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Income, Price, and Government Expenditure Elasticities of Oil in the Gulf Cooperation Council Countries

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ABSTRACT: The analysis of the domestic oil consumption data in the six Gulf Cooperation Council (GCC) countries has reached five important findings. First, contemporaneously, no robust short run relationships are found in the data. Second, the international oil price increases tend to induce increased domestic oil consumptions in all member countries except in Oman. Third, three member countries, Bahrain, Kuwait and United Arab Emirates, are found to be oil conserving as their per capita GDP grow and expand; whereas, the other three countries, Oman, Qatar and Saudi Arabia, tend to drive up their domestic oil consumptions as their per capita GDP expand and grow. Fourth, the three oil-conserving countries also have higher income elasticity than the three non-oil conserving countries. Finally, the domestic oil markets are found to be immune to disturbances and shocks to the international oil prices. Therefore, in the face of rising oil prices, per capita oil consumptions are rapidly raising in the GCC countries, while they have taken downward trends in some developed countries such as the United States and Japan.

Keywords: Income elasticity; Oil consumption; GCC
JEL Classifications: C01; C32

1. Introduction

Oil demand elasticities are means whereby economic analysts can forecast changing oil consumptions as consumers get richer, or predict oil consumption responses as oil is taxed or subsidized. There are four demand type elasticities of oil that one can study (Dahl, 1993): income elasticity, own price elasticity, cross-price elasticity, and structural and demographic elasticity. The structural and demographic elasticity indicate how oil needs vary as countries industrialize or de-industrialize, or as citizens urbanize, or as the population gets older. The current paper attempts to address the first two demand elasticities and the responsiveness of domestic oil consumption to the government expenditure in the Gulf Cooperation Council (GCC) countries. This is to shed light on the nature of income and own price elasticities in the context of increased economic modernization and the desire to conserve oil. Studying the short run and the long run nature of these elasticities will indicate how intensified the oil consumption has been with increased income, and whether the oil consumption is a driving force for the economy. The paper uses the international oil price in the demand model to link the domestic oil market with the international market. It tells how the domestic oil consumption disruptions can feed back to international markets and it helps analysts anticipate domestic oil use responses if the oil subsidy is to be reduced or removed. The paper employs vector error correction procedures, impulse responses and Granger causality tests to analyze the relation between the oil consumption on price, per capita GDP and per capita government expenditure for the period 1980-2010 using annual observations. The paper is organized into four following sections: section 2 discusses some relevant literature; section 3 describes and discusses the model and the data;

section 4 presents the estimation techniques and the empirical analyses; and section 5 offers conclusions and policy implications.

2. Literature Review

Dahl (1993) has developed a database on energy demand with a collection of 18,000 equations in more than 1,000 studies across more 41 countries. In this database, the least used estimation technique is autoregressive and error correction methods; they account for less than 5% of the database. Dahl derives general conclusions from the database, which are that income and price elasticities of oil are inelastic, and that the elasticity estimates on static models are lower than those on long run dynamic models. She then posits three testable hypotheses: (a) poor countries have higher income elasticities than rich countries; (b) cross-sectional data yields higher price elasticity than time series; and (c) monthly estimates yield lower long run elasticities than annual estimates. Another testable hypothesis was made by Tang *et al*. (1993) upon Chinese data, where it was found that estimates obtained by using PPP GDP's are higher than those obtained when exchange rates are used to convert GDP's to dollars. Dahl's first hypothesis was rejected by the findings of Dargay and Gately (2010), whose findings show that income elasticities for OECD countries fall between 0.56 and 1.1, whereas for the oil exporting countries it is between 0.70 and 1.0, and below 0.39 for the rest of the countries. The claim that poor countries tend to have higher income elasticity than the developed countries is premised on the observation that energy intensity increases as economies move from agriculture to industry and then decreases as they shift towards services; this was a pattern observed for the developed countries, and it is anticipated that developing countries will repeat it. But with availability of efficient energy technologies, the developing countries may not repeat this pattern.

