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The response of the Arabian gulf economies to the changes in world oil prices

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Abstract

The Arabian Gulf (or GCC) States are primarily oil-exporting nations and their oil revenues, which accrue entirely to the government, are highly sensitive to changes in supply and demand conditions in the world oil markets. From 1974 to 1981, oil prices rose steadily (Phase 1), they then fell steadily for five years (Phase 2) and have since fluctuated (Phase 3). The GCC States' oil revenues followed a closely similar pattern. We assess in this study the impact of these revenue changes on GDP and some key sectors of the economy. Based on 1972-1998 annual time series, our estimates point to a strong correlation and association between these changes and GDP but provide no consistent indication of how these changes relate to changes in manufacturing output and government spending. The 'Dutch Disease' and 'Rent-Seeking' problems often encountered in primary commodity producing countries were found not to have affected significantly the economies of the GCC member states.

1. Introduction

This study is on the economic performance of the Arabian Gulf nations, which, in alphabetical order are: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (UAE). As a first step toward the formation of an economic union, they established in 1981 the Gulf Cooperation Council (GCC) and are commonly referred to as GCC

member states[1].

These states are primarily oil-exporting nations. Jointly, they hold close to 40 % of the proven world crude oil reserves and produce on average close to 14 million barrels of oil a day[2]. Crude and refined oil products account for over 85 % of their exports[3]. Given a very low price elasticity of demand for oil, marginal changes in world supply impact heavily on oil prices and thereby their oil revenues.

The "oil price adjustments"[4] which started in 1973-1974 severely disrupted the world oil markets. Prices leaped upward, from $2.30 a barrel in 1972, to $10.41 in 1974 and to a peak of $32.51 in 1981. They then declined, dropping slightly, to $32.38, in 1981 and then sharply, bottoming at $13.53 in 1986. In the ensuing years, they fluctuated considerably, dropping from a high of $22.26 in 1990 to below $10 late in 1998[5] . They rebounded however in late 1999 and in 2000 had reached levels that exceeded the 1981 peak.

The member states' oil revenues followed a broadly similar pattern and for analytical purposes we divided the 1972-1998 period into three time phases: a phase of rising revenues, namely 1972-1981, a phase of declining revenues, namely 1981-1986 and a phase of uneven fluctuations in revenues, namely 1987-1998.

In the GCC, oil revenues accrue entirely to the state and flow into the economy through the budgeted government expenditures. They provided the resources used to modernize the economy and in particular to establish a modern manufacturing sector[6]. By ensuring a stable manufacturing output, the authorities were able to moderate the adverse

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1 The Charter of the Gulf Cooperation Council (GCC) was signed on May 25, 1981. The primary mandate of the Council is to promote cooperation among the members and pave the way towards the formation of an economic union. See Sandwick (1987: particularly Chapter 2). See also the 1981, 1987 and 1988 publications of the GCC Secretariat.

2 The oil production data are drawn from the *Petroleum Economist*, (March 1995: 48).

3 The oil export data are from the World Oil: 50th Annual International Outlook (1985: 28-30).

4 See Vernon (1976) for an analysis of the events that led to the "oil embargo". For views of the causes of the embargo, see Amuzegar (1973), Adelman (1974 and 1995) and Feldman (1996).

5 The prices are for 'Arab Light', up to 1986, and 'Average Spot Values of the OPEC Crude Basket', since 1987.

6 See the GCC Secretariat's publication *The Resource Base for Industrialization* (1985) for the policies designed to promote industrial development and particularly the establishment of a modern manufacturing sector.

impact on the economy of the fluctuations in oil prices and revenues. As a further national income stabilization measure, they maintained their expenditures at fairly stable levels and thereby "neutralized" the changes in oil revenues through budget surpluses and deficits[7].

Thus, our focus in the present study is on the impact of the changes in oil prices and revenues on the economies of the GCC member states.

In Section 2 of this paper, 1972-1998 annual time series provide an overall perspective on the magnitudes of some of the key variables used in this study.

To ensure the validity of statistical estimates, the time-series were tested for stationarity. These tests are discussed in Section 3.

The strength of the relation of oil revenues with key variables is assessed in Section 4, by means of partial correlation analysis.

The strength of the association of oil revenues with these variables is assessed next, in Section 5, by means of the Analysis of Variance (ANOVA).

The vulnerability of the GCC industrial sector to the "Dutch Disease" is examined in Section 6 and a preliminary quantitative assessment is made in this section. A statistical test of structural stability is conducted in Section 7.

The cause-effects of sectoral changes are examined in Section 8 by means of Granger causality tests.

Concluding remarks are presented in Section 9.

2. Oil prices, oil revenues and related variables

To convey a perspective on the evolution of GDP and some of its key variables, Table 1 shows the 1972-1998 estimated values of Oil Prices, GDP and the mining, manufacturing and government sectors.

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[7] At the GCC level, the budget deficits started in 1983. They entailed first drawing on accumulated reserves and later borrowing from domestic and world markets and the adoption of austerity measures, which included reductions in the subsidies paid. (See *MEED, Gulf States Cut Payments Deficits*, 1985: 5). More recently, income-generating measures were adopted, such as charging fees for some of the government services.

