2000

The Budgetary Consequences of Middle East Peace: What are the Economic Impacts and Causal Linkages?

Looney, Robert. E.

6 The Budgetary Consequences of Middle East Peace: What are the Economic Impacts and Causal Linkages?

Robert E. Looney

INTRODUCTION

Gone is the superpower rivalry of the Cold War era and the strategic significance it lent to the Middle East. The end of Soviet support has caused several Arab governments to realign their foreign policies; Israel is no longer necessarily perceived as an enemy but in some circles is seen as a potential economic and political partner.[1] Clearly a major motivation for expanding defence expenditures has therefore been eliminated. Even so, there are still gaps in the defence systems of most states in the region, and most countries wish to modernize their armed forces. Even the peace process will not stand in the way of modernization, and actual defence spending is not expected to fall significantly for some time.[2]

It is commonly believed that the major constraint on new defence spending is the poor performance of regional economies and the strain on government budgets of maintaining a system of subsidies and social welfare. It follows that the pace of arms transfers may slow down as a result of the need to conserve resources, but the region is certain to continue spending heavily on security, even if the future enemy is more likely to be an Islamist than an Israeli.[3]

While not disputing that view, this chapter takes another approach. Specifically it examines whether and to what extent the eastern Mediterranean states and Saudi Arabia have become so accustomed to defence expenditures that a reduction in their levels or rates of growth might actually result in economic disruption. Clearly if large segments of the economy are adversely affected by reduced allocations to the military, there will be some limits to the extent to which military cutbacks occur. Whether or not the reluctance to make further cuts in defence expenditures will derail

the peace process is problematic, but there is no doubt that this phenomenon may hamper both economic and political progress.

LITERATURE SURVEY: THE IMPACT OF DEFENCE EXPENDITURES

A body of conventional wisdom has amassed over the years concerning the causes and consequences of Third World militarization. More often than not in the academic literature this wisdom has been anecdotal and biased towards the standard "guns or butter" metaphor. Since the modern defence establishment is a heavy consumer of technical and managerial manpower and foreign exchange, resources that are especially scarce in the Third World, the conventional argument is that increased defence burdens should reduce the overall rate of growth.[4]

To test this theory, a rapidly growing body of empirical research has attempted to identify the impact of defence spending on various aspects of economic development and growth. Numerous studies have grown out of the debate but, unfortunately, no consensus has emerged. In the original study, Benoit[5] found strong evidence to suggest that defence spending encouraged the growth of civilian output per capita in less-developed countries.

This research has gone through various stages and levels of sophistication, with the initial studies largely based on ordinary least-squares regression techniques using Benoit's data-set for the 1950–65 period. The original research analysing Benoit's data-set[6] grouped countries on the basis of discriminant analysis with savings and investment used as variables. It was found that countries with relatively high levels of savings and investment experienced positive impacts on growth, while the impact was statistically insignificant for countries experiencing low levels of savings and investment.

On the other hand, Rothschild[7] concluded that increased military expenditures lowered economic growth by reducing exports in 14 OECD countries during the period 1956–69. In his examination of 54 developing countries for the sample period 1965–73, Lim[8] found defence spending to be detrimental to economic growth. Deger and Sen,[9] Leontief and Duchin,[10] Faini, Annez and Taylor,[11] Biswas and Ram,[12] and Grobar and Porter[13] also found evidence refuting the claim that defence spending stimulates economic growth.

In contrast, Wolf's[14] research examining the economic impact of Third World military expenditures utilising various sub-groupings of countries tended to contradict these findings. Much of this research implicitly argues that, in certain economic situations, by creating a stable environment it is possible that added defence expenditures may stimulate higher rates of investment, technological progress, technology transfer and hence increased overall growth.

Frederiksen and myself[15] also used Benoit's sample countries. However, our study grouped countries largely on the basis of foreign exchange earnings, import elasticity and productivity of investment. Again, relatively unconstrained countries experienced positive impacts on growth stemming from defence expenditures, while the countries that were relatively constrained in terms of foreign exchange showed a statistically insignificant but negative impact. Using a later time period, 1965–73, and again grouping developing countries on the basis of their relative savings and investment,[16] we found that the relatively unconstrained countries enjoyed a positive impact from defence expenditures.

These initial studies examined only the impact of defence expenditures on growth. More recent analysis in the area has been more sophisticated, employing more elaborate statistical devices and/or more subtle country groupings. For example, Third World military producers[17] during the period 1970–82 experienced positive impacts from military expenditures on growth, investment and savings, but declines in productivity.[18] Non-producers experienced declines in growth and investment. In recent years, analysis has branched into more complex issues, and utilized both time-series[19] and simultaneous-equation models estimated by two and three-stage least-squares regression techniques. These studies introduced the demand for military expenditures into the analysis to allow for feedback from the macroeconomy to defence.[20] Interestingly, the results[21] produced by these techniques tended to confirm the results obtained from the simpler, more naive models.

In short, the existing body of research demonstrates a consistent pattern whereby certain groups of Third World countries – usually the more successful economically, the more stable politically, or those engaged in military production[22] – derive positive impacts on investment and growth 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 defence expenditures.