Ghosh (2009) does find that India repeats the pattern, as his results show income elasticity to be 1.97 in India, with economic growth driving up the energy consumption, and not vice versa. Similar unidirectional causality is found in South Africa by Ziramba (2010), but in South Africa oil is a necessity. Earlier on in India, Paul and Bhattacharya (2004) found the causality relation between energy consumption and economic growth to be bi-directional. These conflicting results could be due to the fact many causality tests involve only an energy and an economic variable, whereas large sample sizes and multivariate models, which are close to economic theory, are often ignored (Zachariadis, 2007). The absence of production side, which involves GDP, energy, capital, and labor in the modeling, could produce conflicting results as well. Oh and Lee (2010) include the production side in the modeling of demand side of energy, GDP and real energy price and found no causality between energy and GDP in the short run; however, in the long run, causality is found to run from GDP to energy consumption. This relation is found in 11 oil exporting countries in a panel data study by Mehrara (2007). This means that the exporting countries, which often suffer from domestic oil price distortions, can undertake energy conservation without a damaging consequence on their economic growth. In China, it is bi-directional (He *et al.,* 2008); in South Africa, it is bi-directional (Odhiambo, 2009); in Gambia, Ghana and Sengal, it is uni-directional, running from GDP to energy (Akinbo, 2008); in Canada, it is uni-directional, running from energy to GDP (Balcilar, 2006). In Canada, therefore, energy conservation can impede economic growth; this result is further confirmed by Lee and Chien (2010), who find that energy consumption drives up economic growth in Canada, Italy and Great Britain. They find it is neutral in Germany and the United States, as well as in some developing countries such as Cameroon, Côte d'Ivoire, Nigeria, and Kenya (Akinbo, 2008). This shows that oil consumption has varying patterns with the economic activity across countries, even across countries that are of the same income classification.

The current paper contributes to this debate and literature by providing additional evidence for the pattern of the relation in oil exporting countries, which have embarked on tremendous industrialization to reduce dependency on oil revenues. It is important to enlighten policymakers in these countries on the pattern and nature of the relationships between domestic oil consumption and income, and on how domestic consumption responds to changes in the international oil prices. More specifically, the paper attempts to address the following questions:

1. Has energy consumption intensified with the growth of per capita income?
2. How responsive is the domestic oil consumption to the changes in international oil markets?
3. How responsive is the domestic oil consumption to the structural shocks to GDP, oil prices, and government expenditures?

4. Is oil a necessity or a luxury for GCC countries' consumers?
5. Is there any long term relationship between oil consumption and the per capita GDP?
6. What is the nature of Granger causality relation in the short run and the long run between oil consumption and per capita GDP?

3. Theoretical Framework and Data

The general question this paper attempts to investigate is what drives local oil consumption in the Gulf Cooperation Council countries. In economic theory, consumption depends on income and the opportunity costs of consumption. The opportunity costs of consumption are the best alternative uses for the resources that go into consumption; for example, the money consumed is a tradeoff for the returns on the best investment for that money. Similarly, the oil consumed locally is a tradeoff for the export sale price and the government revenue thereof. Thus, theoretically, an increase in money income drives up the local oil consumption; whereas, an increase in the opportunity costs of local oil consumption tends to reduce the local oil consumption. This is represented as,

