Government Expenditures, Military Spending and Economic Growth: Causality Evidence from Egypt, Israel and Syria

Suleiman Abu-Bader and Aamer S. Abu-Qarn
Department of Economics, Ben-Gurion University of the Negev, Beer-Sheva, Israel

Abstract

This study uses multivariate cointegration and variance decomposition techniques to investigate the causal relationship between government expenditures and economic growth for Egypt, Israel and Syria, for the past three decades. When testing for causality within a bivariate system of total government spending and economic growth, we find bi-directional causality from government spending to economic growth with a negative long-term relationship between the two variables. However, when testing for causality within a trivariate system – the share of government civilian expenditures in GDP, military burden and economic growth – we find that the military burden negatively affects economic growth for all the countries, and that civilian government expenditures cause positive economic growth in Israel and Egypt.

Classification: O23, O53, H50, N15.

Keywords: Middle East, economic growth, government expenditure, military burden, Granger causality and error correction models.

Introduction

The relationship between government expenditure (aggregate as well as disaggregated into its major components including defense spending) and economic growth has attracted considerable interest among economists and policy makers.

Empirical analyses of the impact of overall government expenditure on long-run economic growth include, among others, Feder (1983), Landau (1983), Ram (1983, 1986), Grier and Tullock (1989), Romer (1989), Barro (1990, 1991), Levine and Renelt (1992), Devarajan et al. (1996), and Sala-i-Martin (1997). The majority of these studies used cross-section analysis to link measures of government spending with economic growth rates and produced mixed evidence; the most common results show that government expenditure is detrimental to economic growth. Most of the evidence emerged from cross-section growth regressions [*à la* Barro (1991)] that provided only pooled estimates of the effects of government expenditure on economic growth. Cross-country growth regressions do not capture the dynamics of the relationship between these two variables and disregard country-specific factors.

Another pitfall of these studies is that when economic growth was regressed on a wide spectrum of variables, researchers interpreted a significant coefficient of the measure of government expenditure as a confirmation of causality from government spending to economic growth. However, a significant coefficient in this equation can be equally compatible with the Keynesian view – causality from government expenditure to growth, or with Wagner's Law – from growth to government expenditure as well as with a bi-directional causality between the two variables. Typical growth regressions provide no insights into the direction of causality but rather focus on associating government spending and a host of variables with economic growth. Recently some empirical studies have begun testing for the direction of causality between government spending and economic growth by using time series data and applying Granger causality tests. The studies that used these techniques focused mainly on developed countries where long-term series data are available. [Ahsan et al. (1989), Bharat et al. (2000), and Ghali (1998) among others]

Cross-section growth regressions have been used to assess the relationship between military spending and economic growth. As when examining overall government spending, the evidence that emerged was mixed and subject to criticism due to the use of inappropriate empirical techniques. For example, Benoit (1973, 1978) used the Spearman rank order correlation and regression analysis to show that military spending positively affects economic growth in a sample of 44 LDCs (less developed countries) between 1950-1965. However, most other studies found a negative effect of defense spending either directly [Fiani et al. (1984), Lim (1983)] or indirectly through their negative impact on saving, [Deger and Smith (1985)] investment, [Deger and Sen (1983)] or exports. [Rothschild (1977)] Biswas and Ram (1986) found no consistent, statistically significant connection between military spending and economic growth. Aware of the severe pitfalls of cross section analysis, Dakurah et al. (2001) used cointegration and error correction models to study the causal relationship between the military burden and economic growth for 62 countries and found no common causal relationship between military spending and growth among these countries.

Among the countries that have received little attention in the empirical literature on the relationship between government expenditure and economic growth are the countries of the Middle East, which are characterized by large fiscal imbalances due to high expenditures and the vulnerability of government revenues to external shocks. Moreover, due to the long-standing Israeli-Arab conflict, the military burden, as proxied by the share of government spending devoted to military expenditures, is very high by international standards. Almost all of these countries have undertaken some fiscal adjustments – mainly through reducing expenditures. However, with the rapidly growing population and the vulnerability of revenues to external shocks, sustained *per capita* economic growth is still a major challenge. There is an increasing awareness among policymakers of the need to promote a macroeconomic environment that would be conducive to private investment and economic growth. Given the dominant role of the public sectors in Mid-East economies, especially in terms of the resources they control, their contribution to output and their impact on economic incentives, public finance reform and reallocating expenditures to productive areas are important factors for coping with this challenge. [Eken et al. (1997)] Thus it is important to identify which government functions are productive and which are not. While there have been several attempts to investigate the relationship between military expenditures and economic growth for Mid-East countries, [Askari and Corbo (1974), Cohen and Ward (1996), DeRouen, K. (1995), Lebovic and Ishaq (1987), among others] to the best of our knowledge there have been no investigations of the causal relationship between the various components of government spending separated into productive and nonproductive spending and economic growth.