Some studies have also identified a number of adverse effects that stem from defence expenditures which come at the expense of other forms of national expenditure. Such effects obtain even in those countries experiencing higher overall rates of growth from increased allocations to defence. In particular, countries with an indigenous arms industry may suffer a deterioration in the distribution of income from added defence expenditures. The same may also occur in military regimes as the authorities shift income from urban consumers to industrial groups.[23] A major limitation of these studies is that, by their nature, cross-sectional studies are very aggregative, such that applying them to specific countries is hazardous at best.

Obviously they are also incapable of capturing the dynamics associated with time.[24] Lebovic and Ishaq's[25] study of defence spending in the Middle

East attempts to overcome these deficiencies. Using a pooled time-series, cross-sectional analysis on various groupings of Middle Eastern 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. However, while Lebovic and Ishaq drew on time-series data, they were not able to incorporate the potential effects of lags between the time defence expenditures occur, and the period of maximum economic impact.

In this regard, Babin[26] has noted that incorporating the time variable into the analysis can be critical because some relationships that may exist over time disappear in the short run and vice versa. This implies that, at the national level, development usually requires a series of changes that occur through systems, which involve organizations, agencies, economic structures and technological variables. Consequently, as Babin concludes, it unjustifiable to assume that a country's defence spending will have an immediate, or even short-term, effect on national economic performance. Babin's main finding was that while short-run economic impacts of defence expenditure may be nil or even negative, the longer- term effect on growth is likely to be positive.

Along these lines, Kick and Sharda's[27] analysis suggests that an increase in the military manpower ratio has a significant positive effect on infrastructure and social welfare. This impact occurs with a long (12-year) time lag. Kick and 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.

Finally, recent work at the International Monetary Fund[28] suggests positive gains from reduced allocations to the military. The most recent of these studies[29] identified a substantial long-run "peace dividend" in the form of higher capacity output. This, in turn, may result from: (1) markedly lower military expenditure levels achieved in most regions during the late 1980s; and (2) further military spending cuts that might become possible in the future if global peace is sustained and deepened over time.

THE ISSUE OF CAUSATION

Nearly all of these studies have implicitly assumed a pattern of causation: defence expenditures are either politically and/or strategically driven and hence exogenous; or, instead, allocations to the military may simply reflect the underlying resource base (the ability to finance) and are hence endogenous. This is an important point, since many of the contradictory findings on militaries' economic impacts stem from differences in model construction, while the act of model construction in itself implicitly assumes that defence expenditures are either endogenous or exogenous.

It follows that before drawing any definitive conclusions as to the impact of defence expenditures, one must satisfactorily address the issue of causation. Fortunately several statistical tests are gaining wider acceptance for this purpose. To date, the original and most widely used causality test is one developed by Granger.[30]

The Granger Test

Granger defines causality such that X causes (G-C) Y if Y can be predicted more accurately in the sense of mean-square error, with the use of past values of X than without using past X. Based upon the definition of Granger causality, a simply bivariate autoregressive model for defence and gross domestic product (GDP) can be specified as follows:

$$GDP(t) = c + \sum_{i=1}^{p} a(i)GDP(t-i) + \sum_{j=1}^{q} b(j)DEF(t-j) + u(t) \qquad 6.1$$

$$DEF(t) = c + \sum_{i=1}^{r} d(i)DEF(t-1) + \sum_{j=1}^{s} e(j)GDP(t-j) + v(t) \qquad 6.2$$

where DEF = defence expenditures; p, q, r and s are lag lengths for each variable in the equation; and u and v are serially uncorrelated white-noise residuals. By assuming that error terms (u, v) are "nice", ordinary least-squares (OLS) becomes the appropriate estimation method.[31]

Within the framework of unrestricted and restricted models, a joint F-test is appropriate for causal detection:

$$F = \frac{RSS(r) - RSS(u) / (df(r) - df(u))}{RSS(u) / df(u)} \qquad 6.3$$

where $RSS(r)$ and $RSS(u)$ are the residual sum of squares of restricted and unrestricted models, respectively; and $df(r)$ and $df(u)$ are, respectively, the degrees of freedom in restricted and unrestricted models.

The Granger test detects causal directions in the following manner: first, unidirectional causality from *DEF* to *GDP* if the F-test rejects the null hypothesis that past values of *DEF* in equation (6.1) are insignificantly different from zero, and if the F-test cannot reject the null hypothesis that past values of *GDP* in equation (6.2) are insignificantly different from zero. That is, *DEF* causes *GDP,* but *GDP* does not cause *DEF*. Unidirectional causality runs from *GDP* to *DEF* if the reverse is true. Second, bidirectional causality runs between *DEF* and *GDP* if both F-test statistics reject the null hypotheses in equations (6.1) and (6.2). Finally, no causality exists between DEF and GDP if we cannot reject both null hypotheses at the conventional significance level.

Joerding[32] has tested the defence-growth hypothesis using Granger causality methods. That is, he tested for the assumed exogeneity of defence budgets. Using a pooled sample containing 15 observations from each of 57 countries, Joerding employed a multivariate model which also included investment and government spending and concluded that defence expenditures are not strongly exogenous and that previous studies were flawed.