$$CO_t = f\left(\overset{+}{Y_t}, \overset{-}{OC_t}\right) \qquad (1)$$

Where CO is oil consumption liters per person, and Y is the per capita GDP, and OC is the opportunity costs of local oil consumption. In GCC countries, oil revenues are reaped from oil exports and not from local oil consumption. Local oil consumption is highly subsidized; therefore, the loss of export sales due to the local oil consumption represents an opportunity cost of consuming the oil locally. In this respect, an increase in the oil export price per liter tends to reduce the local oil consumption as the incentives dictate less consumption of oil and export more oil to reap the gains from increasing oil export prices. The export price may also work to boost the local oil consumption since high export price can generate high revenues with a low selling quantity. That is, high export prices can tempt the GCC countries to export less oil than before, as with high export prices they can meet their revenue targets, and the remaining oil quantities can be released to the local markets, which will hence boost the local oil consumption. It means the oil export price can work as an opportunity cost or a booster of local oil consumption. It shall become clear in which GCC countries it works as an opportunity, and in which countries it works as a booster, the other probable opportunity cost of the local oil consumption. In its modeling, this paper considers the per capita government expenditure. In GCC countries, tax revenues seldom finance government spending. It is the revenues from selling oil abroad that expand and sustain the government spending; thus, if a government wants to expand and sustain its ambitious economic modernization projects, it will tend to sell more oil abroad at the expense of local consumption. But if economic modernization projects rely heavily on oil for energy, then high government spending will drive up the local oil consumption. In this case, oil energy conservation will not be an option. This modeling is represented as,

$$CO_t = f\left(\overset{+}{Y_t}, \overset{\overset{-}{+}}{P_t}, \overset{\overset{-}{+}}{G_t}\right) \qquad (2)$$

Where P is dollar export price of crude oil per liter, and G is dollar government expenditure per person. The prices are sourced from United States Energy Information Administration's (EIA) *International Energy Annual 2010*. For Saudi Arabia and Bahrain, the paper uses Saudi Arabia Light (34) annual price data, for Qatar, Qatar Dukhan (40), for Kuwait, Kuwait (31), for Oman, Oman Blend (34), for United Arab Emirates, TC Murban (39). These prices per barrel are converted into prices per liters using the scale that one crude barrel is equivalent to 159 liters, and then the resultant is multiplied by 100 to transform it into cents per liter. The population and petroleum consumption data are also sourced from the Energy Information Administration. The per capita GDP and the government expenditure data are downloaded from the website of the World Bank Development Indicators.

The local oil consumption series has some interesting trends and patterns, which are worth looking at before embarking on the estimation of the model. The paper graphs the oil consumption liters per person in the GCC in comparison to some advanced countries such as United States, Japan and China over a period of the last 31 years, as presented in figure 1. It reveals that United States and

Japan are conserving and diversifying away from petroleum consumption, whereas China and the GCC are on an upward trend of petroleum consumption. The United States started out at 12 liters per person 31 years ago, and now it is consuming 9.8 liters person; while Japan's highest consumption level was at 7.26 liters per person in 1996, and it declines to 5.58 liters per person in 2010. China's consumption has been rising steadily from 0.26 liters in 1982 to one liter per person in 2010. Rapidly increasing petroleum consumption is realized in GCC, starting from 9 liters person in 1980 and standing at 17.17 liters per person in 2010, an increase of 90.78% over the 31 year period.

