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MILITARY EXPENDITURE AND ECONOMIC GROWTH IN MIDDLE EASTERN COUNTRIES: A DYNAMIC PANEL DATA ANALYSIS

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Defence expenditures have both costs and benefits to the economy. The costs of defence expenditures are mainly emphasized as opportunity costs. On the other hand, defence spending may have growth-promoting potential benefits: a rise in defence spending may result in a higher aggregate demand, production and employment. This paper examines empirically the effects of military expenditures on economic growth for Middle Eastern countries and Turkey, for the time-period 1989–1999. The relationship between military expenditure and economic growth is investigated by using cross-section and dynamic panel estimation techniques. Empirical analysis indicates that military expenditure enhances economic growth in the Middle Eastern countries and Turkey as a whole.

Keywords: Military expenditure; Economic growth; Defence economics; Dynamic panel data analysis

INTRODUCTION

Since Benoit's (1973) seminal work, which suggests that military expenditure positively affects economic development, the effects of military expenditure on economic growth have been examined extensively. There are alternative arguments concerning the growth effects of military expenditure and each of these arguments is empirically supported. It has been argued that there is trade off between productive investments, such as health and education expenditures, and military expenditures. Hence, defence expenditures may retard economic growth by crowding out investment, health and education spending and infrastructural improvement. Lebovic and Ishaq (1987), Mintz and Huang (1990), Scheetz (1991), Ward and Davis (1992), Asseery (1996), Dunne and Vougas (1999) and Dunne *et al.* (2002) provide empirical evidence supporting this hypothesis for a variety of countries.

On the other hand, military expenditure may enhance economic growth through Keynesian-type aggregate demand effects. There may be technological spin-offs, positive externalities

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from infrastructure and human capital. If countries are experiencing under-employment, defence expenditures may have a stimulative effect, with higher aggregate demand, production and employment. Investment in human capital is another area where there may be a substantial positive externality of defence spending on the rest of the economy. Empirical evidence for this argument is provided by, among others, Mueller and Atesoglu (1993), MacNair *et al.* (1995), Chletsos and Kollias (1995), Dunne and Nikolaidou (2001) and Yildirim and Sezgin (2002).

However, there are numerous feedbacks of the change in defence spending, which makes the final effects quite complex. Deger (1986) argues that there exist a large number of simultaneous channels by which these effects and counter-effects operate. Final causality is not clear-cut, and there is mixed evidence about its nature, which is empirically supported by Chowdhury (1991), Madden and Haslehurst (1995), Kollias and Makrydakis (1997) and Dakurah *et al.* (2001).

In the defence economics literature, there are empirical studies concerning the military expenditure and economic growth relationship for OECD countries (see Smith, 1980), Latin American countries (see Scheetz, 1991), NATO countries (see MacNair *et al.*, 1995), among many studies concerning less developed countries. However, there are only a few studies concerning Middle Eastern countries. Lebovic and Ishaq (1987) examined this issue for 20 Middle Eastern countries, in the framework of a Keynesian demand model for the period 1973–1982. They estimate a three-equation model employing panel data analysis and report a negative effect of military expenditure on economic growth. Abu-Bader and Abu-Qarn (2003) investigate the causal relationship between military expenditure and economic growth for Egypt, Israel and Syria for the last three decades. They report that defence expenditures hinder economic growth for all three countries. Regarding the single country analysis of military expenditure–economic growth relationship, DeRouen (2000) reports that military expenditure hinders economic growth in Israel; whereas a positive effect of Turkish defence spending is supported by Sezgin (1999b; 2000) and Yildirim and Sezgin (2002). However, two Granger causality studies by Dunne *et al.* (2001) and Sezgin (1999a) found a negative relationship between defence spending and economic growth for Turkey.

The aim of this paper is to examine the effects of military expenditures on economic growth for Middle Eastern countries and Turkey for the time-period 1989–1999. The relationship between the military expenditure and economic growth is investigated by using cross-section and dynamic panel estimation techniques. Empirical evidence suggests that military expenditure enhances economic growth for the Middle Eastern countries and Turkey for the time-period under consideration. The paper is organized as follows: the next section provides a brief overview of the military balance of the countries that are considered in the analysis. The externality model, which is employed to examine the defence expenditure and economic growth relationship is summarized in the section after. Empirical estimates are presented in the fourth section, and the final section concludes.

