Military Expenditure and Economic Growth:
A Demand and Supply Model for Greece, 1960-1996

Paul Dunne and
Eftychia Nikolaidou

Middlesex University Business School
The Burroughs
London, NW4 4BT
United Kingdom
Tel 0044(0)181 362 6834
Email: E.Nikolaidou@mdx.ac.uk

Abstract

This paper contributes to the continuing debate on the economic effects of military expenditure by undertaking a case study of Greece. Within Europe Greece provides a particularly interesting object of study. It has the highest military burden in Europe and NATO, is the only European Union country situated in the unstable environment of the Balkans, faces a military threat from Turkey, and has a very weak economy. After some background analysis of the economy and military expenditure, the paper investigates the determinants of Greek military expenditure as well as whether the high military burden has played an important role in Greece’s poor economic performance over the period 1960-1996. It estimates a Keynesian simultaneous equation model with a supply side, which allows the indirect effects of military expenditure to be captured explicitly. It concludes that the major determinants of Greek defence spending are not economic but strategic (the threat of war) and that the direct effect of defence spending on economic growth as well as the indirect effects through savings and trade balance are all

* Paper presented at the ERC/METU International Conference on Economics, 9th - 12th September, 1998, Ankara, Turkey. We are grateful to the participants for comments.
significantly negative. On the basis of such strong results, the paper concludes that defence spending is harmful for the Greek economy.
1. Introduction

The end of the Cold War created hopes for reductions in defence budgets around the world. Although the general trend shows reduced military spending world-wide, there are still some countries that continue to spend a huge amount on defence each year mainly for security considerations. Greece is an example of such a country and although Greek military burden (military expenditure as a share of GDP) has shown a tendency to decline over the last decade, it still remains the highest in Europe and in NATO (5.6% compared to 3.5% for NATO). It is also situated in the unstable environment of the Balkans, faces a security threat from Turkey and at the same time struggles to improve its economic performance because of its participation in the EMU. All these characteristics make a case-study of the economic effects of military expenditure in Greece of particular interest.

Case studies of this type provide a valuable addition to the cross sectional and cross country analyses that have made up many of the contributions to the defence growth debate (see Dunne, 1996). They overcome the heterogeneity problem and take into account the historical and institutional information unique for each country. As Ram (1995) comments “cross-section and case-studies should be treated as complementary and not as competitive alternatives”.

This paper estimates a simultaneous four-equation system consisting of a military expenditure equation, a growth equation, a savings equation and a trade balance equation for Greece over the period 1960-96. Section 2 provides a brief economic and political background of Greece as well as Greece’s security considerations and Section 3 briefly reviews the literature on the determinants of military spending and develops the model of the Greek demand for military spending. Section 4 then briefly surveys the literature on the defence-growth relationship and Section 5 develops the supply model: a growth equation, a savings equation and a trade balance equation. These are initially estimated by OLS and then combined with the determinants model to form a simultaneous equation system which is estimated by 2SLS and 3SLS in Section 6. Finally, Section 7 presents some conclusions.
2. Greek economic and security context

Until the late 1950s Greece was an underdeveloped country, with low productivity agriculture and a very weak industrial sector, a situation partly attributed to the Greek Civil War (1944 - 1949). The end of the Civil War resulted in the defeat and banning of the communists and the establishment of a political system which added anti-communism to Greek party politics. In the meanwhile the US and the army had become important forces in Greek politics and Greece became tied to Western organisations such as OEEC, the Council of Europe and, in 1952, NATO. The 1952 constitution, declaring Greece a parliamentary democracy with a monarchy, was followed by a decade of domination by rightwing parties. A brief period of alternative government resulted in a constitutional crisis over the role of the military in 1965 and the political instability resulted in the military coup of 21 April 1967. The evident failure of the military to provide a solution to the instability, together with the incompetence of their involvement in an abortive coup on the independent island of Cyprus, resulted in the collapse of the military regime in July 1974. Since 1974, the new Greek Republic has stabilised into a three-party system. During the post-war period Greece’s security concerns have been the threat from the Warsaw Pact countries and from Turkey. By joining NATO, Greece secured its northern borders but not the eastern ones and the strategic interaction between Greece and Turkey has created the contradictory situation of their being both adversaries and NATO allies (Ifestos and Platias, 1992, Sezer, 1991).