Table 1
Oil Prices, GDP and Value-Added in the Mining, Manufacturing and Government Sectors
(*Oil Prices: US $, other variables; million current US $*)

	Oil Prices	GDP	Mining	Manufacturing	Government
1972	2.29	16,959.4	10,842.6	869.3	1,326.0
1973	3.07	36,915.6	27,527.7	1,791.0	1,902.1
1974	10.73	64,873.0	49,428.2	2,895.8	2,716.4
1975	10.73	74,301.2	49,910.0	3,317.4	3,963.2
1976	11.51	91,317.0	57,465.3	3,887.9	5,048.8
1977	12.39	102,063.5	57,928.7	4,509.0	7,277.8
1978	12.70	113,113.8	60,761.2	5,806.8	9,028.4
1979	17.25	172,011.5	105,911.6	9,110.5	11,416.4
1980	28.64	231,460.0	151,096.7	11,249.2	14,645.6
1981	32.51	232,858.8	141,210.8	11,324.2	18,003.3
1982	32.38	192,633.9	91,307.2	11,592.3	21,827.5
1983	29.04	175,167.3	73,216.6	12,653.7	22,711.0
1984	28.20	168,920.4	67,532.7	12,664.3	24,506.4
1985	27.01	161,720.1	58,502.9	12,164.7	26,546.1
1986	13.53	128,836.6	35,361.5	10,511.4	25,135.7
1987	17.73	136,687.5	40,751.2	12,655.7	25,400.2
1988	14.24	136,963.3	36,626.7	13,113.7	27,069.2
1989	17.31	153,299.3	49,647.4	14,149.6	27,644.8
1990	22.26	178,618.9	69,949.1	13,835.4	31,524.6
1991	18.62	184,133.7	66,232.9	14,568.5	36,006.1
1992	18.44	201,115.2	76,727.1	16,967.0	34,351.4
1993	16.33	200,722.8	70,615.9	17,171.5	35,776.9
1994	15.53	207,056.7	69,469.9	19,243.7	36,519.0
1995	16.86	220,893.2	75,733.0	21,164.0	38,718.3
1996	20.29	242,647.3	89,949.2	23,477.4	40,281.8
1997	18.68	254,709.3	92,279.8	25,722.4	42,635.3
1998	12.28	230,253.7	76,450.0	24,653.0	37,997.3

Sources: Oil Prices: Arab Oil and Gas Directory (1998); other variables: Gulf Statistical Profile (1998).

Starting in 1974, Table 1 indicates that oil prices increased rapidly and considerably: from $2.39 a barrel in 1972, to $ 10.73 in 1974 and to a peak of $32.51 in 1981. The decline was equally rapid and large, bottoming out in five years at $13.53, in 1986. The recovery has since

been weak, with prices fluctuating between a low of $12.28 in 1998 and a high of $22.26 in 1990. The decline in oil prices continued for a large part of 1999 and fell to below $10.00 before reversing. Then, in late 1999 and in 2000, they rose sharply, exceeding the 1981 peak.

Oil revenues followed a pattern that broadly paralleled that of oil prices.

Manufacturing value-added and government services rose steadily from 1972 onward, except for relatively minor declines in 1985, 1986 and 1998.

GDP consists of the contributions of all its sectoral components. It was negatively impacted by the decline in oil revenues and positively impacted by the increases in manufacturing value-added and government spending. The large negative impact of oil revenues outweighed the positive impacts until 1996, when finally GDP reached a level that modestly exceeded that of 1981.

The analysis conducted in this study is based on a number of variables, which include those shown in Table 1. To ensure a uniformity of measurement among the member states, the values of all the variables were converted, through the implicit price deflator, into 1992 constant U.S. dollars. Also, to ensure the validity of the statistical estimates, the variable values were tested for stationarity.

The methods used to test for and achieve stationarity are examined next.

3. Testing for stationarity[8]

A stochastic process is said to be stationary when its mean and variance are constant over time and its auto-covariance between two time periods depends on the distance or lag between the two periods and not on the actual time at which the auto-covariance is computed.

Non-stationary time-series yield least squares (LS) statistics (e.g., t, F, R^2, DW) that are biased and inconsistent and thereby render conventional inference procedures invalid. The stationarity tests generally entail a regression equation of the form:

$$Y_t = \alpha + \beta Y_{t-1} + \varepsilon_t$$

[8] There is a vast literature in time-series analysis on stationarity, on how to test for it and on how to correct for non-stationarity. For a simple outline, see Gujarati, Part V (1995) and Kennedy, Chapters 16 and 17 (1997).

where ε_t is white noise and therefore stationary.