MILITARY BALANCE IN MIDDLE EASTERN COUNTRIES AND TURKEY

Even though there is a downward trend in military expenditures and military burden (i.e., the share of military spending out of GDP) in the period under consideration, the Middle East is the most militarized region in the world according to SIPRI data. The Middle Eastern countries spent an estimated 6.3% of GDP on the military compared with a global average of 2.3% (SIPRI, 2003). Although the world military expenditure trend declined with the end of the Cold War, in the Middle East, military spending has shown an increasing trend. The

economics and demographics of the region is as important as its security considerations for the stability of the region. However, as Abootalebi (1999) points out, after more than four decades of development efforts, the majority of Middle East populations still live in poverty. The annual growth rate of the Middle Eastern countries and Turkey in the 1989–1999 period was 0.052%, which is below the population growth rate. Comparatively good economic performances of Kuwait and United Arab Emirates (UAE) can be attributed to oil and foreign subsidies. Bahrain, Egypt, Jordan, Lebanon and Saudi Arabia (SA) have implemented structural economic reforms, but their prospect of success is not yet certain. The Israeli and Palestinian economies are deeply affected by war. Moreover, with the end of the Cold War, external support has fallen, Western countries are less interested in the long-term development prospects of the region. Additionally, the political system remains authoritarian for the most part.

For Middle Eastern governments, armed forces play an important socio-economic role in addition to maintaining internal security. As Rubin (2001) notes, they absorb excess labour, which might otherwise be unemployed and thus politically disruptive, as in Egypt, or they can be used in development projects. Moreover, armed forces have been seen as reliable instruments for maintaining an internal regime. Thus, political instability, radical Islamic fundamentalism and external threats to state have helped justify allocating scarce resources for military expenditures, rather than for other productive investments for the economic and social development of the countries. In that respect it is important to identify the growth effects of military expenditure.

Even though a number of historical conflicts have existed among Arab countries since their independence after World War II, they form an alliance against Israel. Chen *et al.* (1996) point out that both Jordan and Syria had expansionist ideas. One of the main motives of Jordan being involved in the Israeli wars was the ambition to create a Hashemite state including Jordan, Iraq and parts of Palestine. Similarly, Syria had intentions to create Greater Syria, which resulted in the deployment of Syrian forces into Lebanon. Syria and Iraq have been hostile to each other for about three decades. However, the escalation of the Arab–Israeli conflict resulted in a number of partial coalitions among Arab countries, thus forming a security alliance against Israel. Especially due to the Israeli–Palestinian war, the Arab world has grown steadily more hostile towards Israel. Even though there has not been any direct intervention by outside powers in the Israeli–Palestinian conflict, Syria and Iran have provided extensive support to the Palestinian army. This war has had destabilizing effects for all Arab countries, especially for Jordan, which has a Palestinian majority. The Arab–Israeli peace process, the end of the Cold War and the Gulf War has reduced the international threat, thus leading to a decrease in military expenditures in the region.

Turkey, which tries to be a regional power in the Balkan–Caucasus–Middle East triangle, is the only Muslim state with a secular system. Turkey has close ties with western powers, especially with the United States and the European Union. 'However, its full participation in Middle Eastern affairs is constrained by suspicions among Arab states arising from its long Imperial Ottoman past, Turkey's increasingly close links with both Europe and Israel' (Ismael, 2001: 181). Turkey and Israel signed an agreement on increasing trade and joint armament manufacturing, so increasing strategic military cooperation and intelligence sharing, in 1996. The magnitude of the Turkish military expenditure has been determined by both internal and external security considerations, especially with Greece. Turkey has the largest armed forces, which could affect total demand and thus economic growth.

American intervention during the first Gulf War did not solve the long-term security problems of the southern Gulf States, Saudi Arabia (SA), Kuwait, Oman, Bahrain and UAE, even though it restored Kuwaiti independence. Iraq has been subdued but Iran has long been seen as a threat, especially by SA. Ismael (2001) argues that the Saudi and Iranian regimes are

inherently incompatible for political, economic and ideological reasons. As these countries cannot build military forces to defeat any possible Iranian or Iraqi challenge, a mutual defence pact between the Southern Gulf States, Egypt and Syria was signed in 1991. Moreover, Kuwait and USA signed a ten-year defence pact in 1991. The attempts to establish a security umbrella by Southern Gulf Countries have been shattered by the continuous strife among these countries and their national pride. Since Egypt signed a peace deal with Israel at Camp David, Syria has been seeking the leadership of the Arab world. Syria has the single largest military force bordering Israel. However, after the first Gulf War, Egypt had an active role in bilateral negotiations in the Arab–Israeli peace process.

