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Oil Exports, Non-Oil GDP, and Investment in the GCC Countries

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Abstract

This paper studies the long-run and short-run relationships between oil exports, non-oil GDP, and investment in five major oil-exporting countries. Its goal is to verify the effect of natural resources exports on economic performance. It considers the effect of cross-sectional correlations and uses the corresponding panel unit-root tests to study the long-run characteristics of the data series. The results show that resources' exports have no long-run relationship with the macroeconomic variables. A VAR analysis is used to estimate the short-run dynamics and shows that the effect of oil exports on those variables depends on local policies.

1. Introduction

The role of exports in the local economy has been well debated in the literature on whether they cause growth or are caused by growth (see Giles and Williams, 2000, for a review). In spite of the large literature on the relationship between exports and growth, this topic has not been thoroughly analyzed in the Gulf Cooperation Council (GCC) countries. Those countries have a unique situation: a small indigenous population and a dependence on their large oil wealth. For instance, in 2000 (1990), oil exports' share of total GDP was 44% (42%) in Oman and 38% (34%) in the Kingdom of Saudi Arabia (KSA).

This paper investigates the relationship between oil exports revenues (OER), non-oil GDP (NGDP), and investment in five GCC countries: Kuwait, Oman, Qatar, KSA, and the United Arab Emirates (UAE).[1] Many studies found evidence of a positive impact of trade on growth (Rassekh, 2007), and productivity (Girma et al., 2004; Economidou and Murshid, 2008). However, other papers have focused on the impact of natural resources exports, or abundance on growth in non-GCC countries (Sachs and Warner, 1995; Gylfason, 2001; Stijns, 2005; Brunnschweiler, 2008).

The closest work to the current paper is Al-Yousif (1997), where two models were used to study the relationship between exports and economic growth in four GCC countries. The author concluded that there was no long-run relationship between exports and GDP. On the other hand, Abu-Quarn and Abu-Bader (2004) examined the causality direction between exports and growth in nine Middle East and North Africa (MENA) countries. The authors found some evidence that manufactured exports lead to growth when they represent a substantial volume of total exports.

Neither one of the above-mentioned papers dealt with the effects of primary exports on the non-oil sector nor on productivity. It is important to study the effect of exports on the local non-oil economy as these countries struggle to diversify their source of income.

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The main contribution of the present paper is that it focuses on studying the macro characteristics of OER, NGDP, productivity (proxied by NGDP per worker[2]), aggregate investment, and investment per worker in the GCC countries, and the impact of OER on those aggregates. It benefits from panel econometric developments which eliminate the harmful effects of cross-sectional correlation observed amongst some GCC data as explained below. Our results demonstrate that there exists a nonstationary common component in OER. This component has some positive short-run effects on the remaining aggregate variables. No long-run relationship is detected. Investment and NGDP are shown to be cointegrated.

The remainder of this article is organized as follows. Section 2 highlights some previous work that relates growth to natural resources abundance. Section 3 presents a simple analysis of oil exports and growth in the GCC countries. Section 4 studies the methodology used in this paper, and section 5 discusses the data and the main results of the paper. We conclude in section 6.

2. Natural Resources and Growth

The literature on the effect of natural resources on the economy is not recent. However, since the seminal work of Sachs and Warner (1995), the literature on this topic has been expanding. Sachs and Warner (1995) provided evidence of a negative relationship between growth and exports of primary goods with a sample of 95 abundant natural resources countries. They offered four arguments to explain this negative correlation as follows:

1. Abundant natural resources promote de-industrialization (the Dutch disease).
2. In the long run, natural resource exporters are at a disadvantage because of the loss in their terms of trade.
3. Natural resource production leads to high economic rents, corruption, and inefficient bureaucracy which hinder innovations and shifts resources toward less efficient use.
4. The volatility of natural resource prices leads to more risk and uncertainty which reduce factor accumulation.

Gylfason (2001) added to the above arguments the channel of education where abundance of natural resources weakens incentives to accumulate human capital. Public expenditure on education may fail to promote efficiency and growth because of a mediocre quality.

Stijns (2005) found that resource abundance has no conclusive effects once we consider other variables such as openness, initial GDP, and terms of trade. The type of resources (land, coal, fuel, or minerals) is decisive on the effect sign and its significance. He found some evidence of Dutch disease in countries with abundant oil reserves and concluded that there was no clear evidence that learning by doing was restricted to the manufacturing sector.