The time-series (Y_t) is said to have a unit root (and thereby to be stationary) when the LS estimate of β is statistically equal to 1. The statistical significance of β is assessed in terms of the ratio $R = \beta/s_\beta$, where s_β is the standard deviation of β. When the time-series is stationary, R follows Student's t distribution. When the time-series is non-stationary, R is assessed in terms of a τ, whose distribution was established by Dickey and Fuller (DF) and subsequently expanded by MacKinnon. When the testing equation also accounts for autocorrelation (of ε_t), the test is known as Augmented Dickey-Fuller (ADF) test. When a time-series is found to be non-stationary, stationarity can often be achieved through a first differencing of the data.

The unit root test is based on the ADF τ statistic and the MacKinnon critical values. It was applied to all the variables analyzed in this study and a first differencing of the data was sufficient to achieve stationarity.

Given that several time-series were found to be non-stationary and in order to achieve data uniformity, the analysis was conducted in terms of first differences of all the time series.

Thus, we assess in the next section the correlation between variables, whose values are measured in terms of first differences.

4. Assessing the extent of sectoral interdependence

The analysis of this section is conducted in terms of four variables: 1. Mining (Oil: O), 2. Manufacturing (M), 3. Government (G) and 4. GDP (Y). All the variable values cover the 1972-1998 time period and are measured in million 1992 constant US $ and in terms of first differences: ΔO, ΔM, ΔG and ΔY. The estimated partial correlation coefficients are shown in Table 2.

Table 2
Partial Correlation Analysis

		$\rho_{12.34}$	$\rho_{13.24}$	$\rho_{14.23}$	$\rho_{23.14}$	$\rho_{24.13}$	$\rho_{34.12}$
Bahrain	ρ	-0.0400	0.2122	0.3970	0.0026	0.2173	-0.0103
	t	-0.179	0.971	1.934	0.012	1.265	-0.046
Kuwait	ρ	**-0.6383**	**-0.7640**	**0.9750**	-0.2949	**0.7515**	**0.7282**
	t	-3.708	-5.295	19.624	-1.380	5.094	4.752
Oman	ρ	0.0759	**0.5331**	**0.9074**	**0.4468**	-0.0248	**-0.4983**
	t	0.340	2.818	9.655	2.233	-0.111	-2.570
Qatar	ρ	**-0.4736**	**-0.6856**	**0.9651**	-0.1114	**0.5279**	**0.7097**
	t	-2.405	-4.212	16.483	-0.502	2.780	4.505
Saudi	ρ	-0.2147	**-0.6373**	**0.9367**	-0.119	**0.4326**	**0.6423**
	t	-0.983	-3.698	11.966	-0.504	2.146	3.748
UAE	ρ	**-0.5288**	0.0798	**0.9563**	**0.5103**	**0.5592**	-0.0847
	t	-2.786	0.358	14.629	2.654	3.016	-0.380
GCC	ρ	-0.3299	0.1519	**0.9227**	0.0696	**0.5310**	-0.1127
	t	-1.563	0.6871	10.705	0.312	2.802	-0.507
		t(20) @ 1% = 2.845; @ 5% = 2.086					

1. ΔO (O=Mining: Oil); 2. ΔM (M=Manufacturing); 3. ΔG (G=Government); 4. ΔY (Y= GDP)

$\rho_{12.34}$ = Correlation between ΔO and ΔM, holding ΔG and ΔY constant
$\rho_{13.24}$ = Correlation between ΔO and ΔG, holding ΔM and ΔY constant
$\rho_{14.23}$ = Correlation between ΔO and ΔY, holding ΔM and ΔG constant
$\rho_{23.14}$ = Correlation between ΔM and ΔG, holding ΔO and ΔY constant
$\rho_{24.13}$ = Correlation between ΔM and ΔY, holding ΔO and ΔG constant
$\rho_{34.12}$ = Correlation between ΔG and ΔY, holding ΔO and ΔM constant

Figures in bold indicate significant ρ estimates.
Source : *Gulf Statistical Profile*, Table 2.8, various issues.

Analysis of Table 2 Estimates
Significant Correlations

Correlation Between	Positive	Negative
Oil, Gov't ($\rho_{13.24}$)	Oman	Oman, Qatar, UAE
Oil, GDP ($\rho_{14.23}$)	Kuwait, Oman, Qatar, Saudi, UAE, GCC	Kuwait, Qatar, Saudi
Manuf., Gov't ($\rho_{23.14}$)	Oman, UAE	
Manuf., GDP ($\rho_{24.13}$)	Kuwait, Qatar, Saudi, UAE, GCC	
Gov't. GDP ($\rho_{34.12}$)	Kuwait, Qatar, Saudi	Oman

With regard to the correlation between oil and manufacturing, the finding that $\rho_{12,34}$ is not significantly different from zero in Bahrain, Kuwait, Saudi Arabia and the GCC and is significant negative in Oman, Qatar and the UAE suggests that ΔO has evolved independently of ΔM. (Section 7 reproduces estimates which indicate that in all the member states, oil does not 'Granger-cause' manufacturing output).

A broadly similar conclusion can be reached with respect to the relation between oil revenues and government ($\rho_{13.24}$).

By contrast, the highly significant and positive $\rho_{14.23}$ estimates suggest that the evolution of ΔY has closely paralleled that of ΔO (GDP and Oil Revenues).

