

Survey and Review of the Defense Economics Literature on Greece and Turkey: What Have We Learned?

by

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Abstract: This article contains a critical review of the literature on the economics of military affairs in Greece and Turkey as of December 1999. In particular, I review (a) arms race models, (b) models of the demand for military expenditure, (c) models measuring the economic impact of military expenditure, and (d) literature and issues related to indigenous arms production. I conclude with a number of summary lessons and observations of how future research might improve upon the existing body of work.

Key words: Greece; Turkey; review; defense economics; peace economics; conflict; country studies

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Introduction

The purpose of this article is twofold. Following a brief overview of Greco-Turkish relations, I offer, first, a critical review of a selection of the large body of literature on Turkish and Greek military expenditure, its politico-military underpinnings, and its micro and macroeconomic effects.¹ Second, I point to certain shortcomings, diminishing returns, and substantive gaps in the literature.

There is another purpose to this article. Many of the empirical pieces reviewed here rely on the application of mathematical and econometric tools one finds employed not only to the cases of Greece and Turkey but throughout the entire defense and peace economics literature. Even though my specific remarks concern only the literature at hand, many of my general observations and comments apply to the literature beyond Greece and Turkey and should be of general interest. It is my hope that the points made in this article will affect research practice to some degree.

Greece and Turkey

Greco-Turkish relations since 1923

Some facts of the relevant history of the Greco-Turkish conflict are quickly told. Both the Greek and the Turkish governments agree, as do the scholars, that following the peace treaty of Lausanne and the founding of modern Turkey in 1923, the countries enjoyed a period of mutual friendship under Greek Premier Venizelos and Turkish President Atatürk (Demirel, 1998/99; Stephanopoulos, 1998/99). Substantial Turkish minorities lived in northern Greece and in Bulgaria, and large numbers of Greek population pockets existed in Turkey.² Greeks and Turks also shared, in varying population percentages, a number of Aegean islands. Both nations joined NATO in 1952, constituting NATO's southeastern flank, and both sent troops to Korea during the Korean war (Krebs, 1999, p. 358). For Greece, joining NATO was a decisive event, following, as it did, the defeat of communist forces in its five year civil war of 1944-1949, but this gave its army an overly prominent role in public affairs, culminating in a military dictatorship which lasted from 1967 to 1974. Turkey also saw episodes of military rule, namely from 1960-61, 1971-73, and 1980-83.

The island of Cyprus – the most prominent bone of contention between Greece and Turkey – had been leased by the British from the Ottoman empire since 1878 and came under direct British rule in 1914. Over Turkish-Cypriot unease, Greek-Cypriot guerilla unrest developed on the island in the 1930s, eventually resulting in an independent and Greek-Cypriot dominated Cyprus by 1960 (Turan and Barlas, 1999, pp. 474-475). Even though the new constitution guaranteed representation to both population segments, Greco-Turkish conflicts in and over Cyprus broke out several times throughout the 1960s. Only a “most brutal diplomatic note” by US President Johnson prevented a planned Turkish invasion of Cyprus

in 1964 (Krebs, 1999, p. 361). Then, in the summer of 1974, a Greek-inspired coup on Cyprus led not only to a Turkish invasion of the northern part of the island but also to the fall of the Greek military dictatorship in Athens. In consequence of the invasion, Turkey now holds about 40 percent of the island's territory and 17 percent of the population live in northern Cyprus. Turk-Cypriots declared an independent Turkish Republic of Northern Cyprus (TRNC) on 15 November 1983, an entity recognized only by Turkey.

Apart from Cyprus, there are four other primary areas of dispute between Greece and Turkey. They are: (a) disputes over the extent of territorial waters in the Aegean; (b) disputes over the extent of territorial airspace; (c) disputes over continental shelf rights; and (d) disputes over Greek militarization of certain Aegean islands. Since 1974, the countries' respective forces were placed on full alert in 1987, 1994, and 1996, narrowly avoiding war between Greece and Turkey (Athanassiou and Kollias, 2000; Matthews, 1999). Both countries very much look to the United States in particular to help mediate their conflict which, with the end of the bipolar NATO-Warsaw Pact hostility, has taken on renewed urgency (Krebs, 1999).

Greco-Turkish cooperation

Despite its history of sharp conflict, it must be pointed out that, except for Cyprus, the "Turko-Greek relationship has been characterized by peace" (Turan and Barlas, 1999, p. 486), albeit an uneasy and fragile one, and that Greece and Turkey cooperate in a number of venues. Both joined NATO on 18 February 1952; both contributed to NATO-led peacekeeping forces in Bosnia and Albania (Turan and Barlas, 1999, p. 482); Greece is a member of the EU since 1 January 1981 and, after long opposition (Constas, 1995, p. 78; Neal and Barbezat, 1998, p. 360), recently — in March 1997 — supported Turkey's application for full EU membership if only because Greece's interests are better served with Turkey in the EU than outside the EU (Kurop, 1998). Turkey has been an associate EU member since 1964 and was admitted to full candidacy status in December 1999. Greece and Turkey are both members of the Black Sea economic cooperation area, alongside Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Moldova, Romania, Russia, and the Ukraine, a region comparable in size and population to the EU (Pen, 1993). The association was formed by non-binding declaration in Istanbul on 25 June 1992. And in Athens, on 12 January 1999, Albania, Bulgaria, Greece, Italy, Macedonia, Romania, and Turkey signed an agreement to complete arrangements for a regional peacekeeping force (*NOD & Conversion*, No. 48, June 1999, p. 20).

While Greece is embedded in, and ethnic-Greek populations are strewn across, the tumultuous Balkans, Turkey is not only surrounded by highly insecure and volatile countries, such as Iran, Iraq, and Syria and the newly independent follow-on states of the former Soviet Union in central Asia but also faces internal security considerations regarding Islamic fundamentalism and its restive population of ethnic Kurds. Thus, both countries should greatly benefit from settling their mutual differences.

The Greek and Turkish economies

In 1998, Greece's population stood at 10.5 million people while Turkey's was 64.5 million people. Greece's population growth is near-zero, while Turkey's population tripled between 1950 to 1995. For the 1980s, Greece's economy has been in almost continuous doldrums since joining the EU in 1981, resting on "generous subsidies and agricultural protection provided by the European Community ... directed as political favors inside Greece rather than used as incentives to promote economic growth and efficiency" (Neal and Barbezat, 1998, p. 299). The situation has changed somewhat for the better in the 1990s as Greece attempts to fulfil membership criteria in its bid to join the European monetary union. In contrast, Turkey's economy grew apace despite two drastic recessions in 1980 and in 1994. However, Turkey suffers especially from lack of monetary discipline, as evidenced by its long-standing hyperinflationary conditions. Overall, Greek *per capita* income is about four times as large as that of Turkey.^{3, 4}

Military expenditure – shares, levels, stocks?

Part of the confusion of findings in the empirical studies (summarized in the next sections) stems from whether or not to use *levels* of military expenditure or the *share* of military expenditure out of GDP. Frequently, the results of the studies, and their interpretation, appear to depend critically on whether level or share data are used. While use of *share* data confers certain statistical advantages, e.g., comparability across countries, no need to deal with inflation and deflators or with exchange rate conversions into a common currency, one must of course agree with Smith's (1998) sentiment that statistical convenience may not supplant substantive considerations. For instance, Georgiou, Kapopoulos, and Lazaretou (1996) tested for the presence of a Greco-Turkish arms race rivalry using shares of military expenditure in GDP, whereas Kollias and Makrydakis (1997b) used levels of military expenditures. The former found little evidence of an arms race, the latter found strong evidence of an arms race. Neither discusses the use of their respective share or level data.

