The Oil and Regional Security Revisited: The Case of the Arabian Gulf

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Abstract

Despite the tremendous increase in oil revenue and Military Expenditures in the Gulf region after the second and third oil prices revolutions (1980 and 2003), the relationship between them is not studied fully. This paper studies the effect of the oil revenue on the regional security measured by the Military Expenditure in that region. The analysis suggests that oil revenue is positively affecting Military Expenditure, however; it is not the only factor that determines it. Population, past Military Expenditure, and conflict seem to play more important roles in determining it. Also the region exhibits an increase in its marginal propensity to spend on defense in the long-run, which might lead to devastating results economically, socially, and militarily.

Key words: Oil revenue, Military Expenditure, Gulf, GCC, marginal propensity to spend on defense.

1. Introduction

This paper investigates the relationship between the oil revenues and the security level measured by Military Expenditures (ME hereafter) in the Arabian Gulf Region. The link between economic factors and security measures are of a swing nature with no clear direction of effect. With the end of the Cold War, economic power became the dominant phenomenon in world affairs and economic strength is seen as a guarantee of national security (Treddenick 1996: 5045). Moreover, the end of the Cold War brought a reduction in the level of arms race and there are no longer arms races in today's world (Fontanel and Samson 2008: 127). This peace is a strange peace. It substantially reduces the danger of global warfare, but it increases the opportunities for local conflicts through the proliferation of weapons of mass destruction, the potential for regional wars, and the increasing number of ethnic and religious conflicts (Treddenick 1996: 5644-5645). All these threats to peace exist in the Gulf region.

One of the consequences of the oil price increase after 1973 was an increase in studies about the ME and the economies of the Middle East. However, there was a lack of systematic studies of the effect of oil revenue on the ME. It was considered so familiar that it required no elaboration (Askari and Corbo 1974: 341). Also the absence of studies about the Gulf region with regard to the relationship between the two factors was surprising. Studies focused on the Middle East despite the heterogeneity of countries and the circumstances in the region. This is because the Arab-Israeli conflict was a dominant conflict, and the Arab countries in the Gulf were at early stages of independence and development in the early 1970s (ACDA 1963-1973: 22-61). The absence of studies about the subject after the second oil price increase in the early 1980s was more surprising. The end of the Cold War dropped interest to study the arms race and related issues (Gause (a) 1997: 12).

Despite the importance of the region, little attention was paid to study the region's ME. The countries in the region are oil exporters and involved in a movement of increasing ME. The Arabian countries on the east cost of the Gulf have authoritarian regimes, weak political institutions, fragile security measures, and increasing demographic problems. All are allies of the West and host Western troops and bases. Iran, alternatively, is categorized by a large population, high unemployment rate, and is considered to be a threat to the stability in the region (BBC Arabic March 16, 2009). Iran is the center of growing conflict in the Gulf region with its attempt to develop a nuclear program and aiding organizations categorized as terrorist organizations by Western countries (Tait and MacAskill 2009). The militarization of the region must be understood in two dimensions: the logic of international arms trades and the economics of petroleum. Arms producing countries export arms to the region driven by the desire for cash, reducing the unit cost of their own weapons acquisition and expand their influence. This reason is linked to the economics of petroleum. Oil is the key to the strategic significance of the region.

If the region's major export were cotton, the major powers would have little interest selling arms to the countries of the region. Oil revenue unmistakably parallels ME (Sadowski 1993: 6-8).

Iraq's exit from the military buildup reduced the conflict in the region and sheds light on the ME of other countries. The region now is a focal point in the war on terror and experienced a huge increase in oil revenue from the third oil price increase after 2004. With the increased tension, and major powers increased intervention, the study of the ME and its relationship with oil revenue is increasingly important in this unique region both politically and economically. This research empirically compares the relationship between an economic factor (oil revenue) and security measures (ME) in the Gulf region for the period 1988-2008.

The paper is arranged as follows. Section II gives a review of work done in the field and points to the lack of systematic studies of the issue. Section III discusses the model and its specifications. Section IV covers the data and its sources. Section V contains the results of the analysis, and section VI contains the conclusions and some suggestions for further studies.

2. *Literature Review*

The work on military expenditure and economic power in the Gulf focused on the Middle East as the region of interest. The importance of the Gulf region in terms of economic, military, and demographic terms should be taken into consideration of such studies. In this analysis of oil, conventional and new conflicts, and religion-politics in the Middle East, politics and security did not change but have different faces (Korany 205: 60). As the oil revenue for countries in the region is cyclical, so does their national income. This fluctuation of financial flows is not allowed to affect "national security." Through recycling a substantial sum of their petrodollars in arms purchases, the countries in the region "invested" more than $100 billion of their oil revenue in the purchase of weapons systems since the late 1980s (63). Along with the continuing Arab-Israeli Conflict which was the basis for the region's militarization in the 1970s and 1980s, the border and territorial disputes in the region became a trigger for regional wars as manifested itself in the Iraq-Iran war and Iraq invasion of Kuwait and its consequences. This dispute explains the latest claim by some Iranian officials that Bahrain belongs to Iran (Rafei 2009) and the continuing occupation of the three U.A.E. islands by Iran. More clearly is the Iranian threat to close the Hurmoz Strait to stop the flow of oil from the gulf countries to the world. The region, as part of the Middle East, is characterized by the high politicization of religion. The civil war in Iraq and the Iranian determination to pursue their nuclear dream could play an essential role in determining the trend of the conflict in the region (Korany 2005: 68-73).

Lebovic and Ishag (1987: 106-138) claim that no detailed study on the region exists on the issue of the ME. Using pooled time-series cross-sectional analysis, developing a measure of military capability, and capturing the effect of rapid increase in revenue of Middle East OPEC members, they find a significant effect of military expenditures on GDP. They use their model on non-oil producing countries and find a significant negative impact of ME on GDP growth. They do not investigate the effect of GDP growth on ME and do not use their model on the oil producing countries to compare the two groups.

In a study on the determinants of ME in Third World countries, Loony (1987) finds that the mineral exporting countries have different patterns of ME than do their non mineral counterparts. He does not specify the type of minerals in the study, but oil was included. This study marks the first study that tries to explain the effect of natural resources on ME. However, it does not focus on developing countries by including Norway and the U.K. (Loony 1987 (a): 17).

By studying the short-run effects of expensive oil on the transfer of weapons, Chan (1980) uses a pooled cross-sectional time-series data on oil and arms trade. He finds a link between oil and arms trade and finds a necessary but not sufficient condition for proving that weapons have been used by arms producing countries to recycle petro-dollars from the OPEC countries. He acknowledges that the arms importers constitute a heterogeneous group, and therefore the dramatic increase in oil price had different short-term effects on the weapons procurements for different countries. He argues that while the oil exporting nations imported more weapons because the increase in oil revenue, there are other factors involved. The increase in the strategic and economic importance of these countries, the rapid socioeconomic change, and the availability of ready cash affected the decisions to invest heavily in weapons. Using data on 56 countries from 1971 to 1976, he finds some evidence indicating a link between arms and oil trades such that the major fuel producers buy more weapons.