Thus, the purpose of the present study is to fill this gap by modeling short-run and long-run dynamic interactions between civilian and military government spending and economic growth, and by testing for the direction of causality between these variables for Egypt, Israel, and Syria. The reason for choosing these particular countries is that they are major participants in the Israeli-Arab conflict and thus endure substantial military burdens. Additionally, long-run data is available for these countries, which enable us to assess the causal relationships between aggregate and disaggregated government spending, and economic growth.

To do so we used multivariate Johansen's (1988) cointegration test and Granger causality tests. In particular, we modeled the relationship between real GDP growth, share of government civilian expenditures in GDP, and military expenses using a vector error-correction (VEC) model and test for the direction of Granger causality between these variables. We also assessed the relative importance of each variable in explaining changes in the growth rate of real GDP beyond the sample period by using variance decomposition and impulse-response functions. We pay particular attention to data stationarity, the choice of the optimal lag-length and testing for cointegration among the variables.

The remainder of the paper is organized as follows: Section 2 discusses the theoretical framework of the relationship between the components of government expenditures and economic growth; Section 3 explains the empirical methodology we applied in this study; Section 4 presents the data and results; and Section 5 concludes the paper.

Theoretical Background

A subject of intense debate for economists has been whether the government should intervene to correct for short-run fluctuations in economic activity. While the Classical economists oppose intervention, the Keynesian school of thought advocates the use of fiscal policies to boost economic activity in times of recessions. Classical economists believe that market forces swiftly bring the economy to long-run equilibrium through adjustment in the labor market, while Keynesians allege that the assumed self-regulating mechanisms in the economy fail to lead the economy back to equilibrium mainly due to rigidities in the labor market. Thus, Keynesians prescribe expansionary fiscal policies to avoid long recessions.

Classicals and Neoclassicals deem fiscal policies ineffective on the grounds of the well-known crowding-out phenomenon, i.e. as public spending rises, public goods are substituted for private goods, thus causing lower private spending on education, health, transportation and other goods and services. Furthermore, when governments borrow heavily to fund spending, pressures in the credit market result in higher interest rates which hamper private investment. In practice, the effectiveness of fiscal policies may be hindered by the relatively long time lags from recognizing a need for action until realizing the results of the policies.

The argument that fiscal policies enhance economic growth has gained additional support with the introduction of new growth theories. Unlike the Neoclassical growth model as formulated by Solow (1956), which did not prescribe the channels through which government spending may influence long-run economic growth, the new growth theorists[1] suggest that there is both a temporary effect from government intervention during the transition to equilibrium, and a possible long-term effect from government spending on economic growth.

In order to examine the role of government in the economy, it is important to pinpoint the main areas and channels wherein government actions can affect economic growth by means of economic activity. Government actions may be

[1] See Romer (1986) and Lucas (1988).

beneficial because: 1) the government supplies pure public goods that constitute a sizeable component of the aggregate demand; 2) the government may own or operate enterprises and institutions that provide quasi-public or private goods; 3) regulations and controls imposed by the government can facilitate the protection of property rights and enhance allocative efficiency in the presence of externalities; 4) income taxes and transfer payments affect income distribution and may create a more equitable society; 5) governments often act as facilitators in markets with asymmetric and imperfect information. [Poot (2000)]

However, government actions may also retard economic activities. For example, competition between the less efficient public sector and the private sector in the credit market often leads to an increase in interest rates, which reduces private investment, and eventually hampers economic growth. Also, taxes imposed by the government can distort market prices and resource allocations.

The arguments so far were that government expenditure has either a positive or negative effect on economic growth. Wagner's (1890) law, on the other hand, suggests a different direction of causality between government spending and economic growth. It states that in the process of economic development, government spending tends to expand relative to national income. Three reasons are given to justify such a hypothesis: 1) public functions substitute for private activity; 2) economic development results in the expansion of cultural and welfare expenditures; 3) government intervention may be needed to manage and finance natural monopolies. In other words, expanding government spending is seen as the product of economic development and not vice versa. [Bird (1971)]

To sum up, the Keynesian effect and Wagner's law present two different positions concerning the relationship between economic growth and government spending. While according to the Keynesian approach causality runs from government spending to economic growth, Wagner's law postulates that causality runs in the opposite direction.

Apart from overall government expenditures, theoretically different functions may affect economic activity in different ways. Military spending can have an adverse affect on economic growth by crowding-out private investment. Higher military spending results in distorted resource allocation, and the diversion of resources from productive activities to the accumulation of armaments and the maintenance of sizeable military forces. According to Benoit (1978), however, in LDCs only a small percentage of the decrease in military spending, if any at all, goes to productive investment. Therefore, reducing military spending will not necessarily increase economic growth. He further argues that in LDCs, military spending will increase growth through different channels; it may contribute to the civilian economy indirectly by providing education and vocational and technical training that can boost human capital. Military forces also engage in certain R&D and production activities that spread to the civilian sector. [Benoit (1973, 1978)]

Military spending can also affect economic growth positively through an expansion of aggregate demand (the Keynesian effect). The resulting increased demand leads to the increased utilization of otherwise idle capital, higher employment and profits, and therefore higher investment, all of which cause economic growth. In contrast to Benoit, Joerding (1986) argues that causality runs from economic growth to military spending. He claims that a growing country may want to strengthen itself against foreign or domestic threats by increasing its military spending.