In the 1960s the Greek economic structure underwent important changes in structure. In 1962 the contribution of the industrial sector to national output became greater than that of agriculture for the first time (Kollias, 1996). During 1961-1970, Greece allocated an average of 4.3% of GDP to defence and achieved an annual average growth rate of GDP equal to 7.6%, well above the European average, while the annual average of inflation for this period was very low at 3.1%.
In the 1970s the impressive growth rates of the previous decades started to decline as the structural weaknesses of the Greek economy became apparent. Despite the fact that the annual average growth rate fell to 4.7%, (in comparison to 7.6% the previous decade) it was still well above the EC average. Military burden increased to 5.75% of GDP and inflation went up to 13.7. In the early 1970s a government controlled defence industry was established partly because of weapon embargoes during
the military government, but also because Greece wanted some independence in weapon procurement due to the increasing tensions with Turkey. By the mid-1970s the communist threat had all but disappeared, giving way to the more traditional animosity with Turkey (Avramides, 1996). In 1974 the Turkish invasion of Cyprus brought this to a head, leading to considerable increases in military expenditure and the very real threat of an open confrontation.

In the 1980s Greek economy deteriorated, with an average annual growth rate of 1.6%, compared 2.3% for Europe as a whole, and inflation averaging at 18.4% annually. Despite persistent economic problems military expenditures were kept at high levels due to the perceived threat from Turkey, with annual average of 6.52% of GDP allocated to defence. In 1981, Greece became a full member of the European Community (EC) and in 1985 it officially declared a defence doctrine according to which Turkey is identified as the principal threat to its security.

More recently, there was deep concern over events in the Balkans, particularly the creation of a state called Macedonia, with the break up of Yugoslavia. Macedonia is the name of the northern part of Greece. There was also some concern over the treatment of the Greek minority in Albania. Initially this event seemed to suggest additional security problems for Greece but, since none of these countries possess large military establishments, Greek defence policy and military planning have not been significantly affected.

Economic indicators slightly improved during 1991-1997, mainly because of Greece’s effort to achieve the required criteria for joining EMU. GDP growth rate was 1.9%, while the military burden fell to 5.5% of GDP because of the tight macroeconomic policies. Inflation was also brought down to an annual average of 11.7. Despite these improvements, Greece’s economic remains very poor relative to the EU’s average. On top of this, the conflict with Turkey remains unsolved - there are still disagreements over Cyprus, over the continental self of the Aegean Sea and over the control of the airspace above it. All these security considerations maintain the pressure on Greek defence spending.

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2 From the Greek perspective, Turkey is characterised by imperialism and aims to change the status quo which was established by the treaties of Lausanne (1923), Montreux (1936) and Paris (1947). The 1974 Turkish invasion of Cyprus and the up to date occupation of 40% of the island by Turkish troops is a clear proof of Turkey’s ambitions and strategic aims.
Table 1: Greek Main Economic Indicators

<table>
<thead>
<tr>
<th>Year</th>
<th>% change of GDP</th>
<th>Investment/ GDP</th>
<th>% change of Investment</th>
<th>Exports/ GDP</th>
<th>Inflation</th>
<th>Employment % change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961-70</td>
<td>7.6</td>
<td>26.3</td>
<td>9.3</td>
<td>7.7</td>
<td>3.1</td>
<td>-0.8</td>
</tr>
<tr>
<td>1971-80</td>
<td>4.7</td>
<td>29.8</td>
<td>2.8</td>
<td>12.4</td>
<td>13.7</td>
<td>0.7</td>
</tr>
<tr>
<td>1981-90</td>
<td>1.6</td>
<td>23.4</td>
<td>-0.3</td>
<td>16.9</td>
<td>18.4</td>
<td>1</td>
</tr>
<tr>
<td>1991-97</td>
<td>1.9</td>
<td>21.3</td>
<td>4.5</td>
<td>16.3</td>
<td>11.7</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*Source: EUROSTAT (various issues)*