Figure 1 presents a comparative analysis of the military burdens of the Middle Eastern Countries and Turkey for the period 1989–1999, which clearly reflects the impact of the 1991 Gulf War. Moreover, it indicates that there is little correlation between country size and military burden. Overall, military burdens seem to be cyclical, that is increasing with wars and then decreasing. During the first Gulf War, the military expenditures, especially of the Southern Gulf States, increased dramatically. Then, such expenditures presented a downward trend. For example, the military burden of Kuwait increased to more than 100% in that period. However, the Gulf War did not lead to long-term and persistent increases in the military burdens of the countries. Even though it had a major affect on the economies of Iraq, Kuwait and Saudi Arabia, other countries of the region, especially oil exporting ones, managed to offset the detrimental effects of Gulf War, through oil revenues.

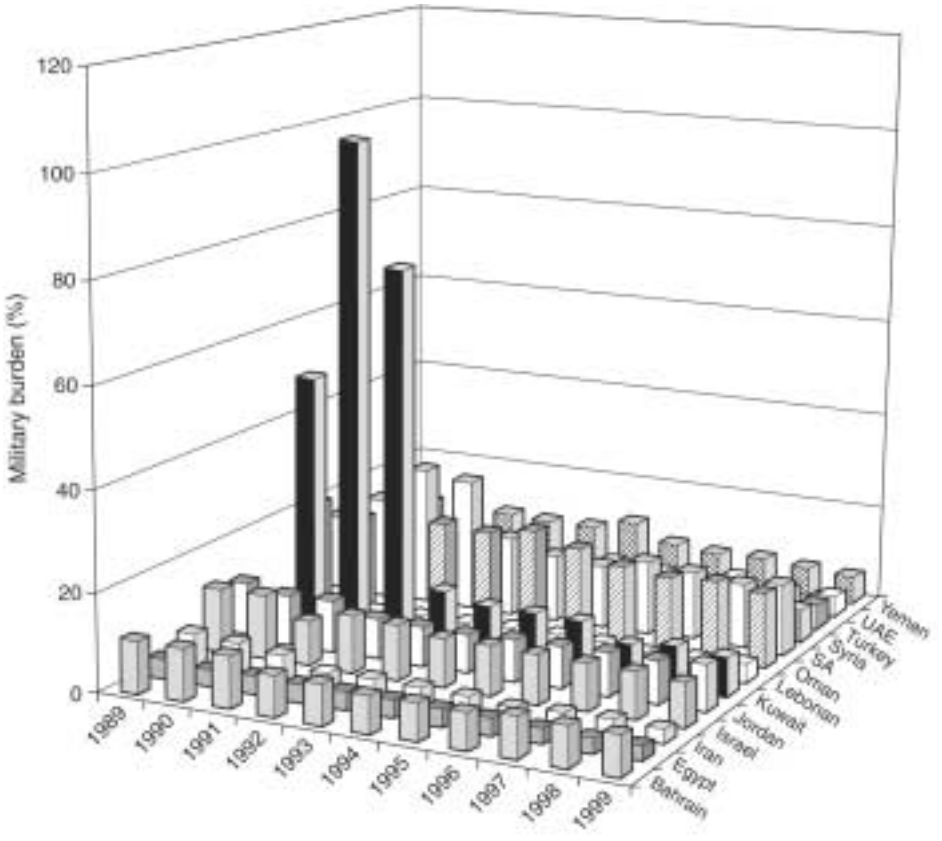

FIGURE 1 Comparative military burdens of the Middle Eastern countries and Turkey.