He includes only three countries from the Gulf region in his study (Iran, Kuwait, and Saudi Arabia) and his results are unable to discriminate between the rival hypothesis concerning the direction of the causal relationship between increase in oil prices and weapons sales (Chan 1980: 235-244).

In a related study, though somehow descriptive only, Morteza Gharehbaghiar (1987) discusses the relationship between oil revenue and the militarization of Iran: 1960-1978. He attributes the militarization of Iran in that period to its strategic position bordering the Soviet Union, its relationships with the west, and economic reasons where oil plays the main role. He asserts that there has always been a direct correlation between oil revenue and arms purchases. Oil revenue has been a secure income on which the military expenditure has mainly relied. Also a major part of the oil revenue returned to the industrialized nations through the purchase of arms.

Faced with an increase in its oil revenue, Iran chose a large scale military expenditure to absorb the excess supply of revenue. Two factors played roles in determining that course of action: the suppression of the internal opposition and the increase in its external leverage in the region.

Iran military expenditures accelerated after 1973 due to the rise in oil revenue. The value of weapon imports had grown from a yearly $8.5 million in the early 1960s to an average of $10 billion a year after 1974. Iran was the leading country among the Less-developed Countries (LDCs) in arms purchasing with a share of 13.6%, same pattern happens to Saudi Arabia. In 1976, Iran spent 12.5% of its GDP on military expenditures compared to 3.8% for France. As a result of the arms inflow, there was a great expansion in the size of the Iranian armed forces. The number of men under arms in all services had risen from 161,000 in 1970 to 413,000 in 1978. Gharehbaghiar concludes that the link of militarization with oil revenue after 1973 was a problem of absorption. Given the size of the economy, production absorption of revenue was limited, one easy way out was to turn to unproductive stockpiling of weaponry. However, he acknowledges that the argument is not the sole explanation of the phenomena and that other factors equally important but not included (Gharehbaghian 1987: 87-100).

From the review of literature, it appears that no econometrics study exists that deals with the ME of the Gulf region directly with the exception of Gharehbaghian's study. In addition, no study investigated the causal relationship between oil revenue and ME yet even though these studies all addressed the link between the ME and oil revenue. Therefore, this paper is an attempt to fill that gap in the literature by studying the relationship between the oil revenue and ME in the Gulf region.

3. *The Model*

Different versions of models used to explain the ME follows from the utility that a country obtains from spending on the defense sector, the security function. The theoretical model is based on the assumption that the state acts as rationally to maximize social welfare, subject to a resource constraint.

The utility function is given by:
W= W(S, C, N, ZW).
where W is the social welfare, S is the security function, C is consumption, N is population, and ZW is the variable set that captures other factors in the welfare function.

The security level is determined by the military expenditure (ME), military expenditures of other countries ME_1, ME_2, and the political and strategic dimensions given by ZS.
S= S (ME, ME_1, ME_2, ZS).

Some of the other countries may be allies in such that there is a "spillin" from their military expenditures, ME_1, which raises the security of the countries. Others may be potentially hostile in which case their expenditure ME_2 poses a threat to the security of other countries.

Maximizing the social welfare function, subject to the budget constraint given by:
Y= P_{me} ME + P_c C.
Where Y is the GDP, P_{me} and P_c are the prices of ME and C, yields a derived demand function for ME: [1]

$$ME_t = \left(\frac{Y}{P_{ME}}, ME_{1t}, ME_{t-1}, \left(\frac{Y}{P_{ME}} \right)_{t-1} \right).$$

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[1] For details of the derivation of the demand function see appendix 1.

Based on econometric specifications and to avoid the autocorrelation problem between Y_t and Y_{t-1}, Dunne and Perlo-Freeman (2003: 463) modified the model to include the demographic and the strategic variables as:
ME= ME (Y, P_m/P_c, N, ME_{t-1}, ME_1, ME_2, ZW, ZS).

Smith (1995: 71-75) modified the model to include the military expenditure of allies, ME_{2t}, to capture the effect of the "spillin" and reaches an econometric model given by:
$ME_t = \beta_o + \beta_1 (Y/P_{me}) + \beta_2 ME_{1t} + \beta_3 ME_{2t} + \beta_4 ME_{t-1} + \beta_5 N + \beta_6 Z + u_t$.

Because countries usually do not maintain indices of the price of military activity, data on P_{ME} are typically not available. Price can be dropped from the equation without biasing results, provided that the price of military activities has inflated at the same general rate as that of non-defense activities (Sandler and Hartley 1995: 61).

For the purpose of this research, the demand equation was modified to include the "spillin" from the ME of the GCC countries on each other since the GCC represents a form of general alliance, and the Z factor to represent conflict in the region, in the following formulation:

$$ME_t = ME (Y_t, ME_{t-1}, ME_{1t}, ME_{2t}, N, Conflict) \qquad (1).$$

Conflict represents the level of tension in the region and is a dummy variable equals 0 for the years of détente' between the GCC countries and Iran (1992-2001), and 1 otherwise.
Therefore the econometric model is given by the following functional form:
$$ME_{it} = \beta_0 + \beta_1 \, Oil\ Revenue_{it} + \beta_2 \, ME_{i\,(t-1)} + \beta_3 \, ME_{1t} + \beta_4 \, ME_{2t} + \beta_5 \, Population_{it} + \beta_6 \, Conflict_t + U_{it} \qquad (2).$$
where i= 1,2, … 7 representing the seven countries included in the study.

The GDP is replaced by oil revenue without loss of generality. The countries covered by the study depend on oil for their GDP and CGE for more than 85% (table 1). In order for those countries to finance such large ME, they need cash to pay for it. Oil seems to be the natural if not the only source.

Table 1: Correlation Coefficients of Oil Revenue with GDP, CGE, and ME 1988-2007.

Country	Correlation Coefficient of Oil Revenue with:		
	GDP	CGE	ME
Bahrain	0.93	0.20	0.897
Iran	0.82	0.59	0.925
Kuwait	0.96	0.61	0.704
Oman	0.92	0.54	0.855
Qatar	0.83	0.69	0.438
Saudi Arabia	0.83	0.40	0.781
U.A.E.	0.95	0.10	0.776

Sources: Oil Revenue: OPEC.

http://www.opec.org/library/Annual%20Statistical%20Bulletin/interactive/2006/FileZ/ogdtbl.htm.
Military Expenditures: SIPRI. http://milexdata.sipri.org/

Many weapons suppliers want to see oil producers increase their oil production to purchase more weapons because suppliers double their benefit, recycling the petrodollars and reducing per-unit cost of their own weapon procurements (Chan 1980: 244). Following the 1991 Gulf war, the U.S. supplied Saudi Arabia and other allies among the Gulf states with massive amounts of highly sophisticated armaments. The U.S. and other suppliers delivered more than $100 billion worth of arms from 1990 to 2001. In the late 1980s, Saudi Arabia had imported 17%, by dollar value, of worldwide weapons sales to developing countries. In the 1990s, the Saudi share rose to 38% (Renner 2003: 23-27)

The final part of the econometric analysis in this research is to find the "Marginal Propensity" to spend on defense by the countries examined. This is done to test if the countries attempt to establish, over time, a rather constant proportion of defense allocations to their level of oil revenue. This research calculates the short-run and the long-run marginal propensity of a country to spend on defense. Estimating the parameters in the following equation gives the short-run marginal propensity to spend on defense (Zb) and the long-run marginal propensity to spend on defense (b) (Looney (b) 1988: 148-149), as shown in the following equation:

[2]$ME_{at} = Za + Zb$ oil revenue $_t + (1-Z) ME_{a(t-1)}$ (3).