The correlation coefficient ($\rho_{23.14}$) estimate is significant and positive in only two member states, suggesting that it failed to capture the strong government support in the development of the manufacturing sector.

By contrast, the $\rho_{24.13}$ estimates captured the joint evolution of ΔM and ΔY (manufacturing and GDP).

The government's income stabilization measures, through budget surpluses and deficits, may possibly account for the observed lack of joint evolution between ΔG and ΔY in Bahrain, Oman, UAE and the GCC.

5. Assessment by association

To gain further insight into the extent to which the increases in oil revenues (ΔO) had an impact on the manufacturing and government sectors (ΔM and ΔG respectively) and GDP (ΔY), we ranked the 1972-1998 values of ΔM, ΔG and ΔY in ascending values of ΔO and applied the Analysis of Variance (ANOVA) to the first and fourth quartiles of the resulting distributions, thus obtaining for each variable and each member state two groups of 7 observations each. Given the ascending order ranking on ΔO, we expect the average value of ΔO to be smaller in the first quartile fourth quartile. A strong association between ΔO and another variable, say ΔY, would, in turn, be reflected in an average ΔY value that is smaller in the first than in the fourth quartile.

The ANOVA estimates are presented in Table 3.

Table 3
Anova Estimates

	Bahrain	Kuwait	Oman	Qatar	Saudi	U.A.E.	G.C.C.
	Million $						
ΔO							
Mean 1	-	-	-671.20	-834.97	-14,195.24	-3,058.87	-
Mean 2	154.35	4,520.78	929.43	1,098.94	17,195.40	4,084.99	20,258.37
F	195.56	5,429.22	26.537	45.106	40.227	58.947	25,008.81
	46.737	28.096					42.546
ΔM							
Mean 1	5.28	-845.55	47.70	14.54	-267.01	298.90	-47.24
Mean 2	1.47	711.06	-0.35	4.00	870.21	186.24	1,046.16
F	0.006	25.893	6.544	0.027	5.643	0.310	2.367
ΔG							
Mean 1	54.09	69.40	192.65	146.55	1,352.90	238.81	1,445.64
Mean 2	39.10	78.78	84.52	75.34	965.05	189.74	1,009.36
F	0.426	0.001	1.560	0.385	0.440	0.221	0.132
ΔY							
Mean 1	56.07	-	-82.01	-559.97	-11,842.48	-1,593.58	-
Mean 2	304.45	5,520.97	1,089.39	1,378.49	22,293.02	5,211.31	16,518.60
F	1.062	6,424.89	5.947	12.005	29.772	40.957	29,646.76
		25.880					23.915

ΔO (O = Oil, Mining); ΔM (M = Manufacturing);
ΔG (G = Government); ΔY (Y = GDP)
Variables Measured in Constant 1992 Million U.S. $: 1972-1998
Rankin of ΔM, ΔG and ΔY on ascending ΔO values
First vs Fourth Quartiles : Seven Observations Per Quartile
Mean 1 = Average In First Quartile; Mean 2 = Average In Fourth Quartile
F(1/12) at 5 per cent = 4.75
Source: Same as Table 2.

Analysis of Table 3 Anova Estimates
Significant Differences

Variable	Mean 1 > Mean 2	Mean 1 < Mean 2
Oil (ΔO)		Bahrain, Kuwait, Oman, Qatar, Saudi, UAE, GCC
Manuf.(ΔM)	Oman	Kuwait, Saudi, GCC
Gov't (ΔG)	-	-
GDP (ΔY)		Kuwait, Oman, Qatar, Saudi, UAE, GCC

Given that the ranking was in ascending ΔO values, we can expect for this variable a Mean 1 < Mean 2.

The finding for ΔY in all the member states (except in Bahrain) of a

significant Mean 1 < Mean 2 points to a strong association between oil and GDP (ΔO and ΔY). This agrees with the $\rho_{14.23}$ estimate in Table 2, which measures the strength of correlation between ΔO and ΔY.

The finding of a significant positive ANOVA association of manufacturing output (ΔM) with oil revenues (ΔO) in Kuwait, Saudi Arabia and the GCC is not consistent with the $\rho_{12.34}$ coefficient estimates, in Table 2.

Likewise, the ANOVA estimates which show a complete absence of association between Government (ΔG) and Oil Revenues (ΔO) are also inconsistent with the $\rho_{13.24}$ coefficient estimates of Table 2.

In both cases, the failure of the ANOVA estimates to agree with the partial correlation estimates may be due, in the correlation case, to the partialling out of the following effects:

of ΔG and ΔY on ΔM ($\rho_{12.34}$)

and of ΔM and ΔY on ΔG (in $\rho_{13.24}$)

The partialling out effects may be particularly significant at the extreme ends of the distributions.

6. The Dutch Disease[9]: Shifts in the composition of national output

The term "Dutch Disease" was coined in reference to conditions that ruled in the Netherlands following the development of new natural gas fields under the North Sea, which generated large profits and gas revenues.

