Government Expenditure Multipliers Under Oil Price Swings

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Arab Monetary Fund
2020

These economic studies are the product of the staff of the Economic Department at the Arab Monetary Fund (AMF). The Fund publishes these studies which survey issues pertinent to monetary, fiscal, banking, trade and capital market policies and their impact on Arab economies.

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Abstract

This paper aims at evaluating the impact of government expenditure on the Gross Domestic Product (GDP) under oil price swings. We particularly distinguish the expenditure multipliers in two cases of periods of oil price increase and decrease. For this purpose, we adopt a methodology of Structural Vector Autoregressive Model (SVAR) augmented by a dummy variable describing the oil price inflation movements. We solve the model for a sample of 18 Arab countries of oil exporting and oil importing countries.

The results show that, under oil prices decrease, the expenditure multipliers are much higher than under oil price increase and could attain more than one for many countries in the sample, in the short run while going beyond the value of two in the long run. Moreover, it is noted that, on average, spending multipliers in the oil exporting countries are higher than those in oil importing countries at the time of low oil prices, while the opposite is noticed at the time of increased oil prices. These results are in line with what is observed in the recent literature about fiscal multipliers, in the advanced economies, being large in time of recessions while being weak or even negative in time of expansions. For many oil exporting countries, a sustained decrease in oil prices is to be considered as a proxy for recession cycle. In fact, a sustained decrease in oil prices is more likely to induce these countries in recessions.

Considering the previous results, the fiscal policy should be designed accordingly. Especially in oil exporting countries, fiscal policies should be countercyclical to the oil prices cycle. In time of recessions, an increase in government projects are welcomed by the economy, while in time of expansions, which is the case in time of oil price increase, some of the government expenditures are likely to crowd out the private activities, which leads to lowering expenditure multipliers.

ملخص

تهدف الدراسة إلى تقييم تأثير الإنفاق الحكومي على الإنتاج في ظل تقلبات أسعار النفط، مع التمييز بشكل خاص بين حالتين من مضاعفات الإنفاق في فترات زيادة أسعار النفط مقارنة بفترات انخفاضها. لهذا الغرض، تم اعتماد منهجية نموذج الانحدار الذاتي المتجهي الهيكلي (SVAR) معززاً بواسطة متغير وهمي يصف حركات أسعار النفط. تم تطبيق النموذج على بيانات عينة من 18 دولة عربية من الدول المصدرة والمستوردة للنفط.

في ظل انخفاض أسعار النفط، تشير النتائج إلى أن مضاعفات الإنفاق أعلى بكثير من تلك الناجمة عن الزيادة في أسعار النفط، حيث يمكن أن تبلغ قيماً أكبر من واحد للعديد من البلدان على المدى القصير، بينما تتجاوز قيمة إثنين على المدى الطويل. تتماشى هذه النتائج مع ما لوحظ في الأدبيات الحديثة حول المضاعفات المالية، خاصة في الاقتصادات المتقدمة، حيث تكون المضاعفات كبيرة في وقت الركود، بينما تكون ضعيفة أو حتى سلبية في وقت التوسع الاقتصادي. بالنسبة للعديد من الدول المصدرة للنفط، يعتبر الانخفاض المستمر في أسعار النفط بمثابة مؤشر عن الركود الاقتصادي، لأن انخفاض أسعار النفط قد يؤدي إلى حدوث ركود في هذه الدول. علاوة على ذلك، يلاحظ، في المتوسط أن مضاعفات الإنفاق في الدول المصدرة للنفط أعلى من تلك الموجودة في البلدان المستوردة له في وقت انخفاض أسعار النفط ، بينما يلاحظ العكس في وقت زيادة أسعاره.

استناداً إلى ما سبق، فإن تصميم السياسة المالية يجب أن يتم أخذاً بالاعتبار هذه النتائج. حيث في الدول المصدرة للنفط خاصة، يجب أن تكون السياسات المالية معاكسة لدورة أسعار النفط. في وقت الركود مثلاً، فإن الإنفاق الحكومي لا يؤدي إلى مزاحمة الإنفاق الخاص، عكس أوقات الرخاء، كما هو الحال في وقت زيادة أسعار النفط بالنسبة لهذه البلدان، من المحتمل أن تؤدي بعض النفقات الحكومية إلى مزاحمة الأنشطة الخاصة، مما يؤدي إلى المساهمة في خفض مضاعفات الإنفاق الحكومي.

Multiplicateurs Des Dépenses Publiques Face Aux Fluctuations Du Prix Du Pétrole

Résumé

Cet article vise à évaluer l'impact des dépenses publiques sur la production sous l'effet des fluctuations des prix du pétrole. Nous distinguons particulièrement deux cas de multiplicateurs de dépenses en période de hausse des prix du pétrole par rapport aux périodes de baisse des prix du pétrole. À cette fin, nous adoptons une méthodologie de modèle autorégressif vectoriel structurel (SVAR) augmentée d'une variable muette décrivant les mouvements d'inflation des prix du pétrole. Nous appliquons le modèle à un échantillon de 18 pays arabes exportateurs et importateurs de pétrole.

Les résultats montrent que, sous la baisse des prix du pétrole, les multiplicateurs de dépenses sont beaucoup plus élevés que sous l'augmentation du prix du pétrole et pourraient dépasser pour de nombreux pays de l'échantillon, la valeur de 1 à court terme et 2 à long terme. Ces résultats sont conformes à ce qui est observé dans la littérature récente sur les multiplicateurs budgétaires, dans les économies avancées, qui sont élevés en période de récession et faibles, voire négatifs en période d'expansion. Pour de nombreux pays exportateurs de pétrole, une baisse soutenue des prix du pétrole doit être considérée comme un indicateur indirect du cycle de récession. En effet, une baisse des prix du pétrole risque d'induire ces pays en récession. En outre, il faut noter qu'en moyenne, les multiplicateurs de dépenses dans les pays exportateurs de pétrole sont plus élevés que ceux des pays importateurs de pétrole au moment de la baisse des prix du pétrole, tandis que l'inverse est observé lors de la hausse des prix du pétrole.

Compte tenu de ces résultats, la politique budgétaire doit être conçue conformément à ce constat. En particulier, dans les pays exportateurs de pétrole, les politiques budgétaires devraient être contracycliques par rapport au cycle des prix du pétrole. En période de récession, une augmentation des projets gouvernementaux est bien reçue par l'économie, tandis qu'en période d'expansion, ce qui est le cas en période de hausse des prix du pétrole, certaines dépenses publiques risquent d'évincer les activités privées, ce qui conduit à la réduction des multiplicateurs de dépenses.

Introduction

Fiscal policy plays a prominent role in the Arab economies as the monetary policy was and continue to be, for many countries of the region, constrained by the hard or managed peg to international foreign currencies namely the dollar for the GCC and to some Mashreq countries and the dominance influence of the Euro for the Maghreb countries. Indeed, according to the standard macroeconomic textbooks (Books examples are, Blanchard, 2006; Mishkin, 2010), fiscal policy is more effective as a stabilizing tool sustaining growth and employment under fixed exchange rate regime, especially when economies are involved in more financial liberalization. However, conventional monetary policy, is more effective under flexible exchange regime.[1] Under the flexible regime, the monetary policy acquires more autonomy allowing it to use the interest rate as a "fine-tuning" for the economy. Oppositely, when the monetary policy is constrained by the peg to foreign currency, and there is opposing business cycles between the national country and the foreign country (as is the case for the GCC countries in many previous periods with the United States), it is difficult to adopt conventional monetary measures by moving the interest rate. In this case, fiscal policy is more solicited especially in time of recession.

A similar situation is also observed in the advanced economies but with different constraints, where conventional national monetary policies are constrained by being member of a currency union (as the is the case for Eurozone countries), or those that reached the zero lower bound interest rate especially the case of Japan. Following such constraints, the monetary policy in those economies is less solicited after being principally the prioritized tool of macroeconomic stability especially in the past decades of financial liberalization (the great moderation era). Thus, fiscal policy is becoming more active in the aftermath of the 2008 financial crisis, whether in the first round of the fiscal stimulus or the second round of austerity and fiscal consolidations under the pressure of high accumulated public debt and increasing deficits. The 2008 crisis also activated economic researches in many areas of economic policies. An important strand of active researches

[1] According to Mundell's incompatibility trilemma, an economy fixing its exchange rate can only have an exclusive choice of one of the following two options: allow an autonomous monetary policy by restricting the mobility of financial capital or enjoy financial liberalization to the detriment of the independence of monetary policy (loss of its effectiveness). On the other hand, fiscal policy with a fixed exchange rate is effective with financial liberalization, while, in the opposite case (i.e. autarchy), both monetary and fiscal policies, under fixed exchange rate regime, are all ineffective in adjusting imbalances.

is the assessment of fiscal policy effects. The effectiveness of such fiscal policies is assessed by what is known as the "fiscal multiplier".

Although the story of the fiscal multiplier remounted to the edge of the Keynesianism era after following the 1929's great depression, their empirical assessment has recently extensively revived due to the development of econometrics and statistics. Particularly, since the 2008 economic crisis, a huge literature assessing fiscal multipliers size flourished (Auerbach and Gorodnichenko, 2012; 2013; Romer, 2011; Delong and Summers, 2012; Ramey, 2011; Ramey and Zubairy, 2018).[2] The main contributions tend to find fiscal multipliers larger in time of recession than in time of expansion, and many other economic fundamentals related to the fiscal position (distinguishing between low versus high debt or deficit), the exchange rate (fixed versus flexible), the degree of openness, etc. (Batini and al. 2014). Furthermore, fiscal multipliers revealed to be time and country specific and even sensitive to the assessment method (Baum and al., 2012; Batini and al., 2012). The recent extensive researches on fiscal multipliers are generally contained on the sample of advanced economies while, the assessment of fiscal multipliers in the Arab economies is limited to some scarce researches (Espinoza and Senhadji, 2011; IMF, 2016; Husain and al., 2008).

