Has the non-oil sector decoupled from oil sector? A case study of Gulf Cooperation Council Countries

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Abstract

As oil and gas are exhaustible resources, the need for economic diversification has gained momentum in the Gulf Cooperation Council (GCC) countries immediately after the end of the first oil boom in 1973-74. Economic diversification, in the context of GCC countries, implies development of the non-oil sector and reduction of the proportion of government revenue and export proceeds from the oil and gas sector. Applying newly developed measures of business cycle synchronicity between oil and non-oil sectors in three GCC economies (Kuwait, Qatar and Saudi Arabia), we show both the degree of diversification achieved so far and the direction of diversification in terms of individual non-oil sectors. Overall, Kuwait and Saudi Arabia appear to be moderately ahead than Qatar in reducing their dependence on oil. Nevertheless, by developing large production capacities of natural gas, Qatar has recently reduced its dependence on oil in favor of natural gas. A quantitative assessment of the determinants of business cycle synchronization is also provided.

JEL Classification: E32, E62, H30; Q32.

Keywords: Business cycle; Synchronization; Oil price; Fiscal policy; GCC countries.

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1 Introduction

The symptoms of a typical oil-dependent economy are well known. High volatility and unpredictability of oil prices can significantly impact major components of national income accounting. Output, investment, government spending and exports all move in tandem with the oil price, thereby making the economy highly vulnerable to oil price volatility. The six countries of the Gulf Cooperation Council (GCC) – Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE) – are a typical case of such symptoms of an oil-dependent economy. Between 1970 and 1980 when oil prices rose sharply over an extended period, the GCC economies recorded impressive growth. However, once oil prices collapsed during most part of late 1980s and in 1990s, the overall GCC economies suffered terribly.[1] As oil prices started to increase gradually at the beginning of this decade, the GCC economic story changed once again. Strong positive real growth, fiscal and current account surpluses (along with higher inflation) became the economic stigma of the GCC states.[2] See Table 1 for some stylized facts about the GCC economies.

Table 1: The role of oil in GCC countries' government revenues, exports and GDP: 1980 and 2007 (percent)

	Government revenues		Exports		GDP	
	1980	2007	1980	2007	1980	2007
Bahrain	77.0	80.0	33.6	79.2	28.0	24.6
Kuwait	82.0	93.1	90.0	94.4	59.7	53.2
Oman	86.0	76.4	92.4	75.8	59.3	45.1
Qatar	94.0	60.0	95.0	80.8	64.0	56.4
Saudi Arabia	91.2	82.5	99.9	88.0	65.8	50.9
UAE	96.0	77.0	94.0	38.5	57.0	11.1

Source: ESCWA (2001); national authorities. UAE figures are preliminary.

Indeed, such volatility in economic activity such as government spending is costly for the overall economy, and efforts to smooth-out economic swings became a dominant policy agenda of the GCC economies.[3] Since oil and gas are exhaustible resources, the incentive to smooth-out economic cycles by means of *economic diversification* began soon after the first oil boom (1973-74).[4] Economic diversification, in the context of the GCC economies, simply means the

[1] See ESCWA (2001) for an accounting of economic performance of GCC economies from 1970-1999.

[2] See Sturm et al. (2008) for an overview of recent economic performance in GCC countries.

[3] See Barnett and Ossowski (2002) and the references therein for an assessment on the macroeconomic costs of fiscal volatility in oil-producing countries.

[4] See ESCWA (2001), Fasano and Iqbal (2003), Malaeb (2006) and Sturm et al. (2008) on economic diversification in the GCC countries.

development of the non-oil sectors and the reduction of the proportion of government revenue and export proceeds from oil and gas sector. As the oil and gas sector offers limited employment opportunities given that it is very capital intensive, the need for diversification is especially pressing in GCC countries due to their high population growth and a rising a pool of young unemployed workers.[5] Until recently, public sector has been absorbing a large part of unemployed nationals in every GCC states. For instance, in Kuwait over 90% of nationals are employed in the public sector. However, there is a limit to job creation in the public sector, let alone its sustainability. Therefore, the development of the non-oil sector was considered vital not only for easing labor market pressure but also for reducing the exposure of economic development to volatile international oil market (Sturm et al., 2008).[6]

The objective of this paper is to empirically analyze the degree of diversification achieved so far among the six Gulf countries. The question of economic diversification in the context of GCC countries, that is the decoupling of non-oil sector from the oil sector,[7] is tantamount of asking the question whether emerging markets have decoupled from the advance economies.[8] That is, one can utilize the cross-country approach that is used to analyze global business cycles convergence or divergence to answer a local question: "has the non-oil sector decoupled from the oil sector in an oil-dependent economy?" Taking GCC countries as a case study, in this paper we provide a quantitative answer to the above question.[9] In this paper, the degree of decoupling is used as an indicator of economic diversification achieved in the GCC countries. In doing so, we have analyzed the degree of business cycle synchronicity between the oil sector and the non-oil sectors in the GCC economies. Defining business cycles as output gaps, we measure cycle synchronicity using the recently proposed nonparametric method of Mink, Jacobs and de Haan (2007).

Several interesting results emerge from the analysis. Overall, the non-oil sectors in Kuwait and Saudi Arabia appears to be moderately ahead than Qatar in reducing their dependency

[5] Almost one third of the overall GCC population is below the age of 15. Save for Kuwait and Qatar, unemployment among nationals is comparatively high in Bahrain (17 percent), Oman (16 percent) and Saudi Arabia (14 percent). In the UAE, unemployment among university graduates is as high as 60 percent! See, among others, Shochat (2008) for a recent account on the labor market condition in GCC countries.

[6] Nevertheless, the pressure to diversify varied across GCC countries in line with the differences in energy reserves. Bahrain has advanced itself as the most diversified economy in GCC as oil and gas reserves (at current production levels) are projected to run out during the next two decades. See Sturm and Siegfried (2005) for an analysis of projected depletion of hydrocarbon reserves in GCC countries.

[7] Unless stated otherwise, by oil sector we imply the hydrocarbon (oil and gas) sector. In this paper, we use "oil and gas" and "oil" interchangeably.

[8] Some recent studies analyzing the decoupling between advanced and emerging countries are Mink et al. (2007), Kose et al. (2008) and Wälti (2009).

[9] Due to data limitation, only Kuwait, Qatar and Saudi Arabia are considered in the analysis.

on oil sectors. However, aggressive and large expansion of Qatar's natural gas production has helped the country to reduce its dependence on oil in support of natural gas, which in turn partially shield the economy from unfavorable fluctuations in international oil prices. At the sectoral level, while Qatar's manufacturing sector shows some meaningful decoupling from the oil sector, the rest of non-oil sectors remain heavily dependent on oil cycle. In Saudi Arabia the financial service sector stands as least dependent on oil, while its manufacturing sector continues to depend on oil. By comparison, investment income from Kuwait's large foreign assets has helped the country to avoid slowdown in key non-oil sectors during times of weaker oil prices. Finally, fiscal stance variable and oil price significantly explain the business cycle synchronization between oil and non-oil sectors in Saudi Arabia, whereas results are less supportive for Kuwait and Qatar.

The rest of the paper is organized as follows. Section 2 discusses the determinants of business cycle synchronization in the context of GCC countries. Section 3 describes the estimation methodology and data. Section 4 presents the main empirical results. A quantitative assessment of the determinants of business cycle synchronization is offered in Section 5. Section 6 concludes the paper.

2 Determinants of Business Cycle Synchronization

Unlike cross-country studies, where external shocks such as trade and financial integration play a large role in business cycle synchronization across countries, the within-country determinants of business cycle synchronization are quite the opposite. In this section, we review some possible channels through which shocks can transmit from oil to non-oil sectors in typical oil dependent economies.

2.1 Government Spending

Public spending is the lifeblood of non-oil sector in the GCC countries. Although GCC economies are heavily dominated by oil and gas, there is no direct link between the oil and non-oil sectors. As oil and gas industries are primarily publicly owned[10] and revenues from their extraction accrue to the government, the non-oil sector receives its share of oil revenue mainly through fiscal budgets. Thus, upon receiving the oil revenue, government has a choice

[10]The gross share of the government oil company in crude oil production in 2006 was estimated at 100% in Qatar, 97% in Saudi Arabia and 90% in Kuwait (Sturm et al., 2008).

between saving the oil revenue in order to accumulate financial assets and/or invest in domestic physical assets (in the form of capital expenditure). History shows that GCC authorities have fulfilled both purposes. Like other oil exporting countries, GCC authorities have set up oil stabilization and savings funds, often referred to as the sovereign wealth funds (SWFs),[11] with the aim of, apart from investment return motive, making fiscal policy less volatile and less procyclical by de-linking public spending from oil revenues. On the other hand, investment in physical and social infrastructure (e.g., education, health) is generally regarded as being conducive to diversifying the economy away from hydrocarbons, developing the non-oil sector and also creating a basis for generating tax revenues (Sturm et al., 2009).

