta = 0.70$ represents the proportion of imports by public and private agencies that are traded at the free market rate, on average.

The main source for the country-specific GDP weights was the World Development Indicator database of the World Bank. Finally, the quarterly oil production series (in thousand barrels per day) was obtained from the U.S. Energy Information Administration International Energy Statistics. These data were available only from 1994Q1 onwards, so the quarterly series for the period 1979Q2-1993Q3 was linearly interpolated (backward) using the annual series. Section 1.1 of Supplement A of Dees *et al.* (2007) includes the description of the interpolation procedure.

The trade weights (ω_{ij}) and the five foreign variables ($y_{it}^{*}, \pi_{it}^{*}, ep_{it}^{*}, r_{it}^{*S}, r_{it}^{*L}$) were computed using equations (2) and (3), respectively, based on data from the IMF's Direction of Trade Statistics (DOTS) database. The trade weights are reported in Table A1 of the Appendix.

Country-Specific VARX* Models

We specify three different sets of individual country-specific (VARX*) models. The first model is common across all major oil producers (including Kuwait), apart from the United States. These 13 VARX* models include a maximum of six domestic variables (depending on whether data on a particular variable is available), or in other words $x_{it} = [y_{it}, \pi_{it}, r_{it}^{S}, r_{it}^{L}, ep_{it}, q_{jt}^{o}]'$. In addition, all domestic variables, except for that of the real exchange rate and oil production, have corresponding foreign variables, i.e., $x_{it}^{*} = [y_{it}^{*}, \pi_{it}^{*}, eq_{t}, r_{it}^{S*}, r_{it}^{L*}]'$ The second model is for the remaining 14 countries (again excluding the US), where $x_{it} = [y_{it}, \pi_{it}, r_{it}^{S}, r_{it}^{L}, ep_{it}]'$. Following the GVAR literature, the 28$^{\text{th}}$ model (United States) is specified differently, mainly because of the dominance of the United States in the world economy. First, given the importance of US financial variables in the global economy, eq_{t} was included as an endogenous variable in the US model, while the US-specific foreign financial variables (i.e., $r_{US,t}^{*S}$, and $r_{US,t}^{*L}$) were not included in this model. The appropriateness of the exclusion of these variables was confirmed by statistical tests, in which the weak exogeneity assumption was rejected for $r_{US,t}^{*S}$ and $r_{US,t}^{*L}$. Second, since e_{it} was expressed as the domestic currency price of the United States dollar, it was by construction determined outside this model. Thus, instead of the real exchange rate, $e_{US,t}^{*} - p_{US,t}^{*}$ was included as weakly exogenous foreign variables in the US model.

Global Oil Market

Given that one of the main objectives of this study is to examine the macroeconomic effects of oil shocks, the nominal oil prices in US dollars need to be included in the country-specific VARX* models. In this context, in the literature, the log oil prices (p_{t}^{0}) had been included as an endogenous variable in the US VARX* model and as a weakly exogenous variable in all other countries models (see, for instance, Cashin *et al.*, 2014 and Chudik and Pesaran, 2016). The main justification for this approach is that the US is the world's largest oil consumer and a demand-side driver of the price of oil. However, it seems more appropriate for oil prices to be determined in global commodity markets rather than in the US model alone, given that oil prices are also affected by, for instance, disruptions to oil supply in the Middle East. Therefore, in contrast to the GVAR literature, in this paper, the oil price equation was modelled separately; and then, p_t^0 was introduced as a weakly exogenous variable in all country-specific VARX* models (including the US), thereby allowing for both demand and supply conditions to influence the price of oil directly, rather than using the US model as a transmission mechanism for the global economic conditions to the price of oil.