4. *Data Sources and Description:*

This research, as previous studies, faces the problem of limited data. A number of factors explain the issues with the data. Differences in the definitions of ME, bad reporting by governments, even cheating, and data preparation are few of the problems encountered. Different sources of ME utilize different ways to prepare data regarding time arrangement, inflation correction, and currency conversion. This is true despite the number of well known and reputed institutions reporting ME data. All that leads to the conclusion of the increase in the uncertainties about data on ME (Brzoska 1981: 261).

Among institutions that are involved in ME reporting are the United States Arms Control and Disarmament Agency (ACDA); the International Institute for strategic studies (IISS); and the Stockholm International Peace Research Institute (SIPRI). Each one has different resources of the ME, which give large variations in reporting the ME and related issues for identical countries and years. This problem is worse for LDCs, especially for the Gulf region where secrecy and misleading information is the dominant strategy regarding ME data. Public information is not yet those states strategy especially when it comes to national security issues (Lebovich 1987: 162-165).

The problem with choosing the source of the ME data revolves around the purposes of the use of the data. Therefore, this research relies on the SIPRI data for a few reasons. First, it is the most complete data about the countries in the region and the time of study. The ACDA has yet to publish the data on ME after 1999 and the Correlations of War (COW) data stops at 2000. Second, the ME reported by SIPRI is already converted to constant 2005 U.S. dollars which resolves the problem of converting the currencies. Also these data are based on publicly available information, not national governments information, which is highly unreliable in the region, or secret service information, which is usually limited and cannot be controlled. The choice of the SIPRI data set comes at the cost of being coupled to use the reference year as 2005 and the inflated, compared to other sources, figures of ME reported, to mention a few problems (Brzoska 1981: 262-265).

4.1 Dependent Variable

The ME is the dependent variable that is measured in millions of 2005 constant U.S. dollars. This includes "all current and capital expenditure on the armed forces including peace keeping forces, defense ministries and other government agencies engaged in defense projects, and paramilitary forces. Such expenditures should include military and civil personal, operation and maintenance, procurement, military research and development, and military aid". (www.sipri.org/contents/milap/milex/mex_sources.html). This research uses the dollar value of the ME because it represents the amount allocated by the Gulf states to their military establishment as a measure of security. Other studies use the Military Burden[3], or the Militarization Index[4], both of which do not seem to be appropriate for this study.

4.2 Independent and Control Variables

The independent variable is oil revenue. The data on that are obtained from OPEC and converted to constant 2005 U.S. dollars. The oil revenue is expected to have a positive effect on ME since it is the main financial source to pay for ME as one of the large components of the CGE. Control variables include the population, last year ME, and conflict. The data of population are obtained from the United Nations statistical division. In this regard, population is expected to have a negative effect on ME because as the population increases, the countries should allocate more of the resources for social service, which means lees resources allocated for ME. The effect of the conflict is expected to be positive because these countries respond to higher tension in the region by expanding and strengthening their militaries which means higher ME. Brief descriptive statistics about the data are given in table 2.

5. *The Methodology and Analysis*

The Middle East arms race has been fuelled by the large revenue of the oil exporting states and the willingness of supplier states to sell them almost any kind of weapon.

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[2] For detailed derivation of the above equation see appendix 2.

[3] Percentage of ME of the GDP.

[4] The percentage of Armed Forces per 1000 of population.

In 1973, oil revenue in the Middle East was $25 billion, and ME was about $10 billion. In 1979, the figures were $125 billion and $27 billion respectively (SPIRI 1982: 12). There is a direct correlation between oil income and Military expenditures (Figure 1). In regional terms, the Middle East comprises the major Third World market for the arms producers-about 56% of total transfers. The Middle East accounted for more than 72 percent of total U.S. arms transfers to the Third World from 1990-1993, up from 61% over the previous four years, while the position of every other major arms supplier dropped significantly (Stork 1995: 14-19).

Table 2: Summary Statistics of the Data

|	Military Expenditures				Oil Revenue				Population			
	Obs.	Mean	Max	Min	Obs.	Mean	Max	Min	Obs.	Mean	Max	Min
Region	136	5078.8	33793	213	138	31648.1	173031	934	140	13.1	71.2	0.43
GCC	140	31226.5	42549	23617	140	192789	319321	91374	140	28.3	36.2	2.14
Bahrain	20	344.1	543	213	18	4349.2	9206	934	20	0.61	0.75	0.46
Iran	19	3483.3	7677	1160	20	25582.6	53590	7984	20	63.6	71.2	53.7
Kuwait	20	4748.7	15857	2540	20	23943	48996	1611	20	2.19	2.85	1.73
Oman	20	2365.1	3905	1722	20	20887.6	38405	4468	20	2.23	2.59	1.72
Qatar	19	1843.4	3396	306	20	104307	173031	45522	20	0.60	0.84	0.43
Saudi Arabia	20	19231.9	33793	13078	20	30903.2	66656	16002	20	19.7	15.0	24.7
U.A.E	18	3095	3703	2559	20	8833.9	22844	3171	20	2.91	4.38	1.67