Another important variable that affect the World economies, and particularly the Arab region, and weigh on fiscal policies, is the international oil price. The latter highly impacts negatively the overall budget of oil exporting economies in time of oil price retrenchment while putting pressure on the fiscal balances of the oil importing countries in time of high oil prices, particularly, as these prices are mainly or partially subsidized. In 2014, oil prices start to decrease and stagnate, since then, in moderate low levels compared to their high levels in 2013. This put pressures on the budget of oil exporting economies, which began by instituting fiscal measures such as the implementation for the first time of the value added tax in some GCC countries and an ongoing process of implementation for others, partially or fully liberalizing domestic oil prices in oil exporting as well as in net oil importing countries. following the recent trend of oil prices, some studies focused on

[2] See, for example, Ramey (2018) for a recent literature review.

rethinking fiscal policies in the Arab region (ESCWA, 2018) and oil exporting countries in general (Mirzoev and Zhu, 2019).

At a time when the oil producing countries affected by low oil prices must undertake considerable fiscal consolidation to correct budget and current account imbalances, the assessment and review of fiscal multipliers under oil prices movements has come to the fore. Furthermore, oil importing countries have always suffered from high oil prices. Evaluation of expenditure multipliers for those countries in relation to the oil prices fluctuations is important for their choice in terms of fiscal policy instruments, especially as these countries have a relatively diversified taxes system to use actively whenever their spending policy is inefficient.

From this perspective, and as many Arab countries are fully dependent on the oil sector for many oil exporting countries such as, GCC countries, Algeria, Iraq and Libya as well as other countries that are fully net importers (such as Jordan and Morocco), an assessment of fiscal multipliers especially expenditure multipliers are crucial to determine how the fiscal policies should be implemented according to oil price changes.

The remaining of this paper is as follows. Section 2 presents the literature review on fiscal multipliers focusing particularly on the fiscal spending multipliers and their determinants, their sensitivity to the business cycle as well as the fiscal position and oil price changes. Section 3 presents a methodology for assessing fiscal multipliers in time of increasing as well as decreasing oil prices for a sample of 18 Arab countries. Section 4 presents empirical results. Section 5 concludes.

1. Literature review

In studying fiscal multipliers, many recent researches tend to confirm the sensitivity of those multipliers to the business cycle. Particularly, fiscal spending multipliers revealed to be larger in recessions than in expansions periods. Auerbach and Gorodnichenko (2012, 2013) were among the first studies that emphasized this tendency of fiscal multipliers to be large in recessions, which could reach values more than 2, compared to periods of economic expansion. Consequently, many other researches confirmed their results differentiating between fiscal multipliers in recessions and expansions (Parker, 2011; Glocker and al., 2019; Caggiano and al., 2015; Barro and Redlick, 2011;

Fazzari and al., 2015; Corsetti and al., 2012). This also pushed other researches which leads to find out the vulnerability of fiscal multipliers to other determinants. Therefore, fiscal multipliers revealed to be dependent on the fiscal position measured by the level of debt ratios and deficits (Huidrom and al., 2016; Corsetti and al., 2013), on the monetary policy stance (Hall, 2009) particularly the constrained monetary policy either by the zero lower bound interest rate (liquidity trap) or by the loss of monetary independence as in the pegged exchange rate or monetary union (Cogan and al., 2013; Christiano and al., 2011; Delong and Summers, 2012; Farhi and Werning, 2017).

There are many motives why the size of the fiscal multiplier changes. Besides the proper characteristics of the studied economy which are obviously due to macroeconomic fundamentals (economic environment) as well as institutional environment, the difference of methods and the accuracy of data have their important contribution on these differences. The degree of openness also plays an important role in this issue with more closed economy having larger fiscal multipliers than more opened ones. This happens particularly in the short run and incomplete financial markets as prices not fully adjusted push up the demand for home goods which stimulates GDP growth (Barrell and others, 2012; Ilzetzki and others, 2013).

Moreover, fiscal policy effects taking into account the fiscal position of the economy measured by the level of the public debt and/or the fiscal deficit are highly debated in the aftermath of the 2008 financial crisis (Corsetti and al. 2012; Bi and al. 2016; Huidrom and al. 2016; Boussard and al. 2012; Blot and al. 2014; Canzoneri and al. 2015; Poghosyan 2017; Broner and al. 2017; Afonso and Leal, 2018; Perdichizzi, 2017; Auerbach and Gorodnichenko, 2017; Blanchard, 2019; Ramey, 2018; Ramey and Zubairy, 2018).

Another important variable that affects the world economies is the oil price, which impacts negatively the overall budget of oil exporting economies in time of oil price retrenchment while putting pressure on the fiscal balances of the oil importing countries in time of high oil prices, particularly, as these prices are mainly or partially subsidized. Oil prices could play the role of business cycle especially in oil exporting countries which suggest, following the previous literature, expectation of high expenditure multipliers in time of oil prices drops (business cycle recession) compared to weak or even negative expenditure multipliers in time of oil price hikes (business cycle expansion). From this perspective, and as many Arab countries are fully dependent on the oil sector for many oil exporting countries such as, GCC countries, Iraq, Algeria, Libya as well as others that are fully net importers (such as Jordan and Morocco), an assessment of fiscal multipliers especially expenditure multipliers are crucial to determine how the fiscal policies should be implemented according to oil prices swings.

Oil prices play substantial role in influencing and even shaping fiscal policies in the Arab countries. Indeed, according to El Anshasy (2009), fiscal policies are the main channel by which the oil price shocks spread to the economy, explaining the differences in growth performance, especially across oil exporting countries. Moreover, Sadeghi (2017) examines the interaction between the government size (the expenditure to non-oil GDP) and the oil prices in oil exporting countries. He found that following an oil price increase, government expenditure and the non-oil GDP, tend to increase although accompanied with higher GDP volatility. Similarly, El Anshasy and Bradley (2012), investigating the short and long run effects of oil prices on the design of the fiscal policy, found that in the long run, higher oil prices induce larger government size, while in the short run, government expenditures rise less than proportionately than the increase in oil revenues, reflecting prudent expansion in fiscal policy in oil producing countries. Besides, Husain and al. (2008) highlighted that oil price changes affect the economic cycle only through their impact on fiscal policy.

However, while fiscal multipliers were largely calculated for the advanced European and American economies in the aftermath of the 2008 economic crisis, the researches assessment for other economies, especially the Arab region are very scarce. Very few individual or panel assessments include some Arab countries in these researches. (Espinoza and Senhadji, 2011; IMF, 2016; Husain and al., 2008).

Fiscal multiplier is defined as the GDP change in response to an (exogenous) change in a fiscal variable in reference to their baseline levels (Spilimbergo and al., 2009; Coenen and al. 2012). If Y_t and Z_t denote respectively the GDP and the fiscal instrument at time t, fiscal multiplier is simply expressed as $\Delta Y_t / \Delta Z_t$. Or, while the effects come with different lags time, the cumulative fiscal multiplier to a horizon time h is defined as: $(\sum_{j=0}^{j=h} \Delta Y_{t+j}) / (\sum_{j=0}^{j=h} \Delta Z_{t+j})$ (Chinn, 2013).

The concept of multiplier is generally associated with the *General Theory* of John Maynard Keynes (1936). The idea behind fiscal stimulus is that the fiscal multiplier, as the measure of the policy instrument effect, is de facto a Keynesian one, which means that the value of such fiscal multiplier is larger than unity making it rewardable/beneficial to go for such fiscal stimulus. In the Keynesian structural models, the simplest way to compute a spending multiplier is via the marginal propensity to consume. The spending multiplier in the Keynesian framework decreases with the marginal propensity to import as well as the rise in interest rate and increases with the accelerator effects in investment.

In a Vector Autoregression (VAR) approach, spending multipliers are drawn using the impulse response function and mainly a method of identification of Blanchard and Perotti (2002) as a pioneer method for identifying shocks in an SVAR. Many recent literatures on fiscal multipliers used many derivatives of VAR methodology such as SVAR used by Auerbach and Gorodnichenko (2012), Threshold VAR (TVAR) used by Egron (2018), time-varying parameter factor augmented vector autoregressive (TVP-FAVAR) by Glocker and al. (2019), panel VAR (PVAR) used by Combes and al. (2014).

2. Application: Estimation of expenditure multipliers for the Arab countries

In our empirical investigation, we use a structural vector autoregressive (SVAR) to assess for a sample of 18 Arab countries, individually (for each country), the fiscal expenditure impacts on the GDP. We especially tests how the oil price changes (expansion versus contraction) could affect expenditure multipliers size. In what follows, we display first, the data sources, then in the second step, we explain the methodology. The third section develops and discusses results.

2.1 Data

The data, on annual frequency, for GDP and government expenditures are extracted from the Arab Monetary Fund economic database, while the oil prices are downloaded from the International Energy Agency (WWW.IEA.ORG). The data set covers the period ranging from 1983 to 2018 for almost all countries except for Iraq and Syria which have some missing periods.

A first analysis of Pearson correlations (although correlation does not mean causality) between oil price changes and GDP growth rate shows high positive association especially for nominal growth rates to the oil price changes for oil producing countries compared to low or negative association for oil importing countries (table 1). The correlations are 80% in Oman, Qatar, Saudi Arabia and United Arab Emirates, About 70% in Bahrain and Iraq, nearly 64% and 54% in Yemen and Kuwait respectively. However, the oil price changes associations with real growth rates are substantially reduced and could be negative as is the case for Oman. For oil importing countries, Morocco has the highest negative association with oil price changes. For other countries, the association is low especially for Sudan and Lebanon.

Table 1: Oil price changes correlation with Nominal and Real GDP growth rates over the period 1983-2018.

	Correlation with nominal growth rate	Correlation with real growth rate
Algeria	43.2%	17.2%
Bahrain	71.9%	25.0%
Egypt	18.6%	1.6%
Iraq	69.4%	19.5%
Jordan	8.8%	-6.4%
Kuwait	53.9%	5.9%
Lebanon	-2.4%	-4.0%
Libya	28.9%	8.0%
Mauritania	28.6%	29.1%
Morocco	-30.8%	-13.8%
Oman	84.8%	-26.2%
Qatar	84.3%	17.6%
Saudi Arabia	81.8%	9.2%
Sudan	-1.7%	-0.3%
Syria	8.3%	-12.7%
Tunisia	23.6%	30.9%
United Arab Emirates	86.8%	54.0%
Yemen	63.7%	31.8%

2.2 Methodology

Like many previous researches, we rely on the methodology of SVAR and its identification method as in Blanchard and Perotti (2002). Our methodology is particularly based on a bivariate SVAR relying government expenditure to the GDP to study the effects of government expenditures on the real GDP. In order to control exogenously for the oil price changes (expansion versus contraction), the SVAR is augmented by variable dummies corresponding to each of the previous prescribed state, hence becoming an SVAR-X (X for exogenous). Without getting lost in general and detailed cases, we describe here directly the methodology (formulation, identification, etc.) for an SVAR with two stationary endogenous variables. We also assume for simplicity that the optimal lag is of order one.[3] The reader could consult for detailed and general cases, for example, Hamilton (1994).