When the substantive concern is about the economic impact of military expenditure on variables of economic performance, such as economic growth, *share* data may be appropriate (yet see Sandler and Hartley, 1995, pp. 210-211 and Gold, 1997, p. 110). But when analyzing imminent military threat and testing for the presence or absence of an arms race, it is proper to use *level* data or better yet, *stock* data, since levels and stocks indicate actual or expected fighting capabilities of oneself vis-à-vis the putative adversary.⁵ For example, between 1950 and 1985 Turkey's *share* of military expenditure out of its GDP hovered between 3.8 and 6.0 percent, averaging close to five percent. Yet in absolute, inflation-adjusted terms, its military expenditure increased ninefold, matching Greek absolute, inflation-adjusted military expenditure. But after 1985, economic exhaustion in Greece induced it to hold its military spending steady in nominal terms, thus declining in real terms, and declining as a share of Greek GDP. In contrast, since 1985 Turkey's absolute, inflation-adjusted military spending substantially outpaces that of Greece. Clearly, for the consideration of whether or not there existed an arms race, Greece would pay attention to Turkish capabilities reflected in absolute (levels), not in relative (shares) spending and in accumulated spending (stocks). In this case, the nod of methodological approval here must go to Kollias and Makrydakis

(1997b).

But the co-author (Kollias) who correctly used levels data in 1997 used a *mixture* of level and share data in 1995. Writing a demand equation to determine the *level* of Greek military expenditure, Kollias (1995a) uses the *share* of Turkish military spending to Turkish GDP among the independent variables (p. 311). Kapopoulos and Lazaretou construct a similar model for data covering 1962-1988 (1993, p. 77). According to the theory described in the narratives and embodied in the models, a rise in the *share* of Turkish military expenditure to GDP should induce the *level* of inflation-adjusted Greek military spending to rise. But why? For instance, 1980 was a year in which Turkey experienced a severe recession. While the military expenditure *share* in GDP rose, inflation-adjusted Turkish military expenditure actually *fell*, and one would think that Greek policymakers were happy to see that. Such models are not plausible descriptions of real-world data-generating processes and one cannot accept the conclusion which "indicates that an increased growth rate of the Turkish share [of military expenditure in GDP] is interpreted by Greek defence policy makers as signalling an increase in tension and, thus, an increase in war threat" (Kapopoulos and Lazaretou, 1993, p. 83). From a substantive point of view, the sophisticated cointegration tests and error-corrected regression analyses that are packaged in-between these kinds of models and their conclusions are therefore irrelevant.

Following Anderton (1989), and to his credit, it is Kollias who for the Greco-Turkish case first pointed out that military capability is not appropriately measured by levels of military expenditure *per se* either but rather in the men and machines (military labor and capital), i.e., by the *stock* of military capability, that such expenditure finances (Kollias, 1996, especially pp. 222-225). In the process, Kollias uncovers an increasing ratio of Turkish to Greek armed forces, i.e., a quantitative armed force superiority by Turkey that apparently induced Greece to increase its capital intensity per Greek soldier.⁶ In this regard, it is of importance to note that Greece and Turkey are ranked number nine and three, respectively, in the league of the world's largest arms importers and both have recently announced multi-billion dollar expansions of their indigenous arms production industry: Greece by US\$ 15 billion for 1996-2000 and Turkey by US \$31 billion for 1997-2006 (Matthews, 1999).⁷ Although both countries' arms industries predate the Turkish invasion of Cyprus in 1974, both countries stepped up their indigenous arms production efforts in response to that invasion and to arms embargoes imposed on them by the US in particular.

The general lesson here is that future research should think more carefully about the appropriate selection and use of share, level, and stock data for the investigative purpose at hand.

Arms race

With few exceptions, the defense economics literature regarding Greece and Turkey confines itself to four major topics: (a) is there, or was there, an arms race between Turkey and Greece? (b) what determines the demand for military expenditure; (c) what is the impact, if any, of military expenditure on economic growth in Turkey and in Greece; and (d) what is the nature, extent, and impact of indigenous arms production in these countries? This, and the following sections, address each in turn.

In the literature I found six attempts to model and test for the existence of an arms race between Greece and Turkey.⁸ The authors agree on what constitutes an arms race. According to Stavrinou (1992, p. 122) and Georgiou *et al.* (1996, p. 236), if causality is found to run one way only then the “results do not support the basic hypothesis of an arms race process according to which current defence expenditure decisions are based on the opponent’s past behaviour.” Kollias and Makrydakis (1997b, p. 362) agree: “military expenditure aggregates should Granger cause each other.” But Granger-causality, as Stavrinou (1992, p. 120, fn. 4) rightly points out, is an econometric construct and not to be confused with causality as a philosophical construct. In the literature under review here, Granger-causality is the statistical equivalent to Richardson action-reaction models (Dunne, Nikolaidou, Smith, 1999, p. 3). But those, surely, are not the only way to conceive of arms or other races. If one country does not wish to *fall behind*, or does not wish the other to *catch up*, is that not a race? Consider, for one moment, another world region: if India follows China, and Pakistan follows India, do India and Pakistan race each other? Does an arms race exist only if it is mutual? I think not.

This is not merely a technical point and involves one of the more puzzling oddities of the entire set of literature. Of the dozens of empirical papers under review, only two – and none of the six arms race models – explicitly consider the impact of the non-Greek external security environment on Turkey, or the impact of Islamic fundamentalism within Turkey, or the impact of Turkey’s wrangling with its Kurdish population (the exceptions are Chletsos and Kollias, 1995b and Sezgin, 1998). That is, high levels of Turkish military expenditure, for reasons unrelated to Greece, may “falsely” have caused Greece to try to race (to catch up to) Turkey. Alternatively, high levels in Greek military expenditure — for reasons unrelated to Turkey, viz., the volatile situation in the Balkans — may “falsely” have induced Turkey to keep pace with Greece, in addition to its other security concerns. A Richardson arms race model, in Granger-causality form, cannot capture these complexities, and the reported findings are therefore unreliable. “When we apply statistical tests, what we are almost invariably testing are characteristics of specific models, not theories,” writes Smith (1998, p. 421).

Another problem with this literature is that whether or not the statistical results are in line with or contrary to one’s expectations, *post hoc* rationalization of one’s findings is very easy. For instance, suppose one found that Greek military expenditure followed Turkey’s (the *a priori* expectation in Stavrinou, 1992, p. 124 and Georgiou *et al.*, 1996, p. 232). The rationalization is that Greece did not wish to fall behind Turkey. Now suppose the opposite case: Turkish military expenditures follow Greece’s. Now the rationalization is that Turkey does not wish for Greece to catch up (Stavrinou, 1992, p. 124). Whatever the finding, each makes “sense.”

A further problem concerns the display of data. “Authors,” writes Smith (1998, p. 422), “should persuade the reader that they understand the data and are able to describe their statistical characteristics. Often the best way to do this is with well chosen pictures ...” He continues, “Many articles give the impression that the authors have applied the statistical procedures without looking at the data” (Smith, 1998, p. 423). This assessment applies to the literature under review. An excellent exception is figure 1 in Kollias and Makrydakis (1997b). It shows the logarithms of the levels of Greek and Turkish military expenditure from 1950-1995 (these are annual data from various SIPRI yearbooks, expressed in constant

1985 US-dollar). From 1950 to 1966 both increase in line with each other, but Greek military expenditure is at a lower level than Turkey's. The years 1967 and 1968 mark a structural break in the series, catch-up years as it were, and from then on until 1985 Greek and Turkish levels of military expenditure almost perfectly overlap each other. As from 1986, another visually clear structural break occurs: whereas Turkey's military expenditure continues to rise, Greece's stays almost perfectly flat so that the disparity between Greek and Turkish military expenditure grows in Turkey's favor. The statistical analysis merely confirms what the figure makes amply clear: Greece's and Turkey's military expenditure were cointegrated until 1985 but not thereafter. If there was an arms race, it stopped in 1985.

Smith himself does heed his own advice and produces a figure for levels of military expenditure in Turkey and Greece from 1960-1996 (in Dunne, Nikolaidou, Smith, 1999, p. 7) but there are some astonishing differences to the figure produced by Kollias and Makrydakis (1997b, p. 366).⁹ For instance, the first structural break occurs not in 1967 and 1968 but rather from 1966 to 1974 and the second structural break occurs not in 1986 but in 1989/90. Moreover, in the figure by Dunne, Nikolaidou, and Smith, the level of Greek military spending is higher, sometimes drastically higher, than that of Turkey from 1966 to 1975, but in the figure of Kollias and Makrydakis the lines for military spending of the two countries are nearly equal and cross each other twice. Why do these substantive differences arise? The only reason I could identify is that Kollias and Makrydakis used SIRPI data indexed to constant 1985 US-dollars, whereas Dunne, Nikolaidou, and Smith used SIPRI data indexed to constant 1990 US-dollars. If a change in the base-year by a mere five years leads to such drastic differences in the time-series of military expenditures for Greece and Turkey, one wonders about the validity of the statistical results, regardless of the degree of statistical sophistication.