Other authors found that the negative role of resource abundance on economic performance was due to the corruption and rent-seeking behavior caused by the resources (see Auty, 2001; Ross, 2001; Sala-i-Martin and Subramanian, 2003). Brunnschweiler (2008) studied the effect of natural resources abundance while considering the impact of institutional quality on growth. Her results challenged the "curse" of the abundant resources. That is, she concluded that institutional quality and natural resources abundance—especially subsoil resources—had positive effects on growth average.

Since the lack of an indigenous labor force in the GCC countries has been compensated by using foreign workers, Dutch disease is not expected to materialize. There has been no evidence of a resources shift from one sector to another as most factors of production, especially labor, were imported in the process of building the local economy. The deterioration of the terms-of-trade effect does not apply literally in the case of the GCC countries. The recent history shows that throughout the last 40 years, the term of trade was not continuously disadvantaging oil producers. Therefore, it is expected that natural resources will either have a positive effect on productivity through their demand effect, which is enhanced through income distribution, or have a negative effect as determined by the third and fourth points of Sachs and Warner (1995, 1997) or through education as cited by Gylfason (2001).

3. Oil Export Revenues, Investment, and NGDP in the GCC Countries

The first column of Figure 1 displays the path of real OER, NGDP, and investment between 1973 and 2005. The visual inspection shows that NGDP and GCF have more harmonious movements together than with OER. Also, their long-run path is different from OER's; in general, OER has witnessed large and continuous fluctuations since 1973. In the 1970s, oil revenues boosted investment and the non-oil sector in most cases. In the 1980s, they were at low levels and witnessed more fluctuations. NGDP continued to grow slowly (except for Oman which witnessed a strong growth in NGDP). Investment appeared to slow down in that period in all five countries discouraged by low oil revenues and by the Iran–Iraq war (1980–88). In the 1990s, OER experienced higher growth along with higher investment growth. NGDP growth was slower, however. In most cases, the average growth of NGDP in the 1990s was less than in the 1980s (as it appears in column (iii) of Table 1). With higher oil revenue in the early years of the twenty-first century, investment did not seem to respond promptly. But again, NGDP grew at even slower rates.

In the second column of Figure 1, we show productivity and investment per worker. The movements of productivity and investment per worker differ from their aggregate counterpart. This is probably due to the large variations in labor force (as we shall see below). Therefore, fluctuations in aggregate production or investment do not necessarily match their per worker levels.

Obviously, productivity has not been growing steadily. It has grown well in the 1970s in Kuwait, Oman, and KSA, and in the early twenty-first century in Oman and Qatar. UAE witnessed a continuous decreasing productivity over the whole period. Apparently, productivity was closely following the movement of investment per worker. It is also evident that oil exports follow a different stochastic trend than the trend of productivity and investment per worker.

From the above discussion, it appears that there is no strong long-run relationship between OER and the macro variables, and that NGDP and investment are linked more to each other than to OER. However, we will use the quantitative analysis below for more conclusive results.

On the other hand, Table 1 shows that NGDP average growth was higher than investment's (except for Kuwait). The large growth of OER in the 1970s was accompanied by a larger growth in NGDP and investment. Both aggregates have not grown as much in the early years of the twenty-first century despite a large growth of OER. This probably can be explained by the huge need for infrastructure in the 1970s when the GCC economies were relatively well underdeveloped and required huge investment in that sector. We note also in Table 1, columns (i), (v), and (vi), that labor force