The increased profitability and production in the new gas sector triggered an adjustment in the other sectors of the economy. In line, with the Rybczynski effect, it bids resources away from the industrial sector. More specifically, it bids away labor by putting upward pressure on the wage rate, and capital by putting upward pressure on the interest rate. The industrial sector tends to contract under these cost pressures.

In the world financial markets, the increased inflows of foreign funds raise the exchange parity of the national currency and thereby induce an increase in imports and a decrease in exports. As a result, a major part of the non-gas sector tends to contract.

In the GCC, the opening of the oil sector coincided with a limited

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[9] For a comprehensive analysis of the 'Dutch Disease' see Heeks (1998). See also Lam and Wantchekon (1999) and Lindert (1991, Chapter 4).

and mostly traditional industrial activity. Then, the demand for capital was modest relative to the large inflows of oil revenues, which in all the member states accrue entirely to the government. They were largely used to modernize the economy, including the construction of an extensive infrastructure and the development of large energy and capital-intensive upstream industrial complexes. These, in turn, provided the inputs that were used by private sector-owned downstream industries. Within this perspective, the industrial sector owes its development to the oil sector. The further growth of the manufacturing sector was promoted by generous investment incentives, such as loan guarantees, low interest charges, subsidized energy prices and land rents and tax holidays.

The adherence to the same fixed exchange rate has served to ensure the confidence of investors and to prevent a destabilizing speculative activity.

The GCC national workforce is relatively small and at the time had limited exposure to industrial activity. The considerable increase in demand for labor attending the modernization of the economy has mostly been met with the importation of low-wage workers from the densely-populated neighboring countries. This prevented an upward pressure on the wage rate, particularly since the non-government work force consisted primarily of expatriate labor.

Yet, in line with the Rybczynski effect, one can possibly expect the large capital inflows to induce the capital-intensive sectors to grow more than the labor-intensive sectors. Given that 'Goods' production tends to be more capital intensive than 'Services' production, there may be a shift from 'Goods' to 'Services' production during periods of declining oil revenues[10].

We test for this possibility in terms of the GDP sectoral breakdown compiled by the member states, which includes 6 'Services' and 4 'Non-Oil Goods' sectors.

The Services sectors consist of:

Trade, Transport, Finance, Real Estate, Government and "Other" Services

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[10] The share of 'services' in GDP has historically tended to increase in the later stages of industrial development in the economies of the West. This share is today increasing in virtually of the economies of the world, as is evidenced by the share estimates in 1980 and 1995, shown in the World (Bank) Development Report, 1997: 236-237. On this question, see also Wieczorek (1995).

The Non-Oil Goods sectors consist of:

Agriculture, Construction, Manufacturing and Public Utilities

The sectoral outputs and GDP are measured in millions 1992 constant US dollars and in terms of first-differences. For testing purposes, the time-series data were aggregated over the three time-phases of oil prices:

Increasing Oil Prices: 1973-1981: Phase I

Decreasing Oil Prices: 1982-1986: Phase II

Fluctuating Oil Prices: 1987-1998: Phase III

Table 4 shows for the GCC the totals of the 'Services' and 'Non-Oil Goods' sectors averaged over the three phases, together with the Services/Non-Oil Goods ratios.

The markedly larger ratio in Phase II lends support to the possibility of a production shift from 'Non-Oil Goods' to 'Services' in the phase of declining oil prices and revenues.

A statistical test of this possibility is conducted in the next section.

Table 4

Sums of "Services" and "Non-Oil Goods" Sectors Averaged Over Phases

Phase	Services	Non-Oil Goods	Services/Non-Oil Goods
I	41,283.67	27,833.77	1.483
II	24,774.97	2,904.57	8.530
III	19,650.08	18,447.52	1.065

Source : Same as Table 2

Note: Phase I: 1973-1981; Phase II: 1982-1986; Phase III: 1987-1998

Data Measured In Million 1992 U.S. Dollars and in Terms of First-Differences G.C.C. Level Estimates

7. Testing for Structural Stability

Through a 'Dummy Variable' version of the Chow test, we test in this section for the statistical significance of differences between the 'Services' and 'Non-Oil Goods' sectors over Phases I, II and III of oil prices and revenues, where:

Phase I denotes the 1973-1981 time period

Phase II denotes the 1982-1986 time period, and

Phase III denotes the 1987-1998 time period

The testing regression equation is of the form:

$$R_t = \alpha + \beta_1 D_1 + \beta_2 D_2 + \beta_3 GDP + \beta_4 (D_1 x GDP) + \beta_5 (D_2 x GDP) + \varepsilon_t$$

where:

R_t = 'Services'/'Non-Oil Goods'
D_1 = 1 in Phase II and = 0 otherwise
D_2 = 1 in Phase III and = 0 otherwise
ε_t, the error term, is white noise
and the parameters in Phases I, II and III are
Phase I: $\alpha + \beta$
Phase II: $(\alpha + \beta_1) + (\beta_3 + \beta_4)$
Phase III: $(\alpha + \beta_2) + (\beta_3 + \beta_5)$

The testing equation was fitted to data drawn from the six member states and the GCC. In order to highlight the breakpoints in the coefficients structure, only the estimates which are significant at the 10 % level, or better, are shown in Table 5.