In addition, with regard to the *share* of military expenditure in GDP, Dunne, Nikolaidou, and Smith insert a revealing footnote according to which Turkey's shares as reported in the 1998 SIPRI yearbook are much smaller than those reported in previous yearbooks and this is "not due to a change in the levels of military expenditure but to revisions in GDP series" (p. 7, fn. 2). In any event, after applying an array of cointegration, ECM, and VAR models, Dunne, Nikolaidou, and Smith are unable to find statistical evidence of an arms race between Turkey and Greece: "... there is some evidence of cointegration in Greece and Turkey," they write (p. 14) "but not in the form of a long run arms race. The results we get are difficult to interpret and extremely sensitive to minor features of the specification." In contrast, Kollias and Makrydakis (1997b) do find a systematic arms race but only if the statistical work includes a term to account for the second structural break in 1985.

So, is there, or was there, an arms race between Greece and Turkey? We cannot tell until authors extract from complex realities an underlying theory of data generating processes poured into causal models, and then to put *these* models to a statistical test. Whereas the statistical analysis is often handled masterly, the pre-statistical work is, too often, *ad hoc* and weak. Much the same has been pointed out by Anderton's general review of arms race models (1989) and by Alogoskoufis and Smith (1991) with respect to the use and misuse of error-correction models (ECMs), and is well acknowledged in Georgiou's application to Greece and Turkey: "... suffice it to say that a mechanical approach is implicit in most A-R [action-reaction, i.e., Richardson type] models, no matter how sophisticated" (1990, p. 71).

In particular, it seems to me, the relation between Greece and Turkey needs to be modeled not as Granger-causality but as an overlapping relation (a regular system of two simultaneous equations): Turkey has a set of internal and external security concerns, part of which concern Greece, and Greece has a set of primarily external security concerns, part of which concern Turkey. Neither have security concerns that are exclusively related to each other and that's where all the arms race models fail because that is all they model. But I am persuaded by the data that after the second structural break (either with 1985 or with 1989/90), the arms race, if any, between Greece and Turkey ended and that with respect to learning and insight, the return to further arms race models of the Granger-causality type is near zero.

Single-equation demand for military expenditure

I have seen nine papers on the demand for Greek military expenditure and four papers on the demand for Turkish military expenditure (two papers treat both countries).¹⁰ With respect to the papers on Turkey, two are Granger-causality papers and are not treated here (details are in Brauer, forthcoming b). Of the remaining two papers (Kollias, 1995c, and Chletsos and Kollias, 1995b), I will deal here only with the latter one. It is an error-correction mechanism (ECM) paper that opens up certain problems regarding the proper economic interpretation of econometrically estimated coefficients of an ECM equation.

The most curious result of that paper is that the long-run, cointegrated demand equation shows a statistically significant and positive effect of Greek military spending on Turkish military expenditure, an effect that completely disappears in the short-run, error-corrected estimation. Also, in the long-run equation the coefficients for Cyprus and the Kurdish problem appear statistically insignificant (the t-values are low; p-values are not reported) whereas in the short-run equation, the authors specifically state the statistically significant positive effects of these variables (p. 72). This raises a couple of econometric issues: (a) what exactly is the econometrics of dummy variables in error-correction models? and (b) how shall we interpret the finding that Greek military spending is influential on Turkey's in the long-run but not at all in the short-run equation? In an important paper, Alogoskoufis and Smith (1991) show that there are at least three approaches to and interpretations of ECMs (Phillips, Sargan and Hendry, and Engle and Granger). Alogoskoufis and Smith point out that the Phillips, and Sargan and Hendry approaches do not necessarily yield coefficients that possess "a theoretical interpretation" (p. 104). Long-run coefficients, in particular, "will reflect equilibrium, adjustment and expectations parameters" (p. 105) and "parameterisations with quite different theoretical interpretations are observationally equivalent ... [and] ... the estimates themselves cannot inform us about the appropriate interpretation" (p. 106). In contrast, the Engle and Granger approach treats long-run equilibrium as a statistical, rather than substantive, phenomenon. The Engle-Granger approach is an a-theoretical line of inquiry interested in statistical properties of time-series rather than in substantive questions of decision-making for economic actors. "... the economic interpretation of the estimated parameters is problematic, ... [and does not] ... provide a satisfactory solution to the

identification problem” (p. 110). The contributors to the Greek-Turkish empirical literature invariably rely on the Engle-Granger approach, devoid of interpretative content.

Assume, however, that the Chletsos and Kollias suggestion – that Turkish military spending is more sensitive to the Kurdish rebellion than to Greek military spending – is correct. Then note that the data period covered ends in 1992. This means, astonishingly, that we know virtually nothing about the demand for military expenditure in Turkey, certainly not for the 1990s. Let me hasten to qualify this conclusion by saying that some of the simultaneous equation models reviewed later do contain a military demand equation, but the objective there is not strictly to model demand for military expenditure but to capture interaction terms between military expenditure and, ultimately, variables of economic performance such as economic growth.

With regard to Greece, I have inspected nine pieces on the demand for military expenditure. Again, several papers are Granger-causality papers and are not discussed here as they do not strictly model “demand” for military expenditure. The other papers vary, over time, from simple to very complex models and statistical treatment. At first, Greek military expenditure is treated as a function merely of Turkey's. Then, armed force ratios and military expenditure per soldier are added to the models, but still only for Greece and Turkey. Then US and NATO military spending are added. Then Greece's GDP is added but already a mixing of level and share data occurs which in my opinion invalidates the statistical results. Moreover, security concerns other than over Turkey are never modeled in the equations for Greece.

I discuss two of the nine papers in some detail (the others are covered in detail in Brauer, forthcoming b). They are Refenes, Kollias, and Zapranis (1995) and Avramides (1997). The first applies a neural-network model to the data. As compared to regression analysis, its purpose concerns the predictive power of neural network modeling, both in forecast errors and turning-point errors. It is an interesting and novel piece of work. For the time period of 1962-1990, the model captures the growth rate of Greek military expenditure in time $t + 1$ as a function of (a) the ratio of Greek to Turkish armed forces; (b) constant Greek military expenditure per soldier; (c) constant Turkish military expenditure per soldier; (d) Greek military expenditure as a percentage of Greek GDP; and (e) Turkish military expenditure as a percentage of Turkish GDP (Refenes, Kollias, Zapranis, 1995, p. 33). The study concludes that the least-squares error of the neural network “is much better than [in the] regression, but more important is the fact that the neural network is capable of predicting directional changes far more accurately than the regression” (p. 35). But is the regression a valid regression on an underlying hypothesized data-generating process, or is it a “straw man”? Refenes *et al.* never make the case for their particular regression, nor are the regression diagnostics convincing. For example, even though p-values are not reported, not one of the independent variables appears statistically significant (i.e., the t-values are relatively small) and there is likely a fair amount of uncorrected multi-collinearity among the independent variables. This does not strike me as a good demand equation for Greek military expenditure, although the point of the paper — on neural networks — is of course well taken.

The paper by Avramides (1997) breaks new ground in that it attempts to derive a military expenditure function from economic principles rather than from *ad hoc* reasoning (p. 146). The paper uses two variants on maximizing a social-welfare function under constraints, one based on levels, the other, separately, on

shares.¹¹ Following a Stone-Geary utility specification, the results suggest that in the long-run Greece catches up to (“follows”) Turkish military expenditure and is a free-rider on US and Mediterranean military expenditure before 1974. After 1974, Greece seems to follow Mediterranean NATO allies’ military expenditure. The error-corrected short-run estimation also indicates that Greek changes in its level of military expenditure react to contemporaneous and lagged changes in the level of Turkish military expenditure. Avramides then estimates a share-equation based on Deaton-Muellbauer. Unfortunately, the table that reports the estimates (table 4, p. 174) leaves the substantive question on the relation of Turkish to Greek military expenditure shares undecided as it misprints either the estimate of the coefficient or its associated t-statistic for the crucial variable of concern: the change in the share of Turkish military expenditure in GDP carries a negative sign (i.e., the higher this change, the lower the corresponding change in the share of Greek military expenditure in GDP which is counter-intuitive), but its t-statistic is reported with a positive sign. Since the estimate and the t-statistic must possess the same sign, there must be a misprint in the published results.