3. Determinants of Military Expenditures

There is a wide variety of models of the demand of military spending: public choice, bureaucratic behaviour, alliances, arms-races, or general models of aggregate defence spending in which all the above can be either incorporated or seen as special cases (Dunne, 1996). Most empirical studies focus on arms-race models and on general models of aggregate defence spending. The former is developed from Richardson’s (1960) seminal work, where arms increases are the result of action-reaction by the actors. Intriligator (1975), Intriligator and Brito (1990), Levy (1984) developed these arms race models using game theory and introducing strategic capability measures. Researchers have applied these models to the Greek-Turkish confrontation to test for the existence of an arms-race between the two countries. Majeski and Jones (1981), Majeski (1985), Kollias (1991), Kollias and Makrydakis (1997) and Refenes et al. (1995) find some interrelation between Greek and Turkish military spending. In contrast, Georgiou (1990, 1996) and Georgiou, Kapopoulos, Lazaretou (1996) find no evidence of an arms race. The second group of studies (the general models of aggregate defence spending) either focuses on the pure economic or political determinants of military spending or considers all possible influences of military spending (economic, political, strategic) and tries to operationalise them in empirical analysis. Kapopoulos and Lazaretou (1993), Kollias (1994a, 1996), Avramidis (1997), Antonakis and Karavidas (1990) and Antonakis (1995, 1997) all analyse the demand for Greek military spending.
In this paper we use a simple demand model developed to reflect the features of the Greek economy (see Smith, 1980; Dunne and Mohammed, 1995). This leads us to the following specification:

\[ M = M (GDPC, POP, NG, TB, NATO, TM, M(-1), CYP, POL ) \]

Defence is a considered a public good and conventional public finance theory suggests that the levels of military spending should be positively related to income. This should be captured by the positive coefficient of real GDP per capita (GDPC). However, once a country attains a certain degree of security, further increases in income leave defence budgets relatively unchanged, thus, leading to reductions in military spending shares (Antonakis, 1997). If this were the case for Greece, then we would expect the coefficient of GDPC to be negatively related to the share of military spending (M). Following Deger’s (1986) study, population (POP) is also introduced as a proxy variable to capture the public good effect of military spending with an expected positive sign.

The inclusion of the share of non-military government expenditure (NG) in the model represents the economic burden of defence and we expect it to enter the equation with a negative sign to account for the opportunity cost of defence. The share of the trade balance in GDP (TB) reflects the openness of the economy and its sign is ambiguous. To account for the strategic and political factors that played an important role in military spending during 1960-1996, two dummy variables are introduced. POL to capture the effect of the military government that was in power for seven years (1967-74) and CYP, an impulse dummy for the year 1974 to capture the effect that the Turkish invasion of Cyprus. Although military governments tend to spend more on defence this is not a general fact and as Dunne and Mohammed (1995) claimed that ‘there is unlikely to be a simple dichotomy between military and non-military governments’. As such, we cannot predetermine the sign of POL. The second dummy variable captures the threat of war, the expected sign is positive. Since Greece is a member of the NATO alliance, the inclusion of the alliance’s military burden, excluding Greece and Turkey, seemed reasonable in order to account for the spill-in effect. If the sign on NATO is positive Greece is a ‘follower’, otherwise a ‘free-rider’. Turkey’s military burden (TM) is introduced to see whether Greece’s military burden depends on the “enemy’s” military burden. Finally, the lagged value of the
dependent (M) is introduced to account for inertia, such as hangover from previous expenditures or commitments to programmes (Dunne and Mohammed, 1995).