In the (almost) absence of taxation, oil revenue serves as the pivotal element of fiscal policy in GCC countries. However, given the volatility and unpredictability of oil prices,[12] public authorities' in GCC countries have very little control over the level of oil revenues. The volatility of oil prices, and hence government revenues, tends to contribute to a procyclical pattern of government expenditure, and to abrupt changes in government spending, which in turn affect the growth prospects of the non-oil sector. Historically, procyclicality has been a feature of fiscal policy in much of the oil-exporting countries. Studying the fiscal policies in 19 oil-exporting countries over the period 1965-2005, Sturm et al. (2009) find support of procyclical conduct of fiscal policy, including a more pronounced response during 1985-2005 sub-period.

There is little disagreement among economists that, as a rule, fiscal policy should not be procyclical. However, in the context of GCC countries, procyclical fiscal policies are sometimes warranted for several reasons. First, there is a distribution-related concern in which citizens and private businesses may think that it is fair to benefit from windfall oil revenue in the form of higher public spending. Indeed, there is a spending pressure on government during good times that may lead to higher subsidies, more public sector employment, higher public wages etc., while local businesses benefit from lucrative government contracts.[13] Since this kind of implicit social contract between nationals and government ensured that everybody gained from the newly acquired fortunes, higher public spending receive broad popular support.[14]

[11] Kuwait's fund, perhaps the oldest in the world, created in 1953, while the Abu Dhabi's fund, created in 1976, is believed to be the largest in the world (Beck and Fidora, 2008).

[12] According to Cashin, Liang and McDermott (1999), there is a one-in-three change of a monthly oil price change greater than 8 percent. The average annual oil price change during 1970-2005 was 27 percent.

[13] For example, in Kuwait over 90% of nationals are employed in the public sector. A recent distribution related expenditure in GCC countries is the widespread public sector wage increase, which in part was granted in response to rising inflation. See Sturm et al. (2008) on recent wage developments in GCC countries.

[14] Even if there is limited public pressure for higher spending, the incentives for fiscal prudence are low since budgetary competition increases in good times, spending grows more than proportionally relative to the increase

Second, demand for higher public spending may also arise due to development-related spending needs such as spending on infrastructure, education and health. Unlike, distribution-driven expenditure, these areas are generally considered vital to economic development, private investment, and in particular, economic diversification. Indeed, part of oil proceeds has been used to modernize infrastructure and improve social indicators. During 1980-2000, the six GCC states had increased literacy rates by 20 percentage points to over 80%, added almost 10 years of average life expectancy to about 74 years and created a world-class infrastructure by spending a total of $2 trillion.[15] While such efforts should be given their dues, in practice it might be difficult to disentangle these expenditures from primary distribution-related considerations.[16]

Third, limited borrowing access to international financial markets during economic downturns provides another important explanation as to why discretionary policy is not countercyclical during recessions. After the collapse of oil price in early 1980s, the level of Saudi Arabia's public deficit was second only to that of the United States. As a result, Saudi Arabia was forced to postpone its March 1986 budget for the fiscal year 1986-87 (Ramazani, pp. 103-04, 1988). Similar financial retrenchment was also evident in other GCC countries. Kuwait's 1986-87 budget projected a real deficit, first time in its modern history, although Kuwait's substantial reserves were believed to be sufficient to absorb the deficit quite easily. Whereas lacking the cushioning effects of financial reserves, Qatar underwent a persistent fiscal deficits over 1986-1999 period (barring 1990). Although a deeper examination of the causes of budget deficits in GCC countries is an interesting topic for further research, but nevertheless we dare to speculate that restricted borrowing ability in bad times may have been a factor behind fiscal consolidation in downturns.

Another explanation of procyclicality stems from the presumption that it is often difficult for policymakers to accurately gauge the stage of the cycle (Balassone and Kumar, 2007). Proper assessment of the output gap and the economy's momentum can be problematic due to the difficulties in estimating the underlying or potential growth of the economy. Moreover, there may be substantial lags in the availability of data. Therefore, even if the government has the means to engage in countercyclical policy in the sense of delineating, ex ante, the turning points in the non-oil sector, it may ends up not doing so because of an unreliable assessment of the

in revenue (Lane and Tornell, 1999).

[15] Fasano and Iqbal (2003) and David (2009).

[16] For example, as argued by Sturm et al. (2009), calls for higher salaries for teachers may be well justified to increase the quality of education, but it also includes a distribution component. Likewise, political pressures may lead to stimulative infrastructure development regardless of the economic environment.

economic cycle. Finally, pressure for increased public spending may stem from international community in the context of the debate on global imbalances. For example, the IMF explicitly acknowledges GCC's fiscal role in removing the bottlenecks in global economic activities. According to Dominique Strauss-Kahn, IMF's Managing Director: "The GCC countries are playing an important stabilizing role in the global oil and financial markets. Large investment projects aim to expand oil production and refining capacity, and strong import growth supports the international efforts to reduce global imbalances."[17]

In sum, due to the strong fiscal dominance in GCC countries, fiscal policy tends to be the main channel for propagating external shocks associated with oil price fluctuations into the non-oil economy. In Section 5, we empirically examine the role of fiscal stance in explaining the cycle synchronization between oil and non-oil sectors.

2.2 Oil Prices

Generally speaking, changes in oil prices may not have any independent impact on the non-oil sector. Oil revenue is unlikely to influence non-oil output growth unless it is channeled through government's fiscal instruments. Indeed, in a panel regression of 10 oil-producing countries, Husain et al. (2008) find that oil prices do not independently influence the underlying non-oil output. Nevertheless, as argued above, rising oil prices may put political pressure on government's fiscal stance in that the public (or interest groups) may demand their share of windfall revenues in the form of higher public spending. In addition, (favorable) change in oil price can operate via expectations and the overall business sentiment in the non-oil sector. Thus, the impact of oil price on non-oil economic cycle may emerge from its effect on fiscal policy. To allow for this possibility, we therefore use an interaction term between oil price and government spending when analyzing the determinants of cycle synchronization.

3 Estimation Methodology

We use output gap as a measure of business cycle, which looks at the deviation of economic activity from a trend. Several filtering methods are available that can be used to decompose an economic activity such as output into trend and cycle. Perhaps the most widely used technique is the Hodrick and Prescott (1997) filter, a nonparametric filter that estimates the

[17]IMF Press Release No. 08/210, September 17, 2008. http://www.imf.org/external/np/sec/pr/2008/pr08210.htm

trend component by minimizing deviations from trend, subject to a predetermined smoothness of the resulting trend.[18] Once the output gap is estimated, the next step is to determine to what extent these cycles move together. Recently, Mink et al. (2007) propose a nonparametric measure of cycle synchronicity that has several advantages over the conventional output gap correlation measure.[19] For example, whereas the output gap correlation yields averages over a time interval, the Mink et al. (2007) measure can be calculated on a per-observation basis, which is extremely valuable in understanding the direction of business cycle synchronization. Moreover, this new measure is easy to interpret and can be applied bilaterally (between two sectors) or multilaterally (between a group of sectors). The idea behind the synchronicity measure is to determine to what extent an individual cycle moves together with respect to a *reference* cycle. Unlike cross-country analysis where the choice of a reference cycle is not straightforward,[20] in the present application the choice is clear: the oil cycle is chosen as the reference cycle.

Denoting the reference output gap for a country by $g_r(t)$, the synchronicity between an individual sector i and the reference cycle in period t, as proposed by Mink et al. (2007), is given by:

$$\varphi_{ir}(t) = \frac{g_i(t)g_r(t)}{|g_i(t)g_r(t)|}, \tag{1}$$

where $g_i(t)$ stands for the output gap of sector i in period t (see Table 2 for a list of economic sectors considered in the analysis). We use the Hodrick-Prescott filter to extract the time-varying trend from the original data. Following the suggestion of Ravn and Uhlig (2002) we use a penalty parameter of 6.25 for annual data. All output gaps are expressed as the difference between actual GDP and trend GDP, divided by the trend GDP.

