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The Economics of Middle East Military Expenditures: Implications for Arms Reduction in the Region*

Robert E. Looney**
Naval Postgraduate School

1. *Introduction*

Over the decade prior to the Iraqi invasion of Kuwait, there had been a marked slowdown in defense spending in many countries in the Middle East. Contractions in the share of national resources allocated to the military came as growing fiscal problems prompted governments to reorder their spending priorities. This reduction had been less prevalent in countries such as Egypt and Israel. Still apparently the region as a whole has been examining the potential costs and benefits of allocations to the military.

Conventional wisdom has long argued that heavy outlays on defense divert scarce resources from directly productive investment and human capital formation (education, health).[1] While this view makes intuitive sense, there is evidence that military expenditures do not necessarily reduce economic growth in developing countries as a whole. Defense expenditures may act as an economic stimulus through the creation of demand for a variety of heavy-industry products. Presumably, without defense, many of these plants would not be capable of operating at or near full capacity. There is also the acquisition of advanced technologies that may ultimately provide employment and attract further investment.[2]

In view of the likely acceleration in defense expenditure following the recent round of hostilities in the Gulf, this study examines the relationship between defense spending and economic performance in four of the major countries in the region – Egypt, Syria, Israel, Saudi Arabia. On the basis of this assessment, several implications follow concerning future spending patterns. A final section speculates about the economically sustainable military expenditure limits for each country.

2. *Country Trends*

Several distinctive military expenditure patterns have developed in recent years.[3]

2.1 *Saudi Arabia*

Beginning from a somewhat low base, Saudi Arabia experienced a steady acceleration in defense expenditures between 1960 and 1973, with defense increasing its share of Gross Domestic Product (GDP) from 3.7 to 11.9%. Defense's share of non-oil GDP and public allocations also rose during this period, from 9.2 to 42.5% and 38.1 to 65.9%, respectively.

Following the oil price increases of 1973–74, defense rapidly increased its share of non-oil GDP to 67.2% in 1975 and accelerated its share of total GDP to 21.0% by 1979. Other government expenditures also expanded rapidly after 1973, so that the share of total government expenditures allo-

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** Robert Looney is Professor of National Security Affairs at the Naval Postgraduate School, Monterey, California, USA.

cated to defense fell from 65.9% in 1973 to 42.3% in 1979.

After peaking in real terms in 1982, defense expenditures have contracted each year through 1988, with defense maintaining its share of total GDP at 22%. At the same time, defense stabilized its share of total government expenditure in the low forties. Growth in non-oil GDP has caused the military's share of this aggregate to fall from 47.6% in 1982 to 27.8% in 1988.

2.2 *Egypt*

Prior to 1966, Egyptian defense expenditures grew steadily, with the defense share of GDP rising from 5.81 in 1959 to a yearly average of 7 to 8%. Real growth was positive each year, often reaching double digits, with a high of 25.91 in 1954 and a low of 3.33% in 1966.

The 1967 war resulted in a sudden rapid expansion that extended through 1974. This period was characterized by very rapid increases in defense allocations, often increasing by over 30% per annum. Defense increased its share of GDP from 10.88 in 1967 to 36.51% in 1973.

The rest of the 1970s were characterized by generally high negative rates of real growth in defense expenditures. The net result was that by 1980 defense expenditures had fallen to 7.3% of GDP.

The 1980s (at least until the final few years) were again a period of expansion, with defense expenditures increasing from 7.3% of the government's budget to nearly 20% by 1987. Rapid economic growth, however, maintained the share of resources devoted to defense at around 7%.

2.3 *Syria*

From the late 1950s up to the time of the 1977 war, Syria experienced irregular growth in defense. At this time, defense expenditures expanded at rates averaging less than that of real GDP. The net result was a fall in the country's defense burden from 9.5% of GDP in 1958 to 7.5% in 1967. Between the 1967 war and 1980, defense expenditures increased rapidly, from 7.5% of GDP in 1976 to 22.8% in 1980. This pattern made Syria one of the most heavily armed of the Arab states.