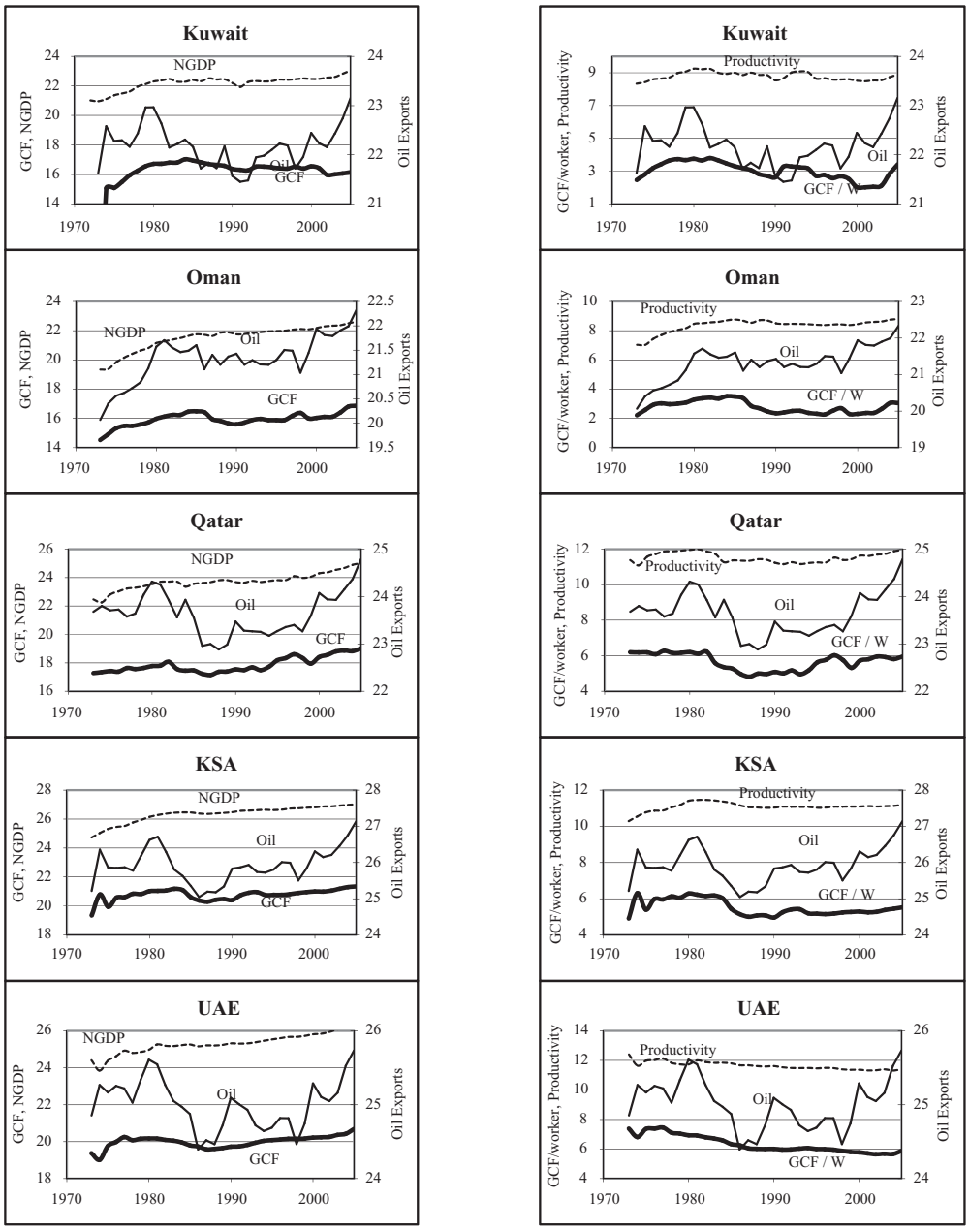

Figure 1. Oil Export Revenues, NGDP, Productivity, and Investment in the GCC Countries (in log of the real local currency, base year 2000)

has been growing steadily with no apparent cyclical behavior. Moreover, we observe that the higher the growth of investment per worker, the greater has been the productivity growth.

A major characteristic of the GCC economies is their low national population and indigenous labor force. High investments have therefore been accompanied by large inflows of expatriate workers from all across the world. Even if all five countries

Table 1. Average Growth Rates of Different Macroeconomic Variables

	Aggregate								*Per worker*			
	Labor force (i)	*Av.**	*OER (ii)*	*Av.**	*NGDP (iii)*	*Av.**	*GCF (iv)*	*Av.**	*Productivity (v)*	*Av.**	*GCF (vi)*	*Av.**
Kuwait												
1973–79	7.3	5.5	19.8	4.8	15.8	6.1	23.9	7.6	8.7	1.3	16.9	2.8
1980–89	5.6		–7.9		3.3		–4.1		–2.1		–9.6	
1990–99	5.0		–2.1		0.5		1.2		–2.6		–1.9	
2000–05	4.2		20.0		9.0		18.9		4.9		14.8	
Oman												
1973–79	5.5	4.8	14.1	6.6	16.9	9.1	13.2	6.3	11.6	4.4	7.9	1.6
1980–89	5.7		2.4		10.7		–0.7		5.2		–6.2	
1990–99	5.3		0.7		2.1		3.4		–3.1		–1.7	
2000–05	1.9		14.8		8.8		14.5		7.0		12.6	
Qatar												
1973–79	7.3	6.6	7.0	3.8	13.4	7.8	6.7	5.6	6.3	1.5	–0.3	–0.7
1980–89	9.9		–10.5		4.3		–2.5		–5.1		–11.9	
1990–99	2.1		6.1		2.4		5.6		0.3		3.5	
2000–05	7.5		19.9		16.0		17.8		8.7		10.5	
KSA												
1973–79	5.8	4.5	17.3	6.5	19.1	7.3	24.7	6.8	13.5	2.9	19.1	2.4
1980–89	6.6		–8.5		4.8		–3.5		–1.5		–9.8	
1990–99	3.0		5.0		3.6		4.8		0.7		1.9	
2000–05	2.3		21.7		3.8		6.5		1.5		4.3	
UAE												
1973–79	20.8	9.7	8.0	2.8	7.6	5.6	13.0	4.1	–11.1	–3.2	–5.7	–4.7
1980–89	5.6		–6.1		3.9		–5.0		–1.5		–10.4	
1990–99	7.4		0.2		4.8		5.1		–2.3		–2.0	
2000–05	7.7		16.5		8.0		8.6		0.6		1.1	