[18] Scott (2000) and De Haan et al. (2008) show that different alternatives to measure output gap do not lead to significant divergences in results. Applying a battery of statistics (including the Hodrick-Prescott filter) to measure the oil and non-oil output gaps across the six GCC countries, Osman et al. (2008) find that estimates of the output gaps variables obtained from different methodologies are not only broadly consistent, they also show strong comovement with each other.

[19] With the conventional correlation measure, it is not clear whether to consider correlations in log levels or correlations in rates of growth. For example, the correlation between the log levels of Saudi Arabia's oil and manufacturing sector is 0.48 over the period 1968-2008, whereas the correlation between their growth rates is 0.03. Moreover, correlation coefficients mix two characteristics of the business cycle: synchronicity and amplitude. See Figure 1 in Mink et al. (2007) for a visual illustration of this point.

[20] For instance, studies that examine synchronization of business cycle in the euro area often face difficulty in choosing a "European business cycle": should it coincide either with the cycle of a leading European economy, or the cycle of a weighted average of several European economies, or the cycle of a common factor. Recognizing this difficulty, Camacho et al. (2006) consider a pairwise comparison of cycles, while Mink et al. (2007) set the reference cycle as the median of all observed output gaps.

When $g_i(t)$ and $g_r(t)$ in equation (1) have the same sign, the synchronicity equals 1 while it equals -1 when their signs are opposite; $\varphi_{ir}(t)$ lies between -1 and 1. In this context, decoupling (or diversification) is easily defined. Thus, when the synchronicity measure converges to -1, that is when both output gaps do not coincide at all, sector i is said to be decoupled from the reference (oil) sector. Likewise, sector i is said to be dependent on the reference sector when the synchronicity measure approaches to 1. When transformed to a uniform [0,1] scale, the synchronicity measure indicates the fraction of times sector i's output gaps has the same sign as the reference cycle in period t.

Finally, a multivariate version of equation (1) which can be used to examine the synchronicity of business cycles between the reference cycle and a group of n sectors in period t, is also available from Mink et al. (2007):

$$\varphi(t) = \frac{1}{N} \sum_{i=1}^{N} \frac{g_i(t) g_r(t)}{|g_i(t) g_r(t)|}, \tag{2}$$

where N is the number of non-oil sectors within a country. Since the aggregate non-oil sector is defined as the sum of individual non-oil sector i, equation (2) is used to examine the synchronicity of business cycle between the oil (reference) and aggregate non-oil sector.

3.1 Data

Data on gross domestic product by sectors at constant prices and fiscal variables for each country in our sample are taken from the respective national sources. These data series are available at the annual frequency and sample size varies for each country. The dataset comprises three GCC countries: Kuwait (1978-2007), Qatar (1980-2006) and Saudi Arabia (1968-2008); long-span data for the remaining three GCC countries could not be obtained. Kuwait's data are extracted from various issues of the *Quarterly Statistical Bulletin* published by the Central Bank of Kuwait. Much of Qatar's data are retrieved from the *Annual Statistical Abstract* CDROM 1981-2005 published by the Planning Council; the remaining data were updated from Government's official websites. The data for Saudi Arabia come from Saudi Arabian Monetary Agency (SAMA) website. In fact, the entire macroeconomic data for Saudi Arabia come as a Statistical Appendix of SAMA's forty-fifth annual report. Finally, the oil price (discussed in section 5) is taken from Federal Reserve Bank of St. Louis's FRED economic database. The oil price is the West Texas Intermediate (WTI) spot price traded on the NYMEX.

4 Empirical Results

Figures 1 to 3 present the synchronicity between individual countries non-oil business cycle and oil (reference) cycle. As the synchronicity measure fluctuates over time, following Wälti (2009) we also report the corresponding long-run trend extracted using the Hodrick-Prescott filter. In addition, where applicable, the Figures are marked with important events such as first oil crisis (1973-74), second oil crisis (1979-81), the Gulf war (1990-91) and the recent oil price shock (2005-2008); during all these episodes oil prices significantly increased. The overall impression is indeed that synchronicity is highly volatile and differs across countries. The long-run trend of synchronicity measure for Kuwait indicates that non-oil sector's dependence on the oil sector has steadily increased over time, suggesting decreasing economic diversification. By comparison, after increasing until mid-1980, the long-run trend of synchronicity for Qatar had been declining, albeit at a very slow pace. Although it would be hasty to consider this as an evidence of meaningful economic diversification, it is nevertheless interesting to speculate. Finally for Saudi Arabia, the long-run synchronicity trend increased modestly until mid-1990 and declined thereafter. The reported non-oil synchronicity as shown in Figures 1–3 become easier to interpret when we transform them to a uniform [0,1] scale. For example, the value for synchronicity in non-oil sectors in Qatar indicates that on average $100\% \times (0.0639 + 1)/2 = 53\%$ of times the non-oil sector had an output gap with the same sign as the output gap of the oil sector.[21] The comparable figures for Kuwait and Saudi Arabia, respectively, are 45% and 46%. Therefore, if decoupling is defined as to how many times the reference and individual output gaps coincide with each other (or have the same sign or not), the non-oil sector in both Kuwait and Saudi Arabia exhibit almost similar extent of diversification from the oil sector. Whereas, Qatar's non-oil sector shows a slightly higher degree of dependence on the oil-sector relative to Kuwait and Saudi Arabia.[22]

Nevertheless, these results should be interpreted with caution. Unlike Kuwait and Saudi Arabia, where oil production remains the significant contributing part of their hydrocarbon production, recently in Qatar the share of natural gas contribution to hydrocarbon output has

[21] The value 0.0639 is the average value of the synchronicity measure, as defined in equation (1), of all non-oil sectors in Qatar.

[22] It is not very surprising to notice the slight difference in results as reported by the long-run trend and the time average of synchronicity measures. This is likely due to the end-of-sample uncertainty in the estimation of trends and gaps. Trends (and gaps) require both past and future data, that is why it is much difficult to estimate their values at the beginning of the sample (where there is no past data) and at the end of the sample (where there is no future data) – see Watson (2007) for further discussion.

exceeded than that of crude oil. The Qatari authorities have invested heavily in natural gas projects over successive years, and it holds the world's third largest natural gas reserves after Russia and Iran. Qatar is currently the world's largest exporter of liquefied natural gas (LNG).[23] Whilst the switch from oil to gas has not eliminated Qatar's dependency on commodity exports, however compared to spot prices of oil, natural gas prices tend to be less volatile, and generally gas exports are arranged on the basis of long-term sales and purchase agreement.[24] Indeed, the significant boost in gas production has helped Qatar to avoid the current global economic crisis and registered strong overall and non-oil GDP growth during 2008-2009 (IMF, 2009). Thus, Qatar is well positioned to survive turbulent economic times than other GCC countries.

It is also useful to look at synchronicity at the sectoral level to gauge the direction of non-oil diversification in term of its components. Figures 4 to 6 show the year-by-year binary synchronicity indicator respectively for Kuwait, Qatar and Saudi Arabia. As above, the concordance measures are presented along with their long-run trends. Roughly, the agriculture and manufacturing sectors can be classified as a tradable sector, while the rest of the sectors can be treated as a nontradable (or service) sector.

The GCC countries do not have a suitable climatic conditions for agriculture. Scarcity of natural water supply, limited arable land and the harsh climatic conditions severely constrain the development of agriculture to become a viable sector. Moreover, the agricultural sector depends almost entirely on imported labor. With these constraints and the cost of heavy subsidies of the factors of production (e.g. cost of desalination of water), some efforts have been made, particularly in Oman and Saudi Arabia, to exploit their limited agricultural potential. For example, the contribution of the agricultural sector (including fishery and forestry) to nominal GDP has nearly doubled in Saudi Arabia, but remained insignificant in Kuwait and Qatar. Figure 4 shows that the synchronization between Kuwait's agriculture and oil output gaps has increased over the years, reflecting a very high degree of oil dependency. Qatar's agriculture dependence on the oil sector has primarily been cyclical. Particularly in the previous ten years (1997-2006), only in three occasions has Qatar's agriculture output gap coincided with the oil output gap. Two of these occurrences took place during 2004–2006, which partly explain the recent rise in the long-run trend of agriculture output. Nevertheless, the lack of coincidence of outputs gaps in the recent decade does not necessarily mean that Qatar's agriculture has

[23] See IIF (2008) for related discussion.