Table 5
Testing Of Structural Stability Over Three Phases of Oil Price Changes

Phase	Bahrain	Kuwait	Oman	Qatar	Saudi	U.A.E.	G.C.C.
II					$\beta_1(+)$		$\beta_1(+)$; $\beta_4(-)$
III	$B_2(-)$; $\beta_5(+)$			$\beta_2(-)$; $\beta_5(+)$	$\beta_5(+)$	$\beta_2(+)$	$\beta_5(+)$

Source: Same as Table 2.
Note: Phase I: 1973-1981; Phase II: 1982-1986; Phase III: 1987-1998
Testing Regression Equation: $R_t = \alpha + \beta_1 D_1 + \beta_2 D_2 + \beta_3 GDP + \beta_4 (D_1 xGDP) + \beta_5 (D_2 xGDP) + \varepsilon_t$
Only the Estimates which are Significant at the 10% level or better are shown

In Table 5, the bracketed algebraic sign next to a β coefficient indicates whether the estimated coefficient value is positive or negative. As noted above, the parameter estimates (intercepts and slopes) are:
in Phase I: $\alpha + \beta$
in Phase II: $(\alpha + \beta_1) + (\beta_3 + \beta_4)$ and
in Phase III: $(\alpha + \beta_2) + (\beta_3 + \beta_5)$

The tested hypothesis is whether in Phase II the estimated β_1 and β_4 coefficients are significant and positive.

As Table 5 shows, the regression analysis yielded significant and positive estimates for β_1 (upward intercept shifts) in Saudi Arabia and the GCC but a significant and negative estimate for β_5 (slope) in the GCC.

Thus, there is generally no ground to believe that production shifted in favor of 'Services' in the phase of declining oil prices.

Overall, there is also evidence that the industrial sector expanded rather than contracted as a result of the windfall large oil revenue

inflows.

8. Granger causality[11]

In all the preceding sections, the impact of the changes in oil prices on the different sectors of the economy has been assessed in terms of joint changes (correlation or association) but not of causation. Even in regression analysis, when it is usually assumed that changes in the value of the dependent variable are caused by changes in the values of the independent variables, the existence of a relationship between the dependent and independent variables proves neither the existence of causality nor its direction.

Based on Granger's special definition of causality, one can say that variable X Granger-causes Y if prediction of the current value of Y is enhanced by using past values of X. Generally, since the future cannot predict the past, if variable X Granger-causes variable Y, then changes in X should *precede* changes in Y. Thus, given a regression of Y on X (and on other variables, including the past values of Y), if we introduce past or lagged values of X and thereby improve significantly the prediction of Y, then we can say that X Granger-causes Y. A similar definition holds if Y Ganger-causes X.

To illustrate, consider the following two regression equations:

$$Y_t = \Sigma a_i X_{t-i} + \Sigma b_i Y_{t-i} + \varepsilon_{1t}$$

$$X_t = \Sigma c_i X_{t-1} + \Sigma d_i Y_{t-i} + \varepsilon_{2t}$$

where the summation for Y_t runs from i to n and for X_t from i to m.

The estimated parameter values allow us to distinguish four cases:

1. Unidirectional causality from X to Y when Σa_i .0 and $\Sigma d_i = 0$
2. Unidirectional causality from Y to X when $\Sigma a_i = 0$ and Σd_i . 0
3. Feedback (bilateral causality) when Σa_i .0, Σb_i .0, Σc_i .0 and Σd_i .0
4. Independence when $\Sigma a_i = 0$, $\Sigma b_i = 0$, $\Sigma c_i = 0$ and $\Sigma d_i = 0$.

We apply in this section the Granger causality test to GDP and 6 sectoral components, namely Mining, Manufacturing, Non-Oil Goods, Trade, Transport and Services. The test results are shown in Table 6. To save on space, we reproduce in this table only the estimates which are significant at the 10% level, or better.

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[11] For an excellent discussion of this topic, see A. Zellner (1979).

Table 6

Granger Causality Tests Applied To GDP, Mining (Oil), Manufacturing, Non Oil Goods, Trade, Transport and Services 1973-1998
Data measured in Million 1992 Constant U.S. $ in Terms of First Differences