Note:
* Represents total period average.

depended heavily on an expatriate labor force, we can still observe that Oman and KSA have been less reliant on foreigners (55% and 64%, respectively, 1997 statistics) than Kuwait, Qatar, and UAE (84%, 82%, and 90%, respectively).[3] It is expected then that the educational policies of the local governments do not have a significant effect on the majority of the labor force. Therefore, we expect that investment plays a major role in productivity rather than education. Table 1 shows that, in many cases, the growth of labor force was higher than investment. With the easy access to the low-cost labor force (from East Asia, Sub-Indian continent), we can expect that producers shift toward this cheaper factor of production which may explain the observed low productivity of labor.

4. Methodology

In order to study the relationship amongst our different variables, we need to study the existence of unit root in our data and cointegration benefiting from panel econometrics. Unit-root existence implies spurious regressions if not properly handled. A cointegrating relationship between two nonstationary time series implies the existence of a long-run relationship and causality between both of them. It does not yield any conclusion on the direction of the causality though. The causality direction can be detected using the Granger causality test. The use of panels in testing for unit root and cointegration allows for more power because of the larger number of observations.

In this paper, we use five unit-root tests: Im et al. (2003, IPS hereafter), Bai and Ng (2004), Moon and Perron (2004), Im et al. (2005), and Pesaran (2007). IPS (2003) are amongst the first that considered heterogeneity in a panel unit-root test. They proposed a *t*-bar test based on the average *t*-test of the Dickey–Fuller regression. They cross-sectionally demeaned their series to get rid of the size distortion problem that may arise from cross-sectional correlation. However, cross-sectional demeaning may not be sufficient to solve the problem of cross-sectional correlation (Pesaran, 2003). For this reason, different authors tried to develop new tests that deal with this problem.

Moon and Perron (2004) allowed for multiple common factors, but they assumed that the source of nonstationarity is idiosyncratic. They constructed two test statistics, t_a^* and t_b^*, that allow for autocorrelation heterogeneity under the alternative. Unlike Moon and Perron (2004), Pesaran (2003, 2007) assumed the existence of only one stationary common factor. He constructed a panel cross-sectional IPS test (*CIPS*) based on a cross-sectional augmented Dickey–Fuller (*CADF*) individual test.

Bai and Ng (2004) considered that the source of nonstationarity may arise from either the common factors (F_t) or from the idiosyncratic errors ($E_{i,t}$), or both. The number of common factors is determined by the principal factors components as described in Bai and Ng (2002). They propose two panel tests: $P^c_{\hat{E}_t}$ (where $\hat{E}_t$ stands for the estimated idiosyncratic residuals) for the pooled idiosyncratic factors, and $ADF^c_{\hat{F}_t}$ (where $\hat{F}_t$ stands for the estimated common factor(s)) to test the nonstationarity of the common factors.

The last unit-root test that we use here is the Γ^B_{LM} test proposed by Im et al. (2005, ILT hereafter). The Γ^B_{LM} test is based on the Lagrange multiplier principle. Unlike the above-mentioned tests, the ILT test does not consider the existence of common factors amongst units of the panel; it allows for a level shift in the data though; ILT showed that their test outperforms the IPS test.

Pedroni (2004) proposed two sets of statistics to test the null of no cointegration for the case of heterogeneous panels. The first one, the set of three panel statistics (Panel-v, Panel-ρ, Panel-t), is based on pooling the residuals along the within-dimension of the panel. It considers that cointegrating vectors are homogeneous under the alternative.

Heterogeneity is considered under the alternative in the second set of two statistics, (Group-ρ, Group-t), the group mean statistics, which is based on pooling the residuals along the between-dimension of the panel. Westerlund (2008) proposed two Durbin–Hausman cointegration statistics, *DHp* and *DHg*, based on a consistent estimate of the residuals to avoid the cross-sectional correlation problem when testing for cointegration.