[24] See QNB (2009, p. 18) for a list of Qatar's contracted LNG exports.

achieved some degree of independence, rather it reflects the limited agricultural potential due to the harsh climatic conditions. The rise and fall in Saudi Arabia's agricultural synchronicity with the oil cycle is perhaps consistent with the Kingdom's uneconomical wheat bonanza of the 1980s which made the country a wheat net exporter. However, the cost of rising subsidy and above all the relatively high amount of water requirement had compelled the Kingdom to lower its wheat production that resulted in the overall reduction of its agriculture production starting 1995. Since then the total agriculture production in Saudi Arabia has largely remained stagnant at the 1995 level.

Food security is as much important for GCC countries as it is for economically poorer countries. Rapid food price escalation in 2007 and the first part of 2008 has brought back the issue of food security to the center stage of GCC policymaking. High volatility in global food prices and a combination of domestic factors (such as rapidly rising local population and increasing cost of domestic agricultural production) have prompted GCC government and private investors to move ahead with investments in agriculture overseas–notably in Africa and Central Asia–to ensure future food security.[25]

Given the region's abundant supplies of natural gas and hydrocarbon by-products, the development of heavy manufacturing industry in the GCC countries has primarily concentrated on petrochemicals, chemical fertilizers, steel and aluminium. Qatar was an early pioneer of the establishment of capital- and energy-intensive heavy industries in the GCC region, followed by Saudi Arabia, UAE and Kuwait (ESCWA, 2001). Aggressive investment and large capacity addition to the various petrochemical plants have made Saudi Arabia one of the largest producers of petrochemicals in the world (SABIC, 2005). Industrial development in the GCC also benefitted from a fairly well diversified base of medium- and small-scale manufacturing industries, which are developed with the aim of substituting imports in domestic markets as well as other Arab export markets.[26] Overall, the development of heavy industry provided a major boost to the total value of output and exports of the GCC countries outside the oil sector. For example, from 1980 to 2005, the gross value-added at 1990 constant prices in the manufacturing industry increased 84 percent in Kuwait, 265 percent in Qatar and 292 percent in Saudi Arabia. The GCC group average value-added rose from US$ 9.50 billion in 1980 to US$40 billion in 2005,

[25]See Woertz et al. (2008) for an assessment of the potential of GCC agricultural investment in countries of Africa and Central Asia. Recently, Qatar has launched a national food security program to ensure long-term food security in the country.

[26]These industries include cement, building materials and equipment, heavy and light metal products, electrical products, textiles, clothing and accessories, food, furniture, household items and a wide variety of other products.

in real terms.[27] As a result, the contribution of the manufacturing sector to GDP, exports, and employment increased in all GCC member countries. Nevertheless, like oil, petrochemical products – which account for nearly half of the total value of manufacturing output in Kuwait, Qatar and Saudi Arabia – face routine upswings and downswings in world demand and prices. Furthermore, higher European Union tariffs on GCC's exports of aluminium and petrochemical products have been preventing the GCC manufacturing export sector to access the European market (Chirullo and Guerrieri, 2002).

During the 1990s, Kuwait's manufacturing sector heavily depended on the oil sector, which may be due to the Gulf war. Whilst in recent years the synchronization measure appears to have fallen (see Figure 4), the reality is that since the start of 2000s Kuwait's oil output has picked up much rapidly than its manufacturing output. As a result, the contribution of the manufacturing sector to its overall GDP has fallen to the 1980s level.[28] Thus the decline in Kuwait's long-run trend of synchronicity is a statistical artifact and does not correspond to actual diversification. In contrast, Qatar's seems to have advanced in manufacturing by reducing its dependence on the oil sector (see Figure 5). The long-run trend of synchronicity is clearly declining, which is also supported by a rise in the manufacturing contribution to non-oil GDP. Despite the unprecedented rise in Qatar's oil output since 2000, the post-2000 manufacturing contribution to overall GDP remained broadly similar to the pre-2000 level. Among the three GCC countries, Saudi Arabia has developed itself as the region's backbone in manufacturing. In the recent decade, the manufacturing contribution to the overall GDP has remained constant at around 10%, while its share to the non-oil GDP has steadily risen. Nevertheless, much of Saudi's comparative advantage in manufacturing lies in the hydrocarbon sector, as is evident from the frequent coincidence of positive output gaps (see Figure 6).

Turning to the remaining non-oil sectors, GCC's nontradable service sector is dominated by financial service, tourism and construction activities. Development in one sector is likely to influence activities in other sectors. For example, development in financial and construction sectors can spur activities in the tourism sectors in terms of greater volume of visitors from neighboring countries involving transactions in financial assets (e.g. offshore banking) or physical assets (e.g. real estate purchase). Over the years, both Bahrain and the UAE have

[27]Source: author's calculations based on United Nations Statistical Division (UNSD) Database, National accounts estimates of main aggregates (http://data.un.org/).

[28]Kuwait's manufacturing sector contribution to non-oil GDP has also declined since 2000, albeit by a lesser magnitude.

transformed themselves into financial and tourism hubs, whereas despite being a late starter, Qatar is rapidly leapfrogging into tourism and finance. Despite being an early pioneer in the establishment of stock exchange in 1977 (much earlier than other official exchanges in the GCC), Kuwait's financial sector has not emerged as a preferred or dominant financial center to compete with Bahrain or the UAE. Nevertheless, Kuwait has a relatively developed derivative market and an active local bond market, but tourism is almost nonexistent in Kuwait. By comparison, Saudi Arabia is a special case with millions of visitors annually visit the Kingdom for the purpose of *Hajj* or *Umrah*, a gathering of religious pilgrimage. The Kingdom has lately begun to promote finance with the planned establishment of the King Abdullah Financial District.

In the interests of brevity, we present the average of the synchronization measure by sector for each country in Table 2. These values indicate the fraction of time the oil and non-oil sectors' output gaps have the same signs (both positive or both negative). Higher values signal greater dependence on oil, and vice versa. The numbers speak for themselves. Saudi's financial sector is the least dependent on oil, which is a reflection of the Kingdom's comprehensive banking services in terms of greater competition and lower concentration than Kuwait and Qatar.[29] The financial sector in Kuwait and Qatar remains dependent on oil during the recent oil boom, while the dependence was relatively lower in Saudi Arabia.

The estimates of synchronicity for Qatar's construction sector appear to be imprecise particularly in the recent years. Figure 5 shows that between 2000 and 2005 Qatar's construction output decoupled from the oil cycle, when in fact budgetary allocation for capital expenditures during these periods persistently increased on the back of rising oil export revenues.[30] The evidence for Kuwait and Saudi Arabia is roughly comparable and is supported by the time average statistic reported in Table 2. On the other hand, the real estate (an associated sector of construction) is highly reliant on oil in Kuwait than Saudi Arabia. The single most important factor that makes the Saudi real estate market different from other markets is the lack of home ownership. This is partly because of sizeable financial and legal barriers to home ownership in Saudi Arabia, with home ownership currently estimated at only 30% of the population. Kuwait by contrast spends more than twice as much on subsidies and transfers as Saudi Arabia and other GCC countries to support basic amenities such as health care, education and housing to its nationals. For example, in the post Iraqi invasion years, the Kuwaiti government bailed

[29] See Salem-Ghanem et al. (2002) and Al-Muharrami et al. (2006) for further discussion.

[30] Capital expenditure on goods and services includes spending on infrastructure, communications and others.

out all consumer and housing loans of Kuwaiti national outstanding at the time of the invasion (Fennell, 1997). These features are clearly evident in Figure 4.

Table 2: Time average of synchronicity measure between oil and non-oil sectors (percent)

Economic sectors	Kuwait (1978-2007)	Qatar (1980-2006)	Saudi Arabia (1968-2008)
Agriculture, forestry & fishing	53	37	49
Manufacturing	50	48	63
Finance & insurance	47	63	22
Real estate	63	–	41
Construction	43	41	44
Wholesale, retail trading & hotels	37	56	39
Transport & communication	47	59	51
Government services	–	59	49
Social & personal services	43	63	27
Non-oil GDP	45	53	46

Note: Values indicate the fraction of time oil and non-oil sectors have coinciding output gaps (both positive or both negative). Thus a higher (lower) value signals higher (lower) dependence on the oil sector. The non-oil GDP is defined as the sum of all above listed sectors plus utilities (electricity, gas & water) less imputed bank service charge. '–' indicates not available.