Since 1980, defense expenditures have contracted every year except 1982, so that by 1987 the defense burden had returned to approximately its 1958 level (around 9.5% of GDP). The sharp contraction in the defense burden has not translated into a similar decline in the government budgets. In 1980, for example, defense comprised around 36% of the central government's expenditures, while by 1987 the military's share had increased to 40.4%.

2.4 *Israel*

The actual figures for Israel's defense expenditures are controversial and subject to a wide range of error. Our data show that the country's allocations to the military have gone through several distinct phases.

From 1950 to the mid-1960s, real defense expenditures increased rapidly, particularly after 1954. The net result, despite rapid economic growth, was a slight increase in defense as a share of GDP from 6.4% in 1950 to 8.1% in 1965.

Between 1966 and 1977 (exception 1972), rapid mobilization resulted in the military's share of GDP increasing to 28.2%. Since 1977, the country has experienced a steady decline in defense expenditures, with six years of negative growth rates in real allocations to the military. By 1987, the defense burden had returned to approximately its 1965 level of 8.5% of GDP. A corresponding decline occurred in the government's budget, where defense declined from around 55% of the budget in 1974 to a little over 26% in 1987.

3. *Economic and Development Impact*

The patterns noted above provide insight into the manner in which the sample countries differ among themselves and from the rest of the world in their patterns of military expenditures, socio-economic development, and general pattern of public expenditures. Clearly, there are several similarities between the four countries in our sample.

These include generally high levels of military expenditures and somewhat large amounts of non-defense expenditures per capita. On the other hand, several significant differences exist, particularly regarding levels of and movements in socio-economic performance.

Surprisingly, the received literature does not provide a definitive answer as to the possible economic consequences of another period of stepped-up military expenditures in the region. Much of this literature is anecdotal and biased toward the standard 'guns versus butter' analogies. Since the modern defense establishment is a heavy consumer of technical and managerial labor and foreign exchange – resources that are especially scarce in the Third World – the conventional argument is that increased defense burdens should reduce the general rate of growth.[4]

In the original empirical examination of these issues, Benoit found strong evidence to suggest that defense spending encouraged the growth of civilian output per capita.[5] On the other hand, Rothschild concluded that increased military expenditures lowered economic growth by reducing exports in fourteen OECD countries during 1956–69.[6]

In an examination of 54 developing countries for the sample period 1965–73, Lim found defense spending to be detrimental to economic growth.[7] Deger & Sen, Leontief & Duchin, Faini, Annez & Taylor, Biswas & Ram, and Grobar & Porter also found evidence refuting the claim that defense spending stimulates economic growth.[8]

Research examining the economic impact of Third World military expenditure using various sub-groupings of countries has, however, tended to contradict these findings.[9] Much of this research implicitly argues that in certain economic situations it is possible that, by creating a stable environment, added defense expenditures may stimulate higher rates of investment, technological progress, technology transfer, and therefore increased growth.

More specifically, it appears that certain groups of Third World countries – usually the more successful economically, the more stable politically, or those engaged in military production – derive positive effects from military spending. Those countries, less successful economically, more politically unstable, or lacking a domestic arms industry, fail to derive any positive economic impacts from defense expenditures.

Having said this, it is important to note that several adverse effects do stem from defense expenditures. This is true even in those countries experiencing higher rates of growth from increased allocations to defense. In particular, countries with an indigenous arms industry may suffer a deterioration in the distribution of income from added defense expenditures. The same pattern may also occur in military regimes as the authorities shift income from urban consumers to industrial groups.[10]

A major limitation of the studies cited above is that cross-sectional studies are, by their nature, very aggregated. The result is that extending their findings to specific countries is hazardous at best. One exception is Lebovic & Ishaq's study of defense spending in the Middle East.[11] Using a pooled time-series, cross-sectional analysis on various groupings of Middle East states, they found that higher military spending tended to suppress economic growth in the non-oil states of the Middle East during the 1973–84 period.