All variables were tested for unit roots by Dickey-Fuller tests, were found to be non-stationary while their first differences found no unit roots and so the differenced series are used for our estimation (the tests are reported in the Appendix). The proposed equation of the demand for military expenditure for Greece over the period 1960-96 is the following:

\[ DM = DM ( \text{DGDPC}, \text{DPOP}, \text{DNG}, \text{DTB}, \text{DNATO}, \text{DTM}, \text{DM}(-1), \text{CYP}, \text{POL} ) \]

where D in front of a variable indicates first-difference.

In estimating this model over the period 1960-96, the data were allowed to determine the particular short-run dynamic form using a general to specific methodology for testing exclusion restrictions. Surprisingly, the coefficient of the dummy for the military government in Greece (POL) although positive was insignificant and the same applied for the population variable (DPOP). As they were both jointly and individually insignificant and so they were excluded from the model. Further specification searches led to:

\[ DM = 0.12 - 0.56 \text{DGDPC}_{-1} - 0.44 \text{DNG} - 0.15 \text{DTB}_{-1} + 0.27 \text{DTM}_{-1} + 0.50 \text{NATO} + 2.42 \text{CYP} - 0.14 \text{DM}_{-1} \]

\[ (1.83) \quad (2.11) \quad (4.31) \quad (3.98) \quad (2.50) \quad (1.42) \quad (6.58) \quad (1.22) \]

\[ R^2 = 0.73, \quad DW = 2.00 \]

The results support the initial expectations for the effect of the change in non-military government expenditure (DNG) which is significant and negative, indicating the opportunity cost of defence, and for the Cyprus dummy which is significant and positive. The change in previous year’s income (DGDPC) is negative and significant which implies increases in income will not lead to increases in defence budgets. The effect of the lagged value of the change in Turkish military burden (DTM) is positive and significant. This suggests that Greek defence spending is influenced by the ‘potential enemy’s’ spending, but it is not influenced by NATO’s spending, as NATO although positive is not significant. The lagged
value of the change in the share of trade balance in GDP (DTB\textsubscript{t}) is negative and significant while Greek military burden doesn’t seem to depend on previous year’s burden.

4. Defence Spending and Economic Growth

Moving on to consider the effects of military spending on economic growth, the starting point for much of the research in this area was Benoit’s seminal study (1973, 1978) on defence-growth relationship. Using a cross-section correlation analysis of 44 LDCs for the period 1950-1965 he found a positive correlation between military burden and economic growth. His surprising results attracted a great deal of attention and criticism. Much of the criticism concerned the nature of his empirical analysis and this led to numerous econometric studies using Neoclassical and Keynesian theoretical frameworks to develop consistent formal models.

Neoclassical, supply-side models initiated from Feder’s (1982) study of the role of exports in growth, which examined the externalities that arise between the export and the non-export sector. Biswas and Ram (1986) adopted Feder’s model as a two-sector model (military and civilian) to assess the externality effect of the defence sector and the factor productivity variations between the two sectors. After them, many versions of the Feder model (comprising many sectors of the economy) have been developed with most of the studies employing cross-sectional methodologies.\textsuperscript{3} Although Neoclassical models [Biswas and Ram (1986), Alexander (1990), Mintz and Huang (1990), Mintz (1991), Mintz and Stevenson (1995), Sezgin (1996), Murdoch, Pi and Sandler (1997)] are strongly based on theory and can provide estimates of the externalities that arise from the defence sector as well as the productivity differentials between sectors, they are concentrated on supply-side (modernisation, positive externalities from infrastructure, technological spin-offs), and do not consider the possible endogeneity of military spending and other variables (investment).