In other areas (trading, transportation, government and social services), Qatar relies more heavily on oil than both Kuwait and Saudi Arabia – see Table 2. The case of Kuwait, however, is quite compelling. During the period 1985-1993 the social service sector seems completely decoupled from the oil sector (save for the Iraqi invasion period of August 1990 to February 1991). Oil price remained low during the entire period 1985-1993. In response, the Kuwaiti government pursued more conservative fiscal policies by restraining high development spending budgeted in earlier years. As a result, Kuwait was able to continue increasing its holding of official assets despite the weaker oil prices (Fennell, 1997). Indeed, investment income from Kuwait's huge foreign assets amounted to 86 percent of oil export receipts in 1989, while budget surplus was close to 30 percent of GDP in the same year (El-Erian, 1997). These developments had helped the government to finance its generous subsidy and transfer programs for nationals amidst the unfavorable international oil prices.

5 Can Cycle Synchronicity be Explained?

The preceding analysis shows that some sectors are more cyclically synchronized with the oil sector than others. However, as economists, we might want to understand what is behind those

synchronization. Are there any economic variables that can help to explain the synchronization of the cycles? In Section 2 we discussed potential factors such as government spending and change in oil prices that might explain the synchronization. Our goal in this section is to provide an empirical assessment of these potential factors in explaining the cycle synchronization across sectors within a country.

Recall the synchronicity measure, $\varphi_{ir}(t)$, which can easily be turned into a binary variable such that:

$$\varphi_{ir}(t) = \begin{cases} 1 & \text{when individual and reference output gaps have the same sign,} \\ 0 & \text{when their signs are opposite.} \end{cases}$$

The binary nature of $\varphi_{ir}(t)$ naturally suggests a panel logit (or probit) specification which relates the binary dependent variable to a set of explanatory variables:

$$Pr\{\varphi_{ir}(t) = 1 | x_{ir}(t), \beta, \alpha_i) = \Lambda(\alpha_i + x'_{ir}(t)\beta\}, \tag{3}$$

where $i = 1, ..., N$ and N is the number of non-oil economic sectors in a country; $t = 1, ...T$ is the time dimension; α_i are random individual-specific effects, $\Lambda(\cdot)$ is the cumulative distribution of the standard normal distribution and the matrix $x_{ir}(t)$ contains explanatory variables in a given year t. For estimation purpose, we rewrite (3) as follows:

$$\varphi_{ir}(t) = \ln\left(\frac{Pr_i}{1 - Pr_i}\right) = \alpha_i + \beta_1 G_t + \beta_2 \Delta O_t + \beta_3 (G_t \times \Delta O_t), \tag{4}$$

where G_t is government spending and ΔO_t represents the change in oil price. Notice that, both G_t and O_t are the same across all cross-section units i. Hence, G_t and O_t can be interpreted as observed common factors for all cross-section units. In constructing the interaction terms, as recommended by Wooldridge (2002, pp. 194-96), we de-mean both G_t and ΔO_t.

Before presenting the empirical results, it is important to determine which fiscal indicator(s) to use as proxy for the government's fiscal stance. With oil revenue accounting for over three-quarters of total government revenue in GCC countries (see Table 1), conventional fiscal indicators such as overall and primary balances are not sufficient to make a full assessment of the short-term fiscal stance or longer-term fiscal sustainability (see Barnett and Ossowski (2002) and Medas and Zakharova (2009)). This is because, when oil prices are rising, for example, an

oil-producing country may be running higher overall surpluses in spite of increasing expenditure financed by higher oil revenues. Therefore, an assessment of the underlying fiscal policy stance on the basis of the overall balance could be misleading. For this reason, other indicators such as non-oil balance are needed to guide fiscal policy in oil-producing countries.

We consider two alternative non-oil fiscal indicators to measure government fiscal stances in GCC countries. Our first non-oil fiscal indicator is the ratio of non-oil primary balance (NOPB) to non-oil GDP, which is considered as a key element in gauging the direction of fiscal policy in oil-producing countries. Following Barnett and Ossowski (2002), the non-oil primary balance is calculated by subtracting the non-oil revenue from total government expenditure. Thus an increase in the non-oil primary balance would indicate an expansionary fiscal policy affected either by higher expenditure or a reduction in non-oil revenue collection. Likewise a reduction in the non-oil primary deficit would signal fiscal consolidation (see Medas and Zakharova, 2009).

Our second indicator uses a broader definition, fiscal impulse, which is traditionally used to gauge the changing impact of the budget on the economy.[31] The fiscal impulse thus focuses whether budgets are moving towards expansion or contraction, rather than analyzing the actual effects of the budget. The first step in calculating the fiscal impulse is to measure the cyclically-adjusted non-oil balance (CANOB), which excludes the effect of automatic stabilizers and other nondiscretionary factors on the non-oil balance, and therefore allows to reveal the portion of the fiscal balance that is directly affected by discretionary fiscal policies (Medas and Zakharova, 2009). Following Husain et al. (2008), CANOB is calculated as:

$$CANOB_t = r_t - g_t \times \frac{Y_t^{NO}}{Y_t^{*,NO}},$$

where r_t is the non-oil revenue to non-oil GDP ratio in period t, g_t is the primary expenditure to non-oil GDP ratio in period t, and $Y^{NO}/Y^{*,NO}$ is real non-oil output divided by potential (trend) output in period t. The potential non-output was obtained by applying the Hodrick-Prescott filter. The fiscal impulse I_t is then defined as:

$$I_t = -\Delta CANOB_t,$$

where a positive (negative) value of I_t indicates an expansionary (contractionary) fiscal policy. Figure 7 shows the behavior of fiscal policy, as measured by the fiscal impulse from non-oil

[31] For a comprehensive review of fiscal impulse analysis, see Heller et al. (1986) and Chand (1992).

output, in the GCC countries. Over the 1981-2006 period, a common time period for all three countries, the mean fiscal impulse measure indicates a fiscal contraction in Qatar and Saudi Arabia and a fiscal expansion in Kuwait. For example, the average size of the fiscal contraction during this period is 3.63 percent of non-oil GDP in Qatar and 0.30 percent of non-oil GDP in Saudi Arabia, while the average size of fiscal expansion is 5.20 percent of non-oil GDP in Kuwait during the same time.

Table 3: Determinants of business cycle synchronization: Panel logit estimation

	Kuwait	Qatar	Saudi Arabia
$NOPB_t$	-0.491	0.195	0.851
	(0.344)	(0.669)	(0.790)
ΔOil_t	0.022	0.008	0.053**
	(0.023)	(0.024)	(0.023)
$NOPB_t \times \Delta Oil_t$	-0.024	-0.094	0.367**
	(0.068)	(0.159)	(0.169)
I_t	-0.129	-0.185	1.933**
	(0.468)	(1.185)	(0.913)
ΔOil_t	0.018	0.006	-0.485e-03
	(0.022)	(0.020)	(0.009)
$I_t \times \Delta Oil_t$	-0.042	0.101	0.555**
	(0.048)	(0.231)	(0.263)
i	8	8	9
N	232	208	351
Sample	1979-2007	1981-2006	1970-2008

Notes: Bootstrap standard errors are in parentheses. The reported standard errors are based on 1000 bootstrap replications. $NOPB_t$, I_t and Oil_t refer to non-oil primary balance, fiscal impulse and oil price, respectively. i is number of cross-section units (economic sectors) and N is number of sample observations. ** denotes statistical significance at the 5% level.

Equation 4 is estimated using the panel logit technique. Due to the small sample size, the regression standard errors are computed using 1000 bootstrap replications. Standard errors are clustered at the sector level to account for heteroskedasticity and serial correlation of error (Peterson, 2009); however this procedure does not permit dependence across cross-section or clusters of observations.

The top panel in Table 3 shows the estimation results when the fiscal stance is measured by the non-oil primary balance to non-oil GDP ratio, NOPB_t. For Qatar and Saudi Arabia, the synchronization indicator between the oil and the non-oil sectors is partly explained by expansionary fiscal policy, while for Kuwait the negative coefficient for NOPB_t signals fiscal consolidation. However, these effects are far from being statistically significant. Changes in

oil price, either directly or via the interaction term do not significantly explain the cycle synchronization for Kuwait and Qatar. In contrast, changes in oil prices appear to significantly explain the business cycle synchronization indicator in Saudi Arabia both directly and through the interaction with fiscal variable. These positive and statistically significant coefficients signal a stronger distribution -and development-related considerations stemming from oil revenue particularly when oil prices are high and rising.

By comparison, when the government's fiscal stance is measured by the fiscal impulse, the results appear to be quite different – see the lower panel in Table 3. For Saudi Arabia, a tighter fiscal policy is associated with a larger synchronization, the coefficient is significant at the 5% level. Whereas, fiscal impulse does not exert any significant impact on the synchronization indicator in Kuwait and Qatar. Although oil prices do not wield any independent impact, changes in oil prices through with fiscal impulse significantly affect the synchronization indicator in Saudi Arabia. By contrast, the results are less supportive for Kuwait and Qatar.