In sum, the foregoing discussion suggests four possible causal relationships between economic growth and military expenditures: unidirectional causality from military expenditures to economic growth, or vice versa; bi-directional causality between the two variables; and finally, a lack of any causal relationship.

In the following section we will describe the econometric methodology we apply to test for Granger causality between government civilian and military expenditures in Egypt, Israel and Syria.

Empirical Methodology

Standard Granger Causality (SGC)

According to the Granger's (1969) approach, a variable *y* is caused by a variable *x* if *y* can be predicted better from past values of both *y* and *x* than from past values of *y* alone. For a simple bivariate model, we can test if *x* is Granger-causing *y* by estimating Equation (1) and then test the null hypothesis in Equation (2) by using the standard Wald test.

$$y_t = \mu + \sum_{j=1}^{p} \gamma_{11j} y_{t-j} + \sum_{j=1}^{p} \gamma_{12j} x_{t-j} + u_t \tag{1}$$

$$\begin{aligned} &H_0 : \gamma_{12j} = 0 \quad for \;\; j = 1,..., p \\ &H_1 : \gamma_{12j} \neq 0 \quad for \;\; at\, least\, one\; j. \end{aligned} \tag{2}$$

Where μ is a constant and u_t is a white noise process. Variable *x* is said to Granger-cause variable *y* if we reject the null hypothesis (2), where γ_{12} is the vector of the coefficients of the lagged values of the variable *x*. Similarly, we can test if *y* causes *x* by replacing *y* for *x* and vise versa in Equation (1).

The assumptions of the classical regression model require that both $\{x_t\}$ and $\{y_t\}$ be stationary and that errors have a zero mean and finite variance. In the presence of nonstationary variables, there might be what Granger and Newbold (1974) called a spurious regression, whereby the results obtained suggest that there are statistically significant relationships between the variables in the regression model when in fact all that is obtained is evidence of contemporaneous correlation rather than meaningful causal relations. Thus, before conducting causality tests, variables must be found to be stationary individually or, if both are nonstationary, they must be cointegrated. The series $\{x_t\}$ will be integrated of order *d*, that is, $x_t \sim I(d)$, if it is stationary after differencing it *d* times. A series that is *I(0)* is stationary. To test for unit roots in our variables, we use the Augmented Dickey Fuller (ADF) test. This test is based on an estimate of the following regression:

$$\Delta x_t = a_0 + a_1 t + \beta x_{t-1} + \sum_{j=1}^{p} \delta_j \Delta x_{t-j} + \varepsilon_t \tag{3}$$

where a_0 is a drift; t represents a time trend; and p is a large enough lag length to ensure that ε_t is a white noise process. Using the results of Dickey-Fuller (1979), the null hypothesis that the variable x is nonstationary ($H_0 : \beta = 0$) is rejected if β is significantly negative. Since it has been shown that ADF tests are sensitive to lag lengths [Campbell and Perron (1991)] we determine the optimal lag length by using Akaike's information criterion (AIC).

The next step is to test for cointegration if the variables are nonstationary in their levels. Generally, a set of variables is said to be cointegrated if a linear combination of the individual series, which are *I(d)*, is stationary. Intuitively, if x_t ~*I(d)* and y_t ~*I(d)*, a regression is run, such as:

$$y_t = \beta x_t + \varepsilon_t \tag{4}$$

If the residuals, ε_t, are *I(0)*, then x_t and y_t are cointegrated. We use Johansen's (1988) approach, which allows us to estimate and test for the presence of multiple cointegration relationships, r, in a single-step procedure. A class of models that embodies the notion of correction has been developed and is referred to as the Error Correction Model (ECM). In general, an ECM derived from the Johansen test can be expressed as:

$$\Delta y_t = \mu_y + \alpha_y ECT_{t-1} + \sum_{k=1}^{p} \beta_{yx,k} \Delta x_{t-k} + \sum_{k=1}^{p} \beta_{yy,k} \Delta y_{t-k} + \sum_{k=1}^{p} \beta_{yz,k} \Delta z_{t-k} + \varepsilon_{yt} \tag{5}$$

$$\Delta x_t = \mu_x + \alpha_x ECT_{t-1} + \sum_{k=1}^{p} \beta_{xx,k} \Delta x_{t-k} + \sum_{k=1}^{p} \beta_{xy,k} \Delta y_{t-k} + \sum_{k=1}^{p} \beta_{xz,k} \Delta z_{t-k} + \varepsilon_{xt} \tag{6}$$

$$\Delta z_t = \mu_z + \alpha_z ECT_{t-1} + \sum_{k=1}^{p} \beta_{zx,k} \Delta x_{t-k} + \sum_{k=1}^{p} \beta_{zy,k} \Delta y_{t-k} + \sum_{k=1}^{p} \beta_{zz,k} \Delta z_{t-k} + \varepsilon_{zt} \tag{7}$$

where ECT_{t-1} is the error correction term lagged one period, z is a third endogenous variable in the system; and $\beta_{ij,k}$ describes the effect of the k-th lagged value of variable j on the current value of variable i; $i,j=x,y,z$. The ε_{it} are mutually uncorrelated white noise residuals.