Yet, while Lebovic & Ishaq drew on time-series data, they could not incorporate the potential effects of lags between the time when defense expenditures occur and the period of maximum economic impact. In this regard, Babin has noted that incorporating the time variable into analysis can be critical because some relationships that may exist over time disappear in the short run and vice versa.[12] Clearly, at the national level, development usually requires a series of changes that occur through systems which involve organizations, agencies, economic structures, and technological change. Consequently, it is unjustifiable to assume that a country's defense spending will have an immediate (or even short-term) effect on

national economic performance. Babin's main finding was that while short-run economic effects of defense expenditure may be nil or even negative, the longer-term effect on growth is likely to be positive.

Similarly, Kick & Sharda's analysis indicated that an increase in the military manpower ratio does have a significant positive effect on two indicators of development, infrastructure and social welfare.[13] This impact occurs with a long (12-year) lag. Kick & Sharda also found that the relationship over a 12-year period is positive. Militarization, whether measured by expenditures or size of the military, does contribute to development, they found.

The statistical tests adopted to assess the economic effects associated with increased defense expenditures in the sample countries were designed to overcome some of the problems noted above.[14] In particular, (1) tests were undertaken to identify the direction of causation – did defense expenditures impact on the economy or were they instead simply determined by changes in the underlying economic environment? (2) lags were explicitly introduced to determine the time phasing of the defense/economic interactions; and (3) comparisons between defense and other types of government expenditure were made in order to determine whether defense expenditures increased (or decreased) economic aggregates over and above that associated with alternative forms of government spending. Several interesting patterns appear to be at work.[15]

3.1 *Saudi Arabia*

While defense expenditures have in a general sense mirrored developments in the oil sector, the impact on the economy is complex and has altered over time:

(1) For the period as a whole, defense and non-oil economic activity were closely interrelated. Movements in defense tended to reduce somewhat increases in real non-oil output with a four-year lag. Increases in non-oil GDP tended to stimulate additional increases in defense expenditures.

(2) The relationship between defense expenditures and real non-oil GDP appears to have changed over time. From the beginning of the period under consideration to the time of the deterioration in oil markets (1982), it appears that defense was largely affected by non-oil GDP (and not vice versa). This was also the case for government consumption (a large component of defense expenditures). Investment and private consumption tended to affect non-oil GDP with short lags.

(3) Over the past 18 years, a clear pattern has emerged whereby defense expenditures have become intertwined with non-oil GDP. Within this new relationship, defense expenditures increased non-oil GDP with an average lag of two years. In turn, increases in non-oil GDP have been translated, with a one-year lag, into expanded allocations for defense.

(4) Also during this period, the relationship between non-oil GDP and government consumption seems to have changed, so that causation began to run largely from GDP to government consumption. One implication of this pattern is that defense expenditures have taken on a stronger role relative to government consumption in stimulating non-oil income.

These findings suggest that, at least on the aggregate level, the Saudi Arabian economy has not suffered from the large defense burden assumed by the government. The same appears true regarding government allocations to socio-economic development. Specifically: over the 1979–88 period:

(1) Defense expenditures appear to be complementary with increased allocations to human resource development and health.

(2) The major negative budgetary tradeoffs involving defense were concentrated in the economic areas: (a) transportation and communications; (b) economic resource development; and, to a lesser extent, (c) infrastructure. Defense expenditures also tended to come at the expense of several

administrative allocations, including payments to municipalities, and subsidies for government lending institutions.

(3) Areas such as general administration and the direct government subsidies program for agriculture did not suffer a reduction in their relative share of the government budget from high levels of military expenditures.

3.2 *Egypt*

The somewhat irregular pattern of Egyptian defense expenditures has resulted in a corresponding differential impact on the country's leading economic aggregates:

(1) For the 1965–87 period as a whole, no statistical pattern occurs between the growth of the defense burden and GDP. During an earlier sub-period, 1965–80, defense expenditures had a negative impact on real GDP. However, a second sub-period, 1970–87, was characterized by little or no interrelation between defense and the economy.