Other than the cyclical movements of the military burden, there are additional issues that shape the Middle Eastern military balance, the most important of which is the Israeli–Arab conflict. Israel, compared to its size, has been the only country to sustain high overall military expenditures to maintain its armed forces and improve their quality. Unlike other Middle Eastern countries, Israel has a modern defence industry that can produce high technology modern arms. Among the Middle Eastern countries, only Israel has a fairly advanced industrial base and its military expenditures are higher than that of its neighbours. De Rouen (2000) points out that the Israeli military industry provides spin-offs and externalities to the private sector, in agriculture, internal security, traffic control and medical surgery. Hence, there could be aggregate demand effects on growth that stem from military expenditures. In addition, Egypt and Turkey have advanced arms industries – although they produce few modern weapons mainly in the form of assemblies of imported weapons from the United States. There has been a slight decrease in the military burden of Egypt, whereas, Turkey is the only country whose military burden has increased in the time-period under consideration. Considering that Turkey has been one of the least affected countries in the region by the Gulf War, this increase in military burden can be attributed to internal considerations as well as the conflict between Greece over the islands of Imea in the Aegean Sea. Moreover, the share of personnel expenditures out of military expenditures has also been high in Turkey due to the size of the armed forces.

The damage of the Gulf War on the Jordanian economy was extensive, as it had to accommodate both Palestinians who escaped from the Palestinian–Israeli war and refugees of the Iraqi invasion. Due to Jordan's political support for Iraq in the Gulf War, it lost the financial support of the Gulf States. Even with unfavourable economic developments after the Gulf War, Jordan has been maintaining almost the same level of military burden. Like Jordan, the Lebanese military burden has been steadily around 4%, even with the economic fluctuations due to years of civil war the lebanese army, which is more like an internal security force, has been heavily influenced by Syria, such that there are Syrian troops stationed in Lebanon. None of the countries in the region has been directly involved in the Israel–Palestinian war, but Syria and Iran have extensively supported anti-Israeli forces. Since the end of the Cold War, Syria has lost the support of the Soviet Bloc, which could help explain the considerable decrease in its military burden. But Syria still tries to keep up with Israeli military expenditure. After the Iran–Iraq War, Iran's military burden has been decreasing with the help of steadily increasing real income.

THE MODEL AND THE ESTIMATION METHOD

Feder (1983) developed a model to analyse the impact of the export sector on economic growth where the economy is divided into two sectors: one is an advanced export sector and the other is a domestically oriented sector (non-export sector). There are positive externalities from the advanced sector to the rest of the economy. Ram (1986), and Biswas and Ram (1986) applied this model to the study of defence spending in a cross-section of 58 LDCs over the period 1960–1977, and many other scholars have employed the Feder model for the defence-growth association.[1] The model in this study is developed from Ward *et al.* (1991), which produces the final form of the Feder model with separate externality effects and factor productivity differentials of defence expenditure, and is obtained as follows:

$$\frac{\dot{Y}}{Y_{-1}} = \alpha \frac{I}{Y_{-1}} + \beta \frac{\dot{L}}{L_{-1}} + \left(\frac{\delta}{1+\delta} - \theta \right) \frac{\dot{M}}{Y_{-1}} + \theta \frac{\dot{M}}{M_{-1}} \tag{1}$$

[1] Please see Sandler and Hartley (1995) and Ram (1995) for comprehensive empirical literature.

Alternatively,

$$\frac{\dot{Y}}{Y_{-1}} = \alpha \frac{I}{Y_{-1}} + \beta \frac{\dot{L}}{L_{-1}} + \gamma \frac{\dot{M}}{Y_{-1}} \tag{2}$$

where Y denotes economic output, I investment, L labour force, M military expenditures and a dot over a variable denotes its difference. In equations (1) and (2) $\frac{\dot{M}}{Y_{-1}}$ represents the size effect of total defence spending and $\frac{\dot{M}}{M_{-1}}$ represents the defence externality. Moreover, δ represents the productivity differential between the military and the civilian sector. Even though we expect positive effects from investment and labour *a priori*, the study offers no expectations about the signs of the size effect and defence externality effect. As argued above, the empirical results do not reach a clear cut conclusion about the nature of the military expenditure–economic growth relationship.

Equations (1) and (2) are estimated employing static and dynamic panel data estimation techniques: the fixed effects panel analysis and the GMM method. The fixed effects model assumes the existence of systematic differences across countries that are captured by country-specific constant terms; whereas the systematic differences across countries are captured by country-specific error terms. However, the usual approach to estimating a fixed-effects model generates a biased estimate of the coefficients due to the inclusion of the lagged dependent variable as a regressor. Nickell (1981) shows that the bias approaches zero as time, *t*, approaches infinity. Thus, the fixed effects estimator only performs well when the time dimension of the panel is large.