Granger causality from variable j to variable i in the presence of cointegration is evaluated by testing the null hypothesis that $\beta_{ij,k} = \alpha_i = 0$ for all k in the equation where i is the dependent variable, using the standard Wald test.

By rejecting the null, we conclude that variable *j* Granger-causes variable *i*. These tests differ from the standard causality tests in that they include error correction terms (ECT_{t-1}) that account for the existence of cointegration among the variables. At least one variable in Equations (5) to (7) should move to bring the relation back into equilibrium if there is a true economic relation, and therefore at least one of the coefficients of the error correction terms has to be significantly different from zero. [Granger (1988)]

Data and Empirical Findings

A. Data and definitions of variables

As a measure of government size, we use the ratio of total nominal government expenditures to nominal GDP expressed in the natural logarithm, LGY. LMY stands for the natural logarithm of the military burden (the ratio of military spending to GDP). In addition, LCGY is the natural logarithm of the ratio of civilian government expenditures to GDP. Finally, LGDP denotes the natural logarithm of real GDP. Government-expenditure data are taken from the *International Financial Statistics* (IFS) 2001 CD-ROM. Military burden data are from the United States Arms Control and Disarmament Agency (ACDA), and real GDP data are taken from the *World Development Indicators* (*WDI*) 2001 CD-ROM. Our sample includes the following countries for the specified periods: Egypt (1975-1998), Israel (1967-1998), and Syria (1973-1998). To account for the possible effects of the reform policies in Israel in 1985 and in Egypt in 1991 we use two dummy variables – IL85 and EGY91 – that take the value zero prior to the reform and the value of one thereafter.

B. Granger Causality Results

The first step in our empirical work was to determine the degree of integration of each variable. The ADF test results are reported in Table 1 for the levels as well as for the first differences of each of the variables. The results show that for Israel and Syria, all variables are nonstationary – I(1) – in their levels but are stationary in their first differences. For Egypt, the variables are of different integration orders where LGDP and LCGY are I(0) and LGY and LMY are I(1) in their levels; however all variables are I(0) in their first differences.

The second step was to test for a cointegration relationship between the relevant variables. We test for cointegration for Israel and Syria but not for Egypt since the variables are of different integration orders and therefore cannot be cointegrated. Table 2 reports the results of Johansen's maximum eigenvalue test (λ_{max}). This test is first applied to a bivariate system that includes the ratio of total government spending to GDP and real GDP, and then it is applied to a trivariate system where the total government expenditure is disaggregated to civilian and military spending. Johansen's λ_{max} tests show that one cointegration relationship between the variables exists for Israel and Syria, both in the bivariate and the trivariate systems. The bivariate cointegration results in Table 2 show that total government expenditures have a negative long-run relationship with economic growth in Israel and Syria. The negative outcome is consistent with earlier empirical studies where government expenditures were found to affect economic growth adversely when the standard OLS method was applied. On the other hand, the trivariate cointegration results in Table 2 show that the military burden affects long-run economic growth negatively in both countries, whereas civilian government expenditures affect economic growth positively in Israel, but negatively in Syria.

Now that cointegration has been determined in the cases of Israel and Syria, we apply the ECM to detect the direction of causality between the variables. To test for causality in Egypt where variables are of different integration orders in levels and therefore are not cointegrated, we apply the standard Granger causality (SGC) in first differences. The main results of the causality tests from Tables 3 and 4 can be summarized as follows:

(a) In Table 3, where a bivariate system of total government expenditures and GDP was utilized, bidirectional long-run causality was detected in Israel and Syria by virtue of the significance of the lagged error terms. As we mentioned, the long-run relationship between these two variables is negative. For

Egypt we detected short-term unidirectional causality from economic growth to government spending.

(b) In Table 4, for Egypt bidirectional causality between civilian government spending and economic growth was detected but no causality from the military burden to either of these two variables is evident. For Israel there was short and long-run causality from both military and civilian government spending to economic growth, and from both economic growth and military burden to civilian government expenditures. For Syria long-run causality from military and civilian government expenditures to economic growth, and from economic growth and military expenditures to civilian government expenditures was detected.

(c) To control for economic reforms in Israel in 1985 and in Egypt in 1991 we added dummy variables that take the value zero up to the year 1985 in Israel and up to the year1991 in Egypt and the value one thereafter. However, no significant changes occur and so results were not reported.

(d) Military burden is exogenous to economic growth and to government civilian expenditures in Egypt and Syria as we can see from Table 4, where the Wald statistic results in the ΔLMY equation are insignificant even at the 10% level. However, in Israel, the military burden is constrained by government civilian expenditures and to a lesser extent by short-run economic growth.

To sum up, our findings support a mutual causal relationship between government spending and economic growth. The strength of the relationship and its sign is a function of the model specification. Using a bidirectional framework, we obtained the usual results of a negative relationship between government spending and economic growth. Breaking down total government spending into civilian and military components revealed that the negative relationship could be attributed mainly to military burdens: in the three cases analyzed, the military burdens are detrimental to economic growth. This supports Lebovic and Ishaq

(1987) findings that the military burdens in Middle-East countries were major causes of slow growth during the years 1973-1982.