		X ⬭ Y	Bilateral			X⬭Y	Bilateral
BAHRAIN	Tsport ⬭ Manuf	x		**SAUDI**	Goods ⬭ GDP	x	
	Sces ⬭ Goods	x			Manuf ⬭ Sces	x	
	Trade ⬭ Tsport	x		**UAE**	Manuf ⬭Goods	x	
	Trade ⬭ Sces	x			Trade ⬭ Goods	x	
	Sces ⬭ GDP	x			Tsport ⬭ Goods	x	
KUWAIT	Manuf ⬭ Trade	x			Sces ⬭ Goods	x	x
	Manuf ⬭ GDP	x			Tsport ⬭ Manuf	x	
	Trade ⬭ Tsport	x			Sces ⬭ Manuf	x	
	Trade ⬭ GDP	x			Manuf ⬭ GDP	x	
	GDP ⬭ Sces	x			Tsport ⬭ Trade	x	
OMAN	Sces ⬭ Goods	x			Trade ⬭ Sces	x	
	Manuf ⬭ Trade	x			Sces ⬭ Tsport	x	x
	Manuf ⬭ GDP	x			Tsport ⬭GDP	x	
	Trade ⬭ Tsport	x			GDP ⬭ Sces	x	
	Trade ⬭ GDP	x		**GCC**	Trade ⬭ Goods	x	
	GDP ⬭ Sces	x			Tsport ⬭ Goods	x	
QATAR	Trade ⬭ Goods	x			Sces ⬭ Goods	x	
	Sces ⬭ Goods	x			GDP ⬭ Manuf	x	
	GDP ⬭ Goods	x			Tsport ⬭ Trade	x	
	Tsport ⬭ Sces	x					
	GDP ⬭ Sces	x					
	Oil ⬭ Goods						

Source: Same as Table 2.
Non-Oil Goods=Goods; Manufacturing=Manuf; Transport =Tsport; Services=Sces

Table 6 shows the Granger Causality Tests results. The notation X ⬭ Y is for a unidirectional causality and means that X Granger causes Y. A feedback causality is denoted by 'Bilateral'.

For Mining (Oil), the table shows only one significant causality estimate. It is in Qatar and with respect to Goods. This strongly suggests a marginal impact of oil revenues on the economy.

By contrast, the table shows a number of significant causality estimates among several sectors of the economy. Of these, two (in the UAE) entail a bilateral causality (Services ⬭ Goods (Goods ⬭ Services) and Services ⬭ Transport (Transport ⬭ Services). All the others entail a unidirectional causality.

As noted above, the marginal causality of Mining suggests a relatively limited impact of oil revenues on the economy. Were this

causality non-marginal and extended to several sectors, given the relatively large number of significant causalities among the non-oil sectors, the GCC economy would have been considerably more vulnerable to the fluctuations in oil prices and revenues.

9. Concluding remarks

The Arabian Gulf (GCC) States are primarily oil exporting countries and their oil revenues, which are a primary source of government income, are highly sensitive to changes in demand and supply conditions in the world oil markets. For decades, oil prices were relatively stable at very low levels. This stability was disrupted in the early 1970s with the 'Oil Price Adjustments'. Oil prices and the States' oil revenues increased sharply over a period of ending in 1981 (Phase 1), then kept falling over a period of ending in 1986 (Phase 2) and have since been fluctuating at relatively low levels (Phase 3).

As in most oil exporting countries, the oil sector in the GCC has characteristics of an enclave sector: it sells virtually all its output in foreign markets, acquires most of its inputs from these markets and has relatively limited linkages with the rest of the economy [12]. In addition, oil revenues accrue to the state and flow into the economy through the budget expenditures. In order to shield the economy from the fluctuations in oil prices and revenues, the states maintained relatively stable expenditure flows, generating thereby budget surpluses and deficits. They also invested heavily in diversifying the production base of the economy and particularly in establishing a modern manufacturing sector.

Since instability in the world oil markets is likely to persist for some time[13], an assessment of how the economy performed over the three time phases of oil revenues can likely shed light on how it will perform in the future.

To this end, we examined first the relation of oil revenues with the two income-stabilization variables: Manufacturing output and government services and with GDP, which accounts for the entire economy. Our estimates, based on partial economic analysis and the Analysis of Variance (ANOVA) provided fairly conclusive evidence of a joint evolution of oil revenues and GDP. The evidence on the

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[12] For a review of inward- and outward-looking policies, see Hogendorn (1992: Chapter 13 and 14).

[13] For the evolution and future of oil prices, see Streifer (1995), El Mallakh (1996) and Yamani (1997).

manufacturing and government sectors was less conclusive, as the correlation estimates do not agree with the ANOVA estimates and both fail to agree with Granger Causality test results. As a result, we have not been able to relate in a definite way the pattern of changes in oil revenues to that of manufacturing output and government services.

This is not unexpected, in light of the government's budget imbalances designed to stabilize national income and the rapid build-up of a modern manufacturing sector, conducted within the broader objective of diversifying the production base of the economy. Similar diversification strategies have been adopted by many primary commodity producers[14] and have met with a mixed success, as they had to contend with serious adverse problems, not least among them is the so-called 'Dutch Disease'. However, our analysis suggests that the GCC have not experienced the deindustrialization process that has been observed in the Netherlands and other countries, following the development of a natural resource sector.

The GCC may also share with the primary commodity producers a "Rent-Seeking" cost[15]. Precise rent estimates for all the commodity producing countries are difficult to obtain, but Krueger (1974) estimates that rents generated by import licenses alone were in a range of 15 per cent of GNP for Turkey in 1968. For a sample of African countries, Gallagher (1991) obtained, for the 1975-1987 time period, estimates which range between 6 and 37 per cent of GDP. Even allowing for overestimation, the magnitude of these rents suggests considerable returns to those able to capture them.