While Joerding's work provides insight into the nature of the relationship between defence and growth, there are three issues that merit further attention, as suggested by LaCivita and Frederiksen.[33] First, Joerding lumps all countries into one sample. This suggests a commonality of causal relationships across diverse economic environments. As Frederiksen and myself have demonstrated, splitting a pooled sample into separate groups (in their case based on the level of relative resource constraints) can lead to quite different results.[34] Second, by aggregating the sample, Joerding assumed a common lag structure for all of the countries in the sample (in his study, four years on the defence and growth variables). It seems reasonable to hypothesize that if a causal relationship does exist (either defence to growth or growth to defence) one could expect the time lags to differ from country to country. And finally, Joerging's method for choosing lag length was *ad hoc*.

The results of Granger causality tests depend critically on the choice of lag length.[35] If the chosen length is less than the true lag length, the omission of relevant lags can cause bias. If the chosen lag is greater than the true lag length, the inclusion of irrelevant lags causes estimates to be inefficient. While Joerding chose his lag lengths based on preliminary partial autocorrelation methods, there is no *a priori* reason to assume lag lengths equal for all of our sample countries. For example, in a study of the Philippines, Frederiksen and LaCivita[36] found no statistical relationship between growth and defence when both variables had a lag equal to four. With a lag length of two periods, however, growth caused defence. Since both lag lengths are arbitrary, one cannot form an objective conclusion as to the direction of causation.

The Hsaio Procedure

To overcome such difficulties noted above, Hsaio[37] developed a systematic method for assigning lags. This method combines Granger causality and Akaike's final prediction error (*FPE*), the (asymptotic) mean-square prediction error, to determine the optimum lag for each variable. In an article examining the problems encountered in choosing lag lengths, Thornton and Batten[38] found Hsaio's method to be superior to both arbitrary lag length selection and several other systematic procedures for determining lag length.

The first step in Hsaio's procedure is to perform a series of autoregressive regressions on the dependent variable. In the first regression, the dependent

variable has a lag of one, and this increases by one in each succeeding regression. Here, we estimate M regressions of the form:

$$G(t) = a + \sum_{i=1}^{m} b(t-1)G(t-i) + e(i) \qquad 6.4$$

where the values of m range from 1 to M. For each regression, we compute the *FPE* in the following manner:

$$FPE(m) = \frac{T+m+1}{T-m-1} ESS(m)/T \qquad 6.5$$

where: T is the sample size, and $FPE(m)$ and $ESS(m)$ are the final prediction error and the sum of squared errors, respectively. The optimal lag length, m^*, is the lag length which produces the lowest *FPE*. Having determined m^*, additional regressions expand the equation with the lags on the other variable added sequentially in the same manner used to determine m^*. Thus we estimate four regressions of the form:

$$G(t) = a + \sum_{i=1}^{m^*} b(t-1)G(t-1) + \sum_{i=1}^{n} c(t-1)D(t-1) + e(i) \qquad 6.6$$

with n ranging from one to four. Computing the final prediction error for each regression as:

$$FPE(m^*,n) = \frac{T+m^*+n+1}{T-m^*-n-1} ESS(m^*,n)/T \qquad 6.7$$

we choose the optimal lag length for D, n^* as the lag length which produces the lowest *FPE*. Using the final prediction error to determine lag length is equivalent to using a series of F-tests with variable levels of significance.[39]

The first term measures the estimation error and the second term measures the modelling error. The *FPE* criterion has a certain optimality property[40] that "balances the risk due to bias when a lower order is selected and the risk due to increases in the variance when a higher order is selected." As noted by Judge *et al.*,[41] an intuitive reason for using the *FPE* criterion is that longer lags increase the first term but decrease the *RSS* of the second term, and thus the two opposing forces are optimally balanced when their product reaches its minimum.

Depending on the value of the final prediction errors, four cases are possible:

(1) *Defence causes growth*. This occurs when the prediction error for growth falls when the equation includes defence. In addition, when growth is added to the defence equation, the final prediction error increases;

(2) *Growth causes defence*. This occurs when the prediction error of growth increases when defence is added to the regression equation for growth, and is reduced when growth is added to the regression equation for defence;
(3) *Feedback*. This occurs when the final prediction error decreases when defence is added to the growth equation, and the final prediction error decreases when growth is added to the defence equation; or
(4) *No relationship*. This occurs when the final prediction error increases when defence is added to the growth equation, and also increases when growth is added to the defence equation.

METHODOLOGY[42]

Several conceptual problems remain. Most economic time-series are non-stationary. Stationarity is an important property as it guarantees that there are no fundamental changes in the structure of the process that would render prediction difficult or impossible. To overcome this problem, I have used the rates of growth of each variable in the estimated equations.[43] Regressing these transformed series on a constant and time produced coefficients that were different from zero for all countries. Similar regressions of the untransformed levels indicated the presence of a trend.

The region's recent defence expenditures show great diversity (see Table 6.1) with few generalizations possible. Clearly, progress in the Arab–Israeli peace process has yet to be reflected in the region's attitude towards defence issues.[44] In many countries weapons systems are being upgraded and expanded, and gaps in national defences are being filled with new acquisitions. Across the Middle East, defence budgets account for anything from 3.3 per cent to 14 per cent of GDP: the European average is 1.85 per cent of GDP.