The SVAR relying two endogenous stationary variables describing respectively the relationship between government expenditures (g_t) and GDP (y_t) for each country is formulated as:

$$\begin{cases} g_t + \beta_{1,2} y_t = c_{1,0} + c_{1,1} g_{t-1} + c_{1,2} y_{t-1} + \varepsilon_{g,t} \\ y_t + \beta_{2,1} g_t = c_{2,0} + c_{2,1} g_{t-1} + c_{2,2} y_{t-1} + \varepsilon_{y,t} \end{cases} \quad (1)$$

Where; $\varepsilon_{g,t}$ and $\varepsilon_{y,t}$ are the structural shocks/innovations of respectively the first and the second variables in this bivariate SVAR, and could be formulated as:

$$\begin{pmatrix} \varepsilon_{g,t} \\ \varepsilon_{y,t} \end{pmatrix} = \varepsilon_t \approx i.i.d. \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_g & 0 \\ 0 & \sigma_y \end{pmatrix} \right) \quad (2)$$

In our case, the real government consumption/expenditure and the real GDP are considered in log differentiated natural logarithm, hence designing the growth rate of the corresponding variables in and allowing direct interpretation of simultaneous parameters as elasticities (reflecting structural shocks) assigned to these variables in the SVAR equations (i.e. $\begin{pmatrix} \beta_{1,2} \\ \beta_{2,1} \end{pmatrix} = \beta$). In matrix form, we have, equation (1) as:

$$\begin{bmatrix} 1 & \beta_{1,2} \\ \beta_{2,1} & 1 \end{bmatrix} \begin{bmatrix} g_t \\ y_t \end{bmatrix} = \begin{bmatrix} c_{1,0} \\ c_{2,0} \end{bmatrix} + \begin{bmatrix} c_{1,1} & c_{1,2} \\ c_{2,1} & c_{2,2} \end{bmatrix} \begin{bmatrix} g_{t-1} \\ y_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{g,t} \\ \varepsilon_{y,t} \end{bmatrix} \quad (3)$$

Which could be also in the form:

$$B v_t = C_0 + C v_{t-1} + \varepsilon_t \quad (4)$$

[3] In practice and in our application to the 18 Arab countries, these lags are tested and determined by information criteria (table 3 in the Appendix).

Where; $D = E(\varepsilon_t \varepsilon_t')$ is a diagonal matrix with elements σ_g and σ_y. Introducing lag operator notations on the previous form, SVAR becomes: $B(L)v_t = C_0 + \varepsilon_t$ with $B(L) = B - CL$.

Augmenting the SVAR model by pure exogenous variables x_t consists of adding this variable and its lags to each component of the SVAR system as in the following:

$$\begin{cases} g_t + \beta_{1,2} y_t = c_{1,0} + c_{1,1} g_{t-1} + c_{1,2} y_{t-1} + \lambda_{1,1} x_t + \lambda_{1,2} x_{t-1} + \varepsilon_{y,t} \\ y_t + \beta_{2,1} g_t = c_{2,0} + c_{2,1} g_{t-1} + c_{2,2} y_{t-1} + \lambda_{2,1} x_t + \lambda_{2,2} x_{t-1} + \varepsilon_{g,t} \end{cases} \tag{1'}$$

In matrix form, we have, equation (3) is as:

$$\begin{bmatrix} 1 & \beta_{1,2} \\ \beta_{2,1} & 1 \end{bmatrix} \begin{bmatrix} y_t \\ g_t \end{bmatrix} = \begin{bmatrix} c_{1,0} \\ c_{2,0} \end{bmatrix} + \begin{bmatrix} c_{1,1} & c_{1,2} \\ c_{2,1} & c_{2,2} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ g_{t-1} \end{bmatrix} + \begin{bmatrix} \lambda_{1,1} & \lambda_{1,2} \\ \lambda_{2,1} & \lambda_{2,2} \end{bmatrix} \begin{bmatrix} x_t \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{y,t} \\ \varepsilon_{g,t} \end{bmatrix} \tag{3'}$$

Or

$$B v_t = C_0 + C v_{t-1} + \lambda f_t + \varepsilon_t \tag{4'}$$

Let's focus for simplicity on the SVAR equations instead of SVAR-X. The methodology is the same for an SVAR-X and Exogenous variables have no impact on the structural parameters. We deduce the reduced form of the SVAR, called a standard VAR model, by multiplying equation (4) by the inverted matrix B^{-1}, assuming it exists, and solving for v_t in terms of v_{t-1} and ε_t:

$$v_t \; = \; B^{-1} C_0 + B^{-1} C v_{t-1} + B^{-1} \varepsilon_t = a_0 + A v_{t-1} + u_t \tag{5}$$

Or equivalently, $A_1(L) v_t \; = \; a_0 + u_t \; with \; A_1(L) \; = \; I - AL$

We can easily deduce the residuals u_t as a linear combination of the structural errors ε_t :

$$u_t = B^{-1} \varepsilon_t = \frac{1}{(1 - \beta_{1,2} \beta_{2,1})} \begin{bmatrix} \varepsilon_{g,t} - \beta_{1,2} \varepsilon_{y,t} \\ \varepsilon_{y,t} - \beta_{2,1} \varepsilon_{g,t} \end{bmatrix} \tag{6}$$

To allow deducting fiscal structural dynamic multipliers from an SVAR model, the structural moving average representation is necessary.

The corresponding "Wold" representation of the reduced form (5) (the moving average, MA) is found by multiplying both sides of (5) by $A_1(L)^{-1} = (I - AL)^{-1}$, which yields:

$$v_t = \lambda + \Psi(\mathrm{L})u_t \tag{7}$$

The structural moving average (SMA) representation of v_t is based on an infinite moving average of the structural innovations ε_t, deduced by substituting $u_t = B^{-1}\varepsilon_t$ into (7), which leads to:

$$v_t = \lambda + \Psi(L)B^{-1}\varepsilon_t = \mu + \Phi(L)\varepsilon_t \tag{8}$$

Where; $\Phi(L) = \sum_{k=0}^{\infty}\varphi_k L^k$

In order to solve for an SVAR, the parameters must be identified, which requires imposing some restrictions. Typical identifying restrictions include either assuming no simultaneous equations effects from one variable to another in the SVAR (for example: $\beta_{1,2} = 0 \; or \; \beta_{2,1} = 0$) or linear restrictions on the elements of the matrix (for example, $\beta_{1,2} + \beta_{2,1} = 0$). In our case, we follow the methodology of Blanchard and Perotti (2002) by identifying government spending shocks using a Cholesky decomposition, ordering government spending first. The Blanchard and Perotti (2002) is a tri-variate SVAR linking 3 variables: Tax revenues, Government expenditures and GDP. For our case, and as many oil exporting countries has no history data of taxes revenues (their revenues are mainly oil revenues), we considered only the government expenditures in our model. The second reason is that we are only interested in government multipliers and no tax multipliers are considered in this paper.

In our restriction, we especially consider that the response of government expenditure to the GDP comes with a lag, which means no contemporaneous effects of GDP to government expenditure. Thus, the coefficient $\beta_{1,2} = 0$. This is also interesting as the opposite case (which means assuming $\beta_{2,1} = 0$ instead of $\beta_{1,2} = 0$) will not allow for assessing the effects of government expenditure on GDP (fiscal multipliers). This restriction could also be considered as imposing long run restrictions, like in the model of Blanchard and Quah (1989), as the fiscal policy shocks are generally considered to be short lived.

In order to draw fiscal multipliers, the formulae of impulse response functions are required. For the bivariate SVAR model, taking the Structural Moving Average (SMA) representation in equation (7) at a horizon time $t + h$, we have:

$$\begin{bmatrix} g_{t+h} \\ y_{t+h} \end{bmatrix} = \begin{bmatrix} c_{1,1} & c_{1,2} \\ c_{2,1} & c_{2,2} \end{bmatrix} \begin{bmatrix} g_{t-1} \\ y_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{g,t} \\ \varepsilon_{y,t} \end{bmatrix} \tag{9}$$

Fiscal multipliers are drawn from structural shocks assigned to each variable; especially we are interested in the effect of structural fiscal (expenditure) shocks on GDP in this case. For this purpose, we consider the structural moving average (SMA) representation of the SVAR. At the horizon time $t + h$, the SMA representation is as:

$$\begin{bmatrix} g_{t+h} \\ y_{t+h} \end{bmatrix} = \begin{bmatrix} \varphi_{1.1}^{0} & \varphi_{1.2}^{0} \\ \varphi_{2.1}^{0} & \varphi_{2.2}^{0} \end{bmatrix} \begin{bmatrix} \varepsilon_{g,t+h} \\ \varepsilon_{y,t+h} \end{bmatrix} + \cdots + \begin{bmatrix} \varphi_{1.1}^{h} & \varphi_{1.2}^{h} \\ \varphi_{2.1}^{h} & \varphi_{2.2}^{h} \end{bmatrix} \begin{bmatrix} \varepsilon_{g,t} \\ \varepsilon_{y,t} \end{bmatrix} + \cdots \tag{10}$$

Then the structural dynamic multipliers are:

$$\frac{\partial g_{t+h}}{\partial \varepsilon_{g,t}} = \varphi_{1.1}^{h} \tag{11.a}$$
$$\frac{\partial y_{t+h}}{\partial \varepsilon_{y,t}} = \varphi_{2.2}^{h} \tag{11.b}$$
$$\frac{\partial g_{t+h}}{\partial \varepsilon_{y,t}} = \varphi_{1.2}^{h} \tag{11.c}$$
$$\frac{\partial y_{t+h}}{\partial \varepsilon_{g,t}} = \varphi_{2.1}^{h} \tag{11.d}$$