Several alternative estimators have been proposed to estimate equations when the panel is not large. Generally, the equation is estimated in differences to transform out the country specific effects and then a dynamic specification in differences, with a lagged dependent variable, is allowed. However, in the differenced equation, the errors are correlated with the lagged dependent variables. Thus, an instrumental variable estimation is recommended. The Arellano and Bond (1991) generalized method of moments (GMM) technique uses lags of the endogenous variables *t*-2 and earlier as instruments to give unbiased and consistent estimates of the coefficients. This requires that the differenced equation does not exhibit second and higher order autocorrelation.

In order to investigate the possible effects of military spending on economic growth in Middle-Eastern countries, a panel of time-series data for each country for the period 1989–1999 was constructed.[2] Data for military spending are taken from SIPRI Yearbooks, whereas data on GNP, employment and investment are from World Bank Economic Indicators Yearbooks.

ESTIMATION RESULTS

Equations (1) and (2) (Model 1 and Model 2 respectively) are estimated using the fixed effect model (FEM) for the Middle Eastern countries and Turkey for 1989–1999. The estimation results are presented in Table I. In Tables I and II, Wald 1 denotes the Wald test of joint

[2] Please see the appendix for the data sources and countries included in the analysis.

TABLE I FEM Estimation Results

Variables	*Model 1*	*Model 2*
I/Y	0.0594 (3.02)***	0.050 (2.06)**
$\Delta L/L$	0.059 (12.0)***	0.058 (12.5)***
$\Delta M/Y$	0.095 (9.58)***	0.112 (20.6)***
$\Delta M/M$	0.152 (2.04)**	
Constant	–0.361 (–1.11)	–0.338 (–0.978)
δ	0.3280	–
Wald 1	χ^2 (4)=4647 [0.000]	χ^2 (3)=2463 [0.000]
Wald 2	χ^2 (23)=2286 [0.000]	χ^2 (23)=274.7 [0.000]
Wald 3	χ^2 (10)=130.5 [0.000]	χ^2 (10)=98.58 [0.000]
AR(1)	–1.662 [0.096]	–1.278 [0.201]
AR(2)	–1.112 [0.266]	–1.114 [0.265]

*, **, *** denote significance at 10%, 5% and 1%, respectively. Values in parentheses are heteroscedasticity consistent *t*-statistics and values in brackets are *p*-values.

significance of the estimated coefficients, which is asymptotically distributed as chi-squared under the null of no relationship. Wald 2 is the Wald test of joint significance of the country dummies, whereas Wald 3 is the Wald test of joint significance of the time dummies. Sargan denotes the test of over-identifying restrictions, which is asymptotically distributed as chi-squared under the null of instrument validity. Moreover, AR(1) and AR(2) are the tests of first- and second-order autocorrelation of residuals, respectively, which are asymptotically distributed as a standard normal N(0,1) under the null of no serial correlation.

In Table I, Model 1 shows that the size effect of the defence sector ($\Delta M/Y$) and the externality effect of military expenditures ($\Delta M/M$) on economic growth are positive with a statistically significant *t*-value. Additionally, the growth rate of labour positively affects economic growth. Moreover, all diagnostics are satisfactory. Table I also reports the estimates of Model 2, which shows the total effect of defence expenditure. Estimation of Model 2 in Table I indicates that a positive impact of defence is valid. The labour growth effect on economic growth is also positive.

In order to investigate the possible dynamics that could not been handled in the fixed effect model, equations (1) and (2) are estimated by the GMM technique proposed by Arellano and Bond (1991). Table II presents the dynamic estimates (GMM). In Table II, the estimation results are close to those of FEM, except the investment–GNP ratio has a negative coefficient that is statistically insignificant. All diagnostics are satisfactory, and the Sargan test does not reject the validity of the instrument set.