5. Data and Results

Our data run from 1973 until 2005. Oil exports series have been obtained from the Arab Monetary Fund. Nominal non-oil GDP series were obtained by subtracting oil exports from nominal GDP, as in Usui (1996) and Haussmann (2003).[4] To obtain nominal productivity, non-oil GDP was divided by labor force.[5] Gross capital formation was used as a proxy for investment. It was divided by total labor force to consider the amount of investment per worker. We deflated our data using the local consumer price index. All data were converted to natural logarithms.

Row (i) of Table 2 shows the cross-sectional correlation for each of our five series: OER, NGDP, investment, productivity, and investment per worker. We have used the cross-sectional (CD) test developed by Pesaran (2004); it rejects the null of no cross-sectional correlation for OER only. This might be an indication that despite heavily relying on oil exports, the five economies have reacted differently to their respective OER. In harmony with Pesaran's CD test results, Bai and Ng (2002) BIC_3 test—the best test when samples have a small cross-sectional dimension—shows that only OER has one common factor (Table 2, row (ii)).

To test for unit root in OER, we use IPS (2003), Bai and Ng (2004), Moon and Perron (2004), and Pesaran (2007) tests as they consider the cross-sectional effect. The first test deals with the common factors by demeaning the data while the remaining three tests assume the existence of at least one common factor. Rows (iii) to (x) of Table 2 show the results of those tests. The IPS (2003) t-test does not show evidence of unit root in demeaned OER. Pesaran's CIPS test shows no evidence of unit root in the OER test.

Table 2. Correlation Test/Number of Common Factors/Unit-Root Tests

			Oil export	*NGDP*	*GCF*	*Productivity*	*GCF/W*
(i)	Pesaran (2004)	*CD*	6.03[a]	1.07	0.46	0.95	–0.19
(ii)	Common factor test	BIC_3	1	0	0	0	0
(iii)	IPS (2003)	t-bar	–0.75	–2.71[b]	0.18	–1.76[b]	0.09
(iv)		t-bar demeaned	–3.89[b]	–3.25[b]	–3.601[b]	–5.02[b]	–0.98
(v)	Moon and Perron	t_a^*	0.29	—	—	—	—
(vi)	(2004)	t_b^*	12.40	—	—	—	—
(vii)	Bai and Ng (2004)	$P_{\hat{E}_t}^c$	3.19[b]	—	—	—	—
(viii)		$ADF_{\hat{F}}^c$	0.38	—	—	—	—
(ix)	ILT (2005)		—	0.64	–1.48	–2.00[b]	–0.82
(x)	Pesaran (2007)	*CIPS*	–2.70[b]	—	—	—	—

Notes:
[a] Rejects the null of no cross-sectional correlation.
[b] Reject the null of unit root.

Table 3. Cointegration Tests

	Test	*No trend*	*With trend*
Pedroni's	Panel-v	2.07	0.43
	Panel-ρ	–2.97*	–1.44**
	Panel-t	–2.59*	–1.63*
	Group-ρ	–1.72	–0.35
	Group-t	–1.85*	–0.54
Westerlund's	DH_p	216.2*	21.99*
	DH_g	42.9*	28.06*

Note:
* (**) rejects the null of no cointegration at the 5% (10%) level.

The remaining two tests do not reject the null. As stated above, demeaning across sections may not be sufficient to remove distortions caused by common factors. CIPS assumes the existence of one common stationary test. Bai and Ng's (2004) $P^c_{\hat{E}_t}$ and $ADF^c_{\hat{E}_t}$ tests show evidence that OER's idiosyncratic factors are stationary while the common factor is nonstationary. ILT (2005) is not used to test OER as the latter contains a common factor which is not considered in the test. We conclude that OER is nonstationary because of the stochastic trend in the common factor.

Because the remaining variables contain no common factors, we use only IPS (2003) and ILT (2005) tests. Their results are conflicting. However, since ILT (2005) showed that their test has more power than IPS (2003), we tend to consider its results and conclude that NGDP, GCF, and GCF/W are nonstationary. The existence of a common nonstationary factor in OER and the absence of any common factor in the remaining variables indicate that there is no systematic long-run relationship (either negative or positive) between the common factor and the economic performance. If primary resource exports have a systematic impact on the local economy, it will materialize through a common effect, which is not the case. This fact can be interpreted against the "curse" of resource abundance. On the other hand, it is expected that productivity and investment per worker share a common trend. As investment per worker changes, productivity should follow. However, the stationarity of productivity versus the unit root in investment per worker suggests that this is not the case in our data. This issue will be addressed below.

On the other hand, the cointegration tests between NGDP and GCF show evidence of common trend as they are cointegrated (Table 3). When a trend is considered, Pedroni's tests do not reject the null of no cointegration, while Westerlund's tests do. Since the latter test is more powerful (as seen above), we may conclude that a long-run relationship exists between aggregate NGDP and aggregate GCF. We conclude that the common factor has no long-run effect on economic performance. Next, we turn to the effects of those common factors below using individual vector autoregression (VAR) analysis.