In order to add oil prices (p_t^0) to the conditional country models, the VARX* models described by equation (1) is augmented by p_t^0, and its lag values are as follows:

$$\Phi_i(L,p_i)x_{it} = \mathrm{a}_{io} + \mathrm{a}_{i1}t + \Lambda_i(L,q_i)x_{it}^{*} + \gamma_i(L,s_i)p_t^{o} + u_{it} \qquad (18)$$

where, $\gamma_i(L,s_i) = \sum_{i=0}^{si} \gamma_i L^i$ is the lag polynomial of the coefficients associated with oil prices (Chudik and Pesaran 2013). Here, p_t^0 can be treated (and tested) as weakly exogenous for the purpose of estimation, and the marginal model for the oil price equation can be estimated with or without feedback effects from x_t. The global oil market can then be incorporated within the GVAR framework by introducing an oil price equation defined as

$$p_t^0 = c_p + \sum_{\ell=1}^{m_p} \alpha_\ell p_{t-\ell}^0 + \sum_{\ell=1}^{m_y} \beta_\ell y_{t-\ell} + \sum_{\ell=1}^{mq} \gamma_\ell q_{t-\ell}^0 + u_t^0 \qquad (19)$$

which is a standard autoregressive distributed lag, ARDL (m_{p^o}, m_y, m_{q^o}), model in oil prices (p^o), world real income (y_t) and world oil supplies q_t^o with all variables being in logs. Conditional (18) and marginal models (19) can be combined and solved as a complete GVAR model as explained earlier.

To take into account developments in the world economy, the oil price equation includes a measure of global output (y_t), which was calculated as:

$$y_t = \sum_{j=1}^{N} \omega_j^{ppp} y_{jt} \qquad (20)$$

where, y_{jt} is the logarithm of real GDP of country j at time $t, j = 1, 2,..., \mathrm{N}, \omega_j^{ppp}$ is the PPP GDP weights of country j and $\sum_{j=0}^{N} \omega_j^{ppp} = 1$. In order to minimize the impact of individual yearly movements on the weights, the ω_j^{ppp} was computed as a three-year average as follows:

$$\omega_j^{ppp} = \frac{GDP_{j,2007}^{ppp} + GDP_{j,2008}^{ppp} + GDP_{j,2009}^{ppp}}{GDP_{2007}^{ppp} + GDP_{2008}^{ppp} + GDP_{2009}^{ppp}} \qquad (21)$$

where, GDP_{jt}^{ppp} is the GDP of country j converted to international dollars using purchasing power parity rates during a given year t, and $GDP_{t}^{ppp} = \sum_{j=1}^{N} GDP_{jt}^{ppp}$.

To capture the global oil supply conditions, a measure for the quantity of oil produced in the world is included in equation (19). A key question is how should q_{jt}^{o} be included in the country-specific models. One option, for instance, was to include a global measure for oil as the sum of OPEC and non-OPEC production. Alternatively, both OPEC and non-OPEC productions could be included, with the former being endogenous in the GCC5 model; while the latter could be included in the US model as an endogenous variable. But, as suggested by Mohaddes and Pesaran (2016a), a different approach was adopted, where instead q_{jt}^{o}, the oil production of country j, was included as an endogenous variable in the VARX* model for major oil producer j, where $j = 1, \ldots 14$ (as there as 14 major oil producers in the sample), and $q_{t}^{o} = \sum_{j=1}^{N} q_{jt}^{o}$ in the oil price equation (19).

Table 3
Lag Orders of the Country-Specific VARX* (p,q) Models Together with the Number of Co-integrating Relations (r)

Country	Order		Co-integrating Relations (ri)	Country	Order		Co-integrating Relations (ri)
	p_i	q_i			p_i	q_i	
Argentina	2	2	2	Malaysia	1	1	1
Australia	2	1	2	Mexico	1	3	3
Brazil	1	2	2	Norway	2	1	2
Canada	1	2	3	New Zealand	2	2	2
China	2	1	2	Peru	2	2	2
Chile	2	1	2	Philippines	2	1	2
Euro Area	2	1	2	South Africa	2	1	1
GCC5	2	1	2	Singapore	1	1	2
India	2	1	2	Sweden	2	1	2
Indonesia	2	1	3	Switzerland	2	1	2
Iran	2	1	1	Thailand	2	1	2
Japan	2	2	3	Turkey	2	2	1
Korea	2	2	3	UK	1	1	2
Kuwait	2	1	1	USA	2	1	3

Notes: *pi* and *qi* denote the lag order for the domestic and foreign variable, respectively, and are selected by the Akaike Information Criterion (AIC).