Military Expenditures and Oil Revenues are measured in million constant 2005 U.S. dollars.
Population is measured in millions.
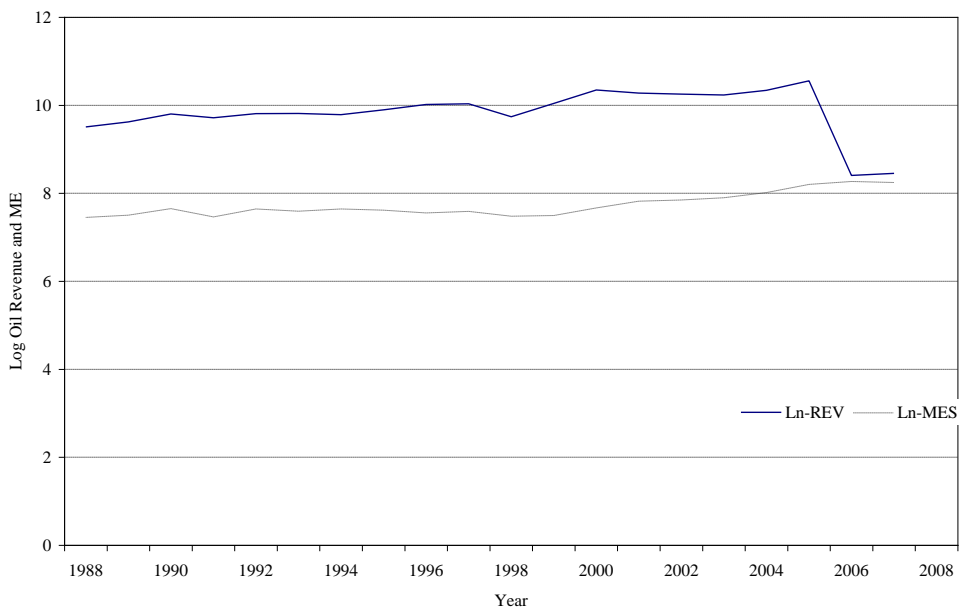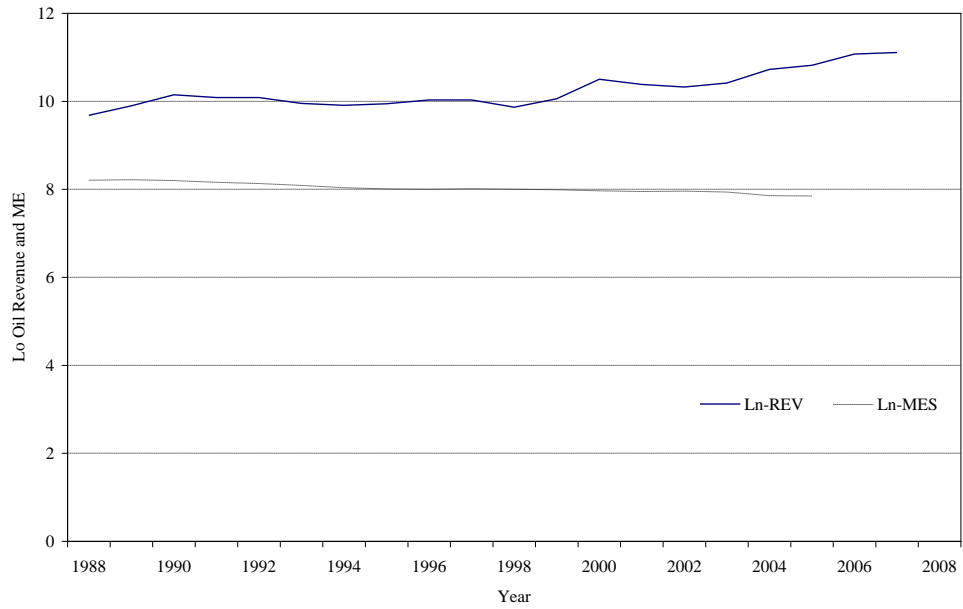
Graph 1: Oil Revenue and ME for the Gulf countries
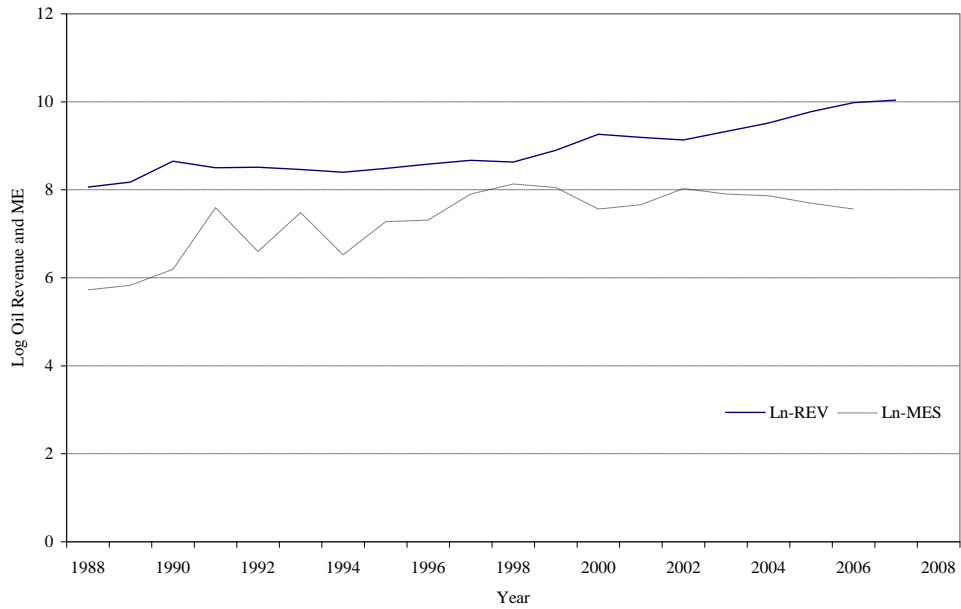
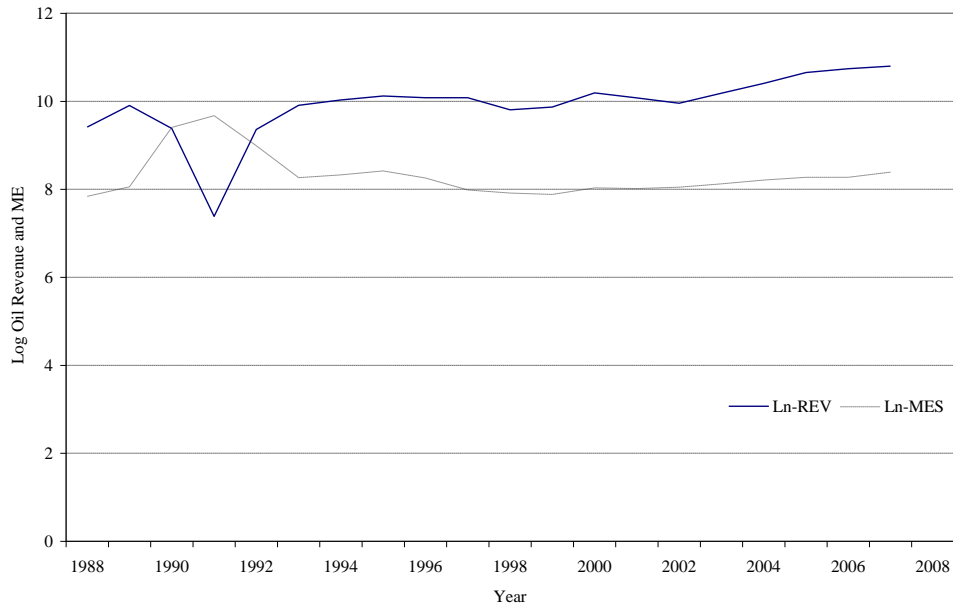**Bahrain**
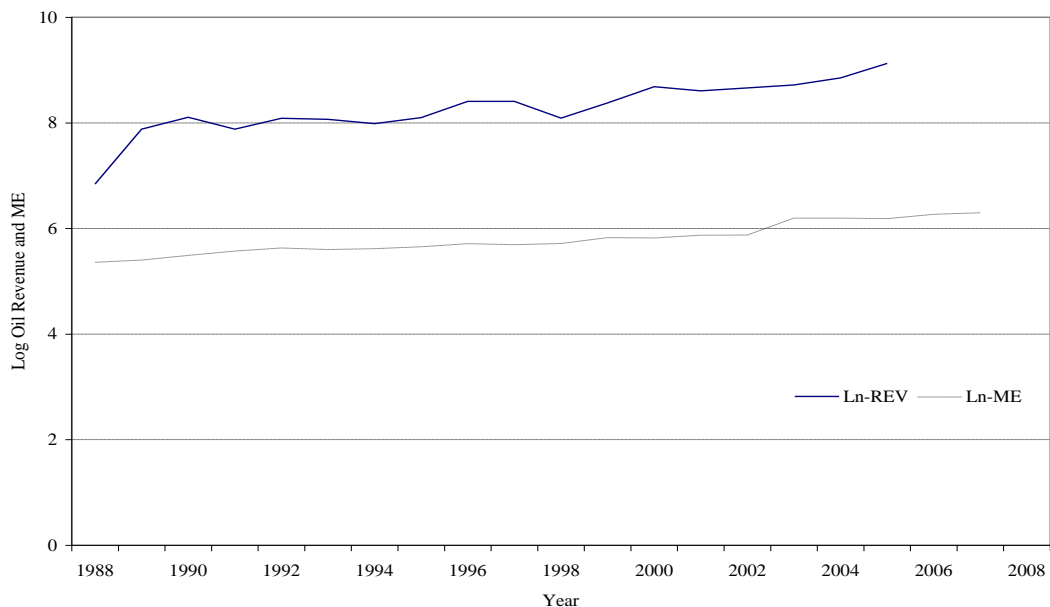
Iran
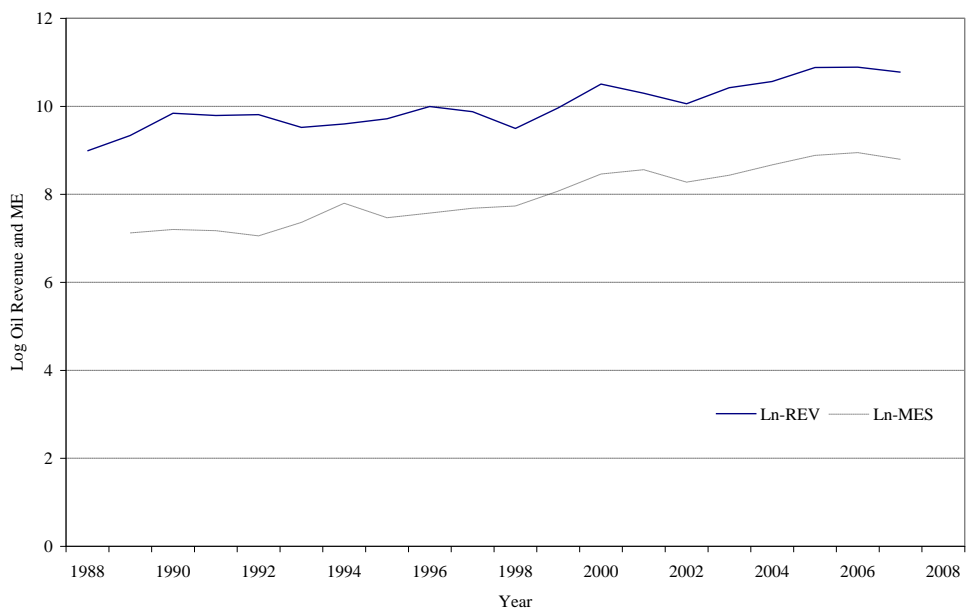
Oman