Nonetheless, Avramides’ primary conclusion is that “levels of defence expenditures and their GDP shares cannot be taken as similar measures of intentions or perceptions” (p. 173), a finding entirely in keeping with my own thinking on the matter.

Where do we stand with regard to understanding the demand for military expenditure in Greece and in Turkey? To be forthright, we stand on shaky ground. For the case of Greece, we have nine papers, but only one survives — and in fact ends up supporting — my critique. That paper (Avramides, 1997) suggests that Greek military expenditure reacts to or follows Turkish military expenditure for the time period 1950-1989. However, in light of the significant break in the time series in 1985, uncovered by Kollias and Makrydakis (1997b) in the context of their arms race paper, my intuition is that Avramides’ substantive finding might disappear if he were to rerun his Stone-Geary formulation for a time period reaching into the 1990s and accounting for the structural break in 1985. Moreover, since Avramides’ time series stops with the end of the cold war, we do not know whether and if so how the behavior of Greek military expenditure changed to accommodate the post-cold war world. In a word, as in the case of Turkey, we do not know much at all about the determinants of Greek military spending either.

This would seem a serious shortcoming in the literature. If we take Avramides’ findings at face value – that Greece’s military expenditures follow Turkey’s – then identifying the drivers of Turkish military expenditure would be important for Greek military policy and budget planners. And if we found that Turkish military expenditure is driven as much by NATO commitments, fears of Islamic fundamentalism, and the desire to suppress Kurdish militants as by disagreements with Greece, it might help make the case for reduced Greek military outlays as at least some Turkish military expenditure is not desired, and perhaps cannot be deployed, against Greece. I am speculating of course but in so doing indicate that an understanding of Turkish military outlays is important not just for Turkey.

Economic impact of military expenditure

I reviewed eleven papers on Greece and four on Turkey (one paper addresses both countries).¹² Again, a detailed review of each paper is in Brauer (forthcoming b). As before, I concentrate here on a selection of particularly germane papers. Invariably, economic impact is understood to mean economic growth. There are no studies, for instance, on the impact of military expenditure on human development for which economic growth may or may not be a reasonable and reliable proxy (see, e.g., Brauer, 1996). Two of the four papers on Turkey (Sezgin, 1997; Özsoy, 2000) use a Feder-Ram production function model (Feder, 1983; Ram, 1986; Biswas and Ram, 1986).¹³ Sandler and Hartley (1995, p. 206, 208-209) describe how this type of model is inherently structured to "find" positive contributions of military expenditure to economic growth, and indeed that is what these two studies do find and that makes them dubious *a priori*: what have we found if a model inherently is set up to find what we found?

In Sezgin's paper, the model is a production function model with a civilian and a military sector and, in Özsoy's case, a three sector model with civilian, non-military public, and military public sectors. Both papers include terms to capture the effects of investment, labor, and human capital on economic growth. In addition, Özsoy's paper includes a term to capture the impact of Greek military efforts on Turkish economic performance. The mathematics of the models work out so that one can compute statistical estimates of the military sector's (a) total effect on the economy; (b) externality or spill-over effects of the military sector on other sectors; and (c) factor-productivity differentials among sectors.

What are the results? Apart from the variables of immediate interest, i.e., those related to the military sector, what strikes me about the results is that in both cases *investment* turns out to be statistically insignificant.¹⁴ *Labor* also turns up statistically insignificant in Özsoy's case, but positive and significant in Sezgin's paper. *Human capital* is statistically insignificant in both papers. A production function model – for any country – in which investment, labor, and human capital nearly all turn out to be statistically insignificant raises doubts about the model and/or the underlying data. Given these observations, both papers find a positive, and statistically significant, total effect of the Turkish military sector on Turkish economic growth for the time period 1949-1993 in Sezgin's case and 1950-1992 in Özsoy's case. Sezgin finds a statistically significant and negative externality effect of the military sector and also computes a negative factor-productivity differential, saying that the military sector is less productive of economic growth than is the civilian sector in Turkey. Özsoy's findings are somewhat different. In his most extensive runs, he finds investment, labor, and human capital statistically insignificant but the non-military public sector, the military public sector, and the civilian sector *per se* all make statistically significant positive contributions to economic growth. When the equation is changed and run to estimate externality effects, however, all variables turn out statistically insignificantly different from zero except for the externality effect of the nonmilitary public sector (whose effect is estimated as positive).¹⁵

In an interesting exercise, earlier performed by Ward, Davis, and Lofdahl (1995), Sezgin computes rolling estimates over 24-year sub-periods (from 1950-1973 through 1970-1993) and finds that the size and externality effects of the military sector in Turkey are large and statistically significant in the early time periods, but gradually decline and become statistically insignificant in the later time periods. This suggests that if Turkey did, at one time, receive positive economic spin-off effects from its military sector, these effects have vanished over time. This conclusion is contrary to Sezgin's own ("Turkish defence spending

is not detrimental for the Turkish economy; on the contrary, it helps economic growth,” p. 407), and it is also contrary to Özsoy’s (“... the net impact of the military public sector on overall economic growth was positive ...,” p.155). In other words, looking at the same tables of numeric estimates, Sezgin and Özsoy arrive at the conclusion that the military sector in Turkey has stimulated Turkish economic growth; I am more skeptical and remain unconvinced in light of the poor performance of the investment, labor, and human capital variables in the models, and especially in light of Sezgin’s own rolling 24-year estimates. In addition, some theoretical and empirical doubts have been raised about Ram’s model by Carr (1989) and Rao (1989). For instance, Carr points out that a goodly portion of government spending is intermediate rather than final output – in a national accounting sense – and that government spending data cannot therefore be treated as final output data as all these models do. However, the defense economics literature tends to overlook this and other objections to Ram’s model. (Also see Ram’s reply, 1989).

But suppose we take Sezgin’s and Özsoy’s interpretation at face value. Then, the next step should be to ask, exactly what is it about the military sector that makes it contribute positively to economic growth? What are the channels by which public spending on the military stimulates GDP? And are we to expect a negative impact on economic growth if Turkey’s military expenditures were to fall? Large-scale macroeconometric models, reviewed in another section, suggest otherwise.

I turn now to a selective review of the impact studies for Greece. They are, in large part, a scholarly dispute between Christos Kollias and Nicholas Antonakis who reach exactly opposite conclusions: for Kollias the impact of Greek military expenditure on savings is negative and, on economic growth, positive, whereas Antonakis finds a positive impact on savings and a negative one on growth. In this instance, I prefer Antonakis’ work, if only because he eventually expands his models to a simultaneous equation system and hence is able to capture a richer set of interplays. However, Sezgin (2000) is also employing a simultaneous equation system with results exactly opposite to Antonakis (i.e., in line with Kollias’ findings). One technical problem, in any event, is that the simultaneous approaches freely mix level and share data and my conjecture is that this is not a proper procedure to use.

The difference between Kollias (1994b), who uses a Keynesian national-income equation set-up to estimate a log-linear equation for 1963-1990,¹⁶ and Antonakis (1995), for 1958-1990, is in their respective growth equations:

$$\text{Kollias: } \text{GDP}_t = \acute{a}_0 + \acute{a}_1 \text{ ME/GDP}_t + \acute{a}_2 \text{ I/GDP}_t + \acute{a}_3 \text{ POP}_t + u_t$$

$$\text{Antonakis: } G_t = a_0 + a_1 \text{ APS} + a_2 (\text{ME/Y})_t + a_3 (\text{Y/P})_t + a_4 (\text{PI})_t + a_5 (\text{PC})_t + u_t$$

where, for Kollias, GDP is in level form at constant prices, ME/GDP and I/GDP are military expenditure and investment shares in GDP and POP is the population growth rate and, for Antonakis, G is Greece’s annual rate of GDP growth; APS its average savings to GDP ratio; ME/Y the share of military expenditure in GDP; Y/P is *per capita* GDP; PI is the annual rate of population growth and PC is the annual rate of change of the GDP price deflator.