Empirical Results

The 28 country/region-specific VARX* (p_i, q_i) models, across the three different specifications discussed earlier, are estimated using quarterly observations over the period 1979Q2-2013Q1. However, prior to estimation, the lag orders of the domestic and foreign variables (p_i and q_i) have to be determined. To this end, we use the Akaike Information Criterion applied to the underlying unrestricted VARX* models. But given data constraints the maximum lag orders are set to $p_{\max} = q_{\max} = 2$. The selected VARX* orders are reported in Table 3(5).

Having established the order of the 28 VARX* models, the number of long-run relations is determined using Johansen's maximal eigenvalue and trace statistics, as developed in Pesaran *et al.* (2000) for models with weakly exogenous $I(1)$ regressors, unrestricted intercepts, and restricted trend coefficients. The number of cointegrating relations (r_i) is chosen based on the trace test statistics, given that, it has better small sample properties than the maximal eigenvalue test, using the 95% critical values from MacKinnon (1991). The final selection results of the number of cointegrating relations are reported in Table 3.

Spillover Analysis

Having estimated the country-specific VARX* models and the oil price equation and having solved the GVAR model as a whole, we are now in a position to investigate the impacts of external shocks on Kuwait's economic growth (and oil production), the economic growth of the GCC5, US, Euro Area, China, as well as the impact on oil prices, and global equity markets. The shocks(6) considered in our analysis are on (i) US GDP, (ii) equity markets, (iii) China GDP, (iv) Euro Area GDP, and (v) oil prices. Each shock is discussed in detail below.

Negative Shock to the US GDP. As a result of the dominance of the US in the world economy, any slowdown in that country can bring about negative spillovers to other economies. Figure 4 shows the impact of a negative US GDP shock to Kuwait GDP and oil production, GCC5 GDP and oil production, oil prices, global equity prices, US GDP, Euro Area GDP, and China GDP. It can be seen that negative US GDP shock has negative and statistically significant impact on all the variables of the model, except for China GDP and Kuwait oil production,

(5) We use an exactly identified model without no over identifying reswtrictions are imposed.

(6) Note that the shocks are permanent because underlying variables are non-stationary. Additionally, the impact is permanent on the levels for these variables yet the effect on the growth rates is temporary.

demonstrating that Kuwait GDP, GCC5 GDP, GCC5 Oil Production, Oil Prices, Global Equity Prices, and Euro Area GDP are highly sensitive to developments in

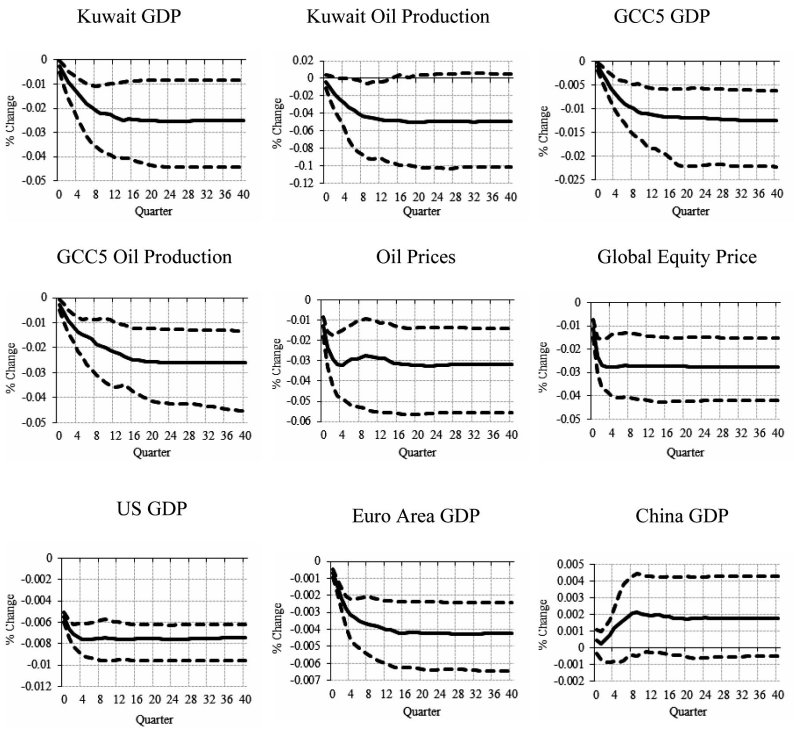

Figure 4
Impact of a Negative US GDP Shock

Notes: Figures are median impulse responses to a one standard deviation decrease in US GDP together with the 16th and 84th percentile error bands. The impact is in percentage points and the horizon is quarterly.

US economic activity. The impact on Kuwait oil production is negative and significant from Q8 to Q12 only. The steady state value of the effect of the US GDP shock on Kuwait GDP (oil production) and GCC5 GDP (oil production) are 2.5% (5%) and 1.25% (2.5%), respectively. This is mainly because lower demand for commodities is an additional channel through which a negative US shock affects commodity exporting countries. In particular, about 20.5% of worlds oil demand comes from the US; hence, it is not surprising that in response to the US shock, oil prices fall significantly. Given the slowdown in the US (and in other advanced economies due to spillovers from the US), the demand for oil and other commodities fall and in response, commodity exporters cut back on production. As can be seen both Kuwait and the GCC5 reduce their oil production. Also, it is worth noting that global equity markets fall in response to lower US and world growth. Overall, the influence of the US on other economies is larger than what direct trade ties would have suggested, owing to third-market effects, together with increased financial integration, tending toward fostering international transmission of business cycles.

Negative Shock to Global Equity Markets. Figure 5 shows the implications of a shock to global equity markets. In response to a decline in the global equity index, US GDP falls by 0.4%. This is expected, given the continuing global dominance of the US debt and equity markets, backed by the still-strong global role of the US dollar. The shock has adverse effects for most of the rest of the world with real output

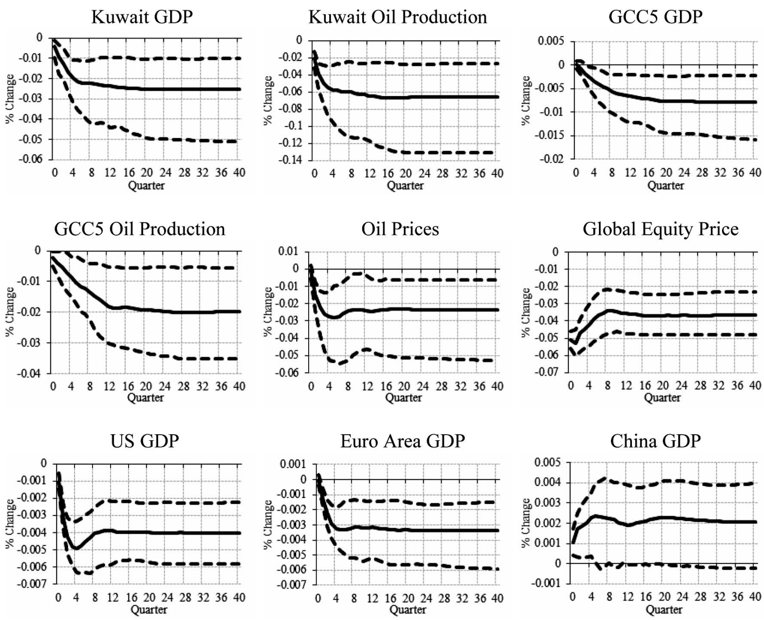

Figure 5
Impact of a Negative Global Equity Shock

Notes: Figures are median impulse responses to a one standard deviation decrease in global equity markets together with the 16th and 84th percentile error bands. The impact is in percentage points and the horizon is quarterly.

falling in the Euro Area, Kuwait, and the GCC5. For instance, Kuwait GDP (oil production) falls by 2.5%, (6%), GCC5 GDP (oil production) falls by 0.5% (2%), and Euro Area GDP falls by approximately 0.35%. Moreover, this negative shock has important effects on the global oil markets, as oil prices fall by 2.5%. This commodity channel of impact further reduces the GDP in oil exporting countries.

Negative Shock to the Chinese GDP. While the Chinese economy is currently rebalancing, its real GDP growth is slowing. Given the emergence of China as a global force in the world economy in recent decades, any slowdown and change in the composition of its real GDP growth can bring about significant spillovers to other systemic economies, major trading partners, and commodity exporters. Figure 6 shows that following a negative output shock in China, US experiences a temporary fall in its GDP, and in the long-run Euro Area GDP falls by 0.3%. This negative shock affects the economies of oil exporters mainly through its impact on global demand for oil and associated prices. This is clearly shown by around 4% fall in oil prices in the long run in response to a negative output shock. Comparing the oil price responses from Chinese and US GDP shocks, it is clear that oil markets are more responsive to the shocks originating in China rather than in the US. The slowdown in Chinese economy has no significant impact on Kuwait's economic activity (GDP and oil production) and global equity market. As for GCC5, the slowdown reduces GDP by 1.25% and oil production by 3%.

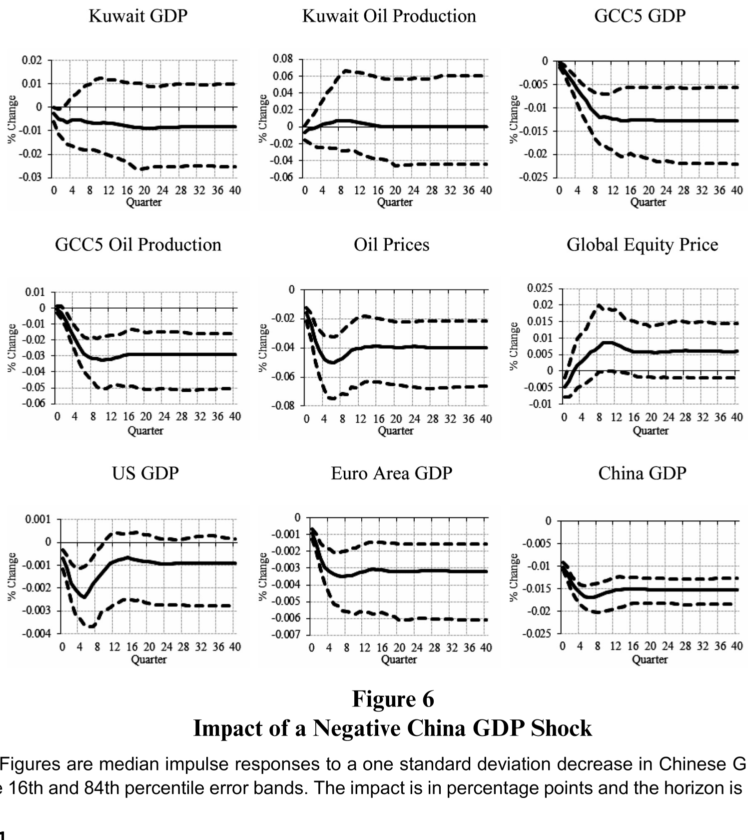

Figure 6
Impact of a Negative China GDP Shock

Notes: Figures are median impulse responses to a one standard deviation decrease in Chinese GDP together with the 16th and 84th percentile error bands. The impact is in percentage points and the horizon is quarterly.

Negative Shock to the Euro Area GDP. As shown in Figure 7, a negative Euro Area GDP has no significant effect in the long-run on any of the variables of the model, except its own economic activity. However, following a negative Euro Area GDP shock, both oil prices and GCC5 oil production level are significantly affected in the short-run. The effect of this shock is relatively muted as compared to the other shocks already investigated, mainly because the spillover effects to other economies are contained and do not spread to the systemic countries (for instance, the US and Chinese economies). However, the estimated spillovers from the Euro Area abstract from financial contagion and may therefore understate the magnitude of true spillovers.

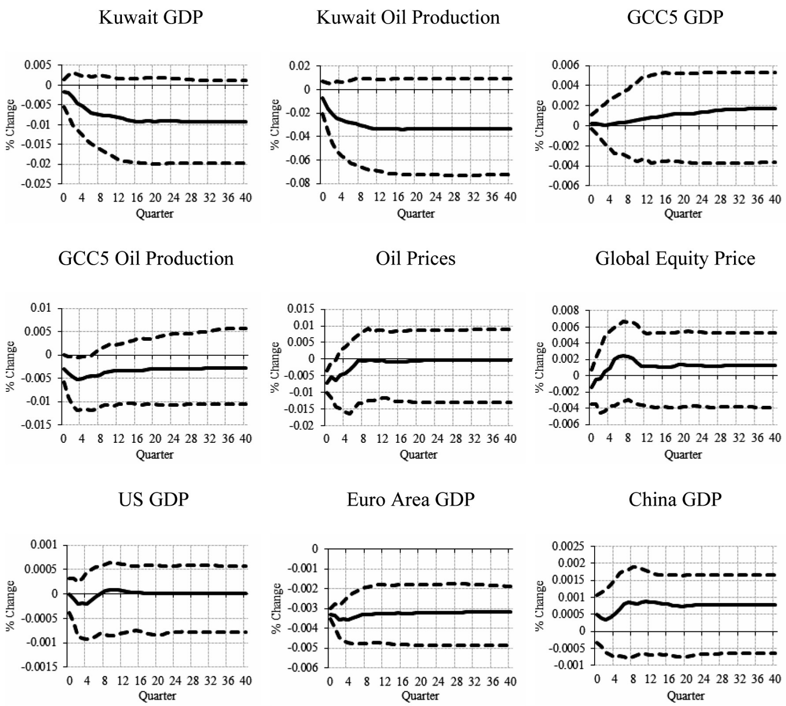

Figure 7
Impact of a Negative Euro Area GDP Shock

Notes: Figures are median impulse responses to a one standard deviation decrease in Euro Area GDP together with the 16th and 84th percentile error bands. The impact is in percentage points and the horizon is quarterly.

Negative Shock to Oil Prices. Figure 8 shows that a negative oil price shock significantly boosts economic activity in the major oil importing economies in the long-run (such as the US and China), which puts upward pressure on global equity markets. For instance, in the long run, the US GDP increases by around 0.25%, China GDP increases by 0.4%, and global equity prices increases by 3%. Also, it significantly boosts Kuwait's economic activity (GDP and oil production). In the short-run, however, the shock has significant adverse impact on GCC5s economic activity (GDP and oil production).(7) The shock has no significant effect on Euro Area GDP. To stabilize oil prices, the GCC5 countries cut production initially but maintain the pre-shock level of production in the long-run. Kuwait's oil production increases by almost 10%, which is mainly due to two reasons. First, given the increase in global real output (after four quarters), Kuwait increases its oil production to satisfy the demand for commodities from the major economies (including China), which leads to an increase in Kuwait's oil export revenues and through that, an increase in its GDP. Second, as postulated by the Target Revenue

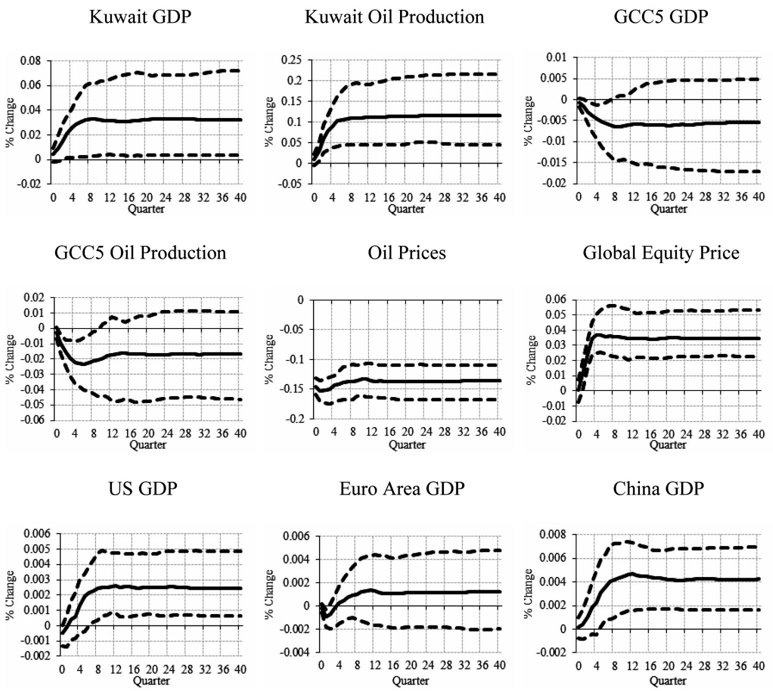

Figure 8
Impact of a Negative Oil Price Shock

Notes: Figures are median impulse responses to a one standard deviation decrease in Oil Prices together with the 16th and 84th percentile error bands. The impact is in percentage points and the horizon is quarterly.

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(7) The effect is significant for up to Q8 and Q10 for GCC5 GDP and oil production, respectivley.

Model (Benard 1980, Cremer and Salehi-Isfahani 1980, and Teece 1982), the major oil exporters heavily depend on oil revenues and so set their oil production to achieve a given level of oil revenues (see also Mohaddes and Pesaran 2016b). As a result of the low oil prices, Kuwait increases its production in order to compensate for the loss in oil revenue due to a fall in prices. The increase in Kuwait oil production is relatively small (around 60 thousand barrels/day), which means that this output increase is unlikely to violate any OPEC quota restrictions, or require large capacity or technological investment.

VI. Concluding Remarks

This paper developed a GVAR model including the GCC countries which we used to examine the direct and the indirect effects of various external shocks on the Kuwaiti and the other GCC economies. More specifically, we considered shocks to (i) US GDP, (ii) Euro Area GDP, (iii) China GDP, (iv) oil prices, and (v) global equity markets. Apart from Kuwait, Bahrain, Oman, Qatar, Saudi Arabia and the UAE the model included 33 other countries of the world (major oil producing countries and Kuwait's trading partners), which accounted for 90% of worlds GDP. Each country-specific model included a maximum of eight variables (real output, rate of inflation, short-term interest rate, long-term interest rate, exchange rate, and real equity prices, oil prices and oil production) and was estimated using quarterly data covering the period from 1979Q2 to 2013Q1.

The assessment of the spillover effects of the external shocks originating from different regions of the world and transmitted through trade, financial, and commodity market linkages showed that shocks to US GDP, oil prices, and global equity markets had permanent and statistically significant long-run impacts on Kuwait's real output and oil production (with the three shocks impacting Kuwait's real output and oil production both directly and indirectly through third markets). As expected, both real output and oil production were found to be most sensitive to oil price shocks. These results illustrated the importance of modeling Kuwait's economy in a global context, rather than in isolation from the rest of the world, which has been the approach mainly taken so far.