United Arab Emirates

Qatar

Kuwait

Saudi Arabia
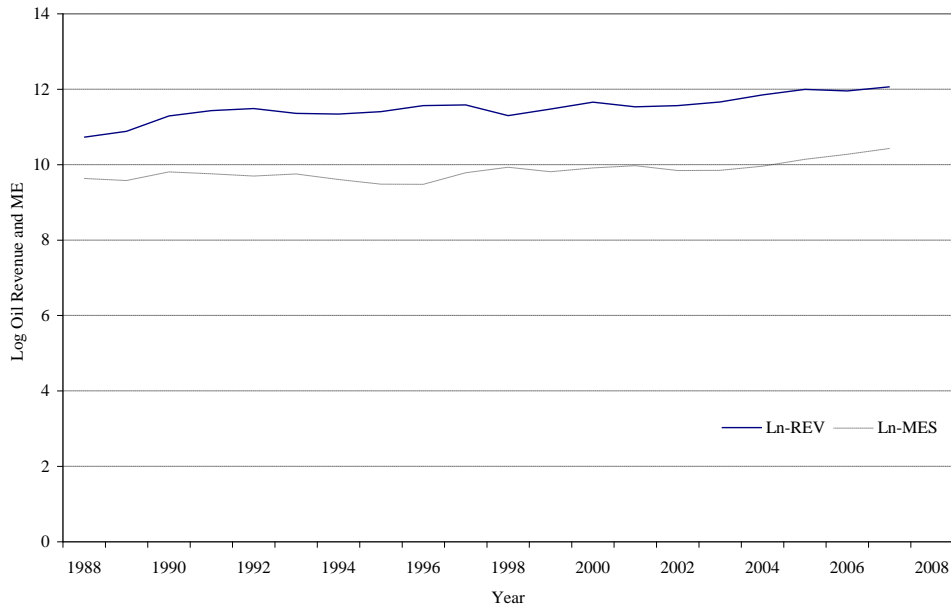
From 1972 to 1988, the states of the Middle East spent 11.6% of their GDP on the military, more than any other region in the world (SIPR 1989: 164-171). During the 1980's, about one-third of the value all weapons traded internationally were destined for the Middle East (World Military Expenditures 1989: 7-15). Levels of ME and indicators of militarization were higher in the Middle East, by almost all measures, than any region of the world. The Military Burden in the Middle East was 30.8, 36.2, and 21.4 in the years of 1974, 1989, and 1999 respectively.

Using cross-sectional time-series data, the model[5] estimates the whole region first and tests the effect of oil revenue on ME. Next the region is separated into two groups, the Gulf Cooperation Council Countries (GCC) and Iran, and, then the same test is conducted. The model was also used to test the effect of oil revenue on ME for each country separately. The model is estimated using the log-log form as it was determined to be appropriate functional form for the data used.

Some scholars argue that in order for a country to respond to the "threat", it has to realize it first (Smith 1995: 70). Therefore, to capture this time span, the ME of the rival country for the last year is used in order to see the effect of the threat on the decision of allocating resources to defense. Thus, another modification was introduced with regard to the "threat" of ME of the rival country.

For the region as a whole, the "threat" and "spillin" effects were dropped from the equation since this research is concerned with the regional security without outside intervention. Perhaps this is a strong assumption because the region is a focal point of world power influence. However, the intervention is one sided, in favor of the countries of the GCC, and this intervention is hard to be captured by the ME of the outside powers. Thus, the equation for the region as a whole looks at the effect of oil revenue, ME $_{t-1}$, population, and conflict on ME.

The threat of the ME of Iran must be considered to analyze the ME of the GCC countries as one block. The rivalry of the two sides of the Gulf is a worldwide known phenomenon, and it is expressed, among other factors, by the level of ME of the countries in the region. Because of the ideological, political, cultural, and demographic differences between the sides of the Gulf, the GCC countries see Iran as a highly potential source of instability and a source of threat to the ruling families. Therefore, Iran's ME could be an important factor in determining the GCC countries' ME to deter the aggression from Iran and to counter Iran's influence and its attempt to be the regional hegemon in the region.