Murphy *et al* (1993), Robinson (1994) and Acemoğlu (1995)

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[14] The strategy of diversifying the production base of the economy in order to shield national income from the fluctuations in primary commodity (including oil) in export earnings have been adopted by many primary commodity producers. This strategy and particularly the development of manufacturing industries as a means of creating a second major source of national income have generally met with modest success. This is due in large part to the complexity of the production processes, to long linkages within the manufacturing sector and with the rest of the economy, to the large capital requirements, mostly tied in advanced technologies, and not least to the 'Dutch Disease'. For an analysis of these factors, see, in particular, Auty (1990 and 1993), Gelb *et al.* (1988) and Sachs and Warner (1995).

[15] For an early analysis of 'Rent-Seeking', see Krueger (1974). For a closely related analytical model, see Bhagwati (1967). For more recent studies, see Katz and Summers (1989), Gallagher (1991), Murphy *et al.* (1993), Robinson (1994), Acemoğlu (1995) and Baland and Francois (2000).

examine the factors responsible for the apparent coexistence of large rent-seeking differences across economies. They argue that rent-seekers compete not only among themselves but also with more productive agents (or entrepreneurs) and that an increase in the number of rent-seekers lowers returns to both rent-seeking and entrepreneurship. However, entrepreneurs operate on the basis of a positive marginal cost and thereby are hurt more than rent-seekers from the lower returns. As a result, the latter crowd out entrepreneurship and induce more agents to move to rent-seeking.

Rent-seeking is made possible by 'monopoly' privileges granted by the government. The adverse economic effects arise out of the higher prices charged to consumers and the distorted distribution of national income. The GDP share which accrues to entrepreneurs tends to be used for investment purposes while the share which accrues to rent-seekers tends to be used for consumption purposes. In addition, in a rent-seeking economy, the government as regulator, acquires a large and often increasing share of GDP, which tends to be used for consumption purposes. Over the years, this leads to a lower GDP and Investment growth rates and a higher consumption and government spending growth rates.

The GCC member states have opted for an 'open' economy, with a fixed exchange rate, free capital mobility and low import tariff rates. A possible opportunity for rent-seeking may be offered to nationals by the 'sponsorship' system, whereby an expatriate must have the sponsorship of a national citizen in order to be legally allowed to conduct an economic activity.

For a perspective on the possible adverse effect of this system on the economy, consider the per capita growth rates estimates of Table 7.

Table 7
Year-to-Year Percentage Growth Rates Averaged Over the 1987-1998 Time Period
Data measured in 1992 Constant U.S. Dollars and in Per Capita Terms %

	Bahrain	Oman	Qatar	Saudi	UAE
Oil Revenues	0.210	-3.583	4.077	6.492	-4.353
Manufact. Sector	3.631	3.481	-0.754	2.975	1.679
Priv. Sector Cons.	4.911	2.944	-1.117	-0.918	1.884
Public Sector Cons.	-0.520	-1.382	-1.267	-0.337	-2.749
Investment	1.384	3.712	10.763	2.061	2.060
GDP	0.818	-0.795	0.899	0.914	-0.695

Due to the large economic distortions created by the Iraqi occupation of Kuwait, in 1991, the growth rates for this State have been omitted from the table.
Source: Same as Table 2.

Clearly, Table 7 estimates give no indication of any major "Dutch Disease" or rent-seeking adverse effect.

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Özet

Arap Körfezi ekonomilerinin dünya petrol fiyatlarına tepkileri

Arap Körfezi ülkeleri petrol ihraç eden ülkelerdir. Petrol gelirinin tümü bu ülkelerin devletlerine gitmektedir ve dünya petrol piyasalarındaki arz ve talep durumundan çok etkilenmektedir. 1974 -1981 arasında petrol fiyatları sürekli yükselirken (1. etap), takip eden beş sene içersinde sürekli düşme eğilimi göstermiş (2. etap), ve bundan sonra da inişli çıkışlı bir seyir izlemiştir (3. etap). Arap körfezi ülkelerinin gelirleri de petrol fiyatlarındaki değişimi yakından izlemiştir. Bu çalışmada, petrol gelirlerindeki değişimin gayrisafi yurt içi hâsılaya ve bazı kilit sektörlere etkisi incelenmektedir. 1972-1998 döneminde yıllık zaman serisi verilerine dayanarak gayrisafi yurt içi hâsıla ve petrol gelirlerindeki değişimler arasında güçlü bir bağlantı ve korelasyon olduğu saptanmıştır. İmalat sektörü ve kamu harcamalarındaki değişimlere gelince, bunların petrol gelirlerindeki değişimlerle ne şekilde bağlantılı oldukları saptanamamıştır. Ayrıca ana madde üreten ülkelerde baş gösteren 'Hollanda hastalığı' ve 'rant arama' gibi problemlerin Körfez ülke ekonomilerini çok etkilemediği anlaşılmıştır.