Of course one must be wary of over-generalizing. Israel's economy is fundamentally different from those of other countries in the region; it is more akin to some of the European economies. Within the Arab Middle East there are important differences between the major oil-exporting countries and those with far less or no oil, and there are also important country differences aside from oil.[45] In the sections below, the analysis has been confined to the economies of Israel Saudi Arabia, Egypt, Syria and Jordan, where, as Eliyahu Kanovsky notes, the relationship between economic stagnation and other socio-economic ills, along with the growth of Islamic fundamentalism, together constitute a grave threat to the longer-term durability of Arab–Israeli peace agreements.[46]

Table 6.1 Defence spending: Middle East and North Africa, 1985–95 (US$ million)

Country	*1985*	*1993*	*1994*	*1995*	*Growth Rate*	
					1985/95	*1993/95*
Sample Countries						
Saudi	23 603	16 450	14 275	13 200	–5.6	–10.4
Egypt	3 400	2 480	2 710	2 960	–1.4	9.2
Israel	6 640	6 200	6 700	6 900	0.4	1.9
Jordan	791	430	433	448	–5.5	–24.7
Syria	4 580	2 380	2 460	2 620	–5.4	–24.4
GCC						
Bahrain	198	251	248	253	2.5	0.4
Kuwait	2 360	3 010	3 090	2 910	2.1	–1.7
Oman	2 834	1 920	1 900	1 590	–5.6	–9.0
Qatar	394	330	302	326	–1.9	–0.6
Other Middle East						
Iran	18 700	4 860	2 300	2 460	–18.4	–28.9
Iraq	16 910	2 600	2 700	n/a	n/a	n/a
Lebanon	263	275	310	343	2.7	14.2
Yemen	1 041	355	318	345	–10.5	–42.4
North Africa						
Algeria	1 250	1 360	1 130	1 330	0.6	8.5
Libya	1 775	1 090	967	960	–6.0	–26.5
Morocco	850	1 090	1 230	1 210	3.6	19.3
Tunisia	550	231	225	262	–7.1	44.9

Source: *The Military Balance, 1994–95* (London: International Institute for Strategic Studies), 1995.

RESULTS

The results show great diversity across the sample of countries. In fact, no one pattern dominates the findings, suggesting that generalizations about the economic motivations for increasing or decreasing defence expenditures are of little value. The alleged peace dividend may be high for the region as a whole, but for several individual countries it is problematic that a reduction in defence expenditures would provide a major boom to their economies.

Israel

The patterns for Israel are particularly interesting and in many respects are more complex than for the other countries examined. The dominant pattern is one of feedback, whereby increases in defence expenditures impact positively on the economy (equation 1, Table 6.2). In turn, economic growth tends to generate additional resources to allow a further expansion in defence. The same pattern also holds for the defence burden (equation 2, Table 6.2). That is, an increase in the growth of the share of defence in GNP tends to increase the subsequent rate of growth in GDP. Here however the link between increased defence burdens and GDP is considerably weaker than the simple Defence → GDP linkages. This pattern seems to hold mainly when defence is not increasing its budgetary share (more specifically the growth in defence share of the budget). When this occurs (Equation 3, Table 6.2) there is a weak reduction in the growth of GDP. Finally, a particularly strong linkage occurs between increases in armed forces (per 1000 population) and GDP. Here, increases in the growth of the armed forces exert a strong (Equation 4, Table 6.2) stimulus to GDP. This stimulus occurs quickly, with the optimal lag around one year.

These findings suggest that defence expenditures in Israel have acted as a positive stimulus to overall economic expansion, but the precise nature of these links is unclear. However, it appears that the government has little incentive from a purely economic point of view in reducing defence expenditure. Presumably the reduction in defence expenditures would have to be replaced by some other type of expenditure to avoid increased unemployment and a slowdown in economic activity.

The ability of defence expenditures to stimulate the economy is consistent with a model of foreign aid recently developed by McGuire,[47] in which foreign aid creates several price and income movements in the recipient country. For Israel, aid from the United States has created an indirect stimulus to investment via the complementarity between investment and defence. In addition, the aid provides significant resources via tax relief to the private sector. Subsequently these resources flow into capital formation: "It appears in summary, that a significant fraction of United States aid goes to support capital formation in Israel via this diversion of resources."[48] In short, United States military grants to Israel have not only allowed the country to increase military expenditures rapidly in the short run, but, perhaps more importantly, to increase them in a way not detrimental to investment and economic growth.

Jordan

In contrast to Israel, Jordanian defence expenditures have tended to respond to an expanding resource base; that is, they have been passive in that they

Table 6.2 Defence expenditure, causal linkages with the macroeconomy: Israel, Jordan and Syria