In a further paper, Antonakis (1996a) estimates single equations and a system of simultaneous

equations for 1958-1990, following Deger's (1986) widely adopted approach. The growth equation is the same as in Antonakis (1995). In various versions of the savings equation, military expenditure consistently turns up with a statistically significant negative sign. The third equation is a demand equation for military expenditure which then enters the other two equations in simultaneous fashion. Interestingly, this equation makes no reference at all to Turkey's military expenditure except for a 1974 dummy term. It appears to be a well-specified equation and researchers might wish to look at it purely from the point of view of a demand equation for Greek military expenditure. The final three-equation model is estimated using 3SLS. The coefficient of military expenditure as a share of GDP in the growth equation is -1.552 but +2.833 in the savings equation. The net effect, $\Delta g/\Delta m$, is computed as -1.106, i.e., a one-unit increase in military expenditure as a share of GDP sacrifices about 1.1 units in economic growth. In Antonakis (1997a), Antonakis again uses a three-equation system for Greece for data for 1960-1990 but arrives at somewhat different results. Here, for example, the coefficient of the share of military spending in GDP is positive, rather than negative, in the savings equation (in both the single-equation OLS estimate and the simultaneous equation 3SLS estimate) and the overall effect of the military spending share on GDP growth, $\Delta g/\Delta m$, is now only -0.4 or about one-third of the effect estimated in his (1996a) paper.

Using a different modeling approach, a similar debate is emerging between Antonakis and Sezgin. Antonakis (1997b) uses a Feder-type production function approach for data pertaining to 1958-1991. The empirical results maintain his findings of a statistically significant negative net effect of military burden on Greek GDP growth, even when the sample is split into pre- and post-1974 (pre- and post-Cyprus) sub-samples. Sezgin (2000) uses an interesting approach: he employs a Feder-type (production function) model as well as a Deger-type (simultaneous equation) model and compares the results of the two. The Feder-type model, with its possibility to compute total, size, externality, and factor-productivity differential effects, shows no effect of military expenditure on GDP growth in Greece for 1959-1994. In contrast, the Deger-type model showed a positive coefficient of military burden on GDP growth and a negative coefficient in the savings equation. Regrettably, Sezgin does not compute the *net* effect, $\Delta g/\Delta m$.

Sezgin's Deger-type model differs from Antonakis' (1996a) in two important respects. First, Sezgin converts all variables into first differences, to take out non-stationarity. Whereas Antonakis deals with the effect of the GDP *share* of military expenditure on GDP *growth*, Sezgin deals with the change in the *level* of military expenditure on the change in the *level* of GDP. Second, unlike Antonakis, Sezgin puts Turkish and NATO military expenditure into the Greek military expenditure demand function (and both are positive and highly significant, statistically). The present article is not the place to do so, but it would serve the research community well if a separate research effort were undertaken to disentangle the simultaneous equation and statistical approaches presented by Antonakis, Kollias, and Sezgin. In this regard, note that the question of *levels* against *shares* has come up again. Whereas in the single-equation context I am confident that levels should be used for military expenditure demand equations and shares for economic growth equations, I express no opinion here on whether to use levels or shares in the simultaneous equation context where the military expenditure demand equation feeds into the economic growth equation.¹⁷

A new paper by Dunne and Nikolaidou (1999) also applies a Deger-type model to Greece for 1960-1996. This four-equation model (growth, savings, trade balance, and military expenditure), applied to first-

differenced data, is unusual in that its estimates find a consistent, statistically significant negative effect of military spending on economic growth, savings, and the trade balance. The combined direct and indirect effects are computed as $\Delta g/\Delta m = -0.026$; $\Delta S/\Delta m = -3.21$; $\Delta TB/\Delta m = -0.136$. Note that the estimated $\Delta g/\Delta m$ is small and much smaller (although for different units) than Antonakis' various estimates.

Indigenous arms production

Most studies on Turkey's and Greece's indigenous arms production sector are descriptive in nature. Recent summative overviews are given in Sezgin (1997, pp. 389-396) on Turkey and Kollias (1995a, pp. 314-317) on Greece which contain references to earlier literature. Antonakis (1996b) writes specifically on procurement offset programs with regard to the Greek military industry. Finally, for both countries, Matthews (1999) contains a detailed, up-to-date, descriptive study with many literature references. None of these descriptive studies explicitly consider the opportunity cost military industry imposes (a few of those are covered in Brauer, forthcoming b).

Some trends may be summarized as follows:

- < both countries' arms industries are at least a hundred years old;¹⁸
- < both countries, after 1974, diversified away from relying solely on the US as their major arms supplier;
- < both countries' indigenous arms industrial efforts picked up sharply after 1974, the goal being some measure of weapons self-sufficiency;
- < both countries created super-agencies under whose tutelage various state arms manufacturers were created;
- < Greece's arms industry still is primarily state-owned, highly inefficient, and underutilizes its capacity; only very recently are a number of these firms being privatized. In contrast, the Turkish arms industry began privatization and foreign joint-venture participation (rather than mere license production) in 1983;
- < both countries still expend majority proportions of their procurement funds on arms imports;
- < both countries' arms industries are diversified into air, land, and sea transportation systems, ordnance, and information technology and associated electronics, but Turkey's arms industry appears substantially more diverse than that of Greece;
- < both countries' arms industries cooperative heavily with foreign countries by means of joint-ventures and similar arrangements;
- < both countries, despite strenuous intentions to the contrary, export few indigenously produced arms;
- < both countries have official direct offset policies, i.e., procurement offsets directly related to their respective armaments industries;
- < Turkey is still subject to some arms supply restrictions and, consequently, has tightened its arms collaboration with former Soviet-block countries and with Israel and Singapore in particular.

The pervasiveness of increased foreign participation in indigenous arms production, coupled with direct

offset requirements, creates some unusual difficulties. For example, the winner of Greece's offset order for main battle tanks (MBTs) will automatically be excluded from bidding on Turkey's order, and Israel Aircraft Industries (IAI) decided in 1997 not to bid on upgrade work on Greek F-4 Phantom aircraft in order not to offend Turkey with which it had signed an upgrade contract for 26 Turkish F-4 aircraft (Matthews, 1999).

The literature does not indicate, for either country, that indigenous arms production *per se* has brought economic benefits. For both countries, earnings from arms exports appear to be very small. I am not aware of a reasonably recent evaluation of military offsets in Turkey. Offsets, in the case of Greece, appear not yet effective (Antonakis, 1996b). Without doubt, there is some degree of job creation and import-substitution taking place, but at what economic cost is unclear. For example, with less than 10,000 arms-production related jobs in Greece and perhaps between 20,000 and 30,000 in Turkey, the relevant question is what *alternative* job creation and economic stimulus could have been provided had the employed resources been applied to non-military sectors. Specifically, I am not aware of any study that would have estimated the cost of pure imports set against the cost of co-production. For example, suppose the pure import of a particular item would cost \$40 million whereas the co-produced item would cost \$45 million, of which say \$20 million are for imported parts and components. In this case, the *net* cost of domestic production exceeds the import cost ($\$45\text{mn} > \40mn) but the foreign exchange cost is lower ($\$25\text{mn} < \40mn). In the case of Greece, Antonakis (1996b, p. 167) writes: "... the Greek government does not claim that all co-produced goods cost no more than an off-the-shelf purchase without offsets. On the contrary, it is believed that this option results in higher costs ..." This higher cost essentially is the domestic economic price for some degree of self-sufficiency. It would be nice to know exactly how high this price is. To my knowledge, studies addressing the question of opportunity costs in this sense from a microeconomic point or field-study point of view have not yet been conducted.

Another aspect, pointed out by Candemir (1995), is that both Turkey and Greece received substantial amounts of US military aid in outright grants and low-interest loans to acquire US weapons, support services, and to train their soldiers and officers. Thus the net import cost or foreign exchange cost of arms imports might be substantially lower than official sources, such as US ACDA, would imply.