(2) The impact of government consumption expenditures in the two sub-periods was somewhat different from that of defense: for the 1965 period, government consumption was interrelated with GDP, tending as with defense to reduce GDP with a one-year lag; for the 1970 to 1987 period, it was determined by GDP. From this we can conclude that defense allocations have been determined in large part by factors independent of changes in the country's resource base. In contrast, other (non-defense) categories of government expenditure appear to mirror closely developments in the economy.

(3) Both defense and general government consumption expenditures are import intensive, with increases in each leading to a follow-on expansion in imports. Still, there is one major difference between the two types of expenditures: in the 1970–87 period, increased imports also facilitated increases in government consumption (but not in defense expenditures). Again, this finding shows the relative reliance of government consumption on the country's underlying resource base.

(4) The major difference between defense expenditures and general government current expenditure lies in their respective effects on real gross capital formation. Increases in the defense burden have a strong positive impact on investment. This impact is spread out over a four-year period – not only for the period as a whole, but for each sub-period as well. In contrast, changes in government consumption had a negative (with a one-year lag) effect on gross capital formation.

(5) Government expenditures affected private consumption, while defense had little relationship to this measure. As with gross capital formation, increases in government consumption reduced, after a one-year lag, the rate of expansion in private consumption. This 'crowding-out' occurred in each sub-period, and for the period as a whole.

From these patterns, we can note that defense expenditures in Egypt have several positive linkages with the economy as a whole. In particular, expanded defense expenditures appear to increase the profitability of investment. The net result was probably higher rates of investment than would have otherwise been the case.

On the other hand, the strong import effect associated with defense expenditures may at times have compounded the country's foreign exchange problems, thus causing a general contraction of the economy. This phenomenon appears to have been present before 1980, but was not a factor in the preceding years, perhaps because of United States military aid. These results also suggest a 'Military Keynesianism' effect emanating from the positive impact of defense procurement on the local economy.

In this regard, military Keynesianism stresses the demand generating aspect of defense expenditures. In this way, military spending may have significant multiplier effects on the local economy, particularly if

concentrated on the acquisition of domestic equipment and supplies.

It is also possible, with excess industrial capacity, that positive industrial linkages to the non-military private sector exist. It follows that the demand generation emanating from the military may, through increased capacity utilization, expand output and increase the rate of return on capital, investment, and possibly growth. The possibility of positive military Keynesian effects associated with counter-cyclical government procurement may in part account for the positive net impact of defense expenditures on growth in Egypt. In Israel, as noted below, defense expenditures have been particularly effective in stimulating increases in capital formation.

In contrast to their possible military Keynesianism effects, defense expenditures have come at the expense of several types of socio-economic budgetary allocations:

(1) During normal (non-surge) periods, increases in defense came at the expense of administration, health (particularly clinics), economic services (particularly communications) and, to a lesser extent, interest payments on the government debt.

(2) During periods of stepped up defense expenditures, cuts are also felt by housing and community activities, energy, transportation and communications and, to a lesser extent, roads.

(3) During normal periods, defense allocations increase allocations to transportation and communication, roads, water, housing, social security and welfare and, to a much lesser extent, education.

These patterns suggest that mild cuts occur over many budgetary categories during periods of moderate expansion in defense expenditures. However, during periods of rapid military buildup, several economic programs bear the full brunt of government cutbacks. These compositional effects may go a long way in explaining why defense expenditures had a negative impact on growth in the years preceding the 1980s, but not afterwards.

3.3 *Syria*

Over the last several decades Syria's economic growth has stemmed from increased government expenditures, including military expenditures, together with rapid increases in investment. Still, the impact of government expenditures has varied over time:

(1) For the period as a whole, increases in the defense burden had a strong effect on GDP. This impact was spread over time, averaging four years. In turn, increases in GDP provided a short-run (one-year) stimulus to the defense budget.

(2) For the initial period (1962–80), causation was largely from increases in GDP to defense, with defense having little impact on the expansion of GDP.

(3) The 1967–87 period mirrored the first sub-period, with defense greatly facilitating economic growth, and in turn receiving a portion of the augmented resources generated through the growth process.