Government nonmilitary expenditures, on the other hand, are not necessarily bad for economic growth. In Israel, a country with a less centralized economy than Egypt and Syria, civilian expenditures positively affect economic growth. A positive, but only marginally significant, short-term causality from civilian spending to economic growth was detected in Egypt. The relationship, however is different for Syria. Nonmilitary spending negatively affected long-run economic growth in Syria. This can be explained at least in part by the unproductive use of these resources. Therefore, it is not enough to mobilize military to nonmilitary spending; reallocation of these civilian expenditures from unproductive to productive spending is required to achieve higher growth rates.

Another important finding is that neither economic growth nor civilian government spending caused a military burden, supporting earlier studies that military spending in the Middle East is determined mainly by regional or internal threats.

C. Results of variance decompositions and impulse-response functions

The empirical findings above reveal that while causality between government civilian spending and economic growth is bidirectional, negative unidirectional long-term causality from military burdens to economic growth is evident in the three countries. The objective of this section is to determine the relative importance of each variable in explaining output growth-rate beyond the sample period for each of the three countries. We do this by using variance decomposition and impulse response functions (IRFs).

Considering the VEC model in Equations 5-7, a change in any one of the random innovations $\varepsilon_{it}, i = x, y, z$ will immediately change the value of the dependent variable and thus the future values of the other two variables through the dynamic structure of the system. Since an innovation in each of the three variables produces changes in the future growth of the real GDP, it is possible to break down the forecast-error variance of economic growth in each future period and to determine the percentage of variance that each variable explains. We also obtain the response of the economic growth rate to one standard deviation of government civilian and military expenditures for the following twenty years. We report results for periods of one, two, five, ten, and twenty years. Since the innovations are not necessarily uncorrelated, the residuals are orthogonalized using the Choleski decomposition in order to obtain a diagonal covariance matrix of the resulting innovations and to isolate the effects of each variable on economic growth.

Table 5 presents the proportions of the forecast-error variance of economic growth that are attributable to its own random innovation shocks and to those of government civilian and military expenditures. The main results in Tables 5 and 6 can be summarized as follows:

(a) Nonmilitary expenditures in Egypt explain 6% of the forecast-error variance of economic growth in the first period and about 9% in each year thereafter (Table 5). From the IRF results of Table 6, the economic growth responses to nonmilitary expenditure shocks are positive in the early periods but become negative after seven years with decreasing magnitude. In the case of Israel, these shocks cause positive responses that are strong in the first five years, explaining about 20% of the forecast-error variance of growth in each of the two first periods but converge to about 3% after 10 years. In the case of Syria, impulse responses of real economic growth to shocks in nonmilitary expenditures are all negative, explaining about 2% of forecast-error variance of economic growth in the first two periods and converge to about 7% after 5 periods.

(b) Unlike the impulse responses of economic growth to shocks in government civilian expenditures, impulse responses to military burdens are all negative for all three countries starting in the first period. The military burden explains an annual ±70% average of the forecast-error variance of economic growth in the case of Egypt. Convergence to this level is very fast as we can see from Table 5, where the proportion explained in the first period is 69%. In the case of Israel, a shock to its military burden explains about 23% of forecast-error variance of economic growth in each of the first two years but this percentage grows to 70% in the fifth year and converges to about 95% in less than twenty years. In the case of Syria, the proportion of variance explained by the military burden grows from 8% in the first year to 17% in the second period reaching 59% in ten years.

(c) The forecast-error variances[2] of military burdens are mostly explained by their own previous shocks in Israel and in Syria but less than 50% of that variance is explained by its own previous shocks in the case of Egypt and about 30% is explained by shocks to government civilian expenditures.

This result shows that while military expenditures seem to be exogenous and independent of economic growth and civilian expenditures in Israel and Syria, in Egypt these two variables constrain the military burden. One possible explanation is that Israel and Syria are still the two major parties of the Israeli-Arab conflict, and therefore each country sees the increase of military expenditures in the other country as a threat to its own security and reacts by increasing military expenditures. This is not the case for Egypt, which signed a peace treaty with Israel in 1979, and therefore does not consider itself as an active partner in the conflict.

[2] The results are not reported here to save space.

Concluding Remarks

Our aim in this study was to see if there is a causal relationship between government expenditures, both the civilian and military components, and economic growth in three MENA countries wherein governments play major roles in the economies and large proportions of spending go to the military. Since government spending is believed to underlie the macroeconomic instability and low growth rates in these countries during the past three decades, we examined the effect of reducing government expenditures and/or reallocating them to see if this would lead to higher economic growth rates Since these economies are among those with the highest military burdens, we were particularly interested to determine if they would reap peace dividends by reducing military spending.