The structural dynamic multipliers/impacts measure how a unit impulse of the structural shocks at time t affects the level of the endogenous variables at the horizon time $t + h$. Especially, the two first equations (11.a and 11.b) represent the response of respectively the government expenditure and GDP growth rates to their proper innovations. The two other equations (11.c and 11.d) assess the crossing effects of the structural innovations between the endogenous variables of the SVAR. Particularly, the equation (11.d) represents the impacts of the GDP growth rate to a structural unit shock of the government expenditure which will be our emphasis in this application. Drawing the structural dynamic impacts $\varphi_{i.j}^{h}$ for the shocks $(i, j) = (1,2)$ allows to visualize such dynamic impacts in what is referred as the impulse response functions (IRFs). For cumulative effects of the structural shocks impacts, since the SVAR is designed to be stationary, which means that the effects $\varphi_{i.j}^{h}$ fade away in the long run (i. e. $\lim_{h\to\infty} \varphi_{i.j}^{h} = 0$), the long run cumulative impact of the structural shocks are captured by the instant IFRs to infinity, which means:

$$\emptyset = \sum_{h=0}^{\infty} \varphi_{i.j}^{h};\ (i, j) = (1,2) \tag{8}$$

The structural dynamic multipliers (short run or long run cumulative) defined above are different from the Keynesian concept of the fiscal multiplier, generally associated with the *General Theory* of John Maynard Keynes (1936). The latter is defined as the GDP change in response to an (exogenous) change in a fiscal variable in reference to their baseline levels (Spilimbergo and al., 2009; Coenen and al. 2012). Hence, for G_t and Y_t denoting respectively the fiscal instrument (the government expenditures here) and the GDP at time t, fiscal multiplier is simply expressed as $\Delta Y_t/\Delta G_t$. Or, while the effects come with different lags time, the cumulative fiscal multiplier to a time horizon h is expressed by: $\sum_{j=0}^{j=h} \Delta Y_{t+j} / \sum_{j=0}^{j=h} \Delta G_{t+j}$ (Chinn, 2013).

To compare our results to the findings in the literature and across countries, an exercise of mapping the IRFs impacts to Keynesian fiscal multipliers is undertaken. In the explicit SVAR, government expenditure variable as well as GDP are introduced in percent of first differences of the natural logarithm of the corresponding levels of the variables (i.e. the growth rates in percent). The unit root Augmented Dicky-Fuller and Phillips-Peron tests show that these variables are integrated of order one in levels. Thus, using the first difference of logarithms insure stationarity of such variables (Table 2, Tables Appendix). Furthermore, introducing the variables in logarithms allows to draw the Keynesian multipliers form directly the effects of elasticities. Let's $\mu_{Y/G}$ define the elasticity of GDP to government expenditure, we have:

$$\mu_{Y/G} = \frac{dlog(Yt)}{dlog(Gt)} = \frac{\Delta Yt}{\Delta Gt} * \frac{Gt}{Yt} = k.\frac{Gt}{Yt} \tag{12}$$

The Keynesian multiplier $k = \frac{\Delta Yt}{\Delta Gt}$ measuring government expenditure effect on GDP is then deduced as the elasticity of GDP to government expenditure rescaled by $\overline{G_t/Y_t}$ representing the averaged share of the government expenditure in GDP (or multiplied by $(\overline{Y_t/G_t})$) (see for example, Ilzetzki and al., 2013; Gonzalez-Garcia and al., 2013; Barnichon and Matthes, 2018; Priftis and Zimic, 2018; Glocker and al., 2019). However, the latter references even though they scale their impacts IRFs by the share of consumption, the results are meaningful in terms of size only if the structural shock is expressed in percent units. The reason is that the structural innovations especially when using Cholesky innovations in an SVAR are expressed in standard deviations units. Therefore, in practice, for the accuracy of results, the impacts should be also rescaled by a standard deviation σ_g of the fiscal variable (government expenditures) as in Combes and al., 2014 (page 1021). Following this precision, an adjustment coefficient is defined to deduce the short run (immediate) fiscal (Keynesian) multiplier from the corresponding Cholesky impact multiplier, as:

$$k^{sr} = IM^{sr} * \overline{Y/G}/\sigma_g \quad (13)$$

Where from equation (11.d) $IM^{sr} = \frac{\partial y_t}{\partial \varepsilon_{g,0}} = \varphi_{2.1}^{0}$ is the immediate effects of government expenditure Cholesky innovations. For the accumulated (long run) expenditure multipliers k^{lr}, they are deducted by the same way as:

$$k^{lr} = IM^{lr} * \frac{\overline{Y}}{G}/\sigma_g = \left(\sum_{h=0}^{\infty} \varphi_{2.1}^{h}\right) * \overline{Y/G}/\sigma_g \quad (14)$$

We run the previous bivariate SVAR controlling for the oil price exogenous changes. The exogenous variable defining oil prices increases and oil price decreases is designated by the oil price inflation sign, which is captured by the dummy (noted opd_t) defined as the following:

$$opd_t = \begin{cases} 1 \; if \; dlog(op_t) > 0; which \; captures \; the \; oil \; price \; increase \; periods \\ 0 \; if \; dlog(op_t) \leq 0; which \; captures \; the \; oil \; price \; decrease \; periods \end{cases} \quad (15)$$

Where; $dlog(op_t)$ is the differentiated natural logarithm of the oil prices at time t corresponding to oil price inflation. The dummy variable opd_t once introduced in the SVAR as exogenous capture the way increases of oil prices affect the other variables constituting the SVAR model. To catch the opposite effect, when oil prices are decreasing, the SVAR is augmented by the complement to the unity of this variable (i.e. by $(1 - opd_t)$).

2.3 Results

Prior to the SVAR implementation, the data series were tested for unit roots using the Augmented Dickey-Fuller and Phillips-Perron tests. However, the Phillips-Perron test, for which the results are displayed in tables 2 and table 2 (continued), is better suited for small samples and therefore more informative in our context. In these tables, the two endogenous variables; the government expenditures and GDP are tested in levels and in first differences and the levels shows that they are integrated of order one (I(1), i.e. nonstationary) for all the studied countries.[4] The two variables once introduced in first differences and tested remain stationary, thus these variables are introduced in the SVAR model in differentiated logarithms, which are equivalent to growth rates.

[4] The procedure of the test assumes the null hypothesis that the variable tested has a unit root and compares the adjusted statistics of the test to the critical values at respectively, 1%, 5% and 10%. Practically, the probability associated with the adjusted statistics of the test allows to conclude comparing to the critical probability values.

The second step is to determine the order of optimal lags that could be introduced in the SVAR. For this purpose, we use tests based on information criteria to select the optimal lag for each VAR (each country). The software EViews displays five of these tests which are sequential modified LR test statistic (LR test), Final prediction error (FPE test), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ). Most of these tests, displayed in table (3) in the appendix, leads to first order lag for all countries except for Iraq and Syria where the tests show an order of 2. However, for these two countries, the sample of data is shorter and considering a higher order may leads to inconclusive results as the degrees of freedom will be highly shortened by the higher order of lags. Thus, we run for all the countries, individually, an SVAR with a lag of order 1.

The SVAR model is augmented by the oil price dummy as in equation (3') in the methodology section, hence, becoming an SVAR-X, where X is designated to capture the exogenous oil price effects in time of increase or decrease. The dummy of oil price defined in the methodology by the equation (15) is introduced to control for the periods of oil price increases while its complement to the unity is introduced to control for the effects of periods of oil price decreases. In the total, we run 36 estimations (18 countries and two cases of oil price increase and decrease).

We run the estimations under EViews program and plot the impulse response functions (IRFs) under oil price increase and oil price decrease in figures 1 to 6 presented in the figures' appendix. Each figure presents a panel of six graph corresponding to three countries with two oil price movements scenarios. The general view is that fiscal multipliers are higher in time of oil price decrease than in the case of oil price expansion. Table 4 presents for the sample of 18 countries, the Cholesky short and long run impacts under the two scenarios of oil prices changes. The short run corresponding to the value of the response to the shock at time $t = 0$ (the first year) while the long run is taken to be the accumulated response attained in time $t + h$ with the time horizon chosen to $h = 10$ years for this exercise.

Table 4: GDP response to a structural Cholesky innovations of government expenditure

	Cholesky impacts			
	Under oil price increase		Under oil price decrease	
Country	Short run	Long run	Short run	Long run
Algeria	0.089	0.104	0.117	0.159
Bahrain	0.041	0.040	0.103	0.202
Egypt	0.140	0.165	0.150	0.195
Iraq	0.038	-0.007	0.174	0.741
Jordan	0.100	0.161	0.105	0.203
Kuwait	0.037	0.047	0.114	0.208
Lebanon	0.009	0.064	0.025	0.093
Libya	0.210	0.153	0.217	0.165
Mauritania	0.026	0.033	0.076	0.142
Morocco	0.083	0.085	0.112	0.199
Oman	0.081	0.090	0.127	0.240
Qatar	0.073	0.109	0.144	0.434
Saudi Arabia	0.048	0.080	0.123	0.241
Sudan	0.099	0.095	0.164	0.200
Syria	0.049	0.147	0.076	0.222
Tunisia	0.045	0.033	0.084	0.137
United Arab Emirates	0.027	0.002	0.128	0.291
Yemen	0.088	0.109	0.131	0.167

In order to draw fiscal multipliers from Cholesky IRFs as explained in the methodology section, especially through equations (9), (10) and (11), we calculate in table (5) the elements that are necessary to deduce fiscal multipliers for each country.