Effect of OER's Common Factor on Economic Performance

In this subsection we study the short-run relationship between OER's nonstationary common factor on the economic performance. For this task, we estimated the following VAR:

$$X_t = \Lambda + \Phi_1 X_{t-1} + \Phi_2 X_{t-2} + \cdots + \Phi_p X_{t-p} + \varepsilon_t = \Phi(L) X_{t-1}, \tag{1}$$

where X_t is a vector of two variables $(x_{1t}, x_{2t})'$, Λ is a (2×1) vector of constants, Φ_i is a (2×2) matrix of coefficients, and ε_t is a vector of white-noise process. Since we wanted to estimate the short-run effect of OER on each of our four macro variables, we estimated the model four times as follows:

$$(x_{1t}, x_{2t}) \equiv (OER_t, NGDP_t), \tag{1a}$$

$$(x_{1t}, x_{2t}) \equiv (OER_t, GCF_t), \tag{1b}$$

$$(x_{1t}, x_{2t}) \equiv (OER_t, NGDP/W_t), \tag{1c}$$

$$(x_{1t}, x_{2t}) \equiv (OER_t, GCF/W_t). \tag{1d}$$

We have then calculated the impulse response functions by imposing a restriction. Each time, we assumed that x_{2t} has no long-run effect on OER. Since our sample consists of five small open economies, we expect that local non-oil economic activities have a negligible effect on OER. We have also imposed an alternative restriction *à la* Cholesky, that the macro variables have no effect on OER at time *t*. The results were practically the same. We present here the results of the long-run restriction. The lag length was chosen using Akaike criterion with a maximum of four. If the chosen lag yields non-normal or autocorrelated residuals, we add one more.

The impulse response functions are displayed in Figures 2 and 3, which show the effect of a one standard deviation of the common factor innovations in oil revenues on NGDP, GCF, productivity, and GCF/W in each of the five countries considered. The dotted lines show ±2 standard error deviations. As it is obvious, there is evidence of a positive and significant effect of the common factor on aggregate investment in all cases while its impact on NGDP is positive and significant in three cases only (Oman, KSA, and UAE). When we consider the per capita variables (Figure 3), the results are similar except that the impact in UAE is not significant any more. If more capital is invested, we expect that productivity rises which is the correct in two cases only. Two arguments can explain why this may not be true. Firstly, the capital itself may not necessarily raise the productivity as expected. Deaton (1999) suggested that the problem of the growth in Africa was the low quality of investment and the absence of complementary factors, especially education. On the other hand, Dhumale (2000) explained the negative impact of the public investment on the economic performance in the GCC by "over-investing to a point where there have been negative implications for productivity" (Dhumale, 2000, p. 319). Also, Shafik (1994) stated that there has been much emphasis in the GCC on the tertiary level of education at the expense of other levels. Moreover, Dhumale (2000, p. 310) mentioned that "there was a greater focus on the quantity of funds expended rather than on the quality of the services supplied" in the MENA countries. Secondly, we observe that the effect of the common factor on productivity is only significant and positive in Oman and KSA. Both countries happen to have the lowest contribution of foreign labor force (see section 3). This may suggest that the local labor policy has an important effect on productivity. That is, using more foreign labor means less control over their quality and skills. Moreover, the openness toward bringing in foreign workers along with the availability of low-cost labor, encourage entrepreneurs to use this resource which has a low productivity even if more capital is