In summary, the two non-oil fiscal indicators do not provide enough favorable evidence in explaining the cycle synchronicity between the oil and non-oil sector. One possible explanation for the lack of empirical support could be due to neglected cross-section dependence which is known to create size distortions. The regression specification may also suffer from misspecification in terms of omitted variables not included in the model. Another possible explanation is the intended use of the indicator. How meaningful are these indicators in assessing the synchronicity? Or is it the purpose of these indicators to assess the sustainability and/or the distortionary effects of adjustments of a budget stance? These issues are well worth future research to investigate further.

6 Conclusions

For many years the six GCC countries have been pursuing economic diversification in order to reduce their dependence on hydrocarbon (oil and gas) exports. Given the inherent volatility in oil receipts and the exhaustibility of the oil reserve, substantial government expenditure has been directed toward the expansion of the non-oil sectors, such as agriculture, heavy industries and services (mainly banking and tourism), as well as rebuilding the GCC's physical and social infrastructure. These expenditure programs have lifted the level of economic development and living standards enormously in past decades. Nevertheless, the GCC countries continue to rely

quite heavily on oil largely because diversification policies were often not complemented with required reform in private, financial and labor markets.

This paper provides a quantitative assessment of the economic diversification achieved so far in the three GCC countries, namely Kuwait, Qatar and Saudi Arabia. We show both the degree of diversification achieved so far and the direction of diversification in terms of individual non-oil sectors. Overall, Kuwait and Saudi Arabia appear to be moderately ahead in comparison with Qatar in reducing their dependence on oil. Notwithstanding, by developing large production capacities of natural gas, Qatar has recently reduced its dependence on oil in favor of natural gas. We also conducted an empirical assessment of the determinants of business cycle synchronization between oil and non-oil sector. We find that the fiscal stance and oil price variables significantly explain the business cycle synchronization between the oil and the non-oil sectors in Saudi Arabia. The results, however, are less supportive for Kuwait and Qatar.

Over the longer horizon, GCC's efforts to meaningful economic diversification are likely to be challenged from several fronts. First, similarities in the development of non-oil sectors may lead to excess supply and therefore underutilization of productive resources. Second, GCC's passion for large investments in real estate and construction sectors may contribute little to diversifying the productive base of the economy or upgrading labor skills. Likewise, promoting higher education is unlikely to provide the required skills unless there is adequate reform in primary and secondary education. Finally, full diversification many be politically costly. Diversification may gradually lead to a societal power base outside the control of ruling political elites, that may challenge state incumbents particularly during times of economic downturns (Dunning, 2005).

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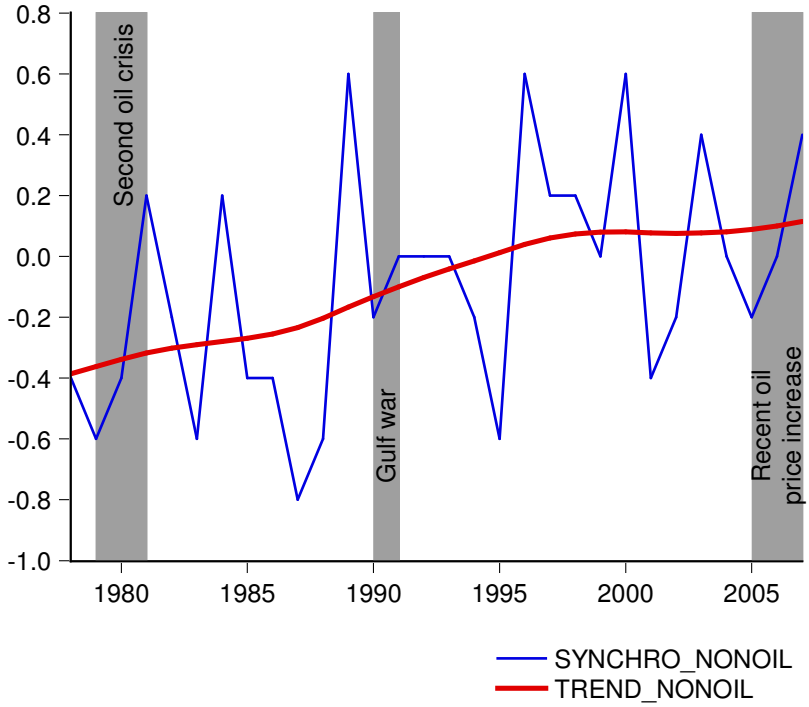
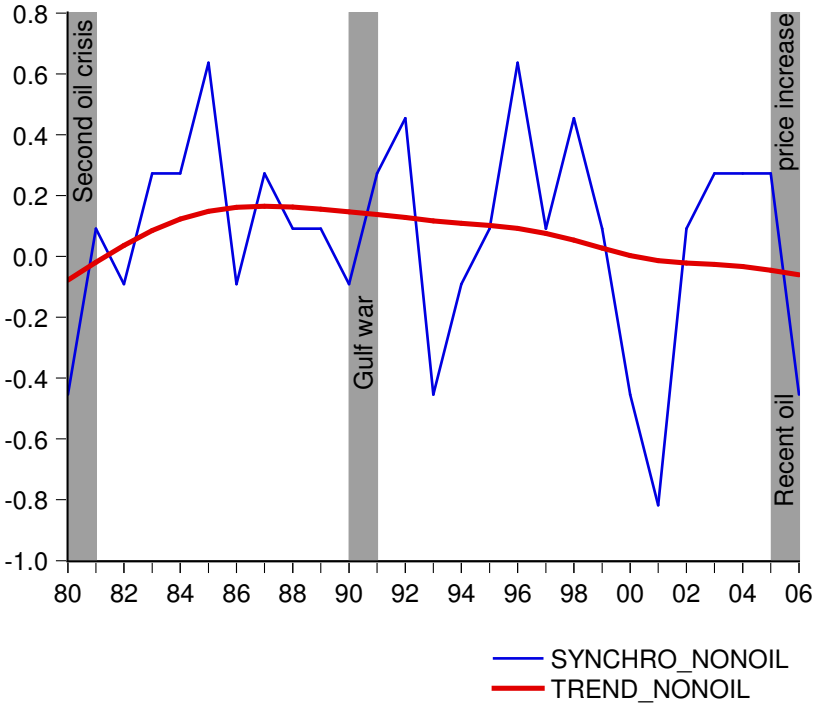
Figure 1: Synchronicity of Kuwait's non-oil GDP vis-à-vis its oil GDP



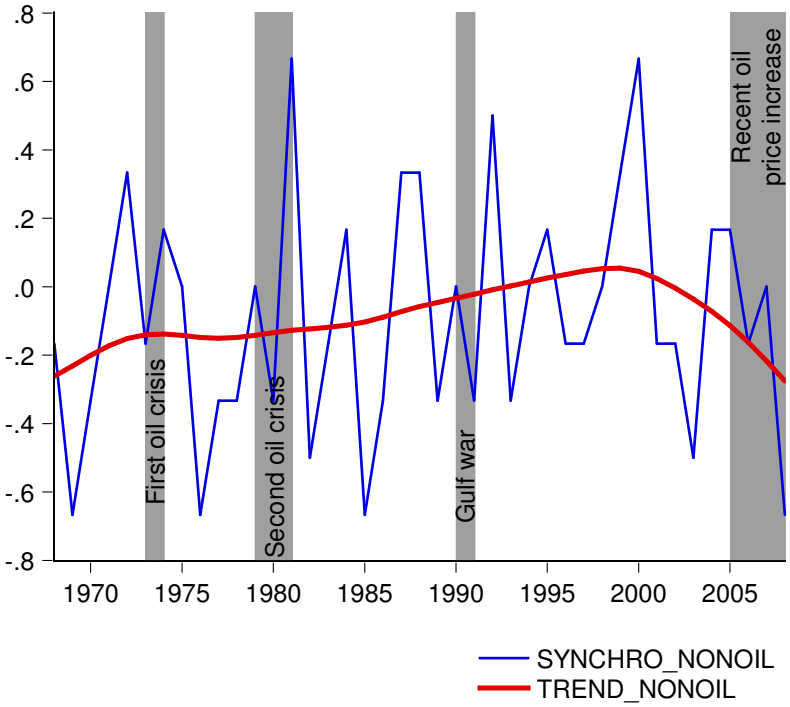
Note: Time period is 1978-2007. The synchronicity is calculated using equation (2) in the text; it lies between -1 and +1. Trend denotes the long-run trend of the synchronicity measure extracted using the Hodrick-Prescott filter. The non-oil GDP is defined as the sum of all sectoral GDP listed in Table 1 plus utilities (electricity, gas, & water) and import duty and less imputed bank service charge.