For the countries as individuals, the "threat" and "spillin" as considered as follows. For the Arab countries, the threat is considered to be aforementioned, the Iranian ME. The "spillin" is the spending of the other members of the GCC countries. The GCC is an umbrella for a variety of common goals for the Arab countries in the Gulf, including "Common Defense" (Gause (b) 1994: 68). The spending of the other members is supposed to be a positive factor that increases the security of the member state, and therefore, reduces its own need for ME. Alternatively, for Iran, there is no "spillin" because it does not have any ally in the region, so the "spillin" factor is dropped (Smith 1995: 77). The threat, however, is the spending of the GCC countries. The results of the regression are reported in table (3).

The oil revenue effect on ME of the whole region appears to be positive as expected by previous studies, and not statistically significant. It appears that a one percent increase in oil revenues increases ME in the region by 0.038 percent. Population effect appears to be positive, which confirms the idea that countries in the region use the military as a venue for an increased supply of labor. As more people enter the labor market, the government spends more on military to expand it to absorb some of the increase in the labor force. Although it is not statistically significant, these results confirm the arguments of prior studies (Gauss (b) 1994: 64-65). The most statistically significant factor to determine ME in the region was past ME. A one percent increase in ME in the prior year brings about a 0.917 percent increase in ME. This shows that once a country spends on military and increases its size by importing military equipment; it will need to maintain that level of the equipment and the size of the armed forces in order to utilize the ME to its maximum level. The contracts on maintenance of military equipment, done mainly through foreign contractors in the GCC countries, are a major part of ME in the GCC countries. Also, training, salaries, health care, and housing for military personnel are other major parts of ME for all the countries in the region. Therefore, as the ME of last year increases, it follows that the ME keeps increasing to maintain the level of readiness and the size of the military.

This analysis shows that the countries in the region are very responsive to security conditions as represented by conflict in the region. The aforementioned conflict represents the level of political, economic, military, and diplomatic tension in the region, specifically between Iran and the GCC countries.

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[5] The paper uses Correlated Panels Corrected Standard Errors (PCSEs) regression since the OLS regression is not appropriate because the data shows signs of homoskedasticity, autocorrelation, and autoregression for the region as a whole and some of the individual countries. Mean VIF is reported in the regressions' results tables.

The results show that it is statistically significant in the region, meaning that an increase in the tension in the region is a significant determinant of the ME. Countries increase their ME in response to increased tension in the region. Therefore, a reduction in tension or détente between Iran and the GCC countries has a direct effect in increasing the level of security as measured by a reduction in the ME.

Following a similar analysis, oil revenue has a positive statistically significant effect on Iran's ME. This indicates the economic reality that Iran is becoming more and more dependent on oil to pay for its military buildup, while the GCC countries are diversifying their incomes through other economic activities. Population plays different roles in Iran and the GCC countries. While it is positively and significantly effecting the ME in Iran, population is negative and non significant in a number of GCC countries. This difference can be attributed to the governments' intentions in the GCC countries to provide social services to their citizens. As the population grows in those countries, the government directs more resources to provide such services through the reduction in ME, though not a significant reduction since security is still the priority. In contrast, Iran, with its ideological and political ambition to become the "Regional Hegemone", pays little attention to social services (Moran 1978-1979:188). As the population grows in Iran, so does the Armed Forces requiring more resource allocation of resources to support it.

The effect of the past ME is positive and significant in the case of the GCC countries because they import large amounts of modern and sophisticated weapon systems from different sources. These weapons require spare parts, maintenance, and training personnel to use them. The cost for such programs is quite large and sometimes constitutes a large portion of the defense contracts of the GCC countries. However, because of the weapons embargo, Iran does not import large quantities of advanced weapon systems from abroad. Instead it tries to develop its own military industry, which is not included in the SIPRE definition of ME. Also, the technical skills and education of the military personnel in Iran is considered to be higher than in the GCC countries because of its long history of education and development. This history could contribute to the reduction of the cost of maintenance of weapons since it is done by domestic labor instead of foreign contractors as in the case of the GCC counties.

The results show that the threat the GCC and Iran are facing from the ME of each other is statistically insignificant. The GCC countries, with all their security vulnerabilities, tend to respond more to the increase in the Iranian ME out of the fear of power imbalance in the region. With their total population of about one third of Iran's, the increase in territorial disputes with Iran, and the Iranian propaganda against them, the GCC countries take the Iranian ME threat more seriously than does Iran takes the GCC countries' ME. The statistical insignificance of the ME of the other GCC countries could be attributed to the fact that the GCC countries depend on the security umbrella provided by the U.S. and other western powers with vital interests in the region. Conflict seems to be positive and significant in the case of the GCC countries, while negative and insignificant in case of Iran. This could be because Iran is causing the conflict and the GCC countries are threatened by Iran thus affecting the GCC countries' ME and not Iran's ME. Similar results were found involving the prior year Iranian ME. These results indicate that the countries in the region are making decisions without considering the threat from the prior year ME of the rival, but rather on an instantaneous reaction to a change in ME. This is a direct result of the making-decision process in those countries whose roots stem from their authoritarian political system.

On the individual level of the countries, the analysis seems to follow the same pattern with few exceptions. Oil revenue is statistically significant and positive in the case of Saudi Arabia for a clear reason: it is the number one oil producing and exporting country in the world. Moreover, Saudi Arabia considers itself the leader of the GCC politically, requiring a high level of security and order in the region and that is reflected in its ME. Also oil revenue is statistically significant in the case of Kuwait, but not significant in the case of Qatar and Bahrain. Qatar depends more on natural gas than petroleum revenue; while Bahrain is the country with the least amount of oil produced, if any, in the region. Therefore, oil is not a significant determinant of their ME. Population has different effects on the countries. For the countries that use the military as a venue for labor growth, population has a statistically significant positive effect; while for the countries with intensive social programs, population has a statistically significant negative effect. In all the GCC countries, except Qatar, ME $_{t-1}$ seems to have a positive and significant effect, as it does in the case of Iran.

The threat factor follows the same pattern of statistical insignificance except in the case of Oman; while the "spillin", in the case of the GCC appears to have mixed effects. It is negative in the case of Bahrain and Qatar indicating that they might be free-riders with regard to defense spending among the GCC countries. As other GCC countries spend more on defense, Bahrain and Qatar seem to feel safer and, therefore, do not increase or reduce their ME. For other GCC members, the "spillin" effect appears to be statistically insignificant. This competitive level of ME indicates that the GCC alliance is a fragile one and does not provide a real security umbrella to its members (Gause (b) 1994: 68).

Conflict appears to have a negative and non-significant effect on Oman's and Qatar's ME simply because of the relationship between them and Iran. Among the GCC countries, the two are the closest friends to Iran and might not fear the Iranian policies as the other four GCC members. Oman is a traditionally neutral country in the region with long historical relations with Iran both before and after the Islamic revolution. This history might give Oman a sense of safety with regard to Iran's ME (O'Reilly 1999: 84). On the other hand, Qatar built a special relationship with Iran's by taking its side on many regional issues. For example Qatar supports Hamas and hosted the Lebanese political factions negotiation in Doha giving Hezbollah of Lebanon more legitimacy in the Middle East. This made Iran more open to Qatar policies, which might reduce Qatar's response to Iran's ME. For the other four members of the GCC, conflict is positive with different levels of significance.