Regarding Turkey's arms industry, there are a number of interesting themes emerging from the work of Günlük-Penesen (1993a, 1993b, 1994, 1995). One theme concerns the constellation of events that induces Turkey to pursue an arms import substitution path: as part of NATO-Europe and of a restive region, faced with restrictions on the use of imported arms, Turkey wishes to maintain an independent arms production capacity. This is highlighted by its war since the late 1980s with the People's Army for the Liberation of Kurdistan, the PKK, and the emerging conflict over water resources with Syria and Iraq (the sources of both the Tigris and Euphrates rivers are in Turkey). The breakup of the Soviet empire led to the creation of volatile Islamist, Turkic-speaking republics on Turkey's border, and of course there is the continuing conflict in the Aegean Sea with Greece, especially over Cyprus. A second theme involves the unusual financing of Turkey's arms production efforts in which a Defense Industries Support Fund (DISF) receives funding from special levies placed on earned income, on fuel, alcohol, and cigarette consumption, on legal gambling and betting, on bank interest earning collections, and so on. Indeed, Turkish men can

make substantial payments to “exempt” themselves from military service. A share of these payments also goes toward the DISF to fund indigenous arms production. All this in addition to “regular” fund transfers via the defense budget and the general budget. The DISF is substantial and not usually accounted for in the computation of Turkey’s defense budget (see Günlük-Penesen, 1999 and forthcoming). Neither is OYAK, the “Armed Forces Trust and Pension Fund”, included in the defense budget. OYAK, begun in 1961, is a conglomerate consisting of vast holdings in Turkey’s civilian economy, from supermarket chains, to real estate, insurance and banking companies, the automotive and petroleum industry, tourism, cement, food-marketing, and other industries (Parla, 1998). OYAK is among the top-five conglomerates in Turkey and achieves its economic success by means of a “unique and unprecedented set of subsidies and legal privileges” (Parla, 1998, p. 32): it is exempt from all taxes and its members pay statutory dues (army regulars, defense ministry employees, etc., even those not entitled to any benefits!). A similar fund was established, with similar privileges, in 1987: called TSKGV, it funds defense projects by means of vast involvement in Turkey’s civilian economy. The distorting impact of these activities – military mercantilism, as Parla calls it – is unaccounted for. As an economist, one suspects that the welfare effects are negative.

A third theme in Günlük-Penesen’s work concerns the question of the plain sense and non-sense of indigenous arms-import substituting production, of “going it alone”. Initially, Turkey’s arms production program was very much geared at arms independence in a literal sense. But in practice, Turkey quickly resorted to joint venture co-production, an arrangement, however, under which foreign governments restrict Turkey from freely using transferred technology. For instance, NATO weapons and co-produced weapons may not be used in Turkey’s war with the PKK, whence Turkey turned to Romania, Russia, and Pakistan to supply those needs. But beyond that, there is increasing unhappiness in Turkey itself about the apparent lack of quality of the requested armaments and an increasing recognition that technological progress in “the west” makes Turkey’s ambitions to be a self-sufficient, fully independent arms manufacturer unrealistic. The best Turkey might hope for is to become a bit-player in the transnational, globalizing arms industry, supplying specialized parts to be assembled into larger weapons systems (see Brauer, forthcoming a). But Turkey’s military and political leaders appear unwilling, at this stage, to grant the point and change policy. Perhaps eventual membership not only in NATO but also in the EU will allow Turkey to integrate into the emerging European weapons co-research, co-development, and co-production sphere and, most likely, help save it untold economic resources.

I am not aware of a similar detailed look (in English) at the Greek armaments industry.

Large-scale macroeconomic studies

There are two large-scale macroeconomic studies available, one each on Greece and Turkey, that simulate the impact of reductions in military expenditure on a variety of economic performance variables.¹⁹ Both were published in 1996, both are technically excellent studies, and both have not been cited much at all in the post-1996 literature. They both find that reductions in military expenditure would benefit both countries. The benefit is very small for Greece but rather substantial for Turkey if the most promising

simulated scenarios were actually implemented. Both models are satisfying in that they include supply and demand equations, fiscal and monetary policy equations, and so on.

Balfoussias and Stavrinou (1996) employ a large-scale macroeconomic model consisting of some 330 equations (90 stochastic and 240 identities) to simulate the effects of possible reductions in Greek military expenditure. The scenarios involve an annual five percentage point reduction in Greek nominal military expenditure for 1995 to 2000, to be taken from procurement, leaving military personnel outlays unaffected. The savings are applied as follows: (a) to public consumption; (b) to public investment; and (c) to tax reduction. The military data are disaggregated into personnel (wages, etc.) and everything else (mostly imported procurement items). Without exception, relative to the baseline scenario without changes in military spending, the disarmament and reallocation scenarios result in higher GDP growth, higher private consumption, lower unemployment, and an improved balance of payments. Private investment increases beyond the reference projection in two of the three scenarios and drops slightly below the growth of the baseline scenario in the public consumption scenario. However, because Greece is a relatively open economy, the authors argue that the simulated effects of disarmament are "relatively minor" (p. 212), as indeed they are. For example, GDP in 2000 is projected to grow by 3.8 percent in the baseline scenario. In the tax reduction scenario, GDP would grow by an additional one percent of 3.8 percent, i.e., by 3.838 percent. This is one of the more satisfying models I have encountered in the literature under review. The simulations permit one to put a price or opportunity cost on alternatives foregone.

A similar disarmament modeling effort was undertaken for Turkey (Özmucur, 1996). His model indicates that any peace dividend "may prove substantial if resources can be directed towards government non-military investment" (p. 215), a conclusion in rather sharp contrast with Sezgin and Özsoy.²⁰ In an interesting twist, and before studying the impact of disarmament on Turkish economic performance variables, Özmucur finds substantial negative, and statistically significant, correlation coefficients between the budgetary shares of Turkish military expenditure and those on expenditure on health and education for data from 1924-1994. Over the entire time period, military expenditure exceeded that of health and education combined. Regarding the simulation, the model used consists of 27 stochastic equations and 30 identities and is estimated over quarterly data for 28 observations (1987:I to 1993:IV). Government spending is split into non-military and military expenditures, as are government investment expenditure and merchandise imports.

The model contains aggregate supply and demand blocks, and blocks for the labor market, balance of payments, prices, the public, and the financial sector. The simulations are run for 1995:I to 2004:IV to obtain a baseline solution. Then military expenditure as a share of GDP is reduced by one percentage point and four scenarios are simulated. In the first scenario, funds are taken from military imports (20 percent), and military current (31 percent) and investment (46 percent) expenditure. The funds are applied to deficit reduction. In the second scenario, military imports are reduced by half (50 percent), military current spending by 15 percent, and military investment by 46.5 percent and applied mostly to improve the balance of payments. The third scenario applies reductions as in scenario 1 but uses the funds for tax reductions. Finally, the fourth scenario also reduces military outlays as in scenarios 1 and 3 and applies the saved funds to non-military public investment. Scenario 4 turns out to be most desirable in terms of the model criteria:

GDP, inflation, unemployment, balance of payments, real wages, and labor productivity. GDP for instance increases by an additional 2.7 percentage points relative to the baseline scenario, involving a substantial gain in living standards. What is likeable about this model is that it considers target variables other than mere GDP and that, although fundamentally a Keynesian demand model, it includes a four-sector supply side.

Gaps and shortcomings

I now turn to view the literature from a somewhat broader perspective. First, as is equally true of other branches of the literature on the economics of military affairs, data and data sources in this literature on Greece and Turkey are not always well reported. Although there are outstanding exceptions, there are numerous examples where the exact data source is left unspecified, there are confusions about the units of measurement used in the analysis (levels, or shares, or logarithms), data are rarely printed out in full or otherwise made easily accessible, and they are seldom displayed visually for easy inspection by the reader. In many instances, authors are not sufficiently cautious in labeling the variables used in their analyses. For instance, an author may refer to military expenditure but leaves open whether the level or the share (in GDP) is meant. In this literature, this turns out to be problematic as levels and shares measure different substantive things: levels (and stocks) of military expenditure measure capabilities and, possibly, intentions, whereas the share of military expenditure in GDP does not. Moreover, a number of authors freely mix up level and share data without an underlying discussion about the appropriateness of this procedure. In future, authors need to take care to more cautiously and precisely describe their data to themselves and to their readers prior to the application of inferential statistics.