Table 5: Coefficient of adjustment to passthrough from Cholesky IRFs to Keynesian multipliers

	GDP to government consumption (Y/G)	Government consumption growth rate standard deviation (σ_g)	Adjustment coefficient [$(Y/G)/\sigma_g$]
Algeria	2.79	0.15	18.19
Bahrain	3.29	0.12	27.75
Egypt	2.70	0.14	19.03
Iraq	2.64	0.32	8.34
Jordan	2.84	0.10	27.92
KSA	2.67	0.15	17.69
Kuwait	2.60	0.16	16.77
Lebanon	4.12	0.24	17.42
Libya	2.46	0.40	6.15
Mauritania	3.50	0.20	17.82
Morocco	3.57	0.10	18.06
Oman	2.32	0.11	20.95
Qatar	2.31	0.15	14.92
Sudan	7.06	0.81	8.74
Syria	3.41	0.14	25.00
Tunisia	3.04	0.11	26.82
UAE	3.34	0.15	22.56

Fiscal multipliers deduced from tables 4 and 5 according to equations (13) and (14) (in the methodology section) are displayed in table 6. We split the countries in three groups: the GCC group (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates), other oil exporting countries group (Algeria, Iraq, Libya and Sudan) and other oil importing countries (Jordan, Egypt, Lebanon, Mauritania, Morocco and Tunisia). The results show that expenditure multipliers (short and long run) are higher under oil price decrease than under the scenario of oil price increase. Especially, under the former case, short run multipliers are generally approaching or more than the value of 2 for all the GCC countries and Algeria. Iraq, Sudan and Libya also recorded values fairly more than one. Oil importing countries also recorded high expenditure multiplier values around the value of 2 except for Lebanon (0.44) and to some extent Mauritania (1.35). These result goes in line with the researches detailed in the literature review especially for advanced countries, where expenditure multipliers are sensitive to the business cycle and their size could reach more than 2.

Table 6: Government expenditure multipliers under oil price changes.

	Government Expenditure Multipliers			
	Under oil price increase		Under oil price decrease	
GCC countries				
Country	Short run	Long run	Short run	Long run
Bahrain	1.15	1.12	2.87	5.60
Kuwait	0.63	0.78	1.91	3.48
Oman	1.69	1.88	2.66	5.03
Qatar	1.09	1.62	2.15	6.48
Saudi Arabia	0.85	1.42	2.17	4.26
United Arab Emirates	0.60	0.04	2.89	6.56
GCC Average	1.00	1.14	2.44	5.24
Other oil exporting countries				
Country	Short run	Long run	Short run	Long run
Algeria	1.62	1.90	2.13	2.89
Iraq	0.31	-0.06	1.45	6.18
Libya	1.29	0.94	1.33	1.01
Sudan	0.87	0.83	1.43	1.75
Average	1.02	0.90	1.59	2.96
Oil importing countries				
Country	Short run	Long run	Short run	Long run
Egypt	2.67	3.14	2.86	3.70
Jordan	2.80	4.48	2.92	5.66
Lebanon	0.16	1.11	0.44	1.62
Morocco	1.50	1.53	2.02	3.59
Mauritania	0.46	0.60	1.35	2.52
Tunisia	1.21	0.88	2.25	3.67
Syria	1.23	3.66	1.91	5.55
Yemen	1.13	1.40	1.69	2.15
Average	1.39	2.10	1.93	3.56

In the average, the GCC group have higher expenditure multipliers in time of oil decrease compared to the oil importing countries group. However, in time of oil price decrease, expenditure multipliers seem to be slightly higher for the group of oil importing countries over the other groups. For the non GCC group of oil exporting countries, although they report expenditure multipliers higher in time of oil price decrease than in time of oil price increase, they recorded slightly multipliers lower than the two groups of oil exporting and oil importing countries.

Conclusion

In this paper, we use the methodology of a Structural Vector Autoregressive Model (SVAR) augmented by a dummy variable describing the oil price inflation movements. We apply this approach to assess the expenditure multipliers for a sample of 18 Arab economies, namely; Algeria, Bahrain, Egypt, Iraq, Jordan, Saudi Arabia, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Sudan, Syria, Tunisia, United Arab Emirates and Yemen.

The results show that, controlling for oil prices decrease, the expenditure multipliers are much higher than under oil price increase and could attain more than one for many countries in the sample, in the short run while going beyond the value of two in the long run. Moreover, it is noted that, on average, spending multipliers in the oil exporting countries, especially for the group of GCC countries, are higher than those in oil importing countries at the time of low oil prices, while the opposite is noticed at the time of increased oil prices. For the other oil exporting countries, Algeria, Iraq, Libya and Sudan, multipliers although being sensitive the oil price movements, are lower compared to the values reported for the other groups. These results are in line with what is observed in the recent literature about fiscal multipliers, in the advanced economies, being large in time of recessions while being weak or even negative in time of expansions. For many oil exporting countries, a sustained decrease in oil prices is to be considered as a proxy of recession cycle as the decrease in oil prices likely to induce these countries in recessions.

Considering these results, the fiscal policy in the Arab countries should be designed according to oil price movements. Especially in oil exporting countries, fiscal policies should be countercyclical to the oil prices cycle. In time of recessions, it is the role of the government sector to stimulates the economy while the public intervention in time of expansions, although not seeming to alter the economic growth (as the multipliers approaching the value of one, except for some countries; Iraq, Lebanon and Mauritania) is less beneficial to the economy than in time of recessions. These result also are against any fiscal consolidation based on cutting expenditures in times of oil price decrease, which could harm the economy, especially for oil countries.

Meanwhile, controlling for oil prices, our results tends to be higher than what is found by some studies for the GCC countries (Espinoza and Senhadji, 2011), Algeria (ElKhadri and al., 2018) and Morocco (IMF, 2016), where these studies revealed (with different approach, and no control for oil prices exogeneity) that the expenditure multipliers are less than unity. It is important that many studies should flourish to challenge uncertainties about results of fiscal multipliers coming from different methods. An important issue is also related to data. Our data set is on annual basis, while fiscal policy effects could be observed in less than one year, less frequency of the data is a best option for such exercise. However, the quarterly data are not produced in many countries of the sample. Few countries that started to produce national account on quarterly basis have short samples (as they started recently) that could not run the VAR and SVAR methodologies.

Finally, this study is dedicated to assessing the fiscal multipliers based on the total government expenditures. Future researches splitting the total expenditures by distinguishing current from capital expenditures under oil prices fluctuations could help countries to undertake fiscal consolidations or fiscal stimulus whenever these are required based on a targeted type of expenditures.

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Appendix of figures

Figure 1. GDP responses to government expenditures following oil prices expansion versus oil prices contraction for Bahrain, Kuwait and Saudi Arabia

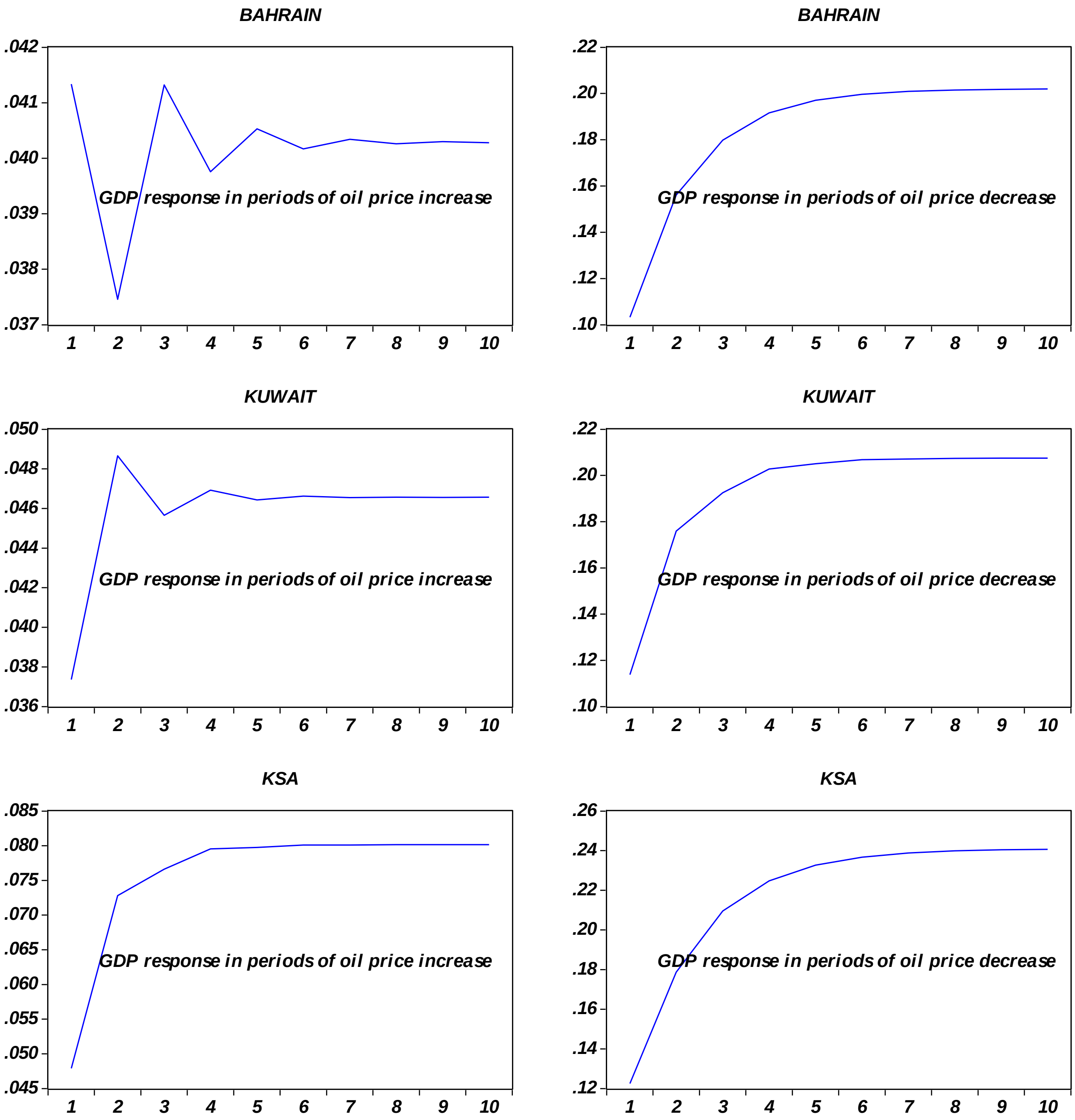

Figure 2. GDP responses to government expenditures following oil prices expansion versus oil prices contraction for Qatar, Oman and United Arab Emirates