Table 3: The Panel-Corrected Standard Error Estimations (PCSE) Regressions Results Using the Current ME of Iran

Variable	Bahrain	Kuwait	Oman	Qatar	S.A.	U.A.E.	Iran[a]	GCC	Region
Oil Revenue	0.026	0.245*	0.043	-0.57	0.362*	0.015	0.400*	0.211	0.0379
	(0.22)	(1.97)	(0.96)	(-0.59)	(2.45)	(0.29)	(2.33)	(0.92)	(1.12)
Population	1.151*	-0.044	-1.219*	6.218*	0.256	-0.075	4.922*	-0.24	0.0345*
	(2.55)	(-0.31)	(-2.38)	(1.99)	(0.41)	(-0.65)	(2.61)	(-0.33)	(1.50)
ME_{t-1}	0.396*	0.402*	0.883*	0.106	0.491*	0.647*	0.207	0.488*	0.917*
	(1.87)	(2.64)	(4.47)	(0.37)	(2.60)	(2.83)	(0.93)	(2.87)	(36.41)
Iran ME_t	0.047	0.105	0.298*	-1.00*	0.046	0.019	------	0.010	-------
	(0.057)	(0.43)	(3.52)	(-1.56)	(0.32)	(0.54)		(0.07)	
MEGCC	-0.026	0.233	0.013	0.745	0.056	0.001	0.070	-------	-------
	(-0.23)	(0.31)	(0.10)	(0.83)	(0.46)	(0.01)	(0.20)		
Conflict	0.084*	0.437*	-0.044	-0.67*	0.036	0.015	-0.05	0.136*	0.0939*
	(2.25)	(1.74)	(-0.71)	(-1.66)	(0.57)	(1.15)	(-0.39)	(2.65)	(2.16)
Const.	-3.708	22.023	12.60	-44.9	-1.245	9.568	-82.4	10.68	0.376
	(-0.091)	(1.64)	(2.15)	(-1.72)	(-0.15)	(1.60)	(-2.59)	(1.38)	(0.65)
χ^2	242.47	52.14	220.4	25.31	95.16	818.03	287.9	34.12	5454.6
N	17	19	19	18	19	17	18	133	127
Mean VIF	8.41	6.32	6.26	11.14	7.32	17.08	7.59	9.57	1.37

The value in the parentheses is the z-value.
[a] The "threat" in this case is the ME of the GCC countries.

The same analysis is done using the ME of the prior year to capture the "threat" factor in the case of Iran and the GCC countries. As mentioned above, those countries need to see the threat before responding. The result of this regression is given in table 4.

Table 4: The Panel-Corrected Standard Error Estimations (PCSE) Regressions Results Using The Prior Year ME of Iran

Variable	Bahrain	Kuwait	Oman	Qatar	S.A.	U.A.E.	Iran[b]	GCC
Oil Revenue	0.046	0.174*	0.062	-1.261	0.379*	0.043	0.423*	0.079
	(0.41)	(1.54)	(1.11)	(-1.15)	(2.66)	(1.10)	(2.57)	(0.38)
Population	1.497*	-0.693	-1.037*	4.160	0.855	-0.100	4.77*	-0.219
	(2.82)	(-0.55)	(-1.64)	(1.23)	(1.12)	(-0.95)	(2.62)	(-0.32)
ME_{t-1}	0.332*	0.297*	0.828*	0.022	0.523*	0.619*	0.224	0.389*
	(1.61)	(2.18)	(3.30)	(0.07)	(2.77)	(2.86)	(1.02)	(2.56)
Iran ME_{t-1}	0.132*	0.351*	0.284*	-0.2889	0.183	0.014	-------	0.018
	(1.51)	(1.65)	(2.37)	(-0.43)	(1.22)	(0.46)		(0.13)
$MEGC_t$	-0.025	0.519	0.051	0.203	0.094	0.070*	0.15	--------
	(-0.18)	(0.73)	(0.27)	(0.22)	(0.44)	(1.34)	(0.64)	
Conflict	0.124*	0.511*	-0.058	-0.187	0.038	0.002	(-0.02)	0.198*
	(2.74)	(2.50)	(-0.67)	(-0.45)	(0.39)	(0.14)	(-0.24)	(3.67)
Const.	-4.439	29.469	10.076	8.73	-10.41	8.769	-75.22	15.99
	(-0.82)	(2.66)	(0.99)	(0.29)	(-0.75)	(1.56)	(-2.59)	(2.05)
χ^2	225.94	72.30	159.43	12.77	90.45	376.62	294.11	39.21
N	16	18	18	17	18	16	18	126
Mean VIF	8.69	6.20	7.50	11.21	8.85	13.19	6.97	8.86

The value in the parentheses is the z-value.
[b] The "threat" in this case is the lagged ME of the GCC countries.
The marginal propensity to spend on defense in the short-run and long-run is shown in table (5).

Table 5: The Marginal Propensity to Spend on Defense

	Short-Run	Long-Run
Region	0.0025	0.0682
GCC	0.0329	0.0691
Bahrain	0.0131	0.0455
Iran	0.0906	0.165
Kuwait	0.1035	0.1839
Oman	0.0164	0.1458
Qatar	0.0014	0.0031
Saudi Arabia	0.2089	0.432
U.A.E.	0.0074	0.0774

The results indicate that the region spends 0.25 cents on defense of each dollar received in oil revenue in the short run, while that spending increases to 6.82 cents in the long-run. The economic effect of ME seems to be larger in the region in the long-run in the high opportunity cost of investment and development. In this case, militarization seems to have a negative effect on development in the long-run. The GCC countries seem to be inclined to spend more on defense in the long-run (0.0691) than in the short-run (0.0329). The Iranian propensity to spend on defense in the long run is much larger (0.165), which means the long run increase came mainly from Iran. This tells us that with the current trend of the Iranian spending on defense, a larger portion of Iranian oil revenue will go to militarization in the long run. This trend could potentially lead to devastating results on the Iranian society and will likely lead to an increase in conflict in the region. For Saudi Arabia the situation might be even worse. With the long-run marginal propensity of 0.432, Saudi Arabia seems to lose a large portion of its resources to defense and must adapt for that in terms of reducing resources allocated to development. To a lesser degree, Kuwait and Oman, exhibit similar situation to Saudi Arabia. The U.A.E. seems to maintain the same level of inclination to spend on defense in the short and long-run.

6. *Conclusions*

From the analysis of the effect of the oil revenue on ME in the Gulf region, this study shows that the effect is generally positive, but different in its statistical significance based on the level of dependency of the country on oil as the source of its revenue.

This tells us that oil plays a role in determining the ME in the region, and it has a significant impact in the case of Iran and Saudi Arabia which are the major spenders on defense in the region. In order to finance their large spending, oil seems to be the natural source to pay for that.

The results suggest that there are other factors play more significant roles in determining the ME in the region than oil revenue. For the GCC members those appear to be ME $_{t-1}$ and conflict mainly, and to lesser extent, population. For Iran, the main determinant of ME besides oil revenue appears to be population.

The paper concludes that oil revenue does not by itself determine the amount of ME the countries in the Gulf region spend, but it has a positive effect. This highlights the causality question between the two. It seems a natural question to see if the other direction might be the direction of causality; that is an increase in ME causes oil revenue to increase by producing more oil to pay for the military spending. This is a very interesting question that should be analyzed in the future.