figure 1: Litres of oil consumption per person

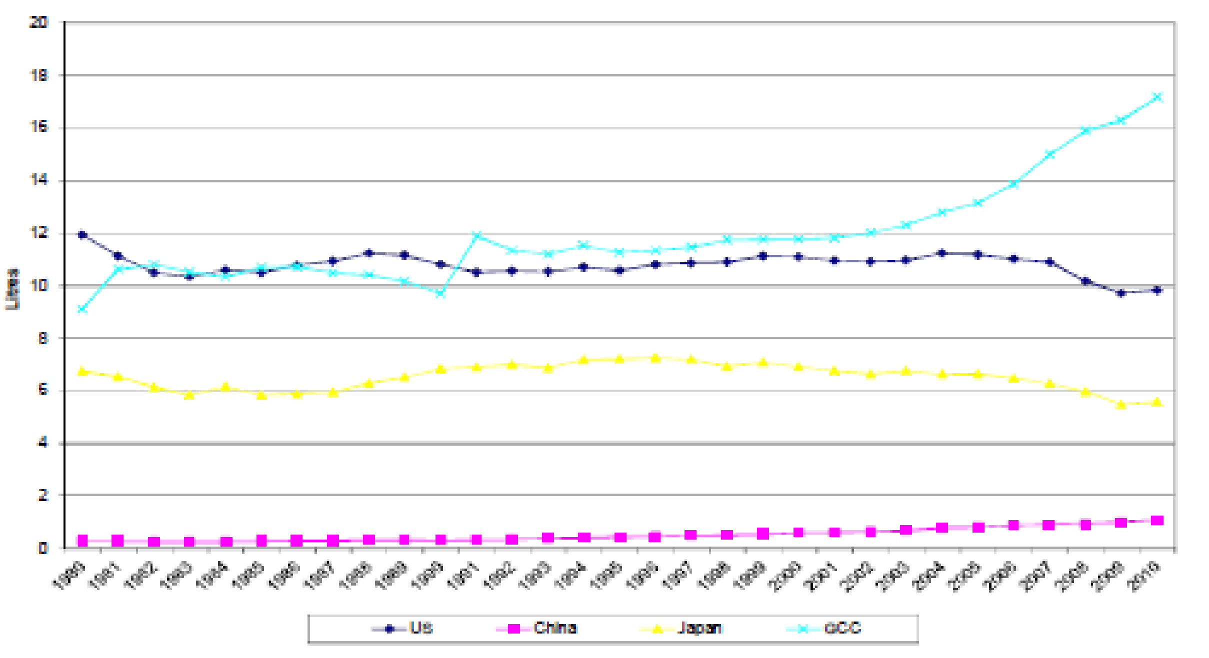
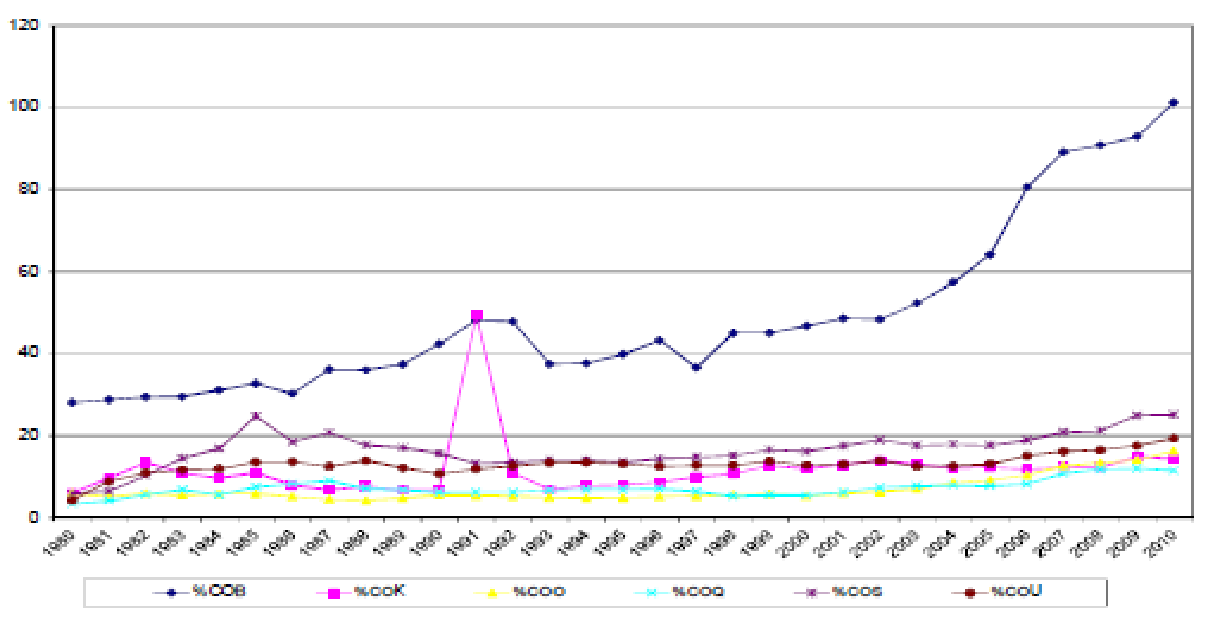


figure 2: Local oil consumption as a percentage of the local production of oil



Where COB = oil consumption to production in Bahrain, COK = oil consumption to production in Kuwait, COO = oil consumption to production in Oman, COS = oil consumption to production in Saudi Arabia, and COU = oil production to production in United Arab Emirates.