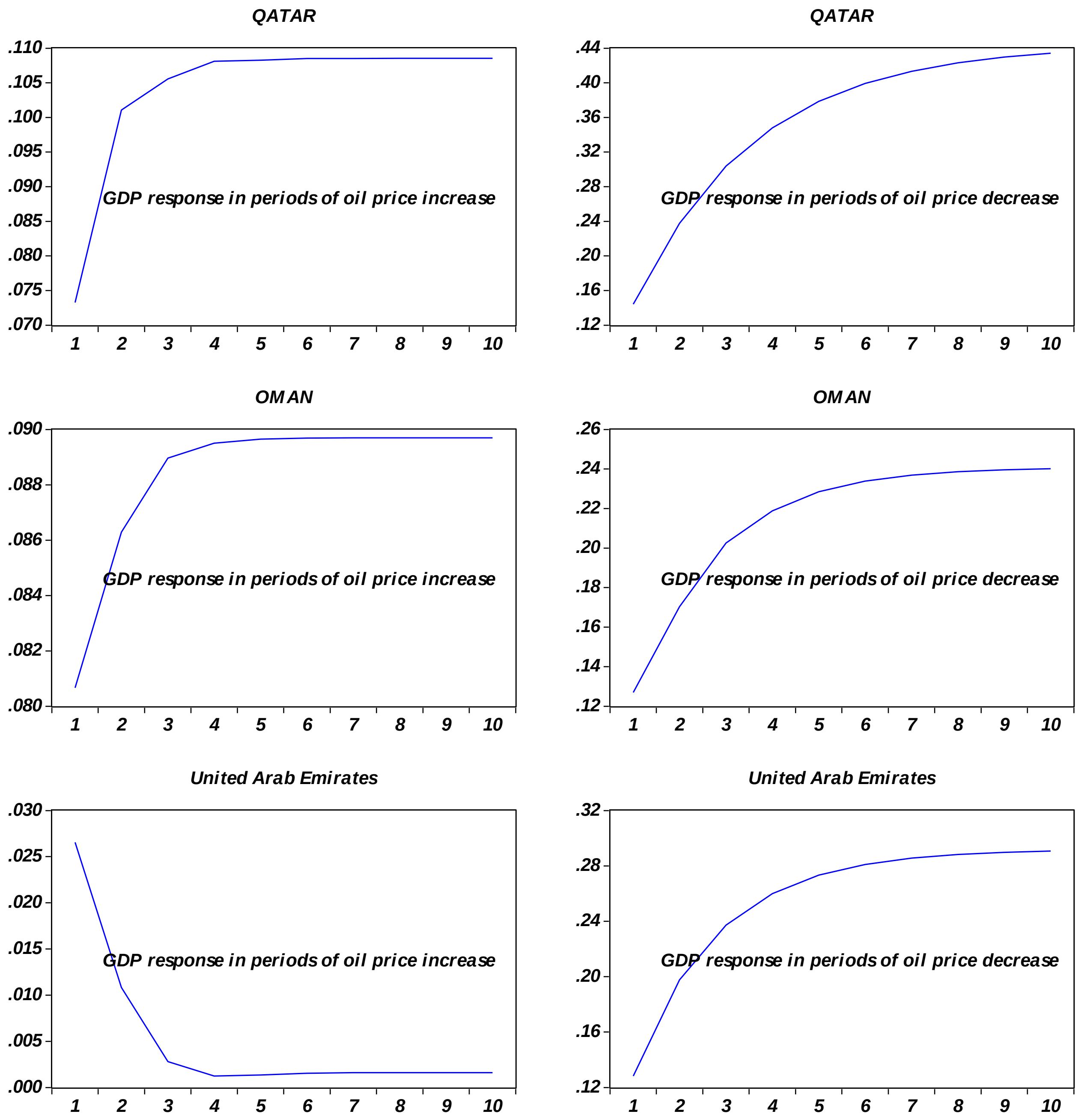

Figure 3. GDP responses to government expenditures following oil prices expansion versus oil prices contraction for Algeria, Libya and Iraq

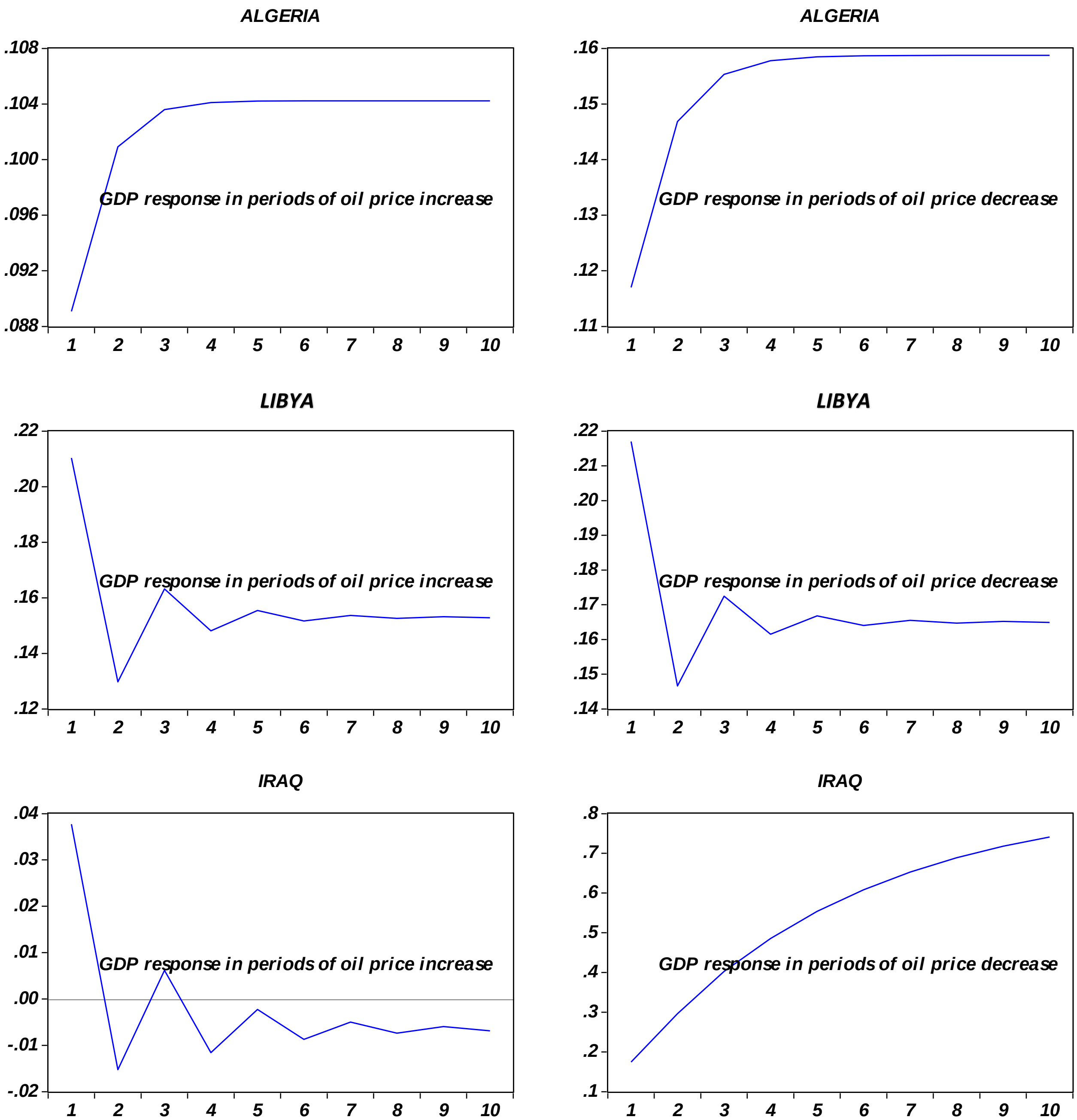

Figure 4. GDP responses to government expenditures following oil prices expansion versus oil prices contraction for Sudan, Syria and Yemen

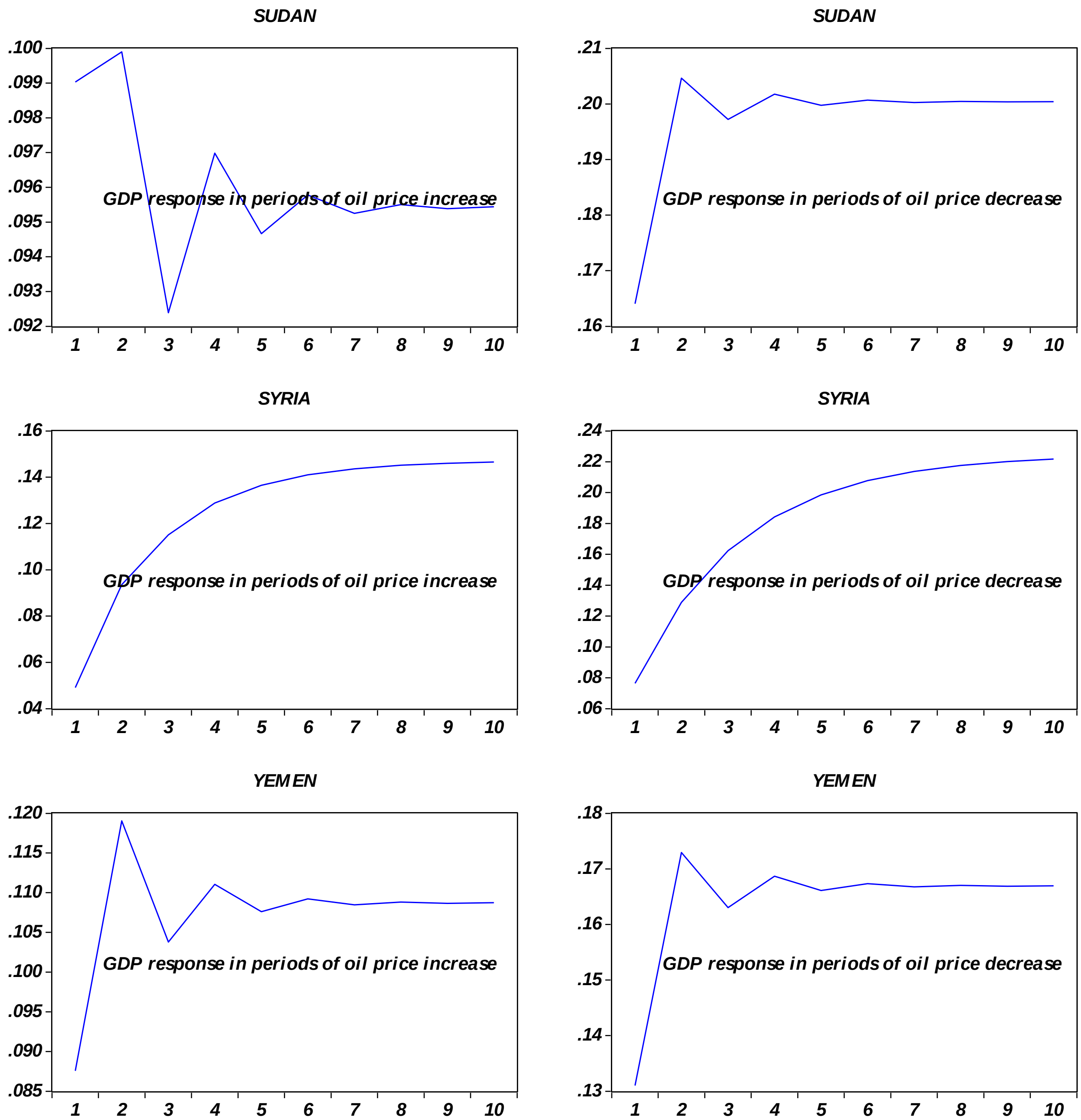

Figure 5. GDP responses to government expenditures following oil prices expansion versus oil prices contraction for Egypt, Jordan and Lebanon