(4) These patterns did not simply reflect the general increase in government expenditures. While government expenditures produced a feedback relationship with GDP for the period as a whole, their relationship to GDP during both sub-periods was considerably different from that associated with defense expenditures: in the first sub-period (1962–80), government consumption increased growth and in turn expanded with the economy. In the second sub-period, government consumption was a major source of growth. However, during this period a feedback mechanism from government consumption to GDP was not a significant factor in affecting the expansion of the economy.

From these findings we may conclude that in Syria defense expenditures have apparently aided the country's economic expansion, particularly in more recent times. There is also evidence that the government gives higher priority to these expenditures than it does to other types of public sector allocations – they are the first to expand

during periods of additional resource availability, and perhaps the last to be cut during periods of austerity.

Several additional defence/economic relationships amplify this conclusion:

(1) A strong set of interrelationships occurs between defense and imports, with defense contributing to the country's import burden. In turn, additional imports are used in part to expand the country's expenditures on defense.

(2) The same pattern was found between defense and gross fixed capital formation and private consumption (with private consumption probably mirroring movements in GDP).

(3) Other than revenue availability, the one constraint on Syrian defense expenditures is official concern over inflationary pressures – increased inflation often reduces expansion in resources earmarked for the military. Despite somewhat high levels of defense expenditures, allocations to the military do not appear to have come at the cost of socio-economic improvement.

(4) Over the 1974–86 period, Syria experienced a steady improvement in socio-economic conditions. This occurred during a period in which, for the most part, the country was becoming more militarized, while simultaneously experiencing declines in public non-defense expenditures per capita.

3.4 *Israel*

Israel's economic problems cannot be attributed solely to its level of military expenditures:

(1) For the period as a whole (1955–87) there is a strong positive relationship from GDP to increased defense expenditures (with a constant-price Shekel increase of GDP equalling one, resulting in a 0.14 constant-price Shekel increase in defense expenditures).

(2) While this relationship held for the 20-year period, 1955–75, it appears to have broken down in recent years; during the 1967–87 period, there was no statistically significant relationship between the growth in defense expenditures and that of the economy.

(3) On the other hand, increases in defense expenditure have, with a one-year lag, stimulated increased rates of investment. While defense expenditures and general government consumption showed no relationship to imports over the 1955–75 period, increases in defense expenditures caused increases in imports over the 1967–87 period. During this time, increases in imports permitted government consumption to expand.

These import patterns suggest that the impact of defense expenditures on the economy is fundamentally different from that of other types of government allocation. In addition, this differentiation is increasing with time. In recent years, defense expenditures have been given high priority, with non-defense expenditures allowed to expand only when excess resources are available, often stemming from United States aid.

Perhaps because of US aid, the impacts of defense expenditures on socio-economic allocations are also less severe than might be expected:

(1) Few if any of the major budgetary categories have been systematically reduced by either increases in the share of defense in the budget, or shorter-term surges in defense expenditures.

(2) On the other hand, the government has apparently viewed general public services, social security and welfare, and interest payments as complementary with defense.

4. *Implications*

External debt has been used to support military spending in several of the sample countries. In large part, these funds have helped to neutralize many adverse effects associated with defense spending. The inability of countries such as Algeria, Egypt, and Syria to increase their external borrow-

ing will mean an increased likelihood of defense expenditures having a negative effect on their economies.

It is also likely that key rivalries in the region will continue to stimulate defense spending in the 1990s. This may result in deteriorating economic performance in the respondent countries, particularly if they are simultaneously confronted with foreign exchange scarcity.

Interestingly enough, defense expenditures have not had the adverse effects often ascribed to them, except in situations where arms races or warfare have accelerated military spending to levels that the domestic economy could not efficiently absorb. This suggests that a threshold exists beyond which defense expenditure becomes detrimental to economic performance.[16] Such thresholds would, of course, vary by country and over time, but barring sudden and dramatic political or economic change they can be forecast at least for the short term.

Drawing on an analysis of short- and long-term impacts of defense expenditures, we shall now forecast defense expenditure thresholds and future military expenditure patterns for the individual countries.