Feder-type models for Greece have been employed by Antonakis (1997), Sezgin (1998) and Nikolaidou (1998). Antonakis’ (1997) model comprised two sectors (one military and one non-military) and found that defence had a negative impact on growth, while Sezgin (1996) found no

significant effect of defence on growth, with defence size and externalities from defence insignificant but the defence sector more productive than the civilian one. Nikolaidou (1998) using a four-sector Feder-
type model comprising a civilian, government, military and exports sector, found no significant size and externality effect of defence but that the defence sector was less productive than the civilian sector, contrary to Sezgin’s (1998) findings. On the other hand, Keynesian models [Smith (1980), Faini et al (1980), Deger (1981), Lim (1983), Faini, Annez and Taylor (1984), Antonakis and Karavidas (1990a,b), Kollias (1994), Chletsos and Kollias (1995)] concentrate on demand-side effects (crowding-out of investment, exports, education, health) ignoring completely the supply-side. As a result Neoclassical models tend to find positive effects of defence on growth while Keynesian find negative ones.

Smith and Smith (1980) were the first to use simultaneous equation models (SEM) to capture both the demand-side influences in a Keynesian aggregate demand framework and the supply-side ones in a growth equation derived from an aggregate production function. This framework was further developed by Deger and Smith (1983), Deger (1986), Scheetz (1991), Dunne and Mohammed (1995), Roux (1996), Antonakis (1997), Sezgin (1998) among others. These models hypothesise possible direct effects of defence on growth through Keynesian demand stimulation and other spin-off effects and negative indirect effect through reductions in savings or investment, balance of payments, education and health. Although these models provide a more complete picture of the defence-growth relationship by accounting for the interrelationships between the variables, they’ve been criticised for not being strongly based on theory and thus, relying on more ad-hoc justifications. But this is more than compensated for by the advantages that these models have to offer as they overcome problems of exogeneity, simultaneity and causality that may influence the defence-growth relationship if analysed in a single equation.

Demand and supply models for Greece have been employed by Antonakis (1997), whose simultaneous equation model consisted of three equations (a growth equation, a savings and a military burden one). He found a negative direct effect of defence on growth and a positive indirect effect through savings, with the net effect being negative. In contrast, Sezgin (1998) using more or less the same system of equations finds a positive direct effect and a negative indirect effect through savings, with the net effect being negative.
5. Specification of the supply model

The simultaneous equation model (SEM) used in this study consists of four equations. In addition to the military expenditure equation specified above, a growth equation, a savings equation, and a trade balance equation. The specification of these supply side equations is presented in this section as well as the preliminary single equation OLS estimates.

Growth equation

The growth equation is derived from a traditional production function: \( Y = f(K, L, T) \) where \( Y \) is output, \( K \) and \( L \) are capital and labour inputs and \( T \) is a measure of technology (see Deger and Smith, 1983, p.341). Using a Cobb-Douglas production function we can transform this relation to one that is linear in the growth rates. Thus output growth rate is a function of capital growth, labour growth and variables which effect the growth in total factor productivity (technology). Capital growth is financed either through domestic savings (\( S \)) and/or foreign capital flows. Lack of data normally means that population growth is used as a proxy for labour force growth, but this is not necessary for Greece as the relevant data are available (\( L \)). The share of military spending in GDP (\( M \)) is intended to pick up the hypothesised modernisation and resource mobilisation impacts of military spending. Similarly, GDP per capita (\( GDPC \)) should capture any “catch-up” effects from importing technology, since countries with higher income per head are probably reaching the upper limits of their growth potential (Deger and Smith; 1983). So, the growth equation is:

\[
DY = DY (DS, DM, DGDPC, DL, DTB)
\]

All variables should be positively related to growth. Estimating this equation by OLS for Greece over 1960-96, the following results were obtained with the addition of a time-trend:
DY = 0.09 + 0.003 DS(-1) - 0.02 DM + 0.09 DGDP + 0.003 DL -0.001DTB- 0.002 T

(16.32) (3.27) (3.85) (7.45) (1.85) (0.42) (9.60)

R² = 0.88, DW = 1.42

The overall performance of the estimated equation is satisfactory, apart from some evidence of serial correlation and the coefficient on the military burden is negative and significant. This implies that the argument that military spending has a positive impact through modernisation and resource mobilisation is not valid for the case of Greece. All the other variables are positively related to growth - except for the trend and the trade balance, which is also the only insignificant variable.

