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Military Spending and Economic Growth in Greece and the Arms Race between Greece and Turkey

By Dimitrios PAPARAS [a†] Christian RICHTER [b] & Alexandros PAPARAS [c]

Abstract. One of the most important reasons that led Greece to the current macroeconomic instability is the high military spending during the last decades. Thus, it is necessary to examine the impact of military spending on economic growth for the case of Greece. Furthermore, it will be very useful to examine the arms race hypothesis between Greece and Turkey in order to identify if there is an interaction between these countries that leads to the high level of military spending. In this paper we empirically test the relationship between military spending and economic growth for Greece and Turkey during 1957-2013, and examine the validity of arms race hypothesis between the two countries. We deployed unit root tests, unit root tests with structural changes, cointegration techniques and finally Granger causality tests. Granger causality tests in the case of Greece and Turkey imply that the causality runs from military spending to economic growth, however we find that there is no evidence of causality between Greek and Turkish military spending, which mean that that these countries act independently.
Keywords. National Government Expenditures, National Security and War, Arms race, Greece, Turkey, Economic Growth, ADF, VAR.
JEL. H5, H56, O40, E62.

1. Introduction

The majority of governments face contradictory demands to provide resources for a rapid increase of development and economic growth, expanded welfare services, better education, infrastructure, health system, living standards, and finally greater national security. Hence, the government authorities of these countries are required to bring together three goals; the national defence and security, the increase of the development and economic growth, and finally their political survival. Military spending is one of the most important topics in the government budgets allocation and is one of the major users of scarce resources. In some countries, such as Greece and Turkey, large amounts of the budget are still allocated for defence spending every year which implies the sacrifice of alternative civil spending, such as education and health spending.

Another reason which reinforces the importance of this empirical paper is the inconsistency of previous literature findings. Various studies (Antonakis & Karavidas, 1990; Antonakis, 1997; Andreou, Parsopoulis & Vrahatis, 2002) have

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found that military spending has a negative impact on economic growth in Greece. However, there are several studies, such as Chletsos & Kollias (1995), and Balfousias & Stavrinos (1996), which identified a positive impact. Finally, there is no common pattern in empirical studies (Majeski & Jones, 1981; Kollias, 1991; Kollias & Paleologou, 2002; Ocal, 2003; Ocal & Yildirim, 2009) which examined the arms race hypothesis between Greece and Turkey.

The study of Benoit (1973) was the starting point for most research to investigate the relationship and the interaction between military spending and economic growth. Benoit found evidence of a positive relationship in LDCs (less developed countries). However, despite the large number of studies in this topic there is no universally accepted conclusion if defence spending leads to an increase or decline of economic growth. Chan (1985) implied that "the claims to generality based on the results of such a search tend to entail substantial costs in empirical sensitivity and specificity" (Chan, 1985, pp. 433). Neuman (1979) claimed that "despite the volume of writing on the subject, we still do not know whether there is a causal relationship between military expenditures and development, much less what this relationship is " (Neuman, 1979, pp. 478).

During the last decades rapid changes occurred in economies, such as the transformation of financial systems, the need for greater national security, the massive increase in oil prices, the international debt crisis, major recessions of developed countries, and finally public policy problems in Europe and the US. Many economists (Deger, 1986; Deger & Sen 1983; Antonakis, 1997; Antonakis & Karavidas, 1990; Nikolaidou, 1999) and policymakers assumed that military spending reduces development and economic growth, however, this view is very simplistic. There is reasonable evidence that certain characteristics of military spending can be productive, while there is no obvious evidence that its reduction leads to an increase in economic growth, and also it cannot be generalized across different countries or group of countries. However, military spending through the provision of security leads to an environment with improved safety and productivity.

The relationship between military spending and economic growth is very complex, because the relationship may not have unidirectional causality. Thus, any model attempting to test this relationship has to investigate any possible bi-directional causality. The next figure (Figure 1) illustrates the complex structure of the relationship between these two variables. Some of the effects can be positive or negative, depending on the structural characteristics of the tested country. Perceived threats to national security may have an internal or external dimension, while both lead to higher military spending. Nowadays, the majority of studies examining the economic impact of military spending in individual countries have focused either on developed or developing countries. Only a few studies have examined the effect of military expenditure on economies that are at an intermediate level of development, like most of the European countries.

Greece is a very interesting case in the European Union for examining the relationship between military spending and economic growth. Greece is a small, industrialised country, with many economic problems such as huge deficits, an exploding public debt and security concerns with Turkey, with the Former Yugoslavic Republic of Macedonia (FYROM), and finally with Albania. This is the reason why, even after the end of the Cold War, Greece continued to spend a significant share of GDP on defence. According to SIRPI, Greece was ranked fifth among the major recipients for convential weapons during the last 10 years (while Turkey was first, Spain 20th and Portugal 23th). The troubled relationship between Greece and Turkey is not recent since both have had a history of invading each other. Greece has been a full member of the EU in 1981, while Turkey became a

candidate in 2005 and both have been allies of NATO since 1952. Despite their joint participation in these institutions, they continued to have antagonistic relations (Rumelili, 2003).

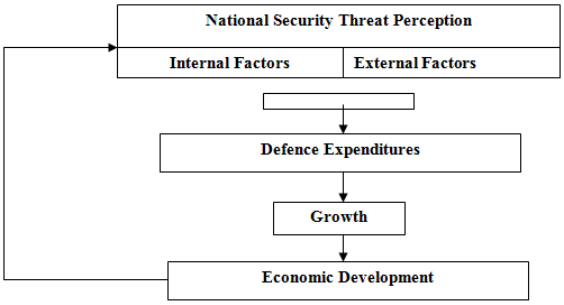

Figure 1. *Security Development: the linkages*

The military spending in Greece and Turkey as a share of GDP, Table 1, in 2000 is higher in comparison with the NATO counties and NATO European countries. Moreover, since 1990's, military spending still increases, whereas in other European and OECD countries it has fallen. This occurred due to the tense relations with Turkey and the need to defend a very long coastline while having borders with non-European countries. Hence, the military spending, in part, can explain the huge public sector of Greece. However, no attempt was made to analyse the efficiency of this large defence spending.