Causal Relationship	*Time Period*	*Direction of Causation*	*Optimal Lag (years)*	*strength*
Rates of Growth: Measures of Defence and GDP				
Israel				
1. Defence/GDP	1970–93	[Feedback]		
		MILX→GDP (+)	(3)	Moderate
		GDP→MILX (+)	(1)	Weak
2. Defence burden/GDP	1970–93	[Feedback]		
		MILX→GDP (+)	(3)	Weak
		GDP→MILX (+)	(1)	Weak
3. Defence budget share/GDP	1970–93	MILX→GDP (–)	(1)	Weak
4. Armed forces/GDP	1970–93	AF→GDP (+)	(1)	Strong
Jordan				
5. Defence/GDP	1970–94	GDP→MILX (+)	(3)	Strong
6. Armed forces/GDP	1970–93	AF→GDP (–)	(1)	Weak
7. Arms imports share of total imports/GDP	1970–93	No Relationship		
Syria				
8. Defence/GDP	1970–90	MILX→GDP (–)	(1)	Weak
9. Defence burden/GDP	1970–90	MILX→GDP (–)	(1)	Weak
10. Armed forces/GDP	1970–90	GDP→AF (+)	(1)	Weak
11. Defence budget share/GDP	1970–90	MILX→GDP (–)	(1)	Moderate

Note: Summary of results obtained from Granger causality tests using a Hsaio procedure to determine the optimal lag; i.e., a four-year lag indicates that most of the impact from the expenditures or GDP in any one year tends to be distributed over four successive years.

have tended to respond to underlying economic trends rather than initiating or modifying those trends. On an overall basis, increases in the armed forces have had a fairly negative impact on GDP. While one could only speculate as to the cause of this pattern, the lost output stemming from shifting workers from civilian to military activities would seem to be a logical place to start. However, it is clear that the country could significantly reduce its allocations to defence without incurring the risk of deflation. Conceivably in Jordan's case the major problems associated with a lasting Middle East peace agreement would be what to do with the resources that do not have to be earmarked for defence. In a recent assessment of the Jordanian economy the World Bank argued that in the short run, while peace may offer Jordan some immediate benefits arising primarily from an investment-led boom in the West Bank and Gaza Strip, it also carries substantial risks to macroeconomic stability.[49] The real question then is whether the country has the capacity to manage these increased risks through improved macroeconomic management and further efforts to strengthen the financial system.

Syria

In contrast to the patterns found in Israel and Jordan, defence expenditures have had a generally negative, albeit weak impact on the Syrian economy. On the one hand, this impact has tended to be short, averaging one year, but it is consistent across defence expenditures, the defence burden and the share of defence in the central government budget. On the other hand, the increased economic growth appears to provide additional resources to expand the armed forces.

Egypt

The dominant pattern in Egypt (Table 6.3) over this period is one of no statistically significant links between defence expenditures and the overall economy. It appears that increased defence expenditures tend to produce a stimulus for increased capital formation, but these linkages are weak. The ensuing link between investment and GDP is rather strong, making the overall impact of defence expenditures difficult to assess.

Saudi Arabia

Saudi Arabian patterns (Table 6.4) are more complex in that it is necessary to distinguish between total GDP and that of non-oil GDP. Given its high oil component, it is safe to assume that GDP could be affected by defence only under highly unusual circumstances. Therefore, it makes sense to test the impact defence may have had on the non-oil component of GDP. That is, did

Table 6.3 Defence expenditure, causal linkages with the macroeconomy: Egypt

Causal Relationship	*Time Period*	*Direction of Causation*	*Optimal Lag (years)*	*strength*
1. Defence expenditures/GDP	1970–90	No relationship		
2. Defence burden/GDP	1970–90	No relationship		
3. Armed forces/GDP	1970–90	No relationship		
4. Defence expenditures investment	1970–93	MILX→Investment (+)	(2)	Weak
5. Defence burden/investment	1970–93	MILX→Investment (+)	(2)	Weak
6. Armed forces/investment	1970–93	[Feedback]		
		Investment→MILX (+)	(4)	Weak
		MILX→INVEST (+)	(4)	Moderate
7. Investment/GDP	1970–93	Investment→GDP (+)	(2)	Strong

Note: See the note to Table 6.2.

Table 6.4 Defence expenditure, causal linkages with the macroeconomy: Saudi Arabia

Causal Relationship	*Time Period*	*Direction of Causation*	*Optimal Lag (years)*	*strength*
Gross Domestic Product				
1. Defence/GDP	1970–91	GDP→MILX (+)	(1)	Weak
2. Defence burden/GDP	1970–91	GDP→MILX (+)	(1)	Weak
3. Armed forces/GDP	1970–91	No relationship		
Non-Oil GDP				
4. Defence/non-oil GDP	1970–91	MILX→GDP(+)	(2)	Moderate
5. Defence burden/non-oil GDP	1970–91	MILX→GDP (+)	(1)	Moderate
6. Armed forces/non-oil GDP	1970–91	Armed forces→GDP (+)	(2)	Moderate
7. Goverment investment/non-oil GDP	1970–91	[Feedback]		
		Investment→GDP (+)	(2)	Weak
		GDP→Investment (–)	(1)	Weak
8. Private investment/non-oil GDP	1970–91	[Feedback]		
		Investment→GDP (+)	(1)	Strong
		GDP→Investment (+)	(1)	Weak
Private Investment				
9. Defence expenditure/private investment	1970–91	MILX→Investment (+)	(3)	Weak
10. Government investment/private investment	1970–91	[Feedback]		
		Private→Public (+)	(1)	Moderate
		Public→Private (+)	(1)	Weak

Note: See the note to Table 6.2.

defence create linkages with the local economy or was it in competition with the private sector for resources? The results are as follows.