The Gulf region seems to move to higher spending on defense in the long run which taking away the region's chance to use the oil revenue for development and prosperity. The increase in the marginal propensity to spend on defense is going to increase the tension in the region and consequently increase ME. To break this cycle of "Security Dilemma", the need for regional understanding and cooperation seems crucial to reduce the ME.

Appendix 1: The Derivation of the ME demand function

To estimate the derived demand function for ME, a simple functional form of the welfare function is the Stone-Geary function given in the form:
$W = \propto \ln C + (1 - \propto) \ln S$.

Consider that the state is not aggressive, but faces a threatening neighbor, with military expenditure ME_1, and no allies exist, then its security is given by:
S=ME-ME*= M-($\delta_0 + \delta_1 ME_1$).

Where ME* is the forces the country would need to counter any attack by its neighbor. ME* is determined partly by fixed elements and partly by the size of the opponents forces with δ_1, the Lancaster Coefficient[6]. For example if there are natural strategic defense then δ_0 would be negative; if surprise attack give the neighbor an advantage, then δ_0 would be positive.

Using the welfare function and the budget constraint, the Lagrangian is:
$L = \alpha \ln(C) + (1 - \alpha) \ln(ME - EM^*) + \lambda(Y - P_{ME} ME - P_C C)$.
The F.O.C. gives:
$\frac{\partial L}{\partial C} = \frac{\propto}{C} - \lambda P_C = 0 \xrightarrow{yields} \frac{\propto}{C} = \lambda P_C$
$\frac{\partial L}{\partial C} = \frac{1 - \propto}{ME - ME^*} - \lambda P_{ME} = 0 \xrightarrow{yields} (ME - ME^*) = \frac{\lambda P_{ME}}{1 - \propto}$
$\frac{\partial L}{\partial \lambda} = Y - P_C C - P_{ME} = 0$.
Substituting and simplifying will give:
$ME = \frac{1 - \propto}{P_{ME}} Y + \propto (\delta_0 + \delta_1 ME_1)$
and $C = \frac{\propto}{P_C}(Y - P_{ME}(\delta_0 + \delta_1 ME_1))$

which determines the real consumption and military expenditure as a function of income, prices, preference parameters (α), strategic parameters (δ_i), and other countries military expenditures, ME_1.

The model can be generalized to allow for a more realistic assumption that security depends on stocks of military forces both physical and human, rather than the flow of military expenditures. The stock of military forces, equipments plus the human capital embodied in experienced personnel, can be defined as the depreciated sum of past expenditures. This would be as follows:
$K_t = (1 - \gamma)K_{t-1} + ME_t$

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[6] The Lancaster Coefficient measures the relative effectiveness of the forces in combat. For more details see: Anderton 1990.

where γ is the depreciation rate which is a peace time concept, not destruction from war. If there is a similar stock measure for the other country, i.e.

$K_{1t}=(1-\gamma)K_{1(t-1)}+M_{1t}$.

then security is given by:

$$S_t = K_t - K_t^*$$
$$= K_t - (1-\gamma)K_{t-1} - \left[\delta_0 + \delta_1\big(K_{1t} - (1-\gamma)K_{1(t-1)}\big)\right] = ME_t - ME_t^*$$

because the level of security must be the same using the stock of military forces or the flow of military expenditures.

Substitution and simplification give:

$$ME_t^* = \delta_0 + \delta_1\big(ME_{1t} + (1-\gamma)K_{1(t-1)}\big)(1-\gamma)K_{t-1}.$$

From the maximization process we have:

$$M_t = (1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t + \alpha\, ME_t^*$$

$$M_t = (1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t + \alpha\left[\delta_o + \delta_1\big(ME_1 + (1-\gamma)K_{1(t-1)}\big) - (1-\gamma)K_{t-1}\right].$$

If stocks are not observed, which is the case usually, then we can substitute it out by using the Lag Operator (L), where:

$$LK_t = K_{t-1}$$

So: $K_t = (1-\gamma)LK_t + ME_t$

$$K_t = \frac{ME_t}{1-(1-\gamma)L}.$$

Therefore:

$$ME_t = (1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t + \alpha\left[\delta_o + \delta_1 ME_{1t} + \delta_1(1-\gamma)\frac{ME_{1(t-1)}}{1-(1-\delta)L} - (1-\gamma)\frac{ME_{t-1}}{1-(1-\delta)L}\right]$$

$$= (1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t + \alpha\,\delta_o + \alpha\,\delta_1 ME_{1t} + \alpha\,\delta_1(1-\gamma)\frac{ME_{1(t-1)}}{1-(1-\gamma)L} - \alpha(1-\gamma)\frac{ME_{t-1}}{1-(1-\gamma)L}$$

$(1-(1-\gamma)L)ME_t = (1-(1-\gamma)L)(1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t + (1-(1-\gamma)L)\alpha\gamma_o + (1-(1-\gamma)L)\alpha\delta_1 ME_{1t} + \alpha\delta_1(1-\gamma)ME_{1(t-1)} - \alpha(1-\gamma)M_{t-1}$

$ME_t - (1-\gamma)ME_{t-1} = \quad (1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t - (1-\gamma)(1-\alpha)\left(\frac{Y}{P_{ME}}\right)_{t-1} + \alpha\delta_o - (1-\gamma)\alpha\delta_o + \alpha\delta_1 ME_{1t} - (1-\gamma)\alpha\delta_1 ME_{1(t-1)} + \alpha\delta_1(1-\gamma)ME_{1(t-1)} - \alpha(1-\gamma)ME_{t-1}$

$ME_t = \alpha\delta_o\gamma + (1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t + \alpha\delta_1 ME_{1t} - (1-\gamma)(1-\alpha)\left(\frac{Y}{P_{ME}}\right)_{t-1} - \alpha(1-\gamma)ME_{t-1} + (1-\gamma)ME_{t-1}$

Grouping similar terms give the derived demand function as:

$$ME_t = \alpha\delta_o\gamma + (1-\alpha)\left(\frac{Y}{P_{ME}}\right)_t + \alpha\delta_1 ME_{1t} - (1-\gamma)(1-\alpha)\left[ME_{t-1} - \left(\frac{Y}{P_{ME}}\right)_{t-1}\right].$$

Appendix 2: The Derivation of the Marginal Propensity to Spend on Defense Equation

The simple model to find the short-run and the long-run "Marginal Propensity" to spend on defense runs as follows:

Let the long-run equilibrium expenditure pattern between oil revenue and ME to be:

$ME^*_t = a + b$ oil revenue$_t$

where b is the long-run marginal propensity to spend on defense. Implicit in this relation is the assumption that the country, given an increase in oil revenue, will require some time to readjust their allocations to defense. Specifically, we use the following adjustment mechanism:

$ME_{at} - ME_{a(t-1)} = Z (ME_t^* - ME_{a(t-1)})$

where ME_{at} is the actual observed ME at time (t), ME_t^* is the desired equilibrium level of ME at time (t).

Substituting yields:

$ME_{at} - ME_{a(t-1)} = Z (a + b$ oil revenue $_t - ME_{a(t-1)})$

Simplifying gives:

$ME_{at} = Za + Zb$ oil revenue $_t + (1-Z) ME_{a(t-1)}$.

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