4.1 *Saudi Arabia*

Because of the recent hostilities in the Gulf and increasing worries about internal security, defense spending is likely to continue to have high priority in Saudi Arabia and will increase over the next several years. Such a trend could over time have negative consequences for the Saudi Arabian economy, which appears to be close to its military expenditure threshold.

Defense expenditures in Saudi Arabia cease to have a positive impact on the non-oil economy when they grow at a rate of over 25% per annum and/or average over 44% of non-oil GDP for a decade or more. In the decade 1978–88, defense expenditures comprised 44% of non-oil GDP. However, during the decade from 1977 to 1987, Saudi Arabian defense expenditures declined at an average rate of 3.7% per annum.

With the prospect of higher oil revenues for at least several years, together with the lower than average rates of increase in defense expenditures, especially in the past five years, the Kingdom should be able to expand its defense expenditures without appreciable negative effects on the domestic economy.

One possible factor limiting the potential positive impact of defense expenditures on the Saudi economy stems from the slowdown in government investment in infrastructure in recent years. If the resulting infrastructure deficiencies limit the expansion of the non-oil economy, defense expenditures may cease to provide a positive net stimulus to the economy.

4.2 *Egypt*

Egyptian allocations to defense will have a negative impact on the economy if they grow at rates (1977–87 = −7.5%) over 9% per annum for an extended period. The current Gulf crisis will result in a considerable expansion in Egyptian defense expenditures. However, given below-average rates of expansion in military expenditures during the past decade, the economy should receive a slight stimulus from these allocations. Historically, defense expenditures have had a positive impact on the economy when they average rates of growth of less than 6.0% per annum.

On the other hand, the Gulf crisis is likely to cost the country upwards of USD 2 billion a year in lost remittances. If the United States were to forgive the Egyptian military debt and/or waive servicing of the debt, the balance-of-payments effect of this expansion would not put a severe strain on the country's foreign exchange reserves.

Most of the stimulus to the economy will come from an expansion in the country's arms industries. Given the likely cancellation of Egyptian military debt by the United States, the country can move toward the more technical end of the spectrum of production through the acquisition of foreign designs, parts and production technology.

4.3 *Syria*

The recent Iraqi aggression is likely to cause repercussions in Syria, as it will throughout the Middle East. Syria will undoubtedly be forced to increase its military spending as the Gulf region becomes more unstable and Israel continues to arm.

In this regard, Syrian defense expenditures will cease to produce a positive stimulus to the economy if they grow at over 14% per annum (1977–87 = −2.0%) for a decade. While the country's debt-service problems have become more severe in recent years, higher oil prices should relieve some pressure. This effect may be tempered somewhat because the country was aided in the late 1970s and early 1980s by several large military grants, which are unlikely to be matched in the future. While no negative impacts from defense are likely, given the already precarious state of the Syrian economy, a sudden surge in defense spending may not produce many positive benefits.

In contrast, a moderate step-up in Syrian military spending brought on by the Gulf crisis should not place severe strains on the economy. These expenditures might even provide a mild stimulus to growth.

4.4 *Israel*

In the face of the Iraqi invasion of Kuwait, Israel will almost certainly increase its defense spending over the next several years.

There is no real evidence that Israeli defense expenditures have either diverted resources away from capital formation or reduced other major sources of growth, as long as growth in defense spending has been confined to under 18% per annum over a decade. The negative 4.3% per annum contraction in defense expenditures over the past 10 years should leave considerable scope for a military buildup without adverse effects on the economy.

This assessment must be qualified, however, because United States grants have helped neutralize any latent negative effects that might have been otherwise associated with Israel's heavy defense burden. Given current US budgetary conservatism and improving oil markets (and the consequent ability of countries like Iraq to finance expanded military expenditures), Israel's defense burden may begin to contribute to the country's economic deterioration before growth rates in the 18% range are reached.