As for how the local oil consumption is eating into the petroleum production of the GCC countries, the paper graphs the trends for each of the GCC countries over the last 31 year period, as illustrated in figure 2. The graphs reveal that the GCC countries are rapidly consuming their own oil to the extent that Bahrain now has nothing left to export; what Bahrain produces now is barely sufficient to meet its own local petroleum demand. This has pressed Bahrain into looking for other avenues to finance and sustain its economic progress. Thus, other countries should start diversifying their economic sources of growth and finance to make up for the rapid local petroleum consumption cutting into their production.

4. Estimation Methods and Empirical Analysis

Standard econometric estimations assume that mean and variance of stochastic series are finite and time invariant. That is, the series are stationary, and they fluctuate around a constant, meaning that they have finite variances that do not depend on time; whereas, a non-stationary series has no tendency to return to long run deterministic path and its variance is time dependent, and it hence follows a random walk. When two and more independent series that follow a random walk are found to be related using standard inferences in ordinary least square regression, the relation is called spurious. To avoid having spurious relations, the series are tested for stationarity or unit root property. For this test, the paper uses the augmented Dickey Fuller procedure, which allows for structural breaks in the series. Taking X as a stochastic series, the procedure is represented as,

$$\Delta x_t = \alpha_0 + \beta x_{t-1} + \alpha_1 \Delta x_{t-1} + \alpha_2 \Delta x_{t-2} + ... + \alpha_{t-p} \Delta x_{t-p} + u_t \qquad (3)$$

The procedure has an intercept and no trend, and lagged difference series are the augmenting factors, for which the lag is determined by minimizing the Schwartz information criterion or the Akaike information criterion. The hypothesis is set as,

$H_0 : \beta = 0$: The series needs to be differenced to make it stationary

$H_0 : \beta \prec 0$: The series is stationary and does not need to be differenced.

The process of differencing continues until the series is found stationary. If the series are found to be first difference stationary, then the data should be differenced before incorporating them in the ordinary least square regressions. The unit root tests have shown that all the variables in the model are first difference stationary. Thus, OLS regressions can be applied to the model. This allows us to employ vector error correction procedures that investigate both the short run and the long run relationships in the model.

Regression methods involving differenced variables can reveal only the contemporaneous relations among the variables and incur the loss of important long run information. To counter such loss, this paper employs the vector error correction method. Under this method, not only the long run information is maintained, but the adjustments corrected towards the long run relation are also revealed. It further investigates the feedback effects from each variable in the model onto the long run relation. This information can be used with the Granger causality test results to examine the weak exogeneity of some variables in the model. This paper imposes some structural order on the VECM to attempt to identify the co-integration ranks and the co-integrating vectors of the model. The VECM is a special case of Vector Autoregressive model for variables that are stationary in their differences. That is, the individual series are non-stationary in their levels but their linear combination is stationary; the variables are bound by one or more equilibrium relationship. Taking x as a column vector of variables, the VECM is generally represented as,

$$\Delta x_t = \phi + \pi x_{t-1} + \sum_{i=1}^{p-1} \phi_i \Delta x_{t-i} + \upsilon_t \qquad (4)$$

Where $\pi = \alpha\beta'$

The columns of β and α contain the m co-integrating vectors and adjustment vectors respectively. The number of co-integrating relations is determined by the number of ranks of π,

$$Rank[\pi] = \min[Rank(\alpha), Rank(\beta)]$$

If the rank of π = 0, it means no co-integration relation exists for the linear combination of the variables in the model. If it has a full rank (Rank (π) = K), which means the number of co-integrating relations equals exactly the number of variables in the model, then the series cannot be I(1), and hence they are stationary in levels, but not in differences. If the rank of π is m, where $0 < m < K$, then there exists at least one co-integration relation, and πx_{t-1} becomes the error correction term of the model. The structural order imposed is that the variables in the model are in the order of LCO, LP, LY, and LG belongs to one long run relation in which the co-integrating vectors are normalized by the long run coefficient of LCO. Table 1 below presents the contemporaneous and error correcting terms of the model, where two lags of the differenced variables are used:

Table 1. Contemporaneous Effects and Error Correcting Terms

Feedback direction	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
D(LP) <= D(LCO)	1, 2	$1^{*(-)}$, 2	1, 2	1, 2	1, $2^{*(-)}$	1, 2
D(LCO) <= D(LP)	1, 2	1, 2	1, 2	1, 2	1, 2	$1^{*(-)}$, $2^{*(-)}$
D(LY) <= D(LCO)	1, 2	1, 2	1, 2	1, 2	1, $2^{*(-)}$	1, 2
D(LCO) <= D(LY)	1, 2	1, 2	1, 2	1, 2	1, 2	$1^{*(+)}$, $2^{*(+)}$
D(LG) <= D(LCO)	$1^{*(+)}$, 2	$1^{*(-)}$, 2	1, 2	---------	1, 2	1, $2^{*(-)}$
D(LCO) <= D(LG)	1, 2	1, 2	1, 2	----------	1, 2	1, 2
D(LY) <= D(LP)	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2
D(LP) <= D(LY)	1, $2^{*(-)}$	1, 2	1, 2	$1^{*(+)}$, 2	1, 2	$1^{*(+)}$, 2
D(LG) <= D(LP)	1, 2	1, 2	1, 2	-----------	1, 2	1, 2
D(LP) <= D(LG)	1, $2^{*(+)}$	1, $2^{*(+)}$	1, 2	-----------	1, 2	$1^{*(-)}$, 2
D(LG) <= D(LY)	1, 2	1, 2	1, 2	-----------	1, 2	$1^{*(+)}$, 2
D(LY) <= D(LG)	1, 2	1, 2	1, 2	-----------	1, 2	1, 2
Error Correcting Term for the imposed structural order	-0.0574 (0.15210) [-0.37750]	0.1613 (0.1271) [1.2689]	-0.3984 (0.34276) [-1.1624]	-0.1114 (0.2420) [-0.4604]	0.10182 (0.17330) [0.58758]	-0.14734 (0.04432) [-3.3248]

Where 1 = first lagged differenced variable, and 2 = second lagged differenced variable; *(+) = significant positive relationship, *(-) = significant negative relationship

The contemporaneous effects in Table 1 show that shocks to domestic oil consumption lead to falls in oil export price in Kuwait and Saudi Arabia; however, shocks to oil export price do not seem to influence any other variables in the model except for the domestic oil consumption in UAE. UAE also experiences increased per capita GDP temporarily when domestic oil consumption increases. It is the UAE domestic market that is found to have significant adjustment towards equilibrium; the other markets tend to experience no error correcting problem within equilibrium relation. That is, most domestic oil markets in GCC countries tend to have no disruptions or disturbances as international oil price changes. When all the error correcting adjustments and changes in Table 1 die out and become zero, the long run relations in the model for each country emerge as in Table 2.

Table 2. Long Run Relationships with the vectors normalized by the long run co-efficient of LCO:

Variable	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
LCO	1.000	1.000	1.000	1.000	1.000	1.000
LP	-0.789^{*} (0.09267) [-8.5151]	-1.5568^{*} (0.2827) [-5.5065]	0.3094^{*} (0.03107) [9.9574]	-0.3936^{*} (0.0664) [-5.9193]	-0.4543^{*} (0.06386) [-7.1136]	-2.5154^{*} (0.54406) [-4.6235]
LY	0.5881^{*} (0.1929) [3.0126]	2.2032^{*} (0.5090) [4.3285]	-0.1667 (0.10108) [-1.6499]	-0.2191^{*} (0.06159) [-3.5606]	-0.2879^{*} (0.07548) [-3.8143]	2.0813^{**} (0.5798) [2.5019]
LG	-0.2150 (0.3119) [-0.6894]	-1.4810^{*} (0.44399) [-3.3358]	-1.0304^{*} (0.1842) [-5.5939]		0.9485^{*} (0.17033) [5.5684]	1.2850^{*} (0.57976) [2.2164]
C	-3.5105	-7.8007	7.13941	0.72677	-5.9955	-27.3683