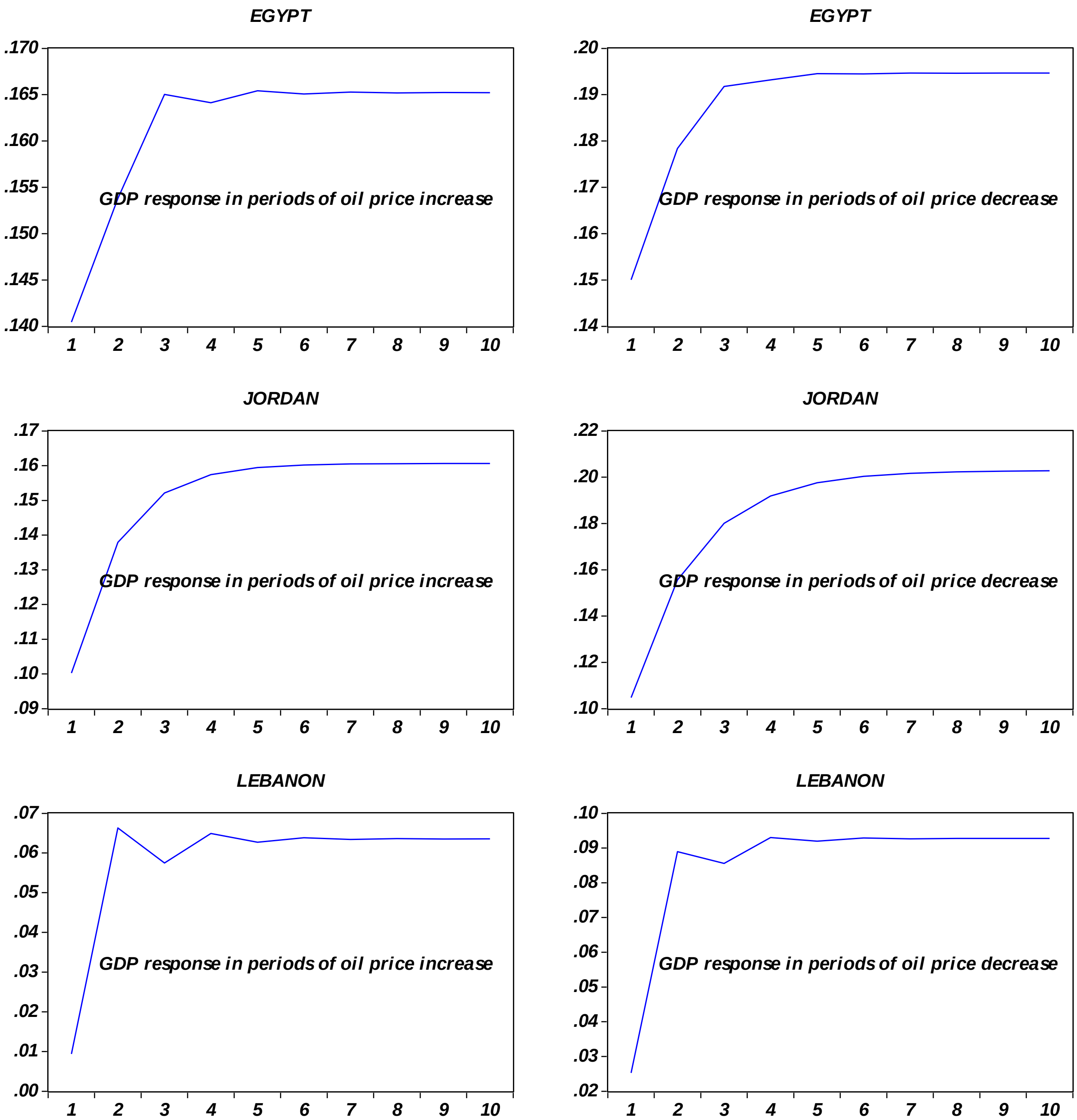

Figure 6. GDP responses to government expenditures following oil prices expansion versus oil prices contraction for Mauritania, Morocco and Tunisia