**Savings equation**

The savings equation is derived from the output/expenditure relation:

\[ Y = C + I + M - TB \]

where \( Y \) is total output, \( C \) is civilian consumption (public and private), \( I \) is total civilian investment, \( M \) is military expenditure. After a few manipulations and after adding some monetary factors, we end up to the following savings equation:

\[ DS = DS(DM, DY, DTB, DINFL, DNG) \]

Inflation (INFL) is included to take account of the inflationary effects on resource creation. Deger (1986b) assumed that inflation leads to forced savings, and thus affects savings positively, but inflation could also retard savings, so the expected sign is ambiguous. Growth of output should affect savings positively while the expectation for non-military government spending is ambiguous. The coefficient of the share of military spending in this equation, should be negative if crowding out is taking place and the trade balance (TB) is expected to affect savings positively through income multipliers and trade taxes (Scheetz, 1991). Estimating the savings equation by OLS over the period 1960-1996, gave the following results:

\[ S = 0.09 + 0.003 DS(-1) - 0.02 DM + 0.09 DGDP + 0.003 DL -0.001DTB- 0.002 T \]

(16.32) (3.27) (3.85) (7.45) (1.85) (0.42) (9.60)

R² = 0.88, DW = 1.42

*Scheetz, 1991 uses a broader term than foreign capital flows, the current account share in GDP.*
Military burden has a negative effect on savings, in accord with the resource reallocation argument, real growth of output has a positive impact on savings, as expected, while non-military government spending and previous year’s trade balance are insignificant.

**Trade Balance equation**

A country’s trade balance can be affected by military burden if aggregate demand is increased and domestic supply inelastic, leading to increased imports and/or reduced exports. This would suggest a negative sign on M, but Greece has received substantial military aid from NATO, so this effect may not be very strong. Deger (1986a) argues that the growth of GDP will affect the trade balance positively if the country in question promotes exports or negatively if it follows an import substitution policy. For Greece a positive effect is expected. The effect of inflation and previous year’s trade balance is ambiguous and the real exchange rate is included to capture the effects of a change in the international purchasing power of the domestic currency with an expected positive sign. This gives a trade balance equation of the form:

\[
DTB = DTB(DM, DY, DINFL, DGDPC, DEXCH, DTB(-1))
\]

Estimating this equation, after introducing some lags and a dummy to capture the deterioration of trade balance after 1974, gave the following results:

\[
DTB = 3.85 - 0.90DM - 43.6DY_{-1} - 0.13DINFL_{-2} - 0.32DTB_{-1} - 0.04DEX - 3.07DGDPC - 1.9D74
\]

(2.66) (1.53) (2.47) (1.78) (1.77) (1.44) (1.57) (1.75)
The trade balance equation is poorly defined in terms of $R^2$ either when it is estimated by OLS or by the instrumental variables method (IV). The effect of military burden on trade balance is negative but not significant.

6. System Estimation Results

The single equation estimates reported above generally give satisfactory results - except for the trade balance equation - and almost all coefficients have the expected signs. But there are problems with these single equation OLS estimates as they do not take into account the likely interrelationships between the variables. Simultaneity and high covariances between variables can lead to biased estimates. To overcome this problem it is necessary to use either some form of instrumental variables technique or simultaneous equations methods. In this case we estimate the system of equations using the 3SLS method and also report the single equation 2SLS estimates.