As anticipated, causation is largely from GDP to defence; that is, an increased resource base is used to fund additional allocations to the military. The impact here is quick, but not necessarily strong (Equations 1 and 2, Table 6.4). This may be due in part to the volatility of oil revenues and the stability in defence procurement contracts, once signed. That is, during periods of high oil revenues, contracts may be let that require expenditures over multiple years. Fluctuations in oil revenues would then mask this underlying linkage.

For non-oil revenues the pattern is largely one of defence expenditures providing a mild stimulus to the economy. Again, this stimulus occurs fairly quickly with an average lag of about two years. In the Saudi Arabian case the impact of private investment and government investment on GDP were also examined. Here it was found that private investment had a strong impact on non-oil GDP, with public investment a much weaker linkage. Of the three, defence expenditures were stronger than government investment as a stimulus to the domestic economy, but weaker than private investment.

While the actual Saudi Arabian defence expenditures appear to be linked to oil revenues and can be expected to decline, the country does appear to derive some domestic benefits from increased allocations to the military. Whether these are linkages with the country's offset programme are unclear. The fact is, these linkages appear stronger than they would be with government investment, for instance. Clearly the main problem for the Saudis will entail finding ways to replace defence expenditures (which are not likely to increase due to budgetary constraints) with other types of expenditures, such as private investment. This is a goal of both the current and the prior development plans. However, given the low productivity of capital investment, the country would apparently gain little from diverting expenditures from the military to further expansion in infrastructure.

CONCLUSION

These results suggest the difficulties in generalizing over possible peace dividends or even the willingness of countries to reduce defence expenditures as part of a Middle East peace process. Israel and Saudi Arabia probably have the least to gain from reduced defence expenditures; they were the only countries to experience a consistently positive linkage from defence to GDP, although the Saudi links are from defence to non-oil GDP. Egypt does not appear to gain any direct growth benefits from defence expenditures; however, there is some evidence that increased defence may stimulate capital investment. That country might benefit from a more detailed analysis

to discern the nature of this linkage and whether or not other types of government expenditure might provide a stimulus of the same order of magnitude. Jordan would be the next most likely country to gain from reduced defence expenditures. As noted, this effect would not be a true peace dividend, since defence expenditures do not impact negatively on the economy. However, it is clear that Jordanians have many opportunities to productively use the resources that might have ordinarily gone to the military. Syria appears to be the country with the greatest economic stake in a lasting Middle East peace. Syria was the one country that derived negative impacts on economic growth from defence expenditures, and as a result it is the only candidate for a true peace dividend.

In general, these findings support Kanovsky's contentions[50] that (1) there is very little likelihood of any further significant reductions in regional military expenditures; and (2) that even if such reductions were to take place, there are many other impediments to economic growth in the Arab Middle East: in particular, adverse economic policies and poor political processes. His feeling is that peace agreements, however desirable in their own right, will not solve the basic economic problems of these countries. Only far-reaching changes in economic policy can extricate them from stagnation, unemployment and underemployment, debilitating poverty and a widening and dangerous gap between the few rich and the many poor.

APPENDIX: TESTING FOR UNIT ROOTS AND CO-INTEGRATION

As noted above, the time series must be stationary to yield valid Granger tests.[51] In this regard the finding of a unit root in a time series indicates non-stationarity.

In a well-known paper, Dickey and Fuller[52] suggested a method for computing a test for a unit root in a time series, and presented critical values for their proposed tests with and without the trend variable included. Dickey– Fuller tests were performed using PCGive Version 7. In a simple case where:

$$xt = a + bxt - 1 + et$$

where $b = 1$, which generates a random walk (with drift if a not equal to 0). Here, the autoregressive coefficient is unitary and stationarity is violated. A process with no unit or explosive roots is said to be $I(0)$; a process is $I(d)$ if it needs to be differenced d times to become $I(0)$. The Durbin–Watson statistic (DW)for the level of a variable offers one simple characterization of this integrated property. For example, if xt is a random walk, DW will be very small. If ^{xt} is white noise, DW will be around 2. Very low DW values thus

indicate that a transformed model may be desirable, perhaps including a mixture of differenced and disequilibrium variables.

The tests[53] consisted of first performing the Dickey–Fuller procedure on the logs of all variables: Here, the t-test on the lagged value is the relevant statistic, with critical values provided in MacKinnon,[54] and Davidson and MacKinnon[55]. As noted above, these tests indicated non-stationarity. Next, tests were performed on the first differences of the log values. In all cases these were significant at the 95 per cent level (and often at the 99 per cent level).