Figure 2: Synchronicity of Qatar's non-oil GDP vis-à-vis its oil GDP



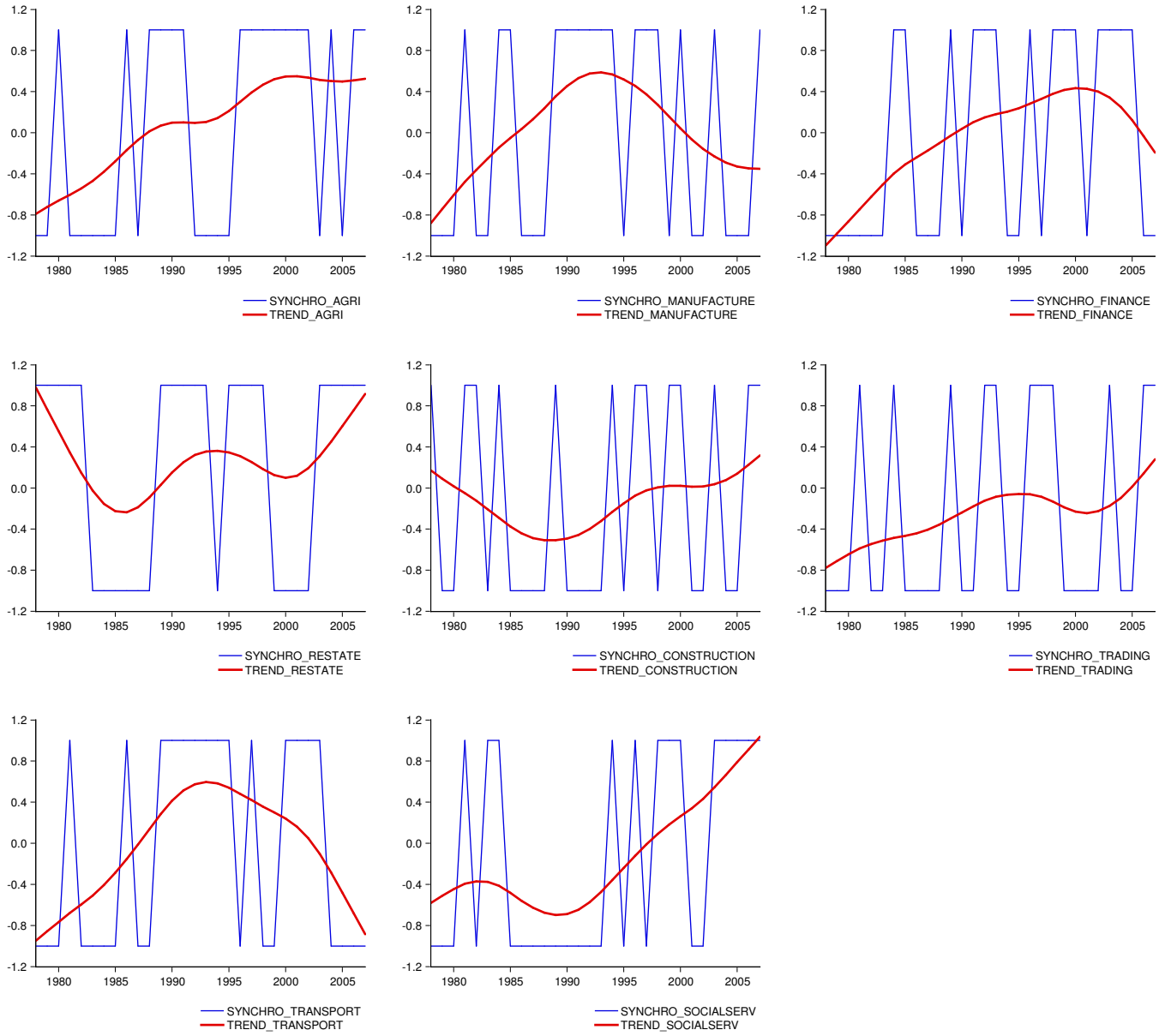
Note: Time period is 1980-2006. The synchronicity is calculated using equation (2) in the text; it lies between -1 and +1. Trend denotes the long-run trend of the synchronicity measure extracted using the Hodrick-Prescott filter. The non-oil GDP is defined as the sum of all sectoral GDP listed in Table 1 plus utilities (electricity, gas, & water) and import duty and less imputed bank service charge.

Figure 3: Synchronicity of Saudi Arabia's non-oil GDP vis-à-vis its oil GDP



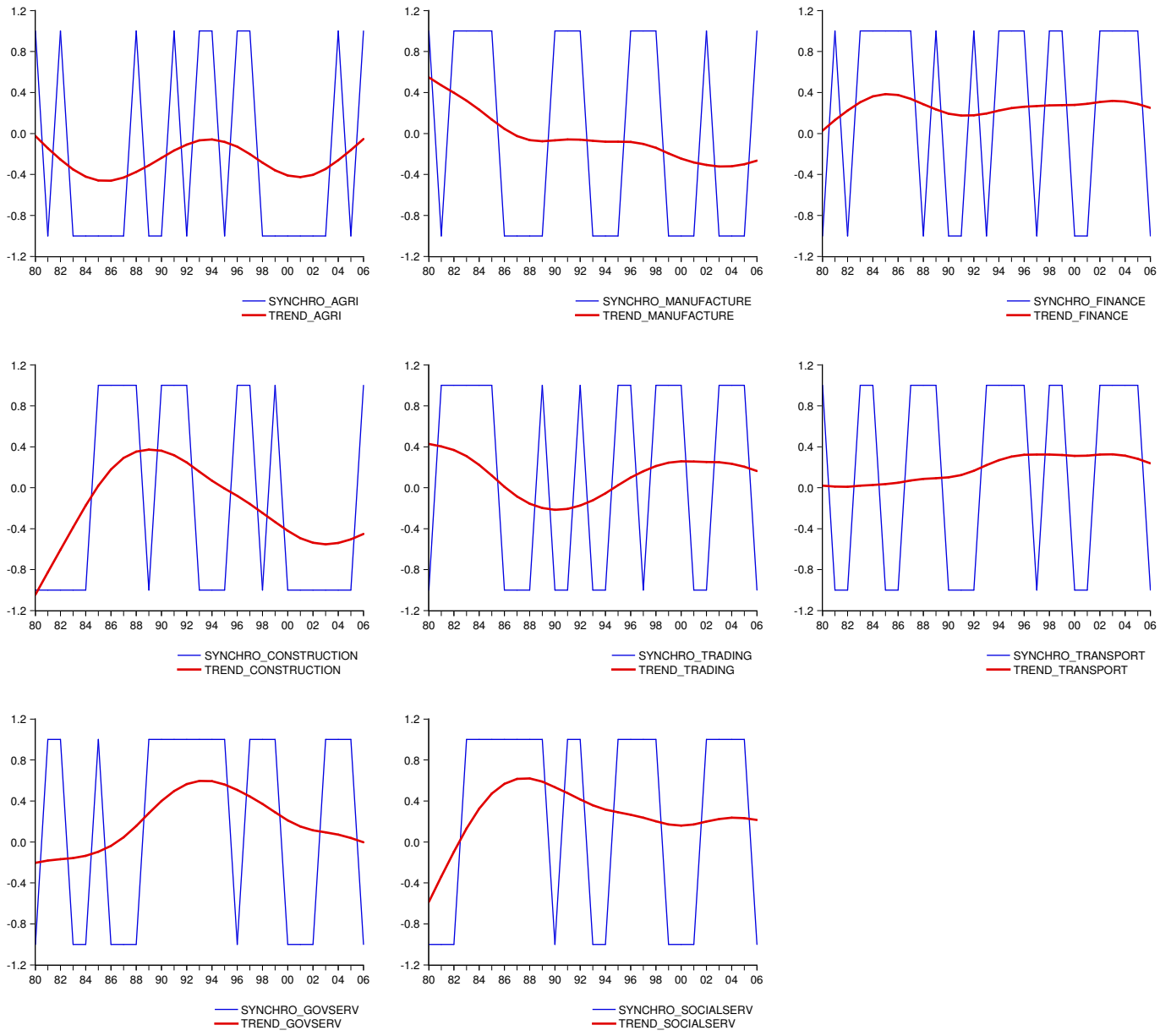
Note: Time period is 1968-2008. The synchronicity is calculated using equation (2) in the text; it lies between -1 and +1. Trend denotes the long-run trend of the synchronicity measure extracted using the Hodrick-Prescott filter. The non-oil GDP is defined as the sum of all sectoral GDP listed in Table 1 plus utilities (electricity, gas, & water) and import duty and less imputed bank service charge.