For the first model, in Tables I and II, it is also possible to calculate the factor productivity differential among sectors, δ, which are 0. 3280 and 0. 7699 for the FEM and GMM estimations, respectively. This indicates that the defence sector is more productive than the civilian sector. However, it has been assumed that the defence sector is less subject to market discipline, suggesting a negative productivity differential coefficient. An earlier study by

TABLE II GMM Estimation Results

Variables	*Model 1*	*Model 2*
I/Y	–0.0025 (–0.039)	–0.157 (–0.586)
$\Delta L/L$	0.069 (7.75)***	0.069 (3.23)***
$\Delta M/Y$	0.065 (8.61)***	0.110 (11.5)***
$\Delta M/M$	0.370 (11.6)***	
Constant	–0.379 (–1.34)	–0.374 (–1.11)
δ	0.7699	
Wald 1	χ^2 (4)=5565 [0.000]	χ^2 (3)=907.9 [0.000]
Wald 2	χ^2 (23)=1325 [0.000]	χ^2 (23)=2156 [0.000]
Wald 3	χ^2 (10)=343.5 [0.000]	χ^2 (10)=183.3 [0.000]
Sargan Test	χ^2 (41)=2.75 [1.000]	χ^2 (42)=10.91 [1.000]
AR(1)	–1.067 [0.286]	–1.246 [0.213]
AR(2)	–1.131 [0.258]	–1.301 [0.193]

*, **, *** denote significance at 10%, 5% and 1%, respectively. Values in parentheses are heteroscedasticity consistent *t*-statistics and values in brackets are *p*-values.

Sezgin (1997) reports a negative externality effect for Turkey. However, a positive productivity differential coefficient for Middle Eastern countries and Turkey, may indicate that these countries' production functions may not be efficient. Alternatively, this could be due to the aggregation bias.

One of the shortcomings of the panel data analysis is that, due to the aggregation of the data, we cannot infer any underlying country specific relationships. In order to overcome this and examine the military expenditure–growth relationship in more detail, we introduced income dummy variables, following the classification made by OECD to the per capita income levels of countries: low income, middle income and high income countries.[3] In order to see if the military expenditure and economic growth relationship differs for each income group, we introduced the dummy variables in multiplicative form, assuming the low income group as the base group.

The estimation results for equations (1) and (2) with income dummies are presented in Tables III and IV, respectively. In the first model of Table III, military size and externality effects for the base group are both positive, in line with our panel estimates. It emerges that the externality and military size effects for middle and high income countries significantly differ from the low income countries. In Model 2, on the other hand, military size effects for the middle income subgroup significantly differ from those of the low income groups for both FEM. The GMM estimation results of Model 1, presented in Table IV, indicate a statistically significant difference for the externality effect for the middle income groups only. All diagnostics for both models in each table are satisfactory.

[3] Please see the appendix for sources of data and income groupings.

TABLE III FEM Estimation Results with Income Dummy Variables

Variables	*Model 1*	*Model 2*
I/Y	0.020 (1.11)	0.008 (0.25)
$\Delta L/L$	–0.036 (–0.55)	–0.190 (–2.35)**
$\Delta M/Y$	0.282 (2.07)**	0.629 (3.82)***
$\Delta M/M$	0.333 (6.03)***	
$(\Delta M/Y)_{mid}$	–0.184 (–1.40)	–0.498 (–3.14)***
$(\Delta M/Y)_{high}$	0.222 (1.66)*	–0.110 (0.675)
$(\Delta M/M)_{mid}$	–0.139 (–1.81)*	
$(\Delta M/M)_{high}$	–0.271 (–4.09)***	
Constant	–0.861 (–7.40)***	–0.994 (–6.31)***
δ_{base}	1.597	
Wald 1	χ^2 (8)=37430 [0.000]	χ^2 (5)=10510 [0.000]
Wald 2	χ^2 (23)=532.1 [0.000]	χ^2 (23)=250.9 [0.000]
Wald 3	χ^2 (10)=440.5 [0.000]	χ^2 (10)=271.9 [0.000]
AR(1)	–0.7830 [0.434]	–0.793 [0.427]
AR(2)	–1.290 [0.197]	–0.8151 [0.415]

*, **, *** denote significance at 10%, 5% and 1%, respectively. Values in parentheses are heteroscedasticity consistent *t*-statistics and values in brackets are *p*-values.