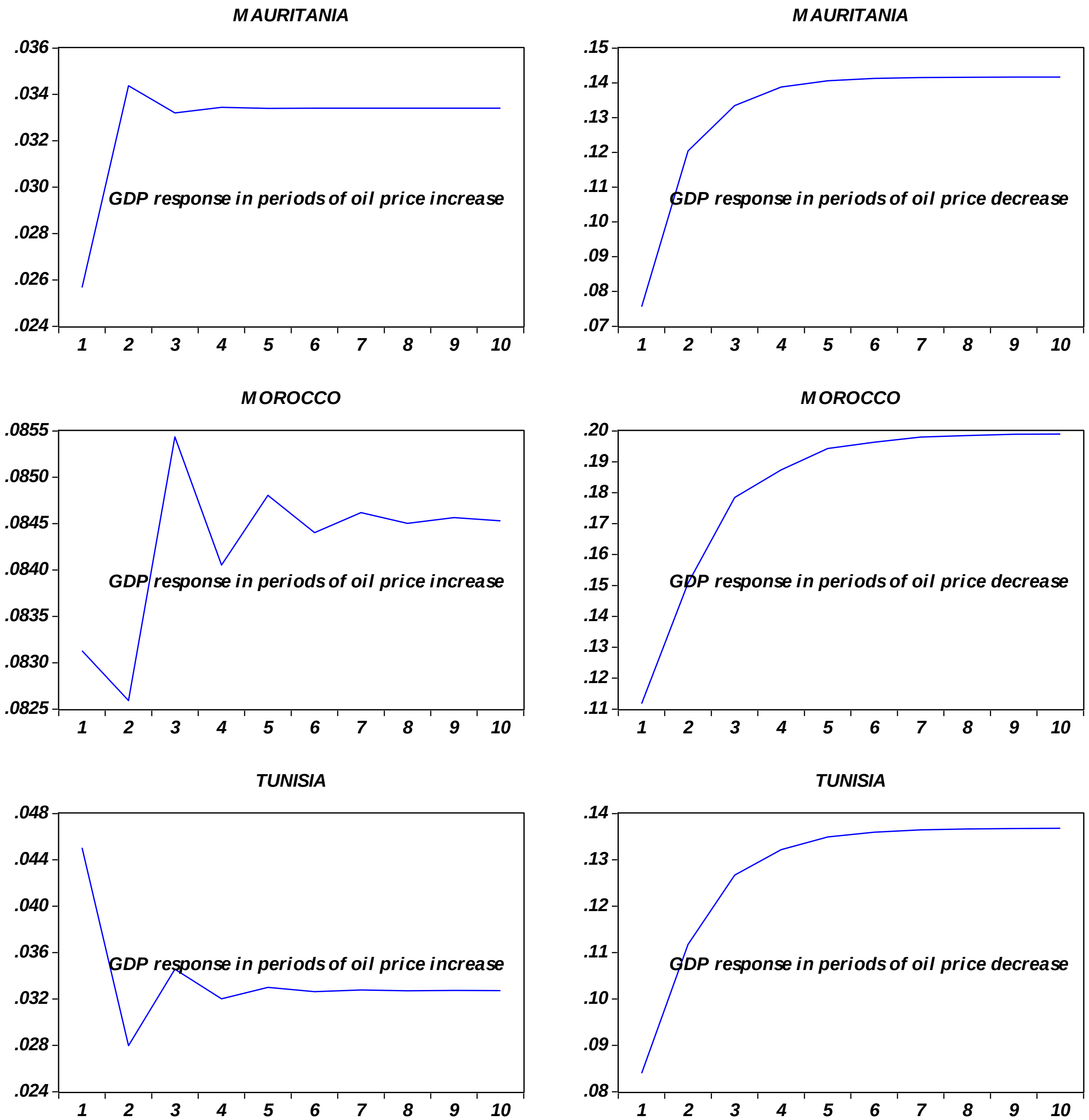

Table 2: Philipps-Peron test results

		Government expenditures				GDP			
		In levels		In 1st differences		In levels		In 1st differences	
		Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*	Adj. t-Stat	Prob.*
ALGERIA		0.7045	0.9902	-4.0005	0.0046	2.6653	1.0000	-5.4183	0.0001
Test critical level values at:	1%	-3.6702		-3.6793		-3.6702		-3.6793	
	5%	-2.9640		-2.9678		-2.9640		-2.9678	
	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Bahrain		6.1976	1.0000	-5.2119	0.0002	3.3638	1.0000	-5.1885	0.0002
Test critical level values at:	1%	-3.6702		-3.6793		-3.6702		-3.6793	
	5%	-2.9640		-2.9678		-2.9640		-2.9678	
	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Egypt		3.2856	1.0000	-2.7107	0.0844	1.6322	0.9993	-4.7786	0.0006
Test critical level values at:	1%	-3.6702		-3.6793		-3.6702		-3.6793	
	5%	-2.9640		-2.9678		-2.9640		-2.9678	
	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Iraq		1.7657	0.9982	-4.3621	0.0131	0.7198	0.9906	-4.5116	0.0013
Test critical level values at:	1%	-4.4206		-4.5826		-3.6702		-3.6793	
	5%	-3.2598		-3.3210		-2.9640		-2.9678	
	10%	-2.7711		-2.8014		-2.6210		-2.6230	
Jordan		2.3228	0.9999	-4.5865	0.0010	4.7089	1.0000	-1.7077	0.0827
Test critical level values at:	1%	-3.6702		-3.6793		-3.6702		-2.6471	
	5%	-2.9640		-2.9678		-2.9640		-1.9529	
	10%	-2.6210		-2.6230		-2.6210		-1.6100	
KSA		3.9259	0.9999	-2.7791	0.0072	6.0785	1.0000	-4.3310	0.0001
Test critical level values at:	1%	-2.6443		-2.6471		-2.6443		-2.6471	
	5%	-1.9525		-1.9529		-1.9525		-1.9529	
	10%	-1.6102		-1.6100		-1.6102		-1.6100	
Kuwait		2.1329	0.9901	-8.4939	0.0000	2.2902	0.9931	-4.3530	0.0001
Test critical level values at:	1%	-2.6534		-2.6607		-2.6534		-2.6607	
	5%	-1.9539		-1.9550		-1.9539		-1.9550	
	10%	-1.6096		-1.6091		-1.6096		-1.6091	
Lebanon		1.0762	0.9962	-5.6398	0.0001	-1.1773	0.6703	-9.0886	0.0000
Test critical level values at:	1%	-3.6892		-3.6999		-3.6793		-3.6892	
	5%	-2.9719		-2.9763		-2.9678		-2.9719	
	10%	-2.6251		-2.6274		-2.6230		-2.6251	
Libya		0.4936	0.9836	-7.9644	0.0000	-1.9927	0.2883	-9.4243	0.0000
Test critical level values at:	1%	-3.6702		-3.6793		-3.6702		-3.6793	
	5%	-2.9640		-2.9678		-2.9640		-2.9678	
	10%	-2.6210		-2.6230		-2.6210		-2.6230	

Table 2 (continued): Philipps-Peron test results

		Government expenditures				GDP			
		In levels		In 1st differences		In levels		In 1st differences	
Mauritania		2.0922	0.9998	-6.1190	0.0000	1.3896	0.9985	-5.9219	0.0000
Test critical	1%	-3.6702		-3.6793		-3.6702		-3.6793	
level values	5%	-2.9640		-2.9678		-2.9640		-2.9678	
at:	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Morocco		3.2360	1.0000	-5.0810	0.0003	0.8711	0.9936	-7.7299	0.0000
Test critical	1%	-3.6702		-3.6793		-3.6702		-3.6793	
level values	5%	-2.9640		-2.9678		-2.9640		-2.9678	
at:	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Oman		4.1056	1.0000	-3.0805	0.0393	3.3606	1.0000	-6.1112	0.0000
Test critical	1%	-3.6702		-3.6793		-3.6702		-3.6793	
level values	5%	-2.9640		-2.9678		-2.9640		-2.9678	
at:	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Qatar		9.6913	1.0000	-9.4295	0.0000	5.2829	1.0000	-4.0647	0.0039
Test critical	1%	-3.6702		-4.3240		-3.6702		-3.6793	
level values	5%	-2.9640		-3.5806		-2.9640		-2.9678	
at:	10%	-2.6210		-3.2253		-2.6210		-2.6230	
Sudan		-1.2223	0.6514	-6.5892	0.0000	1.1706	0.9972	-4.4654	0.0014
Test critical	1%	-3.6702		-3.6793		-3.6702		-3.6793	
level values	5%	-2.9640		-2.9678		-2.9640		-2.9678	
at:	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Syria		0.8687	0.9934	-4.1814	0.0147	0.8360	0.9930	-2.8637	0.0621
Test critical	1%	-3.6999		-4.3561		-3.6702		-3.6793	
level values	5%	-2.9763		-3.5950		-2.9640		-2.9678	
at:	10%	-2.6274		-3.2335		-2.6210		-2.6230	
Tunisia		0.3132	0.9751	-5.3417	0.0001	1.0270	0.9958	-4.9596	0.0004
Test critical	1%	-3.6702		-3.6793		-3.6702		-3.6793	
level values	5%	-2.9640		-2.9678		-2.9640		-2.9678	
at:	10%	-2.6210		-2.6230		-2.6210		-2.6230	
UAE		1.7249	0.9994	-3.1657	0.0327	1.7327	0.9995	-4.5703	0.0011
Test critical	1%	-3.6702		-3.6793		-3.6702		-3.6793	
level values	5%	-2.9640		-2.9678		-2.9640		-2.9678	
at:	10%	-2.6210		-2.6230		-2.6210		-2.6230	
Yemen		1.1201	0.9967	-6.3388	0.0000	0.5319	0.9851	-7.3580	0.0000
Test critical	1%	-3.6702		-3.6793		-3.6702		-3.6793	
level values	5%	-2.9640		-2.9678		-2.9640		-2.9678	
at:	10%	-2.6210		-2.6230		-2.6210		-2.6230	

Table 3: VAR Lag Order Selection Criteria

	Lag	LogL	LR	FPE	AIC	SC	HQ
Algeria	0	-89.89427	NA	3.099673	6.806983	6.902971	6.835525
	1	47.32338	243.9425*	0.000161*	-3.060991*	-2.773027*	-2.975365*
	2	51.11468	6.17841	0.000164	-3.045532	-2.565592	-2.902821
Bahrain	0	-65.53374	NA	0.51008	5.002499	5.098487	5.031042
	1	62.58416	227.7652*	5.19e-05*	-4.191419*	-3.903455*	-4.105793*
	2	65.83677	5.300554	5.53E-05	-4.136057	-3.656118	-3.993346
Egypt	0	-91.42214	NA	3.471103	6.920159	7.016147	6.948701
	1	22.7608	202.9919*	0.000992*	-1.241541*	-0.953577*	-1.155914*
	2	24.00913	2.034308	0.001225	-1.037713	-0.557773	-0.895002
Iraq	0	2.62681	NA	0.002939	-0.156703	-0.136842	-0.290653
	1	12.54804	12.40154*	0.00072	-1.637011	-1.57743	-2.038862
	2	22.59834	7.537723	0.000227*	-3.149585*	-3.050283*	-3.819337*
Jordan	0	-56.15901	NA	0.254715	4.308075	4.404063	4.336617
	1	64.29881	214.1472*	4.57e-05*	-4.318431*	-4.030467*	-4.232804*
	2	67.32287	4.92809	4.95E-05	-4.246138	-3.766199	-4.103427
KSA	0	-92.25364	NA	3.691619	6.981751	7.077739	7.010294
	1	47.93484	249.2240*	0.000154	-3.106284	-2.818320*	-3.020657*
	2	52.15571	6.878468	0.000152*	-3.122645*	-2.642706	-2.979934
Kuwait	0	-86.67338	NA	7.652898	7.710729	7.809467	7.735561
	1	17.32899	180.8737*	0.001284*	-0.985129*	-0.688913*	-0.910632*
	2	17.97272	1.007579	0.001738	-0.69328	-0.199587	-0.569117
Lebanon	0	-95.13433	NA	4.569707	7.195135	7.291123	7.223678
	1	3.220185	174.8525	0.00422	0.205912	0.493876	0.291539
	2	9.932045	10.93785*	0.003475*	0.005034*	0.484973*	0.147745*
Libya	0	-100.3334	NA	6.716467	7.580249	7.676237	7.608791
	1	-8.399984	163.4371*	0.009979	1.066666	1.354629*	1.152292*
	2	-3.78106	7.527135	0.009597*	1.020819*	1.500759	1.16353
Mauritania	0	-85.95626	NA	2.315423	6.515279	6.611267	6.543821
	1	38.46472	221.1929*	0.000310*	-2.404794*	-2.116830*	-2.319167*
	2	38.61348	0.242431	0.000415	-2.119517	-1.639578	-1.976806
Morocco	0	-81.62284	NA	1.679672	6.194285	6.290273	6.222827
	1	48.42953	231.2042*	0.000148*	-3.142928*	-2.854964*	-3.057301*
	2	50.60163	3.539728	0.000171	-3.007528	-2.527589	-2.864817
Oman	0	-72.77433	NA	0.872104	5.53884	5.634827	5.567382
	1	61.07401	237.9526*	5.81e-05*	-4.079556*	-3.791593*	-3.993930*
	2	63.6053	4.125069	6.52E-05	-3.970763	-3.490824	-3.828052
Qatar	0	-84.51029	NA	2.08024	6.408169	6.504157	6.436712
	1	43.36738	227.3381*	0.000216*	-2.767954*	-2.479990*	-2.682327*
	2	44.58036	1.976707	0.000267	-2.561508	-2.081568	-2.418797
Sudan	0	-113.7747	NA	18.17816	8.575907	8.671895	8.604449
	1	-11.07604	182.5755*	0.012167*	1.264892*	1.552855*	1.350518*
	2	-8.671907	3.917843	0.013787	1.383104	1.863044	1.525815
Syria	0	-64.82276	NA	0.898441	5.568564	5.666735	5.594608
	1	47.20444	196.0476	0.000111	-3.433703	-3.13919	-3.355568
	2	56.27346	14.35928*	7.34e-05*	-3.856121*	-3.365266*	-3.725897*
Tunisia	0	-62.43107	NA	0.405346	4.772672	4.86866	4.801214
	1	72.77138	240.3599*	2.44e-05*	-4.946028*	-4.658065*	-4.860402*
	2	73.45569	1.115171	3.14E-05	-4.700422	-4.220482	-4.557711
UAE	0	-93.48983	NA	4.045619	7.073321	7.169309	7.101863
	1	47.17319	250.0676*	0.000163*	-3.049866*	-2.761902*	-2.964239*
	2	49.17224	3.257711	0.00019	-2.901647	-2.421708	-2.758936
Yemen	0	-107.8978	NA	11.76219	8.140577	8.236565	8.169119
	1	-12.07848	170.3454*	0.013105*	1.339147*	1.627110*	1.424773*
	2	-11.14441	1.52219	0.016559	1.566253	2.046192	1.708964