The simultaneous equation model consists of the following four equations and the results are reported in Table 3, together with the OLS estimates.

\[
\begin{align*}
DY &= a_0 + a_1 DS_{,1} + a_2 DM + a_3 DGDPC + a_4 DL + a_5 DTB_{,2} + T \\
DS &= \beta_0 + \beta_1 DM + \beta_2 DTB_{,1} + \beta_3 DINFL + \beta_4 DY + \beta_5 DNG \\
DTB &= \gamma_0 + \gamma_1 DM + \gamma_2 DY_{,1} + \gamma_3 DINFL_{,2} + \gamma_4 DTB_{,1} + \gamma_5 DEX + \gamma_6 DGDPC + \gamma_7 D74 \\
DM &= \delta_0 + \delta_1 DTB_{,1} + \delta_2 DGDPC_{,1} + \delta_3 DNG + \delta_4 DTM_{,1} + \delta_5 DNATO + \delta_6 DM_{,1} + \delta_7 CYP
\end{align*}
\]

**Variables and their Description**

- **DY**: real growth rate of GDP
- **DS**: share of national savings in GDP (first difference)
- **DTB**: current account balance (exports of goods and services less imports of goods and services) as a share of GDP (first difference)
DM: share of military expenditure in GDP (first difference)
DEX: real exchange rate (first difference)
DNG: share of government spending (excluding military expenditure) in GDP (first difference)
DTM: share of Turkish military expenditure in GDP (first difference)
DNATO: share of Nato’s defence spending (excluding Greece and Turkey) in GDP (first difference)
DINF: inflation rate (first difference)
DL: labour force growth (first difference)
DGDPc: GDP per capita in constant 1990 mn US $ (first difference)
D74: dummy to capture the threat of war after 1974 (takes the value of 1 for the years 1974-96)
CYP: impulse dummy to capture the effect of the 1974 Turkish invasion of Cyprus (1974=1, 0 elsewhere)
D74: dummy to capture the deterioration in trade balance after 1974 (1974-96=1, 0 elsewhere)
DPOP: Greek population (first difference)
T: linear trend
Table 3: Estimation Results (1960-1996)

<table>
<thead>
<tr>
<th>Exogenous variables</th>
<th>OLS</th>
<th>2SLS</th>
<th>3SLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>intercept</td>
<td>0.09 (16.32)***</td>
<td>0.10 (14.29)***</td>
<td>0.10 (17.05)***</td>
</tr>
<tr>
<td>DS,1</td>
<td>0.003 (3.27)***</td>
<td>0.002 (2.51)***</td>
<td>0.002 (3.45)***</td>
</tr>
<tr>
<td>DM</td>
<td>-0.02 (3.85)***</td>
<td>-0.02 (3.90)***</td>
<td>-0.02 (4.85)***</td>
</tr>
<tr>
<td>DGDPC</td>
<td>0.09 (7.45)***</td>
<td>0.08 (6.30)***</td>
<td>0.08 (7.27)***</td>
</tr>
<tr>
<td>DL</td>
<td>0.003 (1.85)*</td>
<td>0.003 (1.60)</td>
<td>0.001 (1.22)</td>
</tr>
<tr>
<td>DTB,2</td>
<td>-0.001 (0.42)</td>
<td>0.001 (0.11)</td>
<td>-0.001 (0.24)</td>
</tr>
<tr>
<td>T</td>
<td>-0.002 (9.60)***</td>
<td>-0.003 (9.04)***</td>
<td>-0.003 (10.88)***</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.88</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>DW</td>
<td>1.42</td>
<td>1.15</td>
<td>1.30</td>
</tr>
<tr>
<td>intercept</td>
<td>-1.30 (1.72)*</td>
<td>-1.30 (1.72)*</td>
<td>-1.46 (2.15)**</td>
</tr>
<tr>
<td>DM</td>
<td>-2.07 (2.23)**</td>
<td>-2.07 (2.23)**</td>
<td>-2.04 (2.43)**</td>
</tr>
<tr>
<td>DTB,1</td>
<td>0.30 (0.81)</td>
<td>0.30 (0.81)</td>
<td>0.33 (1.02)</td>
</tr>
<tr>
<td>DY</td>
<td>31.61 (2.27)**</td>
<td>31.61 (2.27)**</td>
<td>34.42 (2.75)**</td>
</tr>
<tr>
<td>DINFL</td>
<td>-0.23 (1.91)*</td>
<td>-0.23 (1.91)*</td>
<td>-0.17 (1.63)*</td>
</tr>
<tr>
<td>DNG</td>
<td>-0.87 (1.04)</td>
<td>-0.87 (1.04)</td>
<td>-0.44 (0.61)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.52</td>
<td>0.52</td>
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<tr>
<td>DW</td>
<td>2.00</td>
<td>2.00</td>
<td>1.91</td>
</tr>
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***: 1% level of significance, **: 5% level of significance, *: 10% level of significance
The 2SLS and 3SLS results are in general consistent with the OLS results. There are no differences in sign and the growth equation results are almost identical. There are some differences in using the systems estimation method for the trade balance model, where the significance of a number of variables improves, and for the savings and military expenditure equations, but none areparticularly significant.