Overall, even though military size and externality effects are positively related with economic growth in the second model, we cannot reach a clear conclusion as regards the different military expenditure–economic growth relationships for the subgroups. It appears that there is a significant difference between low and middle income groups with respect to the growth effects of military expenditure. Moreover, the coefficient of labour growth is negative, although statistically insignificant, and the coefficient of the investment–GNP ratio is not statistically significant. Additionally, we can see if there is a difference among the productivity differential coefficients of the subgroups by dividing the data according to the income levels of countries into three groups following the OECD classification, instead of introducing dummy variables. Thus, we estimated equation (1) for low, middle and high income groups by using the FEM and GMM methods. The estimation results are presented in Tables V and VI.[4]

The comparative analysis of estimation results, presented in Tables V and VI, reveals that the investment variable is statistically significant for low income and middle income countries with the FEM model, and for low income and high income countries with the GMM model. However, the labour growth variable has the correct sign and is statistically significant only

[4] In order to conserve space, estimates of equation (2) are not reported here, as they do not hold any additional information.

TABLE IV GMM Estimation Results with Income Dummy Variables

Variables	*Model 1*	*Model 2*
I/Y	0.024 (0.79)	0.030 (0.759)
$\Delta L/L$	–1.116 (–1.16)	–0.170 (–1.50)
$\Delta M/Y$	0.466 (2.20)**	0.584 (2.47)**
$\Delta M/M$	0.093 (1.11)	
$(\Delta M/Y)_{mid}$	–0.347 (0.10)*	–0.450 (–1.97)*
$(\Delta M/Y)_{high}$	–0.100 (–0.32)	–0.071 (–0.28)
$(\Delta M/M)_{mid}$	–0.015 (–0.09)	
$(\Delta M/M)_{high}$	0.040 (0.25)	
Constant	–0.807 (–5.08)***	–0.982 (–4.51)***
δ_{base}	1.267	
Wald 1	χ^2 (8)=25950 [0.000]	χ^2 (5)=2954 [0.000]
Wald 2	χ^2 (23)=199.1 [0.000]	χ^2 (23)=906.0 [0.000]
Wald 3	χ^2 (10)=273.2 [0.000]	χ^2 (10)=173.6 [0.000]
Sargan Test	χ^2 (37)=9.235 [1.000]	χ^2 (40)=12.80 [1.000]
AR(1)	–0.876 [0.381]	–0.956 [0.339]
AR(2)	–1.210 [0.226]	–1.280 [0.201]

*, **, *** denote significance at 10%, 5% and 1%, respectively. Values in parentheses are heteroscedasticity consistent *t*-statistics and values in brackets are *p*-values.

for high income countries in both FEM and GMM models. Defence size effects are statistically significant and positive in all five estimations except GMM estimates with high income countries. Overall, we can plausibly argue that military expenditure enhances economic growth in Middle Eastern countries and Turkey. Moreover, there is a difference regarding the effect of the investment share of the countries' on economic growth. Additionally, all productivity differential coefficients are positive, indicating that aggregation bias may not be responsible for a positive productivity differential coefficient.

CONCLUSION

In the defence economics literature, the issue of military expenditure and economic growth has long been debated without reaching a clear-cut agreement. It may retard economic growth by crowding out public and private investment. Whereas it may enhance economic growth, through Keynesian type aggregate demand effects. Alternatively, there may not be any relationship between military expenditure and economic growth. The empirical estimates give

TABLE V Comparative Analysis: FEM Model Estimates

Variables	*Low income countries*	*Middle income countries*	*High income countries*
I/Y	0.032 (1.81)***	0.058 (2.46)**	0.311 (0.47)
$\Delta L/L$	–0.160 (–2.55)**	–0.303 (–4.25)**	1.014 (9.38)***
$\Delta M/Y$	0.549 (4.06)***	0.124 (18.3)***	0.470 (26.5)***
$\Delta M/M$	0.217 (2.74)***	0.084 (3.73)***	0.065 (3.99)***
Constant	–1.116 (–16.5)***	–0.589 (–25.7)**	–0.079 (–0.25)
δ	3.273	0.262	1.150
Wald 1	χ^2 (4)=59650 [0.000]	χ^2 (4)=18.80 [0.000]	χ^2 (4)=1048 [0.000]
Wald 2	χ^2 (16)=405.7 [0.000]	χ^2 (13)=429.1 [0.000]	χ^2 (14)=9.242 [0.000]
Wald 3	χ^2 (10)=370.4 [0.000]	χ^2 (10)=259.9 [0.000]	χ^2 (10)=9.950 [0.000]
AR(1)	1.198 [0.231]	–1.462 [0.144]	0.9022 [0.367]
AR(2)	–0.9526 [0.341]	–1.677 [0.094]	–1.360 [0.174]

*, **, *** denote significance at 10%, 5% and 1%, respectively. Values in parentheses are heteroscedasticity consistent *t*-statistics and values in brackets are *p*-values.