Where LCO = log domestic consumption of oil (liters per person), LP = log export oil price, LY = log per capita GDP, LG = log government expenditure per person, and C = constant.

These long run relations for each country can be written as below:
Bahrain:

$$LCO_t = 0.789LP_t - 0.5812LY_t + 0.215LG_t + 3.5105$$

Kuwait:

$$LCO_t = 1.5568LP_t - 2.2032LY_t + 1.48104LG_t + 7.8007$$

Oman:

$$LCO_t = -0.30939LP_t + 0.16677LY_t + 1.0303LG_t - 7.1394$$

Qatar:

$$LCO_t = 0.3934LP_t + 0.2193LY_t + 0.7268$$

Saudi Arabia:

$$LCO_t = 0.4543P_t + 0.2879LY_t + 0.9485LG_t - 5.9955$$

United Arab Emirates:

$$LCO_t = 2.5154LP_t - 2.0813LY_t - 1.285LG_t - 27.368$$

The long run vectors are found significant, except for per capita GDP in Oman and per capita government expenditure in Bahrain. The oil export price tends to increase domestic oil consumption in Bahrain, Kuwait, Qatar, Saudi Arabia and UAE. This confirms the hypothesis that increased oil export price increases revenue from given quantity, and hence the exporting country can sell less quantity internationally while maintaining or boosting its domestic oil consumption. The exception to this hypothesis is Oman, where increased oil export price tends to reduce the domestic oil consumption. For Oman, the opportunity cost of domestic oil consumption increases as oil export price increases, and this encourages Oman to release more oil to the international market and less oil to the local market to reap high oil revenues. For oil conservation, Bahrain, Kuwait and UAE are found to diversify their energy sources and reduce domestic oil consumption as their economies grow, which is indicated here by increased per capita GDP. For Oman, Qatar and Saudi Arabia, domestic oil consumptions are driven up by increased per capita GDP. That is, these countries tend to be non-oil conserving as their economies grow. The oil consumption is found to more income elastic in the oil conserving countries than in the non-oil conserving countries. Increased oil consumption is also found to be induced by per capita government expenditures in all GCC countries except for UAE. This implies that government expenditures in GCC countries induce and increase domestic oil consumption, and this may need to be checked to enhance diversification of energy sources.

Granger Causality

Granger causality implies a correlation between current value of one variable and the past values of other variables. It does not mean changes in one variable causes changes in another, but it is useful for testing whether a variable is exogenous. For example, if no variable in the model is found, according to Granger, to Granger cause the oil export price, P, then it can be considered exogenous. This can be a test for the exogeniety of the variables in the model. It can also be used for forecasting purposes; for example, if oil consumption liters per person, CO, Granger causes per capita GDP, Y, then the present value of per capita GDP can be predicted by using past values of the oil consumption, and vice versa. This test is performed as, Feedback test from oil consumption, oil price, and per capita Government expenditure to per capita GDP:

$$LY_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i} \ln LCO_{t-i} + \sum_{i=1}^{m} \beta_{2i} \ln LP_{t-i} + \sum_{i=1}^{n} \beta_{3i} LG_{t-i} + u_t \quad (5)$$

Feedback test from per capita GDP, oil price, and per capita Government expenditure to oil consumption:

$$LCO_t = a_0 + \sum_{i=1}^{q} a_{1i} \ln LY_{t-i} + \sum_{i=1}^{m} a_{2i} \ln LP_{t-i} + \sum_{i=1}^{n} a_{3i} LG_{t-i} + u_t \quad (6)$$