Our results show that when considering overall government expenditures, there is a bidirectional causality between government spending and economic growth, with a negative long-run relationship in the cases of Israel and Syria, and a unidirectional negative short-run causality from economic growth to government spending in the case of Egypt. Further investigation revealed that military burdens might be the cause of these findings. To test for this hypothesis, we broke down overall government expenditures into civilian and military expenditures and tested for causality within a trivariate framework. In all cases, military burdens negatively affected economic growth; civilian government spending positively affected economic growth in Israel and Egypt but negatively affected long-run economic growth in Syria. Military spending was found to be exogenous both to government civilian expenditures and economic growth. This result supports earlier findings that military burdens in Middle Eastern countries are not determined by economic factors but rather by the geopolitical situation in the area.

To further support our findings beyond the sample period we decomposed the forecast-error variance of each of the three variables and obtained their impulse response functions to exogenous shocks on the other two variables. The results confirm our Granger causality findings within the sample period.

The implications of our analysis are straightforward: Egypt, Israel, and Syria could reap peace dividends by reducing their military burdens. However, the effect of channeling the freed resources to civilian uses on economic growth is not as clear as the direct effect. In the cases of Egypt and Israel, shifting resources from military to civilian spending seems to enhance long-run economic growth; in the case of Syria resources must be reallocated from unproductive civilian activities to productive ones in order to foster economic growth. Therefore, reallocating resources from military to civilian spending may not result in increased growth unless the civilian allocation favors productive activities.

Bibliography

Ahsan S., Kwan A. and Sahni B. (1989) Causality between Government Consumption Expenditures and National Income: OECD Countries. *Public Finance* 44(2): 204-224.

Askari, H. and Corbo, V. (1974) Economic Implication of Military Expenditures in the Middle East. *Journal of Peace Research* 11(4): 341-343.

Barro, R. J. (1991) Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics* 106(2): 407-443.

Barro, R. J. (1990) Government Spending in a Simple Model of Endogenous Growth. *The Journal of Political Economy* 98(5), Part 2: S103-S124.

Benoit, E. (1973) *Defense Spending and Economic Growth in Developing Countries*, Lexington: Lexington Books.

Benoit, E. (1978) Growth and Defense in Developing Countries. *Economic Development and Cultural Change* 26(2): 271-280.

Bharat, K., Panik, M., and Wahab, M. (2000) Government Expenditure and Economic Growth: Evidence from G7 Countries. *Applied Economics* 32: 1059-1068.

Bird, R. M. (1971) Wagner's Law: a Pooled Time Series and Cross Section Comparison. *National Tax Journal* 38: 209-218.

Biswas, B. and Ram, R. (1986) Military Expenditures and Economic Growth in Less Developed Countries: An Augmented Model and Further Evidence. *Economic Development and Cultural Change* 34(2): 361-372.

Campbell, J. Y. and Perron, P. (1991) Pitfalls and Opportunities: What Macroeconomists Should Know about Unit Roots. NBER Technical Working Paper #100, NBER, Cambridge, MA.

Cohen, J. and Ward, M. (1996) Towards a Peace Dividend in the Middle East: the New Dynamics of Military Spending. in *the Peace Dividend. Contributions to Economic Analysis, vol. 235. (*Gledtisch N.P., et al. Eds.). New York: Elsevier Science, North Holland.

Dakurah, H., Davies, S., and Sampath, R. (2001) Defense Spending and Economic Growth in Developing Countries: A Causality Analysis. *Journal of Policy Modeling* 23(6): 651-658.

Deger, S. and Smith, R. (1985) Military Expenditure and Development: The Economic Linkages. *IDS Bulletin* 16: 49-54.

Deger, S. and Sen, S. (1983) Military Expenditure, Spin-off and Economic Development. *Journal of Development Economics* 13(1-2): 67-83.

DeRouen, Karl (1995) Arab-Israeli Defense Spending and Economic Growth. *Conflict Management and Peace Science* 14(1): 25-47.

Devarajan, S., Swaroop, V., and Zou, H. (1996) The Composition of Public Expenditure and Economic Growth. *Journal of Monetary Economics* 37(2): 313-344.

Dickey, D. A. and Fuller, W. A. (1979) Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association* 74: 427–431.

Eken, S., Helbling, T., and Mazarei, A. (1997) Fiscal Policy and Growth in the Middle East and North Africa Region. *IMF Working Paper* WP/97/101.

Feder, G. (1983) On Exports and Economic Development. *Journal of Development Economics* 12: 59-73.

Fiani, R., Annez, P., and Taylor, L. (1984) Defense Spending, Economic Structure, and Growth: Evidence among Countries and Over Time. *Economic Development and Cultural Change* 32: 487-498.

Ghali, Khalifa (1998) Government Size and Economic Growth: Evidence from a Multivariate Cointegration Analysis. *Applied Economic* 31: 975-987.

Granger, C. W. J. (1969) Investigating Causal Relations by Econometric Models: Cross Spectral Methods. *Econometrica* 37(3): 424-438.

Granger, C. W. J. (1988) Some Recent Developments in a Concept of Causality. *Journal of Econometrics* 39(1-2): 199-211.

Granger, C. W. J. and Newbold, P. (1974) Spurious Regressions in Econometrics. *Journal of Econometrics* 2(2): 111-120.