5. *Conclusions*

For the most part, cross-sectional studies have implicitly assumed that a 'guns versus butter' situation exists in developing countries whereby increased defense expenditures come at the expense of investment and, ultimately, of real economic growth. The four country case-studies examined above provide evidence somewhat at odds with this view, however. Looked at in a dynamic context, defense expenditures are not necessarily at odds with acceptable economic performance. In fact defense expenditures appear to have provided a greater stimulus to investment than that offered by other types of government expenditures. Regarding shorter-run budgetary trade-offs, there do not appear to be any strongly negative associations between defense and growth-enhancing expenditures such as economic services or education.[17] Ultimately, however, the generally positive impact of defense on investment must account for the counter-intuitive finding that defense and growth are positively linked.

In this regard, the findings are consistent with the cross-section studies noted above: the impact of defense expenditures seems to vary over time, depending on the relative degree of resource constraint. For the most part, defense expenditures provide a positive stimulus to the economy. However, when defense expenditures outrun the economic resource base, they are either neutral or negative in their impact.

Although there is little evidence supporting the alternative position that investment or growth causes defense, many countries have developed fairly elaborate feedback mechanisms whereby defense impacts on investment and growth and in turn is affected by that growth. While there is little

evidence that defense hurts investment or growth, there is ample support for the position that: (a) the relationship between defense and investment or growth varies considerably among countries, and (b) the lag structures also differ greatly.

The paradox of defense expenditures is that a possible expansion in regional military expenditures following the Gulf conflict is unlikely to produce the disastrous economic effects assumed by many commentators. It does not follow, however, that little concern should be given to the longer-run impacts associated with defense expenditures. Before any final conclusions can be drawn concerning the economic consequences of regional defense expenditures, we need more information concerning the precise manner in which defense allocations affect growth. Are these largely through Keynesian (demand) linkages? or investment (supply) effects? Why is investment stimulated by defense? Is this stimulus due to the link between indigenous defense industries, or does defense buy stability and therefore an improved investment climate?

In large part, defense expenditures have stimulated regional economic activity relative to that provided by non-defense allocations. In a way this is very unfortunate. As Janice Stein has observed, a much higher priority should be given in the future to crisis prevention in the region.[18] Unfortunately the threat of poor economic performance stemming from stepped-up defense expenditures does not appear to be a factor restraining rearmament. Clearly one productive area for crisis prevention would be to aid these countries in identifying the means through which they could obtain a stronger economic stimulus from non-defense expenditures.

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14. The analysis involved the use of Granger Causality tests incorporating a Hsaio Procedure to determine the optimal lag of impact. These tests allowed the determination of the direction of causation: defense to growth; growth to defense or interdependent. Cf. C. W. J. Granger, 'Investigating Causal Relations by Econometric Models and Cross-Spectral Methods', *Econometrica*, 1969, pp. 424–438; C. Hsiao, 'Causality Tests in Econometrics', *Journal of Economic Dynamics and Control*, 1979, pp. 325–332.
15. A full presentation of the statistical results is contained in Robert E. Looney, 'The Economic Consequences of Defense Expenditures in the Middle East'. Paper presented at the Middle East Economic Association Meetings, Washington, DC, 29 December 1990. (Available from the author upon request.)
16. Thresholds were determined by regressing a Koyc-distributed lag-type equation of the form $GDP_t = GDP_{t-1} + DEF_t$ over various sub-periods of elevated defense expenditures. The assumption here is that defense expenditures impact over time on various aspects of the economy over time. When DEF became statistically significant for a period of over a decade or more, it was seen as evidence that a threshold had been reached. GDP_t = real Gross Domestic Product in year t; GDP_{t-1} = real Gross Domestic Product in the previous year and DEE_t = a measure of defense expenditures (real defense expenditures, defense burden) in the current year. See Robert E. Looney, 'Impact of Defense Expenditures on the Saudi Arabian Private Sector', *Journal of Arab Affairs*, vol. 6, Fall 1987, pp. 198–229 for a description of this method.
17. Also see Robert E. Looney, 'Defense Expenditures and Human Capital Development in the Middle East and South Asia', *International Journal of Social Economics*, 1990, pp. 4–16.,
18. Janice Stein, 'Crisis in The Gulf: Could It Have Been Prevented and Can It Be Managed?' *Queen's Quarterly*, Winter 1990, pp. 531–542.