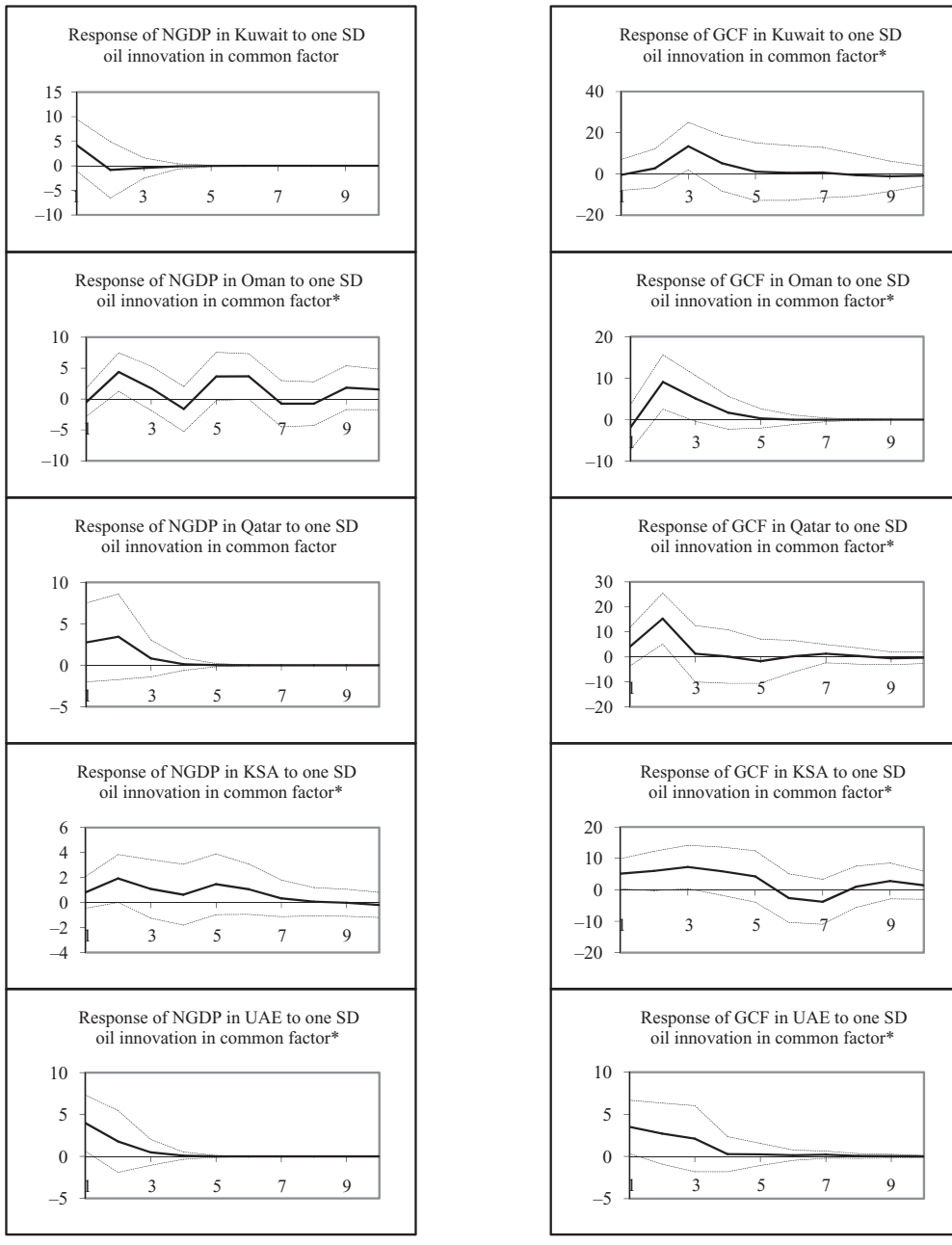

Figure 2. Response of NGDP and GCF to One SD in OER Common Factor Innovations

* Means significant impulse response at 95% confidence level.

used. We have calculated the correlation between variation in labor and variation in NGDP per worker in every country (Table 4). They are all negative and significant except in Oman. Unfortunately, to our knowledge, there have been no formal studies to assess the quality and efficiency of foreign labor, education, and public and private investments in the GCC to verify these hypotheses.