Grier, K., and Tullock, G. (1989) An Empirical Analysis of Cross-National Economic Growth, 1951-80. *Journal of Monetary Economics* 24(2): 259-276.

Joerding, W. (1986) Economic Growth and Defense Spending: Granger Causality. *Journal of Economic Development* 21: 35-40.

Johansen, S. (1988) Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control* 12(2-3): 231-254.

Kormendi, R. C. and Meguire, P. G. (1985) Macroeconomic Determinants of Economic Growth: Cross-Country Evidence. *Journal of Monetary Economics* 16(2): 141-163.

Landau, D. L. (1983) Government Expenditure and Economic Growth: A Cross-Country Study. *Southern Economic Journal* 49(3): 783-792.

Landau, D. L. (1986) Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960-1980. *Economic Development and Cultural Change* 35(1): 34-75.

Lebovic, J. and Ishaq, A. (1987) Military Burden, Security Needs, and Economic Growth in the Middle East. *Journal of Conflict Resolution* 31(1): 106-138.

Levine, R. and Renelt, D. (1992) A Sensitivity Analysis of Cross-Country Growth Regressions. *American Economic Review* 82(4): 942-963.

Lim, D. (1983) Another Look at Growth and Defense in Less Developed Countries. *Economic Development and Cultural Change* 31: 106-138.

Lucas, R. E. (1988) On the Mechanics of Economic Development. *Journal of Monetary Economics* 22(1): 3-42.

Poot, J. (2000) A Synthesis of Empirical Research on the Impact of Government on Long-run Growth. *Growth and Change* 31: 516-546.

Ram, R. (1986) Government Size and Economic Growth: A New Framework and Some Evidence from Cross-Section and Time Series. *American Economic Review* 76(1): 191-203.

Romer, P. M. (1986) Increasing Returns and Long-Run Growth. *Journal of Political Economy* 94(5): 1002-1037.

Rothschild, K. (1977) Military Expenditure, Export and Growth. *Kyklos*, 26, 804-813.

Sala-i-Martin, X. (1997) I Just Ran Two Million Regressions. *American Economic Review* 87(2): 178-183.

Solow, R. M. (1956) A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics* 70(1): 65-94.

United States Arms Control and Disarmament Agency (ACDA). Data Tables, various years.

Wagner, A. (1890) *Finanzwissenschaft* (3rd ed.), partly reprinted in R. A. Musgrave and A. T. Peacock (Eds.), *The Classics in the Theory of Public Finance*, MacMillan, London, 1958.

Table 1 - ADF Unit Root Test Results

Country	Variable	ADF with trend and intercept					
		Levels			First differences		
		ADF	**k**	**LM(4)**	**ADF**	**k**	**LM(4)**
Egypt	LGDP	-4.29***	0	3.691	-4.02***	1	1.553
1975-1998	LGY	-3.12	6	6.420	-5.23***	0	3.185
	LCGY	-3.48*§	4	4.926	-9.36***	0	5.019
	LMY	-2.23	1	6.974	-3.87***	0	1.669
Israel	LGDP	-3.148	1	2.791	-3.541**	1	7.322
1967-1998	LGY	-2.11	0	3.312	-6.80***	0	2.142
	LCGY	-1.98	0	3.248	-6.66***	0	2.376
	LMY	-2.51	1	4.574	-7.08***	0	3.892
Syria	LGDP	-1.49§	3	2.559	-4.75***	0	6.400
1973-1998	LGY	-2.98	0	0.164	-5.11***	0	5.987
	LCGY	-3.55	0	1.561	-5.70***	0	3.622
	LMY	-1.79§	2	5.625	-4.44***	1	2.074

LGDP, LGY, LMY, LCGY are the natural logarithms of real GDP, the natural logarithm of ratio of total nominal government expenditures to nominal GDP, the natural logarithm of the military burden, and the natural logarithm of the ratio of government civilian expenditures to GDP, respectively.

§ The lag lengths that were chosen by Akaike's selection criterion did not guarantee white noise residuals, therefore the reported lag lengths were chosen to guarantee white noise in residuals.

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

LM(4) is the Lagrange Multiplier test for up to fourth-order serial correlation in the residuals, which is asymptotically distributed $\chi^2_{(4)}$.

Table 2 - Johansen Cointegration Test Results

Variables	λ_{max}		P^*	r^*	Cointegration Equation
	$r = 0$	$r = 1$			
Israel 1967-98					
LGDP, LGY	36.01 ***	0.25	1	1	$LGDP = 19.31 - 1.84LGY$
LGDP, LCGY, LMY	35.77 ***	6.10	4	1	$LGDP = 12.23 + 1.55LCGY - 2.25LMY$
LGDP, LCGY, LMY, IL87	35.83 ***	8.22	4	1	$LGDP = 12.58 + 1.52LCGY - 2.34LMY$
Syria 1973-98					
LGDP, LGY	15.92**	0.28	1	1	$LGDP = 14.32 - 0.87LGY$
LGDP, LCGY, LMY	21.38 **	7.96	1	1	$LGDP = 13.45 - 0.37LCGY - 0.42LMY$

LGDP, LGY, LMY, LCGY are the natural logarithms of real GDP, the natural logarithm of ratio of total nominal government expenditures to nominal GDP, the natural logarithm of the military burden, and the natural logarithm of the ratio of government civilian expenditures to GDP, respectively.