If the sum coefficients of per capita oil consumption in equation (5) are significantly different from zero, then the changes in the per capita GDP can be predicted using the past values of the per capita consumption. The feedback will run from per capita GDP to oil consumption, if the sum coefficients of per capita GDP in equation (6) are significantly different from zero. This paper examines three lag scenarios for a bi-variate case. This means past one to three year values are assumed to hold information about the current value of another variable if there are to be feedback processes. The estimation results produce the following meanings in table 3:

Table 3. Granger Causality Tests

Feedback direction	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
LP => LCO	NO	NO	NO	NO	NO	NO
LCO => LP	NO	NO	YES	YES	NO	YES
LY => LCO	NO	NO	YES	YES	NO	NO
LCO => LY	YES	YES	NO	NO	YES	NO
LG => LCO	NO	YES	YES	---------	YES	NO
LCO => LG	NO	YES	NO	----------	YES	YES
LY => LP	YES	NO	YES	YES	YES	YES
LP => LY	YES	NO	NO	YES	YES	YES
LG => LP	YES	NO	YES	-----------	YES	NO
LP => LG	NO	NO	NO	-----------	NO	YES
LG => LY	NO	NO	NO	-----------	NO	NO
LY => LG	NO	YES	YES	-----------	YES	YES

The pair-wise Granger Causality tests with three lags in the table above finds a uni-directional relation running from domestic oil consumption to oil prices in Oman, Qatar and UAE, and to per capita GDP in Bahrain, Kuwait and Saudi Arabia. That is, information contents of domestic oil consumption can predict changes in oil prices in Oman, Qatar and UAE, as well as predicting changes in per capita GDP in Bahrain, Kuwait and Saudi Arabia. No evidence is found in the data indicating that international oil prices predict changes in the domestic oil consumption in GCC countries. This implies that GCC domestic oil markets are immune to international oil price shocks. The data reveals a bi-directional relationship between oil price and per capita GDP in most GCC countries.

5. Conclusion

The analysis of relations in the data reveals five important issues. The first issue concerns rapid per capita oil consumptions in the GCC countries relative to some developed countries for the last 31 years. The United States and Japan are consuming less oil today than they used to 31 years ago. 31 years ago, the United States consumed 12 liters per person, and now it is consuming 9.8 liters per person. Japan's highest consumption level was in 1996 at 7.26 liters per person, and now it is consuming around 5.58 liters per person. The per capita oil consumption has been rapidly increasing; it started out at 9 liters per person, and now it stands at 17.17 liters per person. The second issue concerns the contemporaneous relations between the variables in the model. Contemporaneously, no robust relationships are found between the variables in the model. The only significant error correcting term found is in the UAE data, while the other GCC members experience no significant adjustments towards equilibrium. The third issue concerns the behavior of the international oil price in relation to the domestic oil domestic consumption. For all countries in the GCC except Oman, increased international oil price tends to induce increased domestic consumption, as increased international oil price can generate high revenues from given export volumes while maintaining or boosting domestic oil consumption. Contrary to this case is that of Oman, where increased oil price tends to induce more exports of oil and less oil for the domestic market. The fourth issue revealed in this data regards the oil conservation. Wherein three countries, Bahrain, Kuwait and UAE, are found to diversify their energy sources and reduce their domestic oil consumption as their per capita GDP expand and increase. The other countries, namely Oman, Qatar and Saudi Arabia, seem to be non-oil conserving as their per capita GDP's grow and expand.

Finally, the information content of international oil price is found to be of no relevance to the domestic oil market. The domestic oil markets are immune to disturbances and shocks to the international oil prices. There exists a uni-directional relation running from domestic oil consumption to per capita GDP in Bahrain, Kuwait and Saudi Arabia. For Oman and Qatar, the uni-directional relation runs from per capita GDP to domestic oil consumption, and for most countries there are bi-directional relationships between international oil price and per capita GDP.

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