Table1. *Defence expenditure in Greece and NATO (as a share of GDP)*

	Greece	Turkey	NATO European	NATO Total
1990-94	3.6	3.7	2.6	3.5
1995	3.2	3.9	2.3	3
1996	3.2	4.1	2.2	2.8
1997	3.2	4.1	2.2	2.7
1998	3.1	3.2	2.1	2.6
1999	3.1	3.98	2.1	2.6
2000	3.3	3.74	2.1	2.5
2009	3.1	3.2	2.1	2.4

Source: Ministry of National Economy and Finance, Budget, SIRPI.

2. Literature review

In the political economy, national security is defined as a public good with high externalities. National security was totally financed by the government, while other public goods such as health and education have their private counterparts. However, during the last 2 decades there are several private military companies provides military services[1]. The authorities of some developing countries claimed that enlarged military spending leads to an increased security, however, this may not be always true. Deger & West (1987) stated that " at least some LDCs , there may be some connection between ultra-sophistication of strategic plans, excess military spending leading to 'overkill', and escalation of costs." (Deger & West, 1987, pp. 7).

According to Smith (1980b) the impact of military spending on economic growth is negative in 14 OECD countries. However, he mentioned that this does

[1] Generally known as security contractors, private military contractors or private security contractors.

not necessarily apply in LDCs, because in these countries the spirit of militarism helps the government authorities to increase defence at the expense of the social wage. We can understand that the economic impacts of military spending are likely to be different in developed and in less developed countries.

2.1. Previous theoretical studies

Keynesian school

Keynesians supported that the state is an institution which stands over classes and cares about the general interest of the society. Defence spending is a form of public expenditures that has a positive impact on aggregate demand. At the same time, employment and other economic variables also lead to an increase in economic growth. According to Dunne & Mohammed (1995), the Keynesian theoretical framework emphasizes the role of military spending which increases national income through the multiplier effect. This framework was developed by Smith (1980a) and provided the basis for most of the subsequent studies examined the economic impact of military expenditure. He claimed that this approach was more successful as a means of examining the economic effects of military spending in LDCs, rather than the neo-classical approach.

Faini et al. (1984) claimed that the Keynesian model is the strongest argument advocating that increased defence spending has a positive impact on economic growth. They implied that in an economy with excess production capacity, the increased aggregate demand for any source, such as defence spending, will lead to an increase of the national output. Furthermore, there will be capacity utilization, possible profit rates, investment will increase in response to higher profits and the economy will follow a faster path in the long run. According to Dunne & Birdi (2002), the Keynesian models consider military spending simply as one component of aggregate national spending and, therefore, focus on the economy's demand.

Antonakis & Karavidas (1990) estimated a single demand-side model for the period 1950-1985 so as to test the relationship between military spending and other aggregates of the Greek economy (private investment, government investment, health, social, educational services). They found that the relationship between growth and defence spending is negative and suggested that the opportunity cost[2] of defence constitutes a burden on the Greek economy.

The Keynesian framework is frequently used in the literature in order to investigate the relationship between military spending and economic growth. The model is:

$$\boldsymbol{Y = Q - W = C + I + D + T} \qquad (1)$$

Where Y is the actual output, Q is the summary of demands for goods and services, W is the difference between actual and potential output (Q), C is the consumption expenditure, I is the investment expenditure, D is the defence spending and T is the trade balance.

Another article which applied a demand side model was developed by Smith (1980a). He used data from 14 OECD countries for the period between 1954 and 1973. He tested the crowding out effects between military spending and economic growth, and hypothesised that there is a trade-off between defence spending, economic growth and investment. There was empirical evidence that the coefficient of military spending was negative and implied that an increase of these expenditures leads to a decrease of investment. However, he mentioned that this

[2] Defence spending allocates scarce resources away from productive civilian investment and fails to create any additional savings; hence, we have a shortage of funds for public welfare projects, such as education and health.

does not necessarily apply in LDCs, because in these countries the spirit of militarism helps the government authorities to increase defence at the expense of the social wage.

In accordance, Chletsos & Kollias (1995) used disaggregated military spending data in order to examine the economic effects for the period of 1974-90 in Greece and based their model on a typical Keynesian national income equation. They also found evidence that demand stimulation effects are due to wages and salaries paid to military and civilian personnel employed in the defence sector, rather than to indigenous production and maintenance of military hard ware. This is in accordance with a previous study made by Kollias (1994), who found that indigenous arms production in Greece had insignificant and very weak spin-off effects. Furthermore, investment had a negative impact on public deficits, GDP and to total military spending, while it was positively related to a political dummy variable.

The study of Kollias (1995) included a traditional Keynesian model for the period 1963-1990 in order to examine the Greek-Turkish conflict and military spending. He found that military spending has stimulative effects through aggregate demand. However, he could not draw safe conclusions about the relationship in Greece because in the same period investment and savings were found to be adversely affected by military spending. He suggested that an arms control agreement between the two countries, in order to achieve abalance of power at lower levels of military spending, couldreduce the costs of arming and the tension in the area.

Finally, Kollias & Paleologou (2003) presented a demand function of military expenditure in Greece for the period 1960-1998. By using the autoregressive distributed lag (ARDL) cointegration approach, they found that external threats (Turkey) increased the defence spending. Furthermore, they provided evidