Economic Modelling 35 (2013) 118–125

Contents lists available at SciVerse ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/ecmod

Dynamic relationships between oil revenues, government spending and economic growth in an oil-dependent economy

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ARTICLE INFO

Article history:
Accepted 25 June 2013
Available online xxxx

JEL classification:
E62
H50
H54
N15

Keywords:
Oil revenues
Government expenditures
Growth
Bahrain
ECM

ABSTRACT

The aim of this paper is to empirically examine the dynamic relationships between oil revenues, government spending and economic growth in the Kingdom of Bahrain. Oil revenues are the main source of financing government expenditures and imports of good and services. Increasing oil prices in the recent years have boosted public expenditures on social and economic infrastructure. In this paper, we investigate whether the huge government spending has enhanced the pace of economic growth or not. To this end, we use a multivariate cointegration analysis and error-correction model and data for 1960–2010. Overall results suggest that oil revenues remain the principal source for growth and the main channel which finance the government spending.

1. Introduction

Is natural resource-rich a blessing or a curse for a country? This question has generated considerable academic work. Even though, with an extensive literature, a convincing answer is not provided. Furthermore, the relationship between natural resource abundance and economic growth is controversial among scholars. It could not be settled among economists that natural resource abundance is either a curse or a blessing for natural resource-rich countries.

The first body of the literature establishes a negative relationship between resource abundance and poor economic performance (Auty (1986, 1990, 1993, 1998, 2001), Bulmer-Thomas (1994), Gelb (1988), Lal and Myint (1996), Ranis (1991), Sachs and Warner (1995, 1997, 1999)). The results appear to support the "resource curse" hypothesis. Sachs and Warner (1997) find a clear negative relationship between natural resource based exports (agriculture, minerals and fuels) and growth in the period 1970–90 from a sample of 95 developing countries. Two exceptions were Malaysia and Mauritius that sustained 2% per year growth during 1970–80. In the same way, Auty (2001) found that per capita income of resource poor countries grew between two to three times faster than that of the resource-abundant countries for the period 1960–1990. He admits that crop-led resource abundance would be expected to have lower growth compared to its manufacturing equivalent. Furthermore, mineral driven countries have been among the weakest performers. This so-called "resource curse" has inspired many economists to explain its origins.

Nevertheless, such conclusions exposed above are not without criticism. The results are very sensitive to the period chosen, to the definition of "natural resources" and to the methodology used. Some scholars put forward some doubts about the robustness of these findings due to differences in the measurements of natural resources abundance (Stijns, 2005). Schrank (2004) explains that this evidence does not prove that natural resources abundance of any kind causes poor economic growth even if they are correlated. Correlation does not mean causation. This is what we read in every econometrics manual. Ross (2003) goes further and put forward that the relationship between natural resources abundance and poor economies may be completely spurious by omitting a third variable.

As in most natural resource-rich countries, Bahrain's economic growth has been strongly influenced by the volatility of oil, gas and mineral prices in international markets. This reveals Bahrain's economic dependence on its oil sector even though it is considered as

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0264-9993/$ – see front matter
http://dx.doi.org/10.1016/j.econmod.2013.06.043

the least oil dependent compared to its regional peers. Bahraini growth rates have generally followed a similar path to Saudi growth rates but have been less volatile because of huge gaps in oil and gas production and reserve between the two countries.

Bahrain became one of the first Gulf countries to start diversifying its economy. In the late 70s, the government went one step further in its diversification policy by attracting financial and service institutions to set up regional offices in the country. Moreover, Bahrain was among the first countries in the Middle East and North Africa region to build an industrial base and it has been the most attractive for foreign investors, including regional ones in its industrial development (Looney, 1989). During the past decades, the government has intensified the structural reforms to improve the infrastructure of the kingdom as well as the well being of Bahraini citizens. Bahrain has become an open-ended economy with liberalized trade and capital account. It has also become the hub of international affairs and the preferred destination for investors.[1] Quickly, Bahrain emerged as a key player for banking, Islamic finance, Islamic insurance industry, transportation and communication in the Gulf region and has become home to many multinational firms. Nowadays, the economy has known an unprecedented dynamism, population has been growing drastically and projects have been multiplying. The goal of the Bahraini government in development plans was to reduce the dependence of current expenditures to oil revenues, financing these costs through non-oil sources.

Nevertheless, the slow-down in economic activity between the 1990s and 2000s has caused severe fiscal unbalances for Bahrain and oil revenues decreased drastically.[2] During the last decade, the situation has worsened as the world economy has known a period of severe volatility in oil prices.[3] As a result, Bahrain's fiscal position moved from a minor deficit in 2002 (−0.1% of GDP) to a greater deficit of about 10% of GDP in 2009 due to the drop in oil revenues. Total revenue increased from BD 1.04 billion in 2000 to BD 2.8 billion in 2008 before decreasing to BD 1.7 billion in 2009 (Central Informatics Organisation, 2011). Oil and gas revenues registered a growth from BD 765 million in 2000 to BD 2.3 billion in 2008 before decreasing to BD 1.4 billion in 2009, while non-oil revenues rose from BD 264 million in 2000 to BD 367 million in 2008 before going back BD 262 million in 2009 (Central Informatics Organisation, 2011). This means that the government revenues and the overall fiscal policy in the Kingdom remain hugely based on oil revenues. Oil revenues are the *life blood* of the Bahraini economy (Hamdi and Sbia, 2013a,b).

Regardless of oil revenue volatility, the government has always kept a high level of current expenditures. By contrast, capital or development expenditures are sensitive to fluctuation in oil revenues. These simple and general observations show the vulnerability of the government fiscal situation to unexpected oil revenue shocks. Government cannot adjust its current spending easily in the case of a negative oil market. In this condition, when oil prices go down, the government is not able to reduce the size of its activities immediately, leading to a significant budget deficit (Farzanegan, 2011). This makes budget deficits a critical issue for the government. It is then important to consider a reform of the tax system more seriously.

Given the weight of oil in the small kingdom, this paper sheds light on the importance of oil revenues in financing the government needs and improving the well-being of Bahraini households. Precisely, it aims at investigating the dynamic relationships between oil revenues, total government expenditures and economic growth in the Kingdom of Bahrain. To the best of our knowledge, this type of question has never been analyzed in modern literature despite the importance of oil in financing the economies of oil-dependent countries.[4] Therefore, this paper is the first attempt in literature to analyze the short-run and long-run relationships between oil revenues, government expenditures and economic growth in the case of an oil-dependent economy. To reach this goal, we use an econometric model based on cointegration and error correction model techniques for a long time series data which covers the period from 1960 to 2010. Overall results suggest that despite the efforts of the Bahraini government to diversify its economy, oil revenues remain the principal source for growth and the main channel that finance government spending as they represent 87.85% of total government revenues in 2011 (Central Informatics Organisation, 2011). Therefore, we encourage the government of Bahraini to continue working on effective growth-oriented strategies and to undertake more structural reforms to promote non-oil sector.

The remainder of the paper is organized as follows: Section 2 provides a theoretical background on the macroeconomic consequences of oil price volatility. Section 3 presents the econometric methodology; Section 4 provides the results while Section 5 concludes.

2. Macroeconomic consequences of oil volatility

Last century, especially post-World-War-II period, has witnessed multiple oil shocks including Suez Crisis of 1956–57, the Arab oil embargo of 1973–1974, the two oil shocks (1973–1979), the Iranian revolution of 1978–1979, the Iran–Iraq War in 80s, the Gulf War in 1990–91, and recently the spike in oil prices in 2007–2008 and 2011.[5] Consequently, economists have attempted to provide arguments to explain the behavior of oil prices and to assess the impact of oil shocks on various economies shedding light on different channels of transmission. Broadly, the behavior of oil prices has been investigated through three main approaches: the economics of exhaustible resources, the supply–demand framework and the informal approach (Fattouh, 2007). These studies were initiated by the pioneering works of Mork and Hall (1980), Sachs (1981), Darby (1982) and Hamilton (1983).

The study of Mork and Hall (1980) constructed and simulated a small macroeconomic model of the United States with energy. Their results reveal that large and unanticipated changes in the price of energy have significant negative effects on the economy. They concluded that oil price shock was a major cause of the 1974–75 recession and inflation. Moreover, they extend the analysis by explaining the role of other factors as the removal of the last price controls of the Economic Stabilization Program, and the slowdown of investment activity. Sachs (1981) explained that oil price peak (1973–74) generated considerable surplus in OPEC countries while it led to alarming deficits in both developed and developing countries. Further, income and consumption were deeply impacted. Darby (1982) conducted tests of the significance of oil-price variables in extended Lucas-Barro real income equations of oil-price variables for different countries including the United States, the United Kingdom, France Canada, Germany, Italy, the Netherlands and Japan. However, he could not establish a substantial relationship between oil prices and macroeconomic variables. Hamilton (1983) analyzed the influence of the oil price boom on the U.S. output. Hamilton's paper is considered as an important turning point in oil-macro research. It revealed the strong relationship between oil price shocks and U.S. recessions in a clear manner. These results were confirmed later on by Hooker (2002), Hamilton (2003) and

[1] It is worth recalling that in Bahrain there are no taxes imposed on personal income, wealth or capital gains. Furthermore, there are no death duty taxes or inheritance taxes.

[2] This is mainly due to the Gulf wars and the Asian crisis. South Asian countries are the most important trade partners of Bahrain.

[3] For example, average oil price was 12.716 dollars in 1998, 28.831 dollars in 2003 and 97.256 dollars in 2008 (they reached a record in July 2008: 135.09 dollars per barrel). (OECD database 2009).

[4] The paper of Fasano and Wang (2001) is the only available work that analyzes the relationship between fiscal expenditure policy and non-oil real GDP growth in member countries of the Gulf Cooperation Council (GCC). Their model comprises of the three following variables: capital expenditure, recurrent expenditure and GDP.

[5] Hamilton (2011) provides a brilliant survey of oil shocks since 1859 with a particular focus on the events associated with significant changes in oil price.

Jiménez-Rodríguez and Sánchez (2005). Further, Hamilton (1983) applies in his analysis a vector autoregressive (VAR) model that was newly introduced by Sims (1980). This method became a standard tool for empirical studies investigating the impact of oil price on macroeconomic aggregates.

For a long time, the related literature on the impact of oil price shocks on macroeconomics aggregates was mainly focused on oil-importing in developed countries and specifically in the United States (Bruno and Sachs (1982), Burbidge and Harrison (1984), Mork et al. (1994), Levin and Loungani (1996), Papapetrou (2001), Balke et al. (2002), Bollino (2007) and Cooper (2003) are among others). Jones and Leiby (1996) and later Jones et al. (2004) provide an extended survey of the evolution of the oil price-macroeconomics nexus in developed countries. With less extent, some recent academic works explored the relationship between oil prices and macroeconomics in oil-importing developing countries. Some examples are Raguindin and Reyes (2005) for Philippine, Rafiq et al. (2009) for Thailand, Rafik and Sonia (2009), Jbir and Zouari-Ghorbel (2009) for Tunisia, Jbir and Zouari-Ghorbel (2010) for Morocco, Ozlale and Pekkurnaz (2010) for Turkey and Malik (2010) for Pakistan.

Recent literature on oil shocks also treated the impact of oil prices on macroeconomics aggregate in oil-exporting countries. For example, Eltony and Al-Awadi (2001) claimed that symmetric oil price shocks play a key role in clarifying macroeconomic variables' behavior in Kuwait. Their analysis demonstrated the sensitivity of government expenditures to oil price shocks in oil-dependent country. Ayadi (2005) investigated the relationship between oil price changes and economic development in Nigeria through industrial production. He found that oil price changes have only indirect effect on industrial production. Thus, he concluded that this relationship is insignificant. Similarly, Olomola and Adejumo (2006) examined the effects of oil price shocks on output, inflation, real exchange rate and money supply in Nigeria. Comparing to Ayadi (2005) who used annual data, Olomola and Adejumo (2006) used quarterly data from 1970 to 2003. They suggested that oil price shocks have a significant impact on money supply in the long-run. Further, Akpan (2009) scrutinized the asymmetric effects of oil price shocks on the Nigerian economy. The empirical results revealed a strong positive relationship between positive oil price changes and real government expenditure. Moreover, oil price shocks have marginal effects on industrial output. These results confirmed Ayadi (2005) and Olomola and Adejumo (2006) conclusions about Dutch disease syndrome in Nigeria. Mehrara (2008) explored asymmetric relationship between oil revenues and output growth for 13 oil-exporting countries. He found that gross domestic output reacts in an asymmetric or non-linear way to oil revenues shocks. From a magnitude point of view, he stated that the magnitude of negative oil price shock on GDP is larger than a positive oil price shock. In a VAR framework, Farzanegan and Markwardt (2009) considered the dynamic relationship between oil price shocks and major macroeconomic variables in Iran. They point out the asymmetric effects of oil price shocks. They found that positive as well as negative oil price shocks expressively raise inflation. Moreover, positive relationship between positive oil price changes and industrial output growth was found. They confirmed through their results the "Dutch Disease" hypothesis with abnormal real effective exchange rate appreciation. Berument and Ceylan (2010) evaluated the impact of oil price shocks on the economic growth in selected MENA countries. Their estimates suggested that oil price increases have a statistically significant and positive effect on output in Algeria, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Syria and the UAE. While the impact of oil price increases has no significant impact on output in Bahrain, Djibouti, Egypt, Israel, Jordan, Marroco and Tunisia. The recent study of Farzanegan (2011) analyzed the dynamic effects of oil shocks on disaggregated expenditures of the Iranian government for the period 1959 to 2007. Empirical results show that Iran's military and security expenditures respond considerably to a shock in oil revenue (or oil price). However, social spending components did not. Bouchaour and Al-Zeaud (2012) investigated the impact of oil price distortion on Algerian macroeconomics during the period 1980 to 2011. Using a Vector Error Correction Model (VECM), their results reveal that oil prices have a minor impact on the most variables in the short term excluding inflation and real effective exchange rate. While in the long run, oil prices have a positive impact on real gross domestic product and inflation. Further oil prices have a negative impact on real effective exchange rate and unemployment.

3. The econometric methodology

3.1. Data

The data frequency is annually, and the observation spans are from 1960 to 2010 of the following three variables: oil revenues, total government spending and economic growth. Firstly, oil revenues are the rents from oil and gas in real term. These rents are the main source of income of the government of Bahrain and they represent 22.7% of GDP and 87.85% of government revenues in 2011 (Central Informatics Organisation, 2011). Therefore, oil revenues are also the central source of government expenditures. This means that in the case of increasing oil revenues, the government expenditures also go up because of the larger size of government (Farzanegan, 2011). Whereas, when oil prices fall, the government expenditures would also shrink and in some cases it can cause a significant budget deficit.

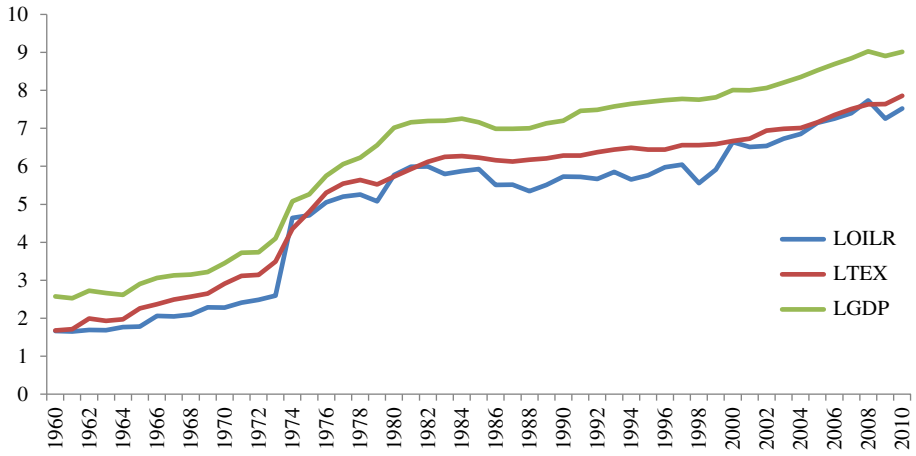
Secondly, the second variable is total real government spending in real term. In Bahrain, government spending consists of the combined current and capital spending of central government including debt interest. The current expenditures are recurring; they intend to maintain the present capacities of government administration. They include final consumption expenditure, property income paid, subsidies and other current transfers (e.g., social security, social assistance, pensions and other welfare benefits). By contrast, capital expenditure is spending on assets. It is the purchase of items that will last and will be used time and time again in the provision of a good or service. Examples would be the building of a new school, the purchase of new equipment, building new roads and so on.

Finally, the third variable is economic growth and it is proxied by gross domestic product (GDP).

All variables are in real local currency and they are also in logarithmic form. Data are collected from various sources such as the World Bank (2012) and the Bahrain Ministry of Finance and National Economy (1991).[6]

Fig. 1 illustrates the trajectory of oil revenues, government spending and economic growth during the period of our study. Oil revenues increased significantly since 1960, this is due to the increase in oil prices and the high demand for oil and energy. As a result, the increase in oil revenues allows the Bahraini government to invest and to improve the infrastructure of the small kingdom. From Fig. 1, we can clearly see the trajectory of GDP which follows the revenues of oil. Therefore, we can conclude that when oil revenues increase, government expenditures increase which in turn improve the economic growth. The positive relationship between the three indicators

[6] Data from WDI and IFS are available from 1970 while data from the Bahrain Ministry of Finance and National Economy (1991) start from 1960. Therefore, we completed the published data from WDI and our study covers the period from 1960 to 2010. The aim is to have a long time series data and efficient results. Data is available upon request.



Source: Ministry of Finance and WDI.

Fig. 1. Evolution of oil revenue, government spending and GDP per capita in Bahrain.
Source: Ministry of Finance and WDI.

started in1973 following the oil shock, where the prices of oil reached a record.

3.2. Methodology

Our empirical investigation has two objectives. The first is to examine the long-run relationship between GDP, government expenditures and oil revenues, while the second is to examine the short-run dynamic causal relationship between the variables. The basic testing procedure requires three steps. The first step is to test whether the variables contain a unit root to confirm the stationarity of each variable (Engle and Yoo, 1987). This is done by using the Augmented Dickey–Fuller tests (F-ADF) and Philips–Perron (PP) tests (1998). The second step is to test whether there is a long-run cointegrating relationship between the variables. This is done by the use of the Johansen–Fisher methods. Finally, if all variables are I(1) (integrated of order one) and cointegrated, short-run elasticities can be computed using the vector error correction model (VECM) method suggested by Engle and Yoo (1987). In this case, an error correction mechanism exists by which changes in the dependent variables are modeled as a function of the level of the disequilibrium in the cointegrating relationship, captured by the error-correction term (ECT), as well as changes in the other explanatory variables to capture all short-term relations among variables (Pao and Tsai, 2010). The VECM in four variables case can be written as follows:

$$\Delta LGDP_t = \alpha_1 + \sum_{i=1}^{p}\beta_{1i}\Delta LGDP_{t-i} + \sum_{i=1}^{q}\beta_{1i}\Delta LOILR_{t-i} + \sum_{i=1}^{r}\beta_{1i}\Delta LTEX_{t-i} + \lambda_1 ECT_{t-1} + \mu_{1t} \quad (1)$$

$$\Delta LOILR_t = \alpha_2 + \sum_{i=1}^{p}\beta_{2i}\Delta LGDP_{t-i} + \sum_{i=1}^{q}\beta_{2i}\Delta LOILR_{t-i} + \sum_{i=1}^{r}\beta_{2i}\Delta LTEXc_{t-i} + \lambda_2 ECT_{t-1} + \mu_{2t} \quad (2)$$

$$\Delta LTEX_t = \alpha_3 + \sum_{i=1}^{p}\beta_{3i}\Delta LGDP_{t-i} + \sum_{i=1}^{q}\beta_{3i}\Delta LOILR_{t-i} + \sum_{i=1}^{r}\beta_{3i}\Delta LTEXc_{t-i} + \lambda_3 ECT_{t-1} + \mu_{3t} \quad (3)$$

Where ECT is expressed as follows:

$$ECT_t = LGDP_t - \beta_0 - \beta_1 LOILR_t - \beta_2 TEX_t, \quad (4)$$

where $t = 1...T$, denotes the time period.

A major advantage of VECM is that it can also be used to verify causality among the variables in case of cointegrated series. According to Fasano and Wang (2001), the VECM helps distinguish between short-run dynamic among the variable (or short-run causality), and each variable's gradual correction from the long-run equilibrium through a series of partial short-run adjustments (or long-run causality). Therefore, a vector Error Correction model can offer a greater appreciating of the nature of non-stationarity among different variables' time series. Further, it can also increase longer term forecasting over an unconstrained model (Engle and Yoo (1987), Reinsel and Ahn (1992) and Lin and Tsay (1996)).

4. Empirical results

4.1. Unit root tests

We use the Augmented Dickey–Fuller (F-ADF) unit root tests to test the non-stationarity in our data series (Dickey and Fuller, 1981). Considering the low power of the ADF test we also use the Phillips-Perron (PP) test (1988), as an alternative test, which takes account of the serial correlation and heteroscedasticity. The results are displayed in Table 1.

The test statistics for the log levels of GDP (LGDP), oil revenues (LOILR) and total expenditures (LTEX) are statistically insignificant. When we apply the unit root tests to the first difference of the two variables, both tests reject the joint null hypothesis for each variable

Table 1
Results of the unit roots tests for Bahrain.

	ADF		PP		Order of integration
	Level	1st diff	Level	1st diff	
LGDP	−1.108	−6.168***	−1.074	−6.184***	I(1)
LOilR	−2.331	−7.905***	−2.286	−8.090***	I(1)
LTEX	−1.555	−4.913***	−1.524	−4.913***	I(1)

Note: The regressions in first difference include intercept.
*** Indicates rejection of null hypothesis of non-stationary of the variable at 1% level of significance.

Table 2
Results for Johansen cointegration tests.

Hypothesized	Trace	Max-Eigen
No. of CE(s)	Statistic	Statistic
None *	31.664**	20.724**
At most 1	10.939	7.967

Trace test and Max-Eigen statistics indicate 1 cointegrating eq(s) at the 0.05 level.
* Denotes rejection of the hypothesis at the 0.05 level.
** MacKinnon–Haug–Michelis (1999) p-values.

at the 1% level. Thus, from all of the tests, the unit root tests indicate that each variable is integrated of order one.

After checking the integration of our four variables at order one, I (1), we selected the optimal lag length of underlying Vector Auto Regression (VAR henceforth) using the conventional model selection criteria. These criteria established that the optimal lag length is two.

4.2. Cointegration: long-run and short-run

The cointegration tests based on multivariate Johansen approach (1988) uses two statistical tests namely: Trace test and Max-Eigen value. The likelihood ratio (LR) test is based on the trace statistics (λ trace) that tests the H_0: $r \leq q$ against H_1: $q = r$ is calculated thus: $\lambda_{trace}(r) = -T\sum_{i=r+1}^{p} \ln\left(1-\hat{\lambda}i\right)$ where $\lambda r + i \ldots. \lambda n$, are the least value of eigenvectors $(p - r)$. The second test is the maximal eigenvalue test (λ_{max}) that tests the H_0: there are r cointegrating vectors against the H_1: there are $r + 1$ cointegrating vectors and is calculated as follows:

$$\lambda_{max}(r, r+1) = -T\ln\left(1-\hat{\lambda}r+1\right).$$

The results of the Johansen cointegration tests are displayed in Table 2 below. The Trace test and Max-Eigen value suggest the existence of one cointegrating vectors at 1% of significance.

The existence of cointegration signifies that there is at least one long-run equilibrium relationship among the variables. In this case, Granger causality exists among these variables in at least one way (Engle and Yoo, 1987). The VECM is used to correct the disequilibrium in the cointegration relationship and to test for long and short-run causality among cointegrated variables. The correction of the disequilibrium is done by the mean of the Error Correction Term (ECT).

The results of the long-run equilibrium relationship are presented in Table 3 below. It shows that the coefficient of LOILR is 0.263 which is positive and significant at the level of 10%. Moreover, the table reveals that LTEX is also positively associated to GDP and is significant at a level of 1%. This conclusion shows that the government of Bahrain adopts the *spend-and-tax hypothesis* as suggested by Peacock and Wiseman (1961, 1979) and Barro (1974). This means that changes in expenditures induce changes in revenue. This is evident due to the continuous effort of the government to diversify the economy and to diminish its dependency to oil and energy sector. Nowadays, the small kingdom is becoming a hub of finance, especially for Islamic finance, and a center for business and economic affairs. Therefore, the financial sector contributes significantly in overall GDP as well as in tourism and manufactory.

Table 3
The results of the long-run equilibrium relationship. Dependent variable: LGDP.

Regressor	Coefficient	t-Values
LOILR	0.263	1.875*
LTEX	0.880	5.051***
C	0.212	

Note: * and *** indicate the rejection of null-hypothesis at 10% and 1% significance levels, respectively.

Table 4
ECM results based on Johansen cointegration.

Regressor	Coefficient	t-Value
ΔLOILR(1)	−0.186	−1.887*
ΔLOILR(2)	0.114	1.049
ΔLTEX(1)	−0.146	−0.535
ΔLTEX(2)	−0.436	−1.616
ECM	−0.276	−2.058**
C	0.103	3.082***
Diagnostic tests	**t-Stats**	**p-Value**
White Test	0.532	0.804
Normality	0.96	0.613
Serial Correlation	0.825	0.572
ARCH	0.028	0.825

Note: ***, **and * indicate the rejection of null-hypothesis at 1%, 5% and10% significance levels, respectively.

We now turn to short-run results which are presented in Table 4. Since the objective of the study is to investigate the dynamic relationships between oil revenues, government expenditures and economic growth, Table 4 illustrates the results only in which LGDP is the dependent variable. Since the optimal lag length was two, the short-run results are also presented for two lags of each variable. The results reveal that oil revenues respond negatively and significantly to GDP at the level of 10% of significance.

For the consistency of the analysis, we performed several diagnostic and stability tests to the ECM model. The results are reported in the lower part of Table 4. They confirm the absence of serial correlation (Breusch–Godfrey Serial Correlation LM Test), heteroskedasticity (White Test) and autoregressive conditional heteroskedasticity (ARCH) in the model. The underlying model also passes the diagnostic test for normality (Jacque–Bera).

After discussing long-and short-run dynamics, the next task is to examine the direction of causality between these variables. The results of causality tests based on the VECM model are reported in Table 5 in which we have performed three Granger causality tests: short-run causality long-run causality and the joint short and long run. The first test indicates the significance of the sum of lagged terms of each explanatory variable by the mean of joint Fisher test; the second test indicates the significance of the error correction term by the mean of the t-test and finally the third test is the short-run adjustment to restore the long-run equilibrium.

The F-statistics for short-run significance reveals that oil revenue is the only variable that Granger causes GDP. Thus, we can confirm the presence of a unidirectional relationship running from oil revenues to GDP. Again, this result shows the weight of oil revenues as a principal factor behind the development and the progress of the small kingdom and any positive or negative shock in the oil revenue would quickly impact the economic growth of the kingdom. This result is similar to the one conducted by Eltony and Al-Awadi (2001) in which they found that oil price shocks affect macroeconomic variables in Kuwait.[7] This conclusion also supports the one revealed in Table 4 in which short-run coefficients of LOILR was significant.

The results further show no causality between government expenditures and GDP. This is mainly because expenditures are not invested into productive projects, which could in turn improve the Bahrain's economic growth significantly. It is worth mentioning that since the past few years, the government of Bahrain has increased

[7] Kuwait is an oil-dependent country with approximately the same structure of economy as Bahrain with greater reserves and production of oil.

Table 5
Results of causality tests based on VECM.

Variable	Short run (F-stats)			ECT (t-stats)	Joint short and long run (F-stats)		
	ΔlGDP	ΔlOilR	ΔlTEX		ΔlGDP & ECT	ΔlOilR & ECT	ΔlTEX & ECT
ΔlGDP	–	2.946*	0.323	−2.058**	–	3.425 **	0.488
ΔlOilR	1.627	–	2.037	0.805	2.057	–	1.669
ΔlTEX	0.392	1.627	–	−0.252	0.268	1.976	–

Note: ** and * indicate the rejection of null-hypothesis at 5% and 10% significance levels, respectively.

and has focused its expenditures in improving the infrastructure of the country by building new roads, bridges, schools, hospitals and initially a large program for social housing. Yet we do not see an obvious positive feedback of these projects on GDP mainly because a huge part from these projects are under construction with major delays because of the global financial crises. Another factor which may explain no causality between government expenditures and GDP is that when oil price increases, the government of Bahrain allocates grants, subsidies and increases the wages and salaries of Bahraini households instead of investing it in the economy. In 2011, when the oil price reached a new peak, the government distributed BD1000 (approximately US$ 2660) to each Bahraini family and it also increased wages by 15%. Therefore, we may say that natural resources are a blessing for Bahraini households as well as for the Kingdom of Bahrain as GDP was positive during the recent period of crises and economic performance was buoyant.[8]

Table 5 also reveals that total expenditures did not respond to oil revenues. This result appears weird as revenues are not automatically devoted to spending. In Reality, not all oil revenues in Bahrain are allocated to expenditures. In fact, since 2006, the Future Generations Reserve Fund (FGF) of Bahrain was established with a Royal Decree issued on July 17, 2006 to strengthen Bahrain's long-term fiscal management and help preserve the hydrocarbon wealth. The FGF is owned by the Government of Bahrain and managed by the Ministry of Finance. It is funded out of mineral royalties (principally oil receives); it receives in monthly payments, part of the oil income accruing from higher than budgeted oil prices (IWG, 2008). Therefore, a portion of oil revenues is assigned into the economy and another portion is allocated to the Future Generations Reserve Fund.

Turning now to error correction results, it is observed that deviation from the long-run equilibrium is mainly corrected by GDP while oil revenues and total expenditures appear to be weakly exogenous. This indicates the fact that any changes in the latter two variables that disturb long-run equilibrium are corrected by counter-balancing changes in the GDP. In this context, it may be concluded that GDP is caused by oil revenues only.

In the last part of Table 5, the results of F-statistics indicate the significance of combined short and long-run effects. In the LGDP equation, error correction term and oil revenues are jointly significant. This indicates the predominant role of oil revenues in GDP. In the other equations there are no significant results.

4.3. Impulse response functions

We use impulse response functions (IRFs), which outline the dynamic response of a one-standard-deviation shock in a variable on current and future values of the variables, in order to capture the short-run dynamics of the model. It can also provide information on the period by which variables go back to the equilibrium following a shock in the long run relationship.

Since the IRFs based on a Cholesky decomposition is influenced by the ordering of the variables, we applied generalized impulse response functions (GIRFs) proposed by Pesaran and Shin (1998).

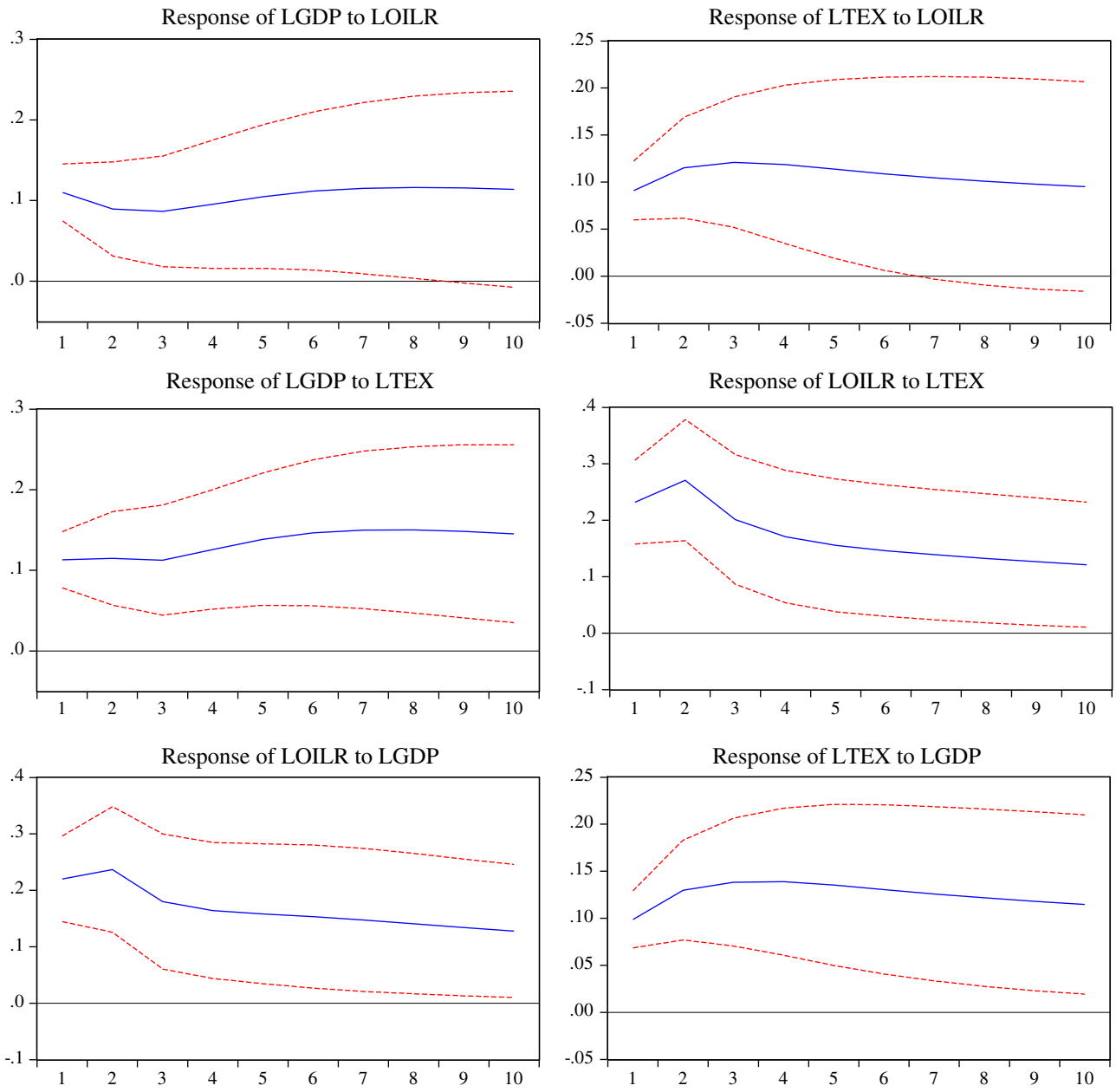
The impulse response functions (IFRs) is presented in Fig. 2. The chart illustrates the response of each variable of the VAR and the impact of other variables. It shows that the response of GDP to oil revenues is negative for the initial three years and reaches at its peak in the 3rd year and became positive afterward. Furthermore, the response of total government expenditures to oil revenues is positive during the first three years and then it decreases progressively. Overall, from Fig. 2, we conclude that the responses are not considerable and the short run equilibrium adjustment process is fairly fast. The recent volatility in oil prices has slowed the pace of growth of all oil exporting countries, but it did not impact substantially the economy of the small kingdom.

5. Conclusion and policy implications

The 2008 financial turmoil and the ongoing sovereign debt crisis have renewed the debate on the role of fiscal policy in stimulating economic growth and have also raised serious concerns among the policy makers around the world because of its adverse impacts. This is because the effectiveness of fiscal policy is very sensitive to a large set of factors. Further, its role in absorbing shocks relies on the size of fiscal multiplier (Espinoza and Senhadji, 2011). This fact is pertinent for the case of Bahrain as a small state with monetary policy based on the fixed exchange rate. Therefore, this was the motivation of this study. Precisely, we set out to investigate the dynamic relationships between oil revenues, total government expenditures and economic growth in the Kingdom of Bahrain. We used annual time series data from 1960 to 2010 and we performed an econometric model based on the cointegration analysis and error-correction model. The estimations were made to obtain both short and long-run results. The time series diagnostics were investigated before the estimation and the stability tests were conducted to confirm the robustness of results. The Johansen method of cointegration confirmed the existence of a unique long-run relationship among the variables. The long-run results indicate that coefficients of total government expenditures and oil revenues' variables are statistically significant. The results for short-run, however, show that oil revenue is the only significant variable. The value of the coefficient of the ECT is −0.276 of the GDP which is statistically significant at 5%. This suggests that the convergence is moving fast enough towards the long-run equilibrium. The study also finds uni-directional causalities running from oil revenues to GDP. The results appear robust and might be useful to policy makers for different reasons. Firstly, Bahrain as a small open economy and an oil-dependent country, is facing a number of specific challenges, stemming mainly from the fact that oil revenues, which constitute the bulk of government revenues, are exhaustible, volatile, uncertain and largely originate from external demand (Sturm et al., 2009). Therefore, Bahrain is highly exposed to external shocks such as oil shocks. Literature on small states,[9] suggests that those countries are very vulnerable to external events and face major challenges. They are heavily exposed to the global market behavior and have limited diversification opportunities because of their small domestic markets (World Bank, 2000). Secondly, Bahrain has a limited monetary policy because of the dollar-pegging regime and thus the fiscal multipliers could be weak due to substantial leakages through remittances and imports (Espinoza and Senhadji, 2011). Consequently, to overcome these drawbacks the government of Bahrain should adopt further structural reforms that promote non-oil sector development

[8] We recall that Bahrain did not experience recession with average GDP growth of 4.9% between 2007 and 2011 (Hamdi and Sbia, 2012).

[9] See World Bank (2000). Small States: Meeting Challenges in the Global Economy. Washington D.C.



Note. The horizontal axis is time (years), and the vertical axis is the magnitude of the response to the impulse (%).

Fig. 2. Impulse response function. Note. The horizontal axis is time (years), and the vertical axis is the magnitude of the response to the impulse (%).

independently from government spending.[10] The government would need to continue its structural adjustment efforts to encourage diversification of the economy,[11] to broaden and deepen the financial market and to improve the effectiveness of the public sector. It is well-known that Bahrain is the most diversified economy in the GCC region. However, as oil is an exhaustible natural resource, further diversification of the economy appears to be a must. This would reduce the sudden shock in oil prices and would make the economy less reliant on energy resources. Here, the government has to strengthen its efforts in encouraging the development of the private sector by ensuring proper environment and adequate strategies.

The Gulf Cooperation Countries' common plan to implement a large tax system could be a good instrument to reduce the effect of oil price volatility. Further work is needed in terms of automatic stabilizers.

[10] It is also worth noting that the Bahraini government is attempting to restrain the impact of sudden changes in oil prices and revenues by intensifying the role of the private sector in the economy and maintaining adequate fiscal policies.

[11] There are no doubts that the increase of the oil prices recorded in recent years has allowed the government to use oil windfalls to modernize infrastructure, create employment and improve social indicators and helped the government to accumulate official reserves and maintain relatively low levels of external debt.

References

Akpan, E.O., 2009. Oil price shocks and Nigeria's macroeconomy. A paper presented at the Annual Conference of CSAE Conference, Economic Development in Africa, 22nd–24th March, Oxford.

Auty, R., 1986. Resource-based industrialisation and country size: Venezuela and Trinidad and Tobago. Geoforum 17.

Auty, R., 1990. Resource-based Industrialisation: Sowing the Oil in Eight Developing Countries. Oxford University Press.

Auty, R., 1993. Sustaining Development in Mineral Economies: The Resource Curse Thesis. Routledge, London.

Auty, R., 1998. Resource Abundance and Economic Development: Improving the Performance of Resource Rich Countries. The United Nations University World Institute for Development Economics, Helsinki.
Auty, R., 2001. Resource Abundance and Economic Development. Oxford University Press.
Ayadi, O.F., 2005. Oil price fluctuations and the Nigerian economy. OPEC Review 199–217.
Balke, N.S., Brown, S.P.A., Yücel, M.K., 2002. Oil price shocks and the U.S. economy: where does the asymmetry originate? Energy Journal 23, 27–52.
Barro, R.J., 1974. Are government bonds net wealth? Journal of Political Economy 82, 1095–1117.
Berument, H., Ceylan, N.B., 2010. The impact of oil price shocks on the economic growth of the selected MENA countries. The Energy Journal 149–176.
Bollino, C.A., 2007. Oil prices and the U.S. trade deficit. Journal of Policy Modeling 29, 729–738.
Bouchaour, C., Al-Zeaud, A., 2012. Oil price distortion and their impact on Algerian macroeconomic. International Journal of Business and Management 7, 99–114.
Bruno, M., Sachs, J., 1982. Input price shocks and the slowdown in economic growth: the Case of U.K. manufacturing. Review of Economic Studies 49, 679–705.
Bulmer-Thomas, V., 1994. The Economic History of Latin America Since Independence. Cambridge University Press.
Burbidge, J., Harrison, A., 1984. Testing for the effects of oil-price rises using vector autoregression. International Economic Review 25, 459–484.
Central Informatics Organisation, 2011. National Accounts 2011. Kingdom of Bahrain.
Cooper, J.C.B., 2003. Price elasticity of demand for crude oil: estimates for 23 countries. OPEC Review 27 (1), 1–8.
Darby, M., 1982. The price of and world inflation and recession. American Economic Review 72, 738–751.
Dickey, D.A., Fuller, W.A., 1981. Likelihood ratio statistics for autoregressive time series with a unit root. Econometrika 49 (4), 1057–1072.
Eltony, M.N., Al-Awadi, M., 2001. Oil price fluctuations and their impact on the macroeconomic variables of Kuwait: a case study using a VAR model. International Journal of Energy Research 25, 939–959.
Engle, R.F., Yoo, S., 1987. Forecasting and testing in cointegrated systems. Journal of Econometrics 35, 143–159.
Espinoza, R., Senhadji, A., 2011. How Strong are Fiscal Multipliers in the GCC? An Empirical Investigation. International Monetary Fund, WP/11/61.
Farzanegan, M.R., 2011. Oil revenue shocks and government spending behavior in Iran. Energy Economics 33, 1055–1069.
Farzanegan, M.R., Markwardt, G., 2009. The effects of oil price shocks on the Iranian economy. Energy Economics 31, 134–151.
Fasano, U., Wang, Q., 2001. Fiscal Expenditure Policy and Non-oil Economic Growth: Evidence from GCC Countries. IMF Working Paper No. 01/195.
Fattouh, B., 2007. The Drivers of Oil Prices: The Usefulness and Limitations of Non-structural Model, the Demand–Supply Framework and Informal Approaches. Oxford Institute for Energy Studies (Working Paper 32).
Gelb, A., 1988. Oil Windfalls: Blessing or Curse? Oxford University, New York.
Hamdi, H., Sbia, R., 2012. Going For Growth in Bahrain. Report for MENA Investment/OECD-MENA. Kingdom of Bahrain.
Hamdi, H., Sbia, R., 2013a. Re-examining government revenues, government spending, and economic growth in GCC countries. Journal of Applied Business Research 29 (3), 737–742 (May/ June issue).
Hamdi, H., Sbia, R., 2013b. Are investment and saving cointegrated? Evidence from Middle East and North African countries? The International Journal of Business and Finance Research 7 (4), 103–113.
Hamilton, J.D., 1983. Oil and the macro-economy since World War II. Journal of Political Economy 91, 228–248.
Hamilton, J.D., 2003. What is an oil shock? Journal of Econometrics 113, 363–398.
Hamilton, J.D., 2011. Historical Oil Shocks. NBER Working Paper No. 16790.
Hooker, M., 2002. Are oil shocks inflationary? Asymmetric and nonlinear specification versus changes in Regime. Journal of Money, Credit, and Banking 34, 540–556.
IWG, 2008. Sovereign Wealth Funds: Generally Accepted Principles and Practices (GAPP). Santiago Principles, Santiago.
Jbir, R., Zouari-Ghorbel, S., 2009. Recent oil price shock and Tunisian economy. Energy Policy 37, 1041–1051.
Jbir, R., Zouari-Ghorbel, S., 2010. The role of subsidy policy in oil price shocks: the Moroccan case. Energy Studies Review 17.
Jiménez-Rodríguez, R., Sánchez, A., 2005. Oil price shocks and real GDP growth: empirical evidence for some OECD countries. Applied Economics 37, 201–228.
Johansen, S., 1988. Statistical analysis of cointegrating vectors. Journal of Economic Dynamics and Control 12, 231–254.
Jones, D.W., Leiby, P.N., 1996. The Macroeconomic Impacts of Oil Price Shocks: A Review of Literature and Issues. Oak Ridge National Laboratory (September).
Jones, D.W., Leiby, P.N., Paik, I., 2004. Oil price shocks and the macroeconomy: what has been learned since 1996. The Energy Journal 25, 1–32.
Lal, D., Myint, H., 1996. The Political Economy of Poverty, Equity and Growth. Clarendon Press, Oxford.
Levin, A.T., Loungani, P.N., 1996. Oil, Money, and Economic Activity in the G-7 Countries: Implications of the FRB/MCM. Paper Presented at the DOE Conference. International Energy Security: Economic Vulnerability to Oil Price Shocks, Washington, D.C.(October 1996).
Lin, J.-L., Tsay, R.S., 1996. Cointegration constraints and forecasting: an empirical examination. Journal of Applied Econometrics 11, 519–538.
Looney, R., 1989. An Economic Assessment of Bahrain's Attempts at Industrial Diversification. Industrial Bank of Kuwait, Kuwait (Papers 33).
MacKinnon, J.G., Haug, A.A., Michelis, L., 1999. Numerical distribution functions of likelihood ratio tests for cointegration. Journal of Applied Econometrics 14 (5), 563–577 (John Wiley & Sons, Ltd.).
Malik, A., 2010. Oil prices and economic activity in Pakistan. South Asia Economic Journal 11, 223–244.
Mehrara, M., 2008. The asymmetric relationship between oil revenues and economic activities: the case of oil-exporting countries. Energy Policy 36, 1164–1168.
Ministry of Finance and National Economy, 1991. 30 years of Economic and Social Development In the State of Bahrain. Kingdom of Bahrain.
Mork, K.A., Hall, R.E., 1980. Energy prices, inflation and recession, 1974–1975. The Energy Journal 1, 41–53.
Mork, K.A., Olsen, Ø., Mysen, H.T., 1994. Macroeconomic responses to oil price increases and decreases in seven OECD countries. Energy Journal 15, 19–35.
Olomola, P.A., Adejumo, A.V., 2006. Oil price shock and macroeconomic activity in Nigeria. International Research Journal of Finance and Economics 3, 28–34.
Ozlale, U., Pekkurnaz, D., 2010. Oil prices and current account: a structural analysis for the Turkish economy. Energy Policy 38, 4489–4496.
Pao, H.T., Tsai, C.M., 2010. CO_2 emissions. Energy consumption and economic growth in BRIC countries. Energy Policy 38, 7850–7860.
Papapetrou, E., 2001. Oil price shocks, stock market, economic activity and employment in Greece. Energy Economics 23, 511–532.
Peacock, A.T., Wiseman, J., 1961. The Growth of Public Expenditure in the United Kingdom. Princeton University Press, Princeton, N.J.
Peacock, A.T., Wiseman, J., 1979. Approaches to the analysis of government expenditures growth. Public Finance Quarterly 7 (3), 3–23.
Pesaran, M.H., Shin, Y., 1998. Generalized impulse response analysis in linear multivariate models. Economics Letters 58, 17–29.
Phillips, P.C.B., Perron, P., 1988. Testing for a unit root in time series regression. Biometrika 75 (2), 336–346.
Rafik, J., Sonia, Z.-G., 2009. Recent oil price shock and Tunisian economy. Energy Policy 37, 1041–1051.
Rafiq, S., Salim, R., Bloch, H., 2009. Impact of crude oil price volatility on economic activities: an empirical investigation in the Thai economy. Resources Policy 34, 121–132.
Raguindin, C.E., Reyes, R.G., 2005. The Effects of Oil Price Shocks on the Philippine Economy: A VAR Approach. Working Paper. University of the Philippines School of Economics.
Ranis, G., 1991. Towards a model of development. In: Krause, L.B., Kim, K. (Eds.), Liberalization in the Process of Economic Development. University of California Press, Berkeley.
Reinsel, G.C., Ahn, S.K., 1992. Vector autoregressive models with unit roots and reduced rank structure: estimation, likelihood ratio test, and forecasting. Journal of Time Series Analysis 13, 353–375.
Ross, M., 2003. The natural resource curse: how wealth can make you poor. In: Bannon, I., Collier, P. (Eds.), Natural Resources and Violent Conflict: Options and Actions, pp. 17–42.
Sachs, J.D., 1981. The current account and macroeconomic adjustment in the 1970s. Brooking Papers on Economic Activity 12, 201–268.
Sachs, J.D., Warner, A.M., 1995. Natural Resource Abundance and Economic Growth. NBER Working Paper, No. 5398.
Sachs, J.D., Warner, A.M., 1997. Natural Resource Abundance and Economic Growth. Center for International Development and Harvard Institute for International Development, Harvard University, Cambridge MA.
Sachs, J.D., Warner, A.M., 1999. The big push, natural resource booms and growth. Journal of Development Economics 59, 43–76.
Schrank, A., 2004. Reconsidering the "Resource Curse": Sociological Analysis Versus Ecological Determinism. Department of Sociology, Yale University, New Haven.
Sims, C., 1980. Macroeconomics and reality. Econometrica 48, 1–47.
Stijns, J.P.C., 2005. Natural resource abundance and economic growth revisited. Resources Policy 30 (2), 107–130.
Sturm, M., Gurtner, F., Alegre, J.-G., 2009. Fiscal policy challenges in oil-exporting countries a review of key issues. European Central Bank Occasional Paper Series No 104. (June 2009).
World Bank, 2000. Small States: Meeting Challenges in the Global Economy. Washington D.C.
World Bank, 2012. World Development Indicators. The World Bank, Washington, D.C.