Notes

1. Peter Kemp, "The Challenges of a Changing World: Middle Eastern Political and Economic Trends", *Middle East Economic Digest* 38(51) (23 December 1994), p. 2.
2. Francis Tusa, "New Prospects Make Waves in the Gulf: Naval Equipment Procurement in the Middle East", *Middle East Economic Digest* 39(49) (8 December 1995), p. 12.
3. Peter Kemp, "In the Age of Peace, Security Starts at Home", *Middle East Economic Digest* 39(49) (8 December 1995), p. 8.
4. Steve Chan, "Military Expenditures and Economic Performance", in United States Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers, 1986* (Washington: United States Arms Control and Disarmament Agency, 1987); and S. Deger and Robert West, "Introduction: Defense Expenditure, National Security and Economic Development in the Third World", in S. Deger and R. West, *Defense, Security and Development* (London: Francis Pinter, 1987).
5. Emile Benoit, "Growth and Defense in Developing Countries", *Economic Development and Cultural Change* 35 (1978), pp. 271–80.
6. P.C. Frederiksen and Robert E. Looney, "Defense Expenditures and Growth in Developing Countries", *Journal of Economic Development* 7 (1982), pp. 113–26.
7. K.W. Rothschild, "Military Expenditure, Exports and Growth", *Kyklos* 30 (1977), pp. 804–13.
8. David Lim, "Another Look at Growth and Defense in Less Developed Countries", *Economic Development and Cultural Change* 31 (1983), pp. 377–84.
9. S. Deger and S. Sen, "Military Expenditure, Spin-Off and Economic Development", *Journal of Development Economics* 12 (1983), pp. 67–83.
10. W. Leontief and F. Duchin, *Military Spending: Facts and Figures* (New York: Oxford University Press, 1983).
11. R. Faini, P. Annez and L. Taylor, "Defense Spending, Economic Structure and Growth: Evidence Among Countries and Over Time", *Economic Development and Cultural Change* 32 (1984), pp. 487–98.
12. B. Biswas and R. Ram, "Military Expenditures and Economic Growth in Less Developed Countries: An Augmented Model and Further Evidence", *Economic Development and Cultural Change* 35 (1986), pp. 361–72.
13. L. Grobar and R. Porter, "Benoit Revisited: Defense Spending and Economic Growth in LDCs", *Journal of Conflict Resolution* 33 (1989), pp. 318–45.
14. C. Wolf, "Economic Success, Stability and the 'Old' International Order", *International Security* 6 (1981), pp. 75–92.

15. P.C. Frederiksen and Robert E. Looney, "Defense Expenditures and Economic Growth in Developing Countries", *Armed Forces and Society* 10 (1983), pp. 633–46.
16. P.C. Frederiksen and R.E. Looney, "Another Look at the Defense Spending and Development Hypothesis", *Defense Analysis* 1 (1985), pp. 205–10.
17. S. Neuman, "International Stratification and Third World Military Industries", *International Organization* 38 (1984), pp. 172–3.
18. Robert E. Looney, "Impact of Arms Production on Third World Distribution and Growth", *Economic Development and Cultural Change* 38 (1989), pp. 145–54.
19. Robert E. Looney, "Factors Underlying Venezuelan Defense Expenditures 1950–83: A Research Note", *Arms Control* (May 1986), pp. 74–108; Robert E. Looney, "The Impact of Defense Expenditures on the Saudi Arabian Private Sector", *Journal of Arab Affairs* 6 (1987), pp. 198–229; and Robert E. Looney "The Role of Defense Expenditures in Iran's Economic Decline", *Iranian Studies* 21 (1988), pp. 52–83.
20. K. Giymah-Brempong, "Defense Spending and Economic Growth in Sub-Saharan Africa, An Econometric Investigation", *Journal of Peace Research* 30 (1989), pp. 79–90.
21. R.E. Looney and P.C. Frederiksen, "Defense Expenditures, External Public Ddebt and Growth in Developing Countries", *Journal of Peace Research* 23 (1986), pp. 329–86; N. Mohammed, "Defense Spending and Economic Growth in Sub-Saharan Africa, Comment on Giymah-Brempong", *Journal of Peace Research* 30 (1993), pp. 95–6; and N. Mohammed, "Economic Growth and Defense Spending in Sub-Saharan Africa, Benoit and Joerding Revisited", *Journal of African Economies* 2 (1993), pp. 145–56.
22. Robert E. Looney, "Military Keynesianism in the Third World: An Assessment of Non-Military Motivations for Arms Production", *Journal of Political and Military Sociology* 17 (1989), pp. 43–64; and Robert E. Looney, "A Post-Keynesian Analysis of Third World Military Expenditures", *Rivista Internazionale di Scienze Economiche e Commerciali* 38 (1991), pp. 779–98.
23. Robert E. Looney, "The Economic Impact of Rent Seeking and Military Expenditures in the Third World", *American Journal of Economics and Sociology* 48 (1989), pp. 11–30.
24. P.C. Frederiksen and R.E. Looney, "Budgetary Consequences of Defense Expenditures in Pakistan: Short-Run Impacts and Longer-Run Adjustments", *Journal of Peace Research* 31 (1994), pp. 11–18.
25. J. Lebovic and A. Ishaq, "Military Burden, Security Needs, and Economic Growth in the Middle East", *Journal of Conflict Resolution* 31 (1987), pp. 106–38.
26. N. Babin, "Military Spending, Economic Growth and the Time Factor", *Armed Forces and Society* 15 (1989), pp. 249–62.
27. E. Kick and B.D. Sharda, "Third World Militarization and Development", *Journal of Developing Societies* 2 (1986), pp. 49–67.
28. Dan Hewitt, "Military Expenditures 1972–1990, The Reasons Behind the Post–1985 Fall in World Military Spending", IMF Working Paper WP/93/18, March 1993; and Dan Hewitt, "Military Expenditures Worldwide, Determinants and Trends, 1972–1988, *Journal of Public Policy* 12 (1992), pp. 105–52.
29. Malcolm Knight, Norman Loayza and Delano Villanueva, "The Peace Dividend, Military Spending Cuts and Economic Growth", International Monetary Fund Working Paper WP/95/53, May 1995.