*; **; *** indicate significance at the 10%, 5%, and 1% levels, respectively.

λ_{max} is the maximum eigenvalue statistic.

p^* represents the optimal lag length based on AIC from the unrestricted VAR model.

r^* is the number of cointegration vectors based on Johansen's method.

Table 3 - Results of Granger Causality Tests

Bivariate Causality between LGY and LGDP

				Independent Variables			**LM(4)**
Country	**Method**	**Dependent Variable**	**p**	**ECM$_{-1}$**	**ΔLGDP**	**ΔLGY**	
Egypt	SGC	ΔLGDP	1			0.09	4.79
		ΔLGY	1		7.57 ***		
Israel	ECM	ΔLGDP	0	-0.046***			2.38
		ΔLGY	0	-0.086**			
Syria	ECM	ΔLGDP	0	-0.165***			2.33
		ΔLGY	0	-0.209**			

Notes:

LGDP, LGY, LMY, LCGY are the natural logarithms of real GDP, the natural logarithm of ratio of total nominal government expenditures to nominal GDP, the natural logarithm of the military burden, and the natural logarithm of the ratio of government civilian expenditures to GDP, respectively.

The values in the ECM column are the coefficients of the error correction terms in the relevant equation. The numerical entries in the columns of ΔLGDP and ΔLGY are the Wald test statistic values for testing the null hypotheses that all coefficients of the lags of these variables in the equation of the dependent variable are zeroes.

*; **; *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Lag lengths of the three variables were determined using Akaike's information criterion with maximum lags of 4 allowed for each variable.

LM(4) is the Lagrange Multiplier test for up to the fourth-order serial correlation in the residuals, which is asymptotically distributed $\chi^2_{(4)}$.

Table 4 - Results of Granger Causality Tests (Trivariate Analysis)

LGDP, LCGY, and LMY

					Independent Variables			**LM(4)**
Country	**Method**	**Dependent variable**	**k**	**ECM_{-1}**	**ΔLGDP**	**ΔLCGY**	**ΔLMY**	
Egypt	SGC	ΔLGDP	4			9.20 *	0.43	13.93
		ΔLCGY	4		8.08 *		5.36	
		ΔLMY	4		6.99	4.63		
Israel	ECM	ΔLGDP	3	-0.08 ***		12.70 ***	16.43 ***	5.21
		ΔLCGY	3	0.32 ***	18.84 ***		10.46 ***	
		ΔLMY	3	0.07	6.26 *	8.22 **		
Syria	ECM	ΔLGDP	0	-0.18 ***				8.72
		ΔLCGY	0	-0.50 ***				
		ΔLMY	0	-0.12				

LGDP, LGY, LMY, LCGY are the natural logarithms of real GDP, the natural logarithm of the ratio of total nominal government expenditures to nominal GDP, the natural logarithm of the military burden, and the natural logarithm of the ratio of government civilian expenditures to GDP, respectively.

The values in the ECM column are the coefficients of the error correction terms in the relevant equation. The numerical entries in the columns of ΔLGDP, ΔLCGY, and ΔLMY are the Wald test statistic values for testing the null hypotheses that all coefficients of the lags of these variables in the equation of the dependent variable are zeroes.

*; **; *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Lag lengths of the three variables were determined using Akaike's AIC method, with maximum lags of 4 allowed for each variable.

LM(4) is the Lagrange Multiplier test for up to the fourth-order serial correlation in the residuals, which is asymptotically distributed $\chi^2_{(9)}$

Table 5 - Variance Decomposition of ΔLGDP (%)

'ears	gypt	;rael	yria	gypt	;rael	yria
	ercentage of forecast-error variance xplained by ΔLCGY			ercentage of forecast-error variance xplained by ΔLMEY		
	.64	0.45	.11	3.94	3.84	.32
	.95	6.96	.87	3.69	3.11	6.74
	0.09	.67	.63	0.60	0.20	9.91
0	.79	.71	.26	4.37	8.84	9.05
0	.09	.57	.86	3.89	4.70	0.72

The results are based on an unrestricted three-variable VAR system of LGDP, LCGY, and LMEY.

Table 6 - Impulse-Response Function of ΔLGDP ($1x10^{-3}$ standard deviation)

'ears	gypt	;rael	yria	gypt	;rael	yria
	.LGDP response to a shock on ΔLCG			LGDP response to a shock on ΔLME		
	.3	0.3	1.8	2.0	11.1	15.6
	.2	.2	).8	8.4	).6	25.6
	.3	.5	15.3	3.8	30.6	41.6
0	).6	.6	16.2	.00	34.0	49.4
0	1.2	.4	17.1	.4	44.4	53.3

The results are based on an unrestricted three-variable VAR system of LGDP, LCGY, and LMEY.