Second, I find that even though the literature is highly focused on military expenditure, it is not in fact well focused at all. It does not, for example, examine the *internal* decision-making processes that generate levels of military expenditure within Greece and Turkey. Virtually all one finds is the occasional use of a dummy variable for Greece's and for Turkey's military governments or for Greece's socialist government that came to power in 1981. But that is not the same as examining the issue from the point of view of administrative or bureaucratic processes within each country, say by means of a public choice model. Many models employ variables for *lagged* military expenditure but this is almost always a "decision" stemming from lag-length determinations in running cointegrated regressions rather than a substantive decision based, for instance, on considerations of inertia in military expenditure budgets. When econometrics determines substance, something is amiss (Smith, 1998).

Third, and to me the most surprising aspect of the literature on the economics of military affairs in Greece and Turkey is how little it concerns itself with *political economy* and how much the literature narrowly sticks to *pure economics*, *mathematical statistics*, and *econometrics*. To be sure, one finds references to the political, military, and strategic literature but that literature does not seem to appreciably influence the modeling and econometric efforts. Lack of political economy is most obvious in the case of the demand for military expenditure equations where Greek military expenditure is almost exclusively modeled in terms of its perceived threat from Turkey, and vice versa. As I insisted earlier, Greece is bound

into the unstable Balkans and surely the determinants of its level of military expenditure do not drive solely on Turkey or even NATO *per se*. Throughout Greece's post-world war II history, Greece has faced *gradations of threat* from a variety of quarters, first the threat of Soviet-style communism via indigenous Greek communist efforts (1944-1949), then the external Soviet communist threat primarily via Bulgaria, then the integration into NATO (1952) which freed both Greece and Turkey to reactivate, after a three-decade hiatus, diverging interests over Cyprus (Sezer, 1991, p. 117; Krebs, 1999), then the threat of an internal Greek military dictatorship (1967-1974) that was partly responsible for Turkey's invasion of Cyprus, then the threat of a highly restive Balkan region, the threat of Turkey itself, the threat to Greece by virtue of the role NATO assigned to Greece for the duration of the cold war; and the threat of NATO's possible disintegration with the end of the cold war (see, e.g., Platias, 1991; Conostas, 1995; Krebs, 1999). The analysis of the economics of military affairs within and between Greece and Turkey, and the associated econometric modeling efforts, fall far short of the richness of Greece post-world war II history.

Similarly, Turkey's levels of military expenditure are primarily modeled on Greece's, and rarely, and never completely, on Turkey's other security problems, both internal (Islamic fundamentalism and Kurdish rebellions) and external (Iran, Iraq, Syria, central Asia). Turkey's role within NATO, pre- and post-cold war, is almost never discussed in the economics literature. For that one must turn, again, to the political science and international relations literature (e.g., Sezer, 1991; Platias, 1991; Conostas, 1995; Krebs, 1999).

Fourth, the extant economics literature never addresses the disagreements and conflict between Greece and Turkey from a game-theoretic view, nor offers any economic analysis of possible, preferably irreversible, solutions. After all, the heart of economics is about interests and how interests, given available resources and constraints, lead to behaviors and outcomes. Economics is therefore also about agents' attempts to change resources and constraints — one's own and one's opponents' — so as to affect behavior and outcomes. Krebs (1999), for instance, contains an exceptionally good account of that and how membership in NATO permitted both Greece and Turkey to resume and intensify their disagreements, but the economics literature is devoid of corresponding analyses.

Fifth, in its focus on the Cyprus conflict in particular, the literature overlooks a rich and complex set of competition *and* cooperation between Greece and Turkey since 1923. The most advanced analysis is again offered by Krebs (1999) who makes, for Greece and Turkey, a persuasive case for his central claim "that [an] alliance [such as NATO] can deepen and intensify conflict among its members" (p. 345). It is remarkable that Greece and Turkey resumed mutual hostility — after three decades of peace — upon joining NATO in 1952. But while competition and cooperation far surpass the issue of Cyprus, it appears equally clear that the resolution of the Cyprus issue is the key that would permit both countries to resolve their other, "follow-on" problems as well. Interestingly, Sezer (1991) makes the perceptive observation that the young, independent nation of Cyprus made the mistake in the early 1960s not to develop "a distinct Cypriot national identity" (p. 121) that might have removed the Cyprus issue from the Greek and Turkish agendas.

In a word, economists have made little contribution to understand and model the political economy, i.e., the institutional setup, interests, constraints, and dynamics under which Greece and Turkey operate.²¹

The literature, as presently constituted, has reached the point of rapidly declining returns. Running more single or simultaneous regression equations, even when incorporating all the latest quirks of mathematical statistics, is unlikely to much advance our substantive knowledge.

Sixth, what is especially overlooked is an assessment of the potential benefits from dispute settlement and active economic and security cooperation between Greece and Turkey. As detailed earlier in this article, I find the econometric results purporting to show positive effects of military expenditure on the economies of Greece and Turkey difficult to believe. But suppose they were correct. Then, what is the opportunity cost of foregoing settlement and cooperation in the Balkans and the Black Sea region? Greece and Turkey, jointly, could make giant strides in pacifying the entire region and they could, jointly, like France and Germany for the European Union, become the powerhouse that spurs economic development across the Black Sea region.²²

In sum, the knowledge gained is slim. There may have been an arms race between Greece and Turkey but it probably ceased in the mid- to late 1980s. We know little about the demand for military expenditure in Turkey; and with respect to Greece it would appear that Greece's spending followed Turkey's up to the late 1980s but we don't know about the 1990s. Moreover, precious few of the studies reviewed take, for Greece, non-Turkish, or, for Turkey, non-Greek security concerns into account which makes all of these studies weak. Regarding the impact of military expenditure on economic performance, the studies on Greece are exactly off-setting and contradictory, and on Turkey probably the victim of the particular modeling (Feder-Ram) approach. Moreover, even if we grant that the impact of military expenditure on growth were "positive" only three studies get at the issue of the opportunity cost of military expenditure and all three suggest that cuts in military expenditure would benefit both Greece and Turkey. Similarly, regarding indigenous arms production, while we are fairly well informed descriptively about the nature and extent of such production, there is little by way of assessing the economic or opportunity cost of putting financial, physical, and human resources to arms production.

What are the prospects? To be sure, militarily Turkey has the upper hand and the onus is on the quality of Greek foreign policy making. Turkey is large and mighty and very much a secular, and Islamic NATO front line state. Turkish and/or Muslim minorities dot the Balkans much more so than Balkan minorities speckle Turkey. But Greece is economically more advanced than Turkey, it does control most of the Aegean, there are sizeable Greek minorities in the Balkans as well which affords opportunities for Balkan cooperation, Greece is a member of the EU and, even after admitting Turkey to EU membership *candidacy*, therefore controls actual *accession* of EU-aspirants to the EU (e.g., Bulgaria and other Southeast and East-Central European nations and, of course, Turkey itself), and Greece could become a member of a EU foreign policy and defense club that might replace, and certainly augment, NATO's increasingly shaky defense guarantee.²³ In a word, Greece's hand of cards is not empty if it would but lose its "introverted security orientation" (Constas, 1995, p. 73), fear of encirclement (Albania, Macedonia, Turkey, Turkey-linked Bulgaria), and settle down toward sustained negotiation. Neither is Turkey's hand quite as strong as it may appear to myopic Greece. The nations surrounding Turkey are a restive lot that could quickly strain Turkey's capabilities. Resolution of differences between Israel and Syria would free the latter to turn unwelcome attention to Turkey. Resolution of western differences with Iran and Iraq would

free them to turn to Turkey and dispute its current regional power status as Turkey's US support might wane. Clearly, both Greece's and Turkey's external security environment is volatile and fleeting enough to encourage both to settle and jointly become stronger.