Appendix A

Table A1. Trade Weights: Averages over 2006–2008

	Argentina	Australia	Brazil	Canada	China	Chile	Euro Area	GCC5	India	Indonesia	Iran	Japan	Korea	Kuwait	Malaysia	Mexico	Norway	New Zealand	Peru	Philippines	South Africa	Singapore	Sweden	Switzerland	Thailand	Turkey	UK	USA
Argentina	0.00	0.00	0.11	0.00	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Australia	0.00	0.00	0.01	0.00	0.03	0.01	0.01	0.01	0.03	0.04	0.00	0.04	0.03	0.01	0.03	0.00	0.00	0.24	0.00	0.01	0.02	0.03	0.01	0.01	0.04	0.01	0.01	0.01
Brazil	0.31	0.01	0.00	0.01	0.02	0.09	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.07	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Canada	0.01	0.01	0.02	0.00	0.02	0.02	0.02	0.01	0.01	0.01	0.00	0.02	0.01	0.00	0.01	0.03	0.03	0.02	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.022
China	0.12	0.17	0.11	0.06	0.00	0.15	0.12	0.10	0.11	0.11	0.15	0.21	0.24	0.06	0.12	0.06	0.03	0.11	0.14	0.11	0.10	0.13	0.04	0.03	0.12	0.08	0.06	0.15
Chile	0.06	0.00	0.03	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Euro Area	0.17	0.12	0.24	0.06	0.17	0.20	0.00	0.15	0.17	0.09	0.24	0.11	0.10	0.13	0.10	0.08	0.46	0.12	0.16	0.12	0.30	0.10	0.54	0.68	0.09	0.48	0.53	0.15
GCC5	0.01	0.03	0.03	0.01	0.04	0.00	0.04	0.00	0.18	0.04	0.12	0.11	0.11	0.05	0.03	0.00	0.00	0.04	0.00	0.06	0.06	0.06	0.01	0.02	0.09	0.06	0.02	0.03
India	0.02	0.03	0.02	0.00	0.03	0.02	0.02	0.10	0.00	0.04	0.10	0.01	0.02	0.11	0.03	0.00	0.00	0.01	0.01	0.01	0.03	0.04	0.01	0.01	0.02	0.01	0.02	0.02
Indonesia	0.01	0.03	0.01	0.00	0.02	0.00	0.01	0.10	0.02	0.00	0.00	0.03	0.03	0.02	0.04	0.00	0.00	0.03	0.00	0.02	0.01	0.05	0.00	0.00	0.04	0.01	0.00	0.01
Iran	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.04	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.05	0.00	0.00
Japan	0.02	0.16	0.04	0.03	0.16	0.09	0.05	0.02	0.03	0.18	0.12	0.00	0.14	0.187	0.13	0.04	0.02	0.10	0.06	0.17	0.10	0.08	0.02	0.03	0.19	0.02	0.03	0.08
Korea	0.01	0.06	0.03	0.01	0.11	0.05	0.03	0.19	0.03	0.07	0.08	0.07	0.00	0.15	0.05	0.03	0.01	0.04	0.03	0.06	0.02	0.05	0.01	0.01	0.04	0.02	0.01	0.03
Kuwait	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.03	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Malaysia	0.01	0.03	0.01	0.00	0.03	0.00	0.01	0.01	0.03	0.06	0.01	0.03	0.02	0.01	0.00	0.01	0.00	0.03	0.00	0.05	0.01	0.16	0.00	0.00	0.07	0.01	0.01	0.02
Mexico	0.03	0.01	0.03	0.03	0.01	0.04	0.02	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Norway	0.00	0.00	0.01	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
New Zealand	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00
Peru	0.01	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Philippines	0.01	0.01	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01
South Africa	0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.01	0.02	0.00	0.03	0.01	0.01	0.00	0.15	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.01
Singapore	0.00	0.05	0.01	0.00	0.03	0.00	0.01	0.04	0.05	0.14	0.02	0.03	0.03	0.08	0.00	0.00	0.01	0.04	0.00	0.10	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.02
Sweden	0.00	0.01	0.01	0.00	0.01	0.01	0.06	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.10	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.06	0.01	0.02	0.01
Switzerland	0.01	0.01	0.01	0.00	0.01	0.00	0.08	0.01	0.03	0.00	0.01	0.01	0.00	0.01		0.00	0.01	0.01	0.06	0.00	0.02	0.01	0.01	0.00	0.00	0.04	0.02	0.01
Thailand	0.01	0.04	0.01	0.00	0.02	0.01	0.01	0.04	0.01	0.04	0.00	0.04	0.01	0.01	0.06	0.00	0.00	0.02	0.01	0.04	0.02	0.05	0.00	0.01	0.01	0.01	0.01	0.01
Turkey	0.01	0.00	0.00	0.00	0.01	0.01	0.04	0.02	0.01	0.01	0.07	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.02	0.00
UK	0.01	0.05	0.02	0.03	0.03	0.01	0.19	0.03	0.04	0.01	0.02	0.02	0.02	0.04	0.02	0.01	0.23	0.04	0.01	0.01	0.07	0.03	0.09	0.05	0.02	0.07	0.00	0.04
USA	0.12	0.11	0.20	0.71	0.20	0.18	0.17	0.12	0.12	0.10	0.00	0.19	0.13	0.11	0.16	0.69	0.06	0.12	0.24	0.19	0.11	0.13	0.07	0.09	0.12	0.08	0.13	0.00

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