The simultaneous equation results serve to underline the findings and suggest that both the direct effect of defence spending on economic growth and the indirect effects through savings and trade balance are negative and significant (at 1% significance level). When we take into account both the direct and indirect effects of military burden we get $\frac{dG}{dM} = -0.026$, $\frac{dS}{dM} = -3.21$, $\frac{dT}{dM} = -0.136$. So military burden has a negative impact on growth, savings and the trade balance.

7. Conclusions

The paper has analysed the determinants of Greek military expenditures as well as the effects of defence spending on economic growth over the period 1960-96. According to our estimates, Greek military burden is not determined by economic factors, but by strategic concerns, namely the threat of war from Turkey. To model the economic effects of military burden on growth, a four-equation system was estimated using both single-equation methods (OLS, 2SLS) and system-equation methods (3SLS) to account for the interrelations between the variables. Our findings suggest that both the direct effect of defence spending on economic growth and the indirect effects through savings and trade balance are significantly negative.

The negative direct effect of defence on growth implies that there are no positive spin-offs or externalities from the defence sector to the economy. The negative indirect effect of defence through savings supports the crowding out argument, that resources are misallocated through the growth of military burden. The negative indirect effect of military burden through the trade balance seems reasonable for a country like Greece which is a big importer of military equipment and only has a very small and underdeveloped defence industry.
Overall, the results suggest that the high military burden in Greece has been harmful to economic performance and has made a significant contribution to the backwardness of the economy and the huge problems it faces. The implications are that cuts in defence budgets in Greece would lead to improved economic performance and that if these resources were reallocated to other more productive sectors of the economy there is likely to be a ‘peace dividend’. The problem is that military burden also appears to be determined by security concerns and if there is no improvement in relations with Turkey it seems unlikely that significant cuts will be on the agenda. The recognition that there are clear economic, as well as security, benefits to be gained by settling the disputes could hopefully provide a much needed incentive to move forward.

APPENDICES

I. Data Sources

Data for GDP, GDP per capita, national savings, government expenditure, trade balance, labour force, population, inflation and exchange rate was taken from the Eurostat database. All figures were deflated to constant 1990 million drachmas and then converted to 1990 million US $ by means of exchange rates. Data for Greek military expenditure as well as for Turkish and NATO military expenditure were taken from SIPRI. We acknowledge the fact that SIPRI (and thus, NATO) definition of military spending does not include the value of military assistance* received from abroad. The approach to measuring non-military government spending was to subtract military expenditure from government expenditure. All the series were tested for unit roots by ADF and were first differenced when non-stationary.

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*The main assistance programmes through which the US provided weapons, training and other defence-related services to Greece (as well as to Turkey) were the Foreign Military Sales Program (FMS), the Economic Support Fund (ESF), the International Military Assistance Program (MAP) and the International Military Education and Training Program (IMET), (Balfoussias and Stavrinos, 1996)
## II. Dickey-Fuller tests for unit roots

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For all the estimations Microfit 4.0 (Pesaran & Pesaran) and Eviews 1.0 (Micro TSP) were used

### References