Perhaps it takes a pair of statesmen like Venizelos and Atatürk in the early 1920s. Were Turkey to become a regional superpower (Constas, 1995, p. 85) and Greece isolated, it would be too late for Greece to settle for much. And were Greece to tie up the Balkans within an EU context and Turkey to become embroiled in southwest or central Asian conflicts, then Turkey would likely hold the losing hand. In distinction to those focusing on costly maintenance of strategic balance (e.g., Turan and Barlas, 1999), I like to think that this is an example of economists pointing to the benefits to be had from cooperation.

Notes

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1. This is a shorter version of a much larger, comprehensive critical review of the pertinent literature. That review also contains several tables comparing data periods, methodological approaches, and findings across several dozen empirical studies (see Brauer, forthcoming b). In the present article I review a smaller, selected number of studies.
2. The Turkish victory over Greek forces at Smyrna in August 1921 ended 2000 years of continuous Hellenic settlement in Asia Minor, leaving large numbers of Greeks "stranded" in Turkey (see Matthews, 1999, p. 52 and literature cited there). Also see the article and map supplement in *National Geographic* magazine (December 1999).
3. Greek 1997 GNP *per capita* is given as US\$12,010, as against only US\$3,130 in Turkey, a ratio of about 4:1. In PPP terms, the numbers are \$13,080 for Greece and US\$6,430 for Turkey, a ratio of about 2:1 (see World Bank, 1999, pp. 190-191).
4. Current overviews on the Greek and Turkish economies are available at the IMF and OECD. On Greece, see the IMF country report (96/121) and the OECD economic survey (12/98), available online at www.oecd.org. On Turkey, the IMF country report (97/110) is available online at www.imf.org and the OECD economic survey (6/99) is online at the OECD site. On the role of the public sectors in Greece and in Turkey, see Neal and Barbezat, 1998.

5. Avramides (1997, p. 173) expresses a similar sentiment. Georgiou *et al.* (1996, p. 230) cite Smith (1989, p. 352) according to whom shares “... can be used as a signal or a measure of commitment to defence” but citing Smith is not equivalent to a discussion of whether or not the use of share data is appropriate for establishing the presence or absence of an arms race. Moreover, the citation is incorrect. It actually reads “shares ... are widely used as a signal or a measure of commitment to defence” (Smith, 1989, p. 352). Smith intended this as a statement of fact, not necessarily as a general nod of approval.

6. Kollias (1996) then mismeasures this capital intensity as “military expenditure per soldier” (p. 224) whereas it should be measured as equipment stock per soldier. There are two issues here. First, only the equipment and directly associated support part of total military spending should be counted, excluding personnel and indirect support expenses. Second, military expenditure even if correctly measured as equipment spending is a *flow* variable whereas capability depends on *stocks*. Thus, the correct measure would be stocks-per-soldier, uneasily aggregated by some form of currency valuation.

Kollias appears to have been the first to examine armed force and “capital intensity” ratios in Kollias, 1993a and 1994a.

7. The SIPRI Yearbook 1999 (table 11.2) ranks Turkey in spot number three (\$6,615 billion) for the years 1994-1998 and Greece in sixth place (\$4,754). The numbers are SIPRI’s “trend-indicator” values in constant 1990 US dollars. The US and Germany are, by far, the most prominent arms suppliers to both Turkey and Greece.

8. Majeski (1985), Georgiou (1990), Stavrinou (1992), Georgiou, Kapopoulos, Lazaretou (1996), Kollias and Makrydakis (1997b), and Dunne, Nikolaidou, and Smith (1999). There is an earlier contribution, Majeski and Jones (1981), but its results are included in Majeski (1985).

9. I am referring to substantive, rather than scaling differences in the display of the data. The figure in Kollias and Makrydakis (1997b, p. 366) is in log terms and the figure in Dunne, Nikolaidou, Smith (1999, p. 7) is in level terms.

10. On Turkey: Chletsos and Kollias (1995b); Kollias (1995c); Kollias and Makrydakis (1997a); Dunne, Nikolaidou, and Vougas (1998). On Greece: Kollias (1993a); Kapopoulos and Lazaretou (1993); Refenes, Kollias, and Zapranis (1995); Kollias (1995a); Kollias (1995c); Kollias (1996); Avramides (1997); Dunne, Nikolaidou, and Vougas (1998); and Kollias and Makrydakis (forthcoming). A tenth paper on Greece (Antonakis and Karavidas, 1990) is published in Italian and therefore not discussed here since my knowledge of Italian is limited. As best as I can determine, the paper finds that the Greek demand for military spending between 1958-1986 is primarily determined by a 1974 Cyprus dummy and lagged Greek military spending (t-1).

11. But when it comes to specify the military expenditure (or security) function within the utility-maximizing framework, Avramides is as *ad hoc* in the picking of the relevant variables to be included in the model as other authors are. Even so, it is a promising paper, and to his credit Avramides is extensive in his

elaboration and reasoning of why certain variables are chosen for inclusion.

12. On Turkey: Sezgin (1997); Sezgin (1998); Sezgin (1999); and Özsoy (2000). On Greece: Kollias (1994b); Antonakis (1995); Kollias (1995b); Antonakis (1996a); Chletsos and Kollias (1995a); Balfoussias and Stavrinou (1996); Antonakis (1997a); Antonakis (1997b); Dunne and Nikolaidou (1999); and Sezgin (2000). "Economic impact" is understood in the literature as the impact of military spending on economic growth. There is one paper that finds that Greek military expenditure from 1960-1992 appear to have positively influenced employment levels in Greece (Chletsos and Kollias, 1997, p. 446).

13. There have been a number of applications of and variations on the Feder-Ram neoclassical production function model in the defense economics literature. They include Alexander (1990) for 9 developed countries 1974-1985; Atesoglu and Mueller (1990) for the US 1949-1989; Huang and Mintz (1990) for the US 1952-1988; Huang and Mintz (1991) for the US 1952-1988; Ward *et al.* (1991) on India 1950-1987; Ward and Davis (1992) for the US 1948-1990; Mueller and Atesoglu (1993) for the US 1948-1990, Alexander (1995) for 11 developed countries 1966-1988; Ward, Davis, and Lofdahl (1995) for the US 1889-1991 and Japan 1879-1990; Antonakis (1997b) for Greece 1958-1991; and Herrera (1998) for Pakistan 1960-1993; and a review by Ram (1995).

14. In some equations, investment is positive and significant but I tend to look at authors' "last run," usually their own most considered or favored model.

15. But unlike Sezgin, Özsoy computes a positive factor-productivity differential for the military sector, meaning that it is more productive than the nonmilitary public sector.

16. Kollias (1994b) is identical to Kollias (1995b) with respect to the estimated equation. The earlier paper contains additional material.

17. On the question of the suitability of the Feder-type model (e.g., implicitly it postulates causality running from military expenditures to economic growth rather than vice versa) see LaCivita and Frederiksen (1991) and on the interpretation of the coefficients see Carr (1989), Rao (1989), Ram (1989), Sandler and Hartley (1995), and Alexander (1995, esp. pp. 18-19).

18. In the case of Turkey, the industry can be traced back to the 11th century (see, Akgul, 1988).

19. A third study, on Greece, is discussed in Brauer (forthcoming b) is Athanassiou, Kollias, and Zografakis (1998).

20. "... empirical evidence showed that Turkish defence spending is not detrimental for the Turkish economy; on the contrary, it helps economic growth" (Sezgin, 1997, p. 407). "Due to the positive effects of the nonmilitary and military sectors on Turkish economic growth, the results reported here suggest that the Turkish government should not make drastic resource-allocation changes between nonmilitary and

military public spending" (Özsoy, 2000, p.156).

21. There is a burgeoning literature on the politics and economics of international institutions. For recent work see, e.g., Aggarwal, 1998a and 1998b. On institutional economics pertaining to NATO see, e.g., Sandler and Hartley, 1999.

22. An altogether different opportunity cost concerns of course the number of lives lost. For example, *The Economist* magazine reports (20 February 1999, p. 16) that the Turkish-Kurdish conflict has cost more than 30,000 lives.

23. NATO's defense "guarantees" is often misunderstood. Indeed, it is *wrong* to understand it as a guarantee at all. Article 5 of the NATO treaty merely pledges the allies to "consult as a group ... prior to determining the necessary response ... [It] does not commit the allies to an automatic military response, or any necessary response" (Sandler and Hartley, 1999, pp. 25-26).

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