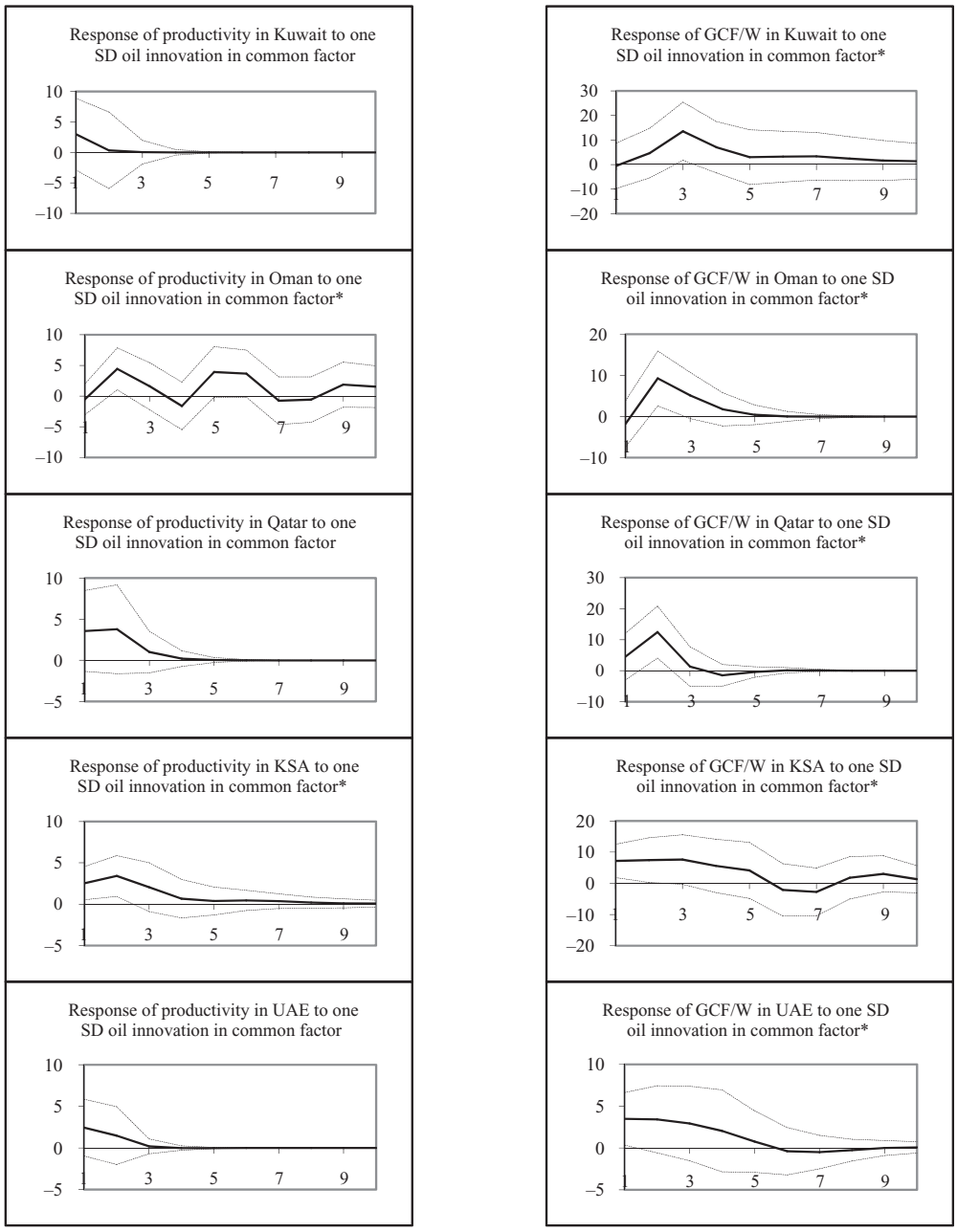

Figure 3. Response of Productivity and GCF/W to One SD in OER Common Factor Innovations

* Means significant impulse response at 95% confidence level.

We have studied the effect of OER's idiosyncratic factors on our macroeconomic variables using the same VAR analysis presented above in equations (1a) to (1d). Our results do not suggest any specific effect.[6] In three cases (Kuwait, Oman, and UAE), those factors have no significant effect while they have a negative impact in Qatar

Table 4. Correlation between Productivity and Labor Force Variations

	Correlation
Kuwait	–0.51*
Oman	–0.01
Qatar	–0.23**
KSA	–0.25**
UAE	–0.24**

Note:
* (**) correlation negatively significant at the 5% (10%) level.

and a positive one in KSA. This is another indication of no similar effects across oil exporters.

6. Conclusion

This article has shown that education may play a decisive role on the effect of oil exports given that the best performing economies are those that rely more on their own labor force. Even if personal experience in the GCC countries may show evidence of unproductive investment in public enterprises and education, a formal investigation is needed in that direction. We recognize, however, the difficulty in obtaining the corresponding data.

Another line of research is to study the effect of the foreign labor force by conducting a comparative study with another panel of oil exporters with no significant foreign labor force.

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Notes

1. Bahrain is the sixth member of the GCC. We exclude it from our analysis because it is not a significant oil exporter.
2. We recognize that this is not the perfect measure for productivity. Data needed to calculate productivity are rarely available in those countries. Dividing total non-oil GDP by total labor force is not ideal because a part of this labor force works in the oil sector. There are no clear and continuous data on the sectoral distribution of the labor force. The little available evidence, however, suggests that the oil sector employs only a very tiny part of the labor force. For instance, this part was 1.5% in KSA during the 1980s, 1.7% in 1995, and 1.4% in 2000 in Kuwait.
3. Data have been obtained from various sources.

4. We recognize that this is not the best way to obtain the non-oil GDP, but we content ourselves to this definition for the lack of precise data.
5. In an ideal case, the unemployed shall be excluded. However, no figure on unemployment is available.
6. The corresponding figures are not presented owing to space limitation. They are available from the author upon request.