TABLE VI Comparative Analysis: GMM Model Estimates

Variables	*Low Income Countries*	*Middle Income Countries*	*High Income Countries*
I/Y	0.134 (2.60)***	0.016 (0.989)	0.902 (1.70)*
$\Delta L/L$	–0.187 (–1.54)	–0.104 (–1.66)	0.979 (23.9)***
$\Delta M/Y$	0.616 (2.46)***	0.112 (13.1)***	0.370 (3.78)***
$\Delta M/M$	0.065 (1.81)*	0.076 (2.26)**	0.144 (1.65)
Constant	–1.141 (–4.39)***	–0.600 (–9.85)***	–0.116 (–0.415)
δ	2.134	0.231	1.057
Wald 1	χ^2 (4)=40470 [0.000]	χ^2 (4)=12.83 [0.012]	χ^2 (4)=41710 [0.000]
Wald 2	χ^2 (21)=59.17 [0.000]	χ^2 (15)=68.53 [0.000]	χ^2 (17)=6/780 [0.986]
Wald 3	χ^2 (10)=45.16 [0.000]	χ^2 (10)=147.7 [0.000]	χ^2 (10)=6.014 [0.814]
Sargan Test	χ^2 (41)=6.901 [1.000]	χ^2 (41)=4.737 [1.000]	χ^2 (41)=4.031 [1.000]
AR(1)	–0.1009 [0.920]	–1.517 [0.129]	–1.090 [0.276]
AR(2)	–1.237 [0.216]	–1.452 [0.147]	–1.684 [0.092]

*, **, *** denote significance at 10%, 5% and 1%, respectively. Values in parentheses are heteroscedasticity consistent *t*-statistics and values in brackets are *p*-values.

conflicting results depending on the country or group of countries in question, the time period covered or the estimation technique used, giving support to each hypothesis.

Even though there are empirical studies concerning this issue for Latin American countries and OECD countries, the empirical evidence for Middle Eastern countries is scarce. The aim of this study was to investigate the military expenditure economic–growth relationship for Middle Eastern countries and Turkey for the period 1989–1999 using panel estimation techniques. Moreover, in order to see if this relationship varies with the income level of the countries in question, we investigated the income growth–military expenditure relationship for low, middle and high income countries. Empirical analysis indicates that military expenditure enhances economic growth in the Middle Eastern countries and Turkey as a whole. Moreover, the factor productivity differentials are positive: it implies that the defence sector is more productive than the civilian sector, probably because the defence sector uses high-technology compared with rest of economies in the Middle East. The findings of our analysis are consistent with much of the related literature. Most of the studies with the Feder model have found a positive effect or no effect of defence spending on economic growth. The results reported in this paper supported those findings.

APPENDIX: DATA

The data for this study come from several sources. Defence expenditure data were taken from various SIPRI yearbooks. All other variables were taken from various World Bank Economic Indicator Yearbooks. All financial data were in constant US dollars. The variables used in the estimation were measured as follows:

- $\Delta Y/Y$ (growth): Dependent variable of the model is measured as the annual rate of growth of output.
- $\Delta L/L$ (labour force): growth rate of labour force.
- I/Y (investment): Investment-to-GDP ratio. Real gross fixed capital of Middle Eastern countries is related to previous year's real GDP.
- $\Delta M/Y$ (defence size and total effect): The difference of real military expenditure between current and previous years is divided by the previous years real GDP.
- $\Delta M/M$ (defence externality): Real growth rate of defence expenditure.

The countries in this study are grouped according to the OECD income classification as follows:

- Low income countries: Egypt, Yemen, Iran, Jordan, Syria, Turkey.
- Middle income countries: SA, Lebanon, Oman.
- High income countries: UAE, Bahrain, Israel, Kuwait.

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