30. C.W.J. Granger, "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods", *Econometrics* 37 (1969), pp. 424–38; and C.W.J. Granger "Some Recent Developments in a Concept of Causality", *Journal of Econometrics* 39 (1988), pp. 199–211.
31. If the disturbances of the model were serially correlated, the OLS estimates would be inefficient, although still unbiased, and would distort the causal relations. The existence of serial correlation was checked by using a maximum likelihood correlation for the first-order autocorrelation of the residuals [AR(1)]. The comparison of both OLS and AR(1) results indicated that no significant changes appeared in causal directions. Therefore, we can conclude "roughly" that serial correlation was not serious in this model.
32. W. Joerding, "Economic Growth and Defense Spending: Granger Causality", *Journal of Development* 21 (1986), pp. 35–40.
33. C.J. LaCivita and P.C. Frederiksen, "Defense Spending and Economic Growth: An Alternative Approach to the Causality Issue", *Journal of Development Economics* 35 (1991), pp. 117–26.
34. P.C. Frederiksen and Robert E. Looney, "Defense Expenditures and Economic Growth in Developing Countries", *Armed Forces and Society* 10 (1983), pp. 633–46; and Frederiksen and Looney, "Another Look at the Defense Spending and Development Hypothesis, *op. cit.*
35. A.R. Chowdhury, "A Causal Analysis of Defense Spending and Economic Growth", *Journal of Conflict Resolution* 35 (1991), pp. 80–97.
36. P.C. Frederiksen and C.J. LaCivita, "Defense Spending and Economic Growth: Time Series Evidence on Causality for the Philippines 1956–1982", *Journal of Philippine Development* 26 (1987), pp. 354–60.
37. C. Hsaio, "Autoregressive Modelling and Money–Income Causality Detection", *Journal of Monetary Economics* 6 (1981), pp. 85–106.
38. D.L. Thornton and D.S. Batten, "Lag-length Selection and Test of Granger Causality between Money and Income", *Journal of Money, Credit and Banking* 17 (1985), pp. 164–78.
39. Since the F statistic is redundant in this instance they are not reported here. They are, however, available from the author upon request.
40. Hsaio (1979), *op. cit.*, p. 326.
41. R.C. Judge, W. Hill, H. Griffiths, H. Lutkephol and T.C. Lee, *Introduction to the Theory and Practice of Econometrics* (New York, John Wiley, 1982).
42. The data for military expenditures used to carry out the Hsaio tests are from the United States Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers, 1993–1994*. Annual data on GDP is from various issues of the International Monetary Fund, *International Financial Statistics Yearbook*. When consistent price deflators were not available, I have introduced the growth of the defence burden (the share of defence in GDP) in the regression equations. Saudi Arabian macroeconomic data is from the Saudi Arabian Monetary Agency, *Annual Report*, various issues. In the case of Saudi Arabia the non-oil GDP deflator is used to obtain constant price series.
43. The Dickey–Fuller method, first published in 1979, was used to address the issue of non-stationarity and co-integration aspects of the time series used. See the Appendix for a full discussion of the method.
44. Peter Kemp, "Arms Rise as Risks of War Recede", *Middle East Economic Digest Special Report: Defense* 38(49) (9 December 1994), p. 9.
45. Edmund O'Sullivan, "In Search of New Growth Strategies: Middle East Economies", *Middle East Economic Digest* 38 (17 January 1994), p. 2.

46. Eliyahu Kanovsky, "Middle East Economies and Arab–Israeli Peace Agreements", *Israel Affairs*, 1(4) (Summer 1995), pp. 22–39.
47. M.C. McGuire, "Foreign Assistance Investment and Defense: A Methodological Study with Application to Israel, 1960–1979", *Economic Development and Cultural Change* 35 (1987), pp. 847–73.
48. *Ibid*, p. 867.
49. World Bank, *Peace and the Jordanian Economy* (Washington: World Bank, 1994), p. 1.
50. Kanovsky, "Middle East Economics", *op. cit.*
51. A full discussion of these issues is given in C.W.J. Granger, "Some Recent Developments in a Concept of Causality", *op. cit.*
52. D.A. Dickey and W.A. Fuller, "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association* 74 (1979), pp. 427–31. See also Dickey and Fuller, "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica* 49 (1981), pp. 1057–72.
53. For a full description of the tests – the selection of lags and the process of differencing – see J.A. Dornik and D.F. Hendry, *PCGive Version 7.0: An Interactive Modelling System* (Oxford: University of Oxford 1992), pp. 111–12.
54. J.G. Mackinnon, "Critical Values for Cointegration Tests", in R.F. Engle and C.W.J. Granger (eds), *Long Run Economic Relationships* (Oxford: Oxford University Press (1991), pp. 267–76.
55. R. Davidson and J.G. Mackinnon, *Estimation and Inference in Econometrics* (Oxford: Oxford University Press, 1993).