Figure 4: Synchronicity by sector: Kuwait



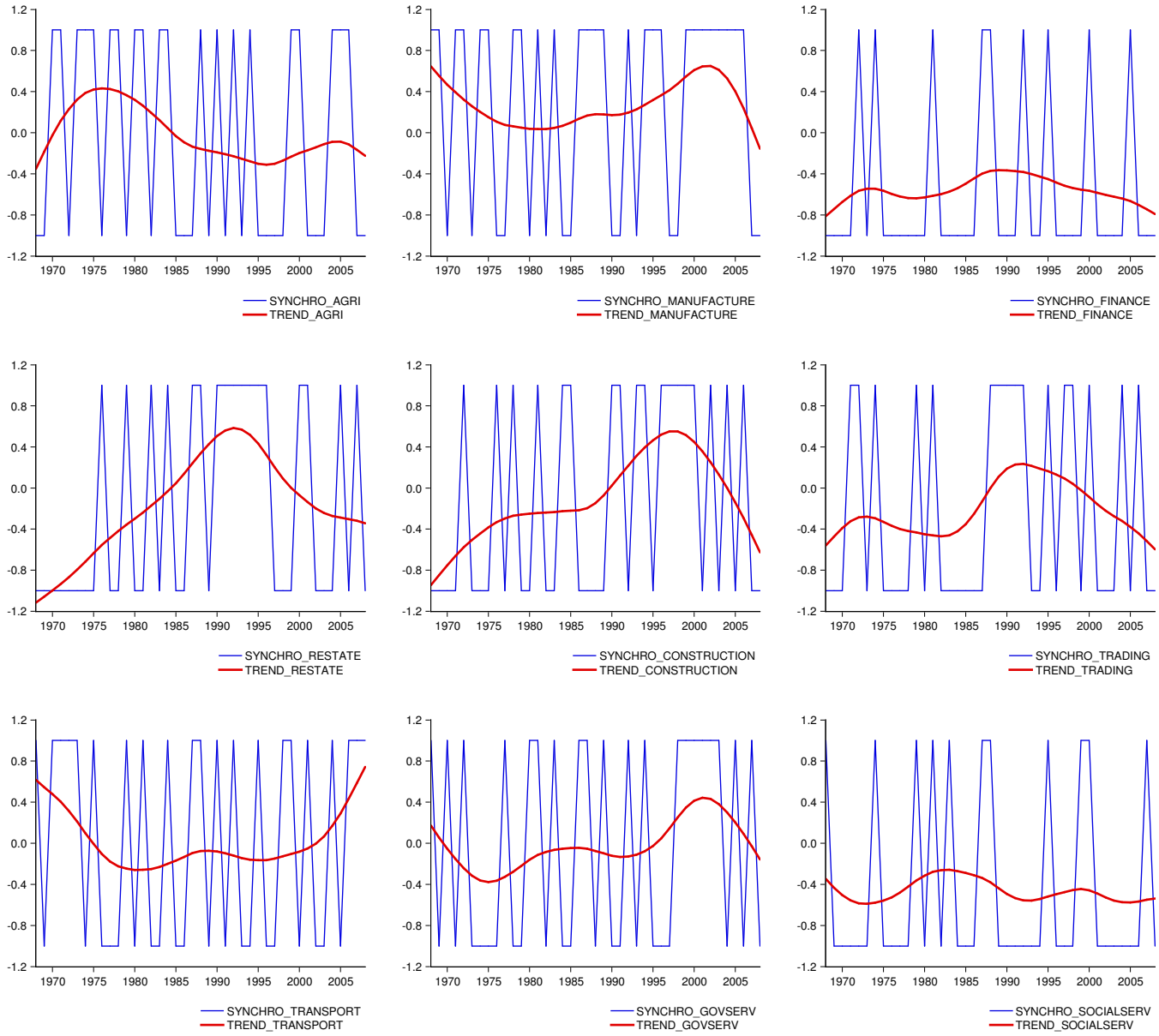
Note: Time period is 1978-2007. The synchronicity is calculated using equation (1) in the text; it lies between -1 and +1. Trend denotes the long-run trend of the synchronicity measure extracted using the Hodrick-Prescott filter. See Table 1 for the list of economic sectors.

Figure 5: Synchronicity by sector: Qatar



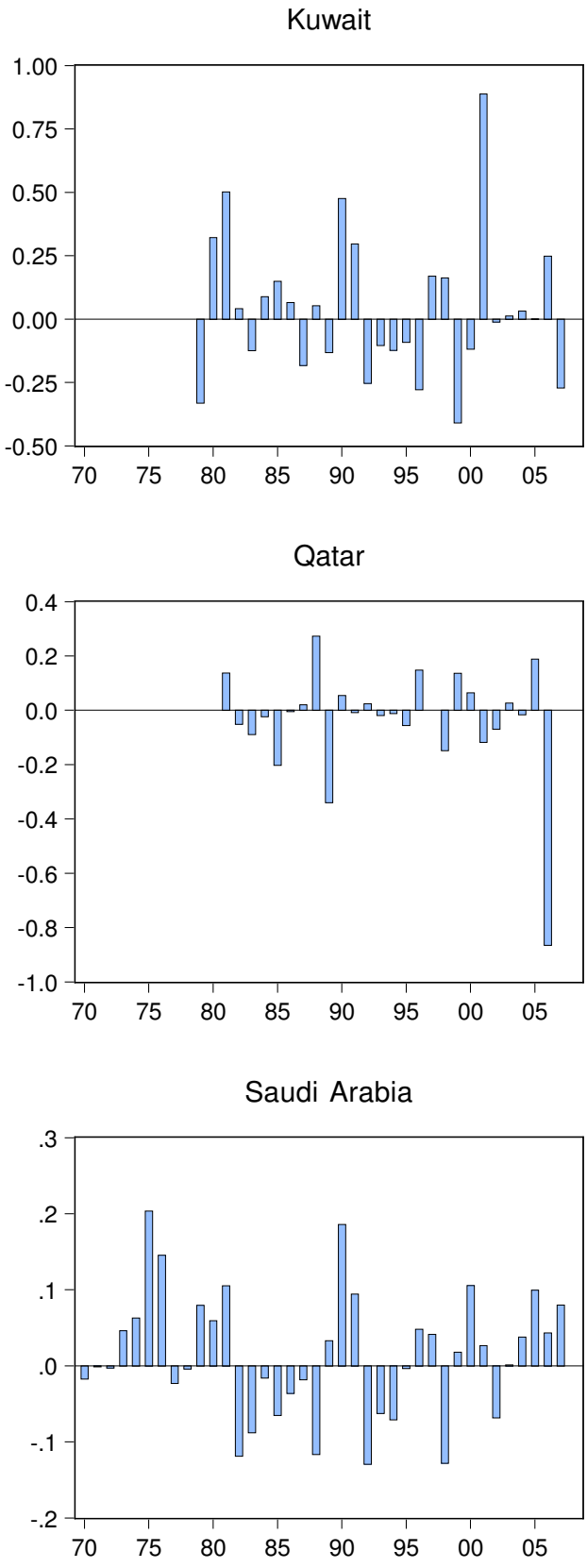
Note: Time period is 1980-2006. The synchronicity is calculated using equation (1) in the text; it lies between -1 and +1. Trend denotes the long-run trend of the synchronicity measure extracted using the Hodrick-Prescott filter. See Table 1 for the list of economic sectors.

Figure 6: Synchronicity by sector: Saudi Arabia



Note: Time period is 1968-2008. The synchronicity is calculated using equation (1) in the text; it lies between -1 and +1. Trend denotes the long-run trend of the synchronicity measure extracted using the Hodrick-Prescott filter. See Table 1 for the list of economic sectors.

Figure 7: Structural fiscal impulse in GCC countries



Note: A positive (negative) value of impulse indicates an expansionary (contractionary) fiscal policy. Time period: 1979-2007 (Kuwait); 1981-2006 (Qatar); 1970-2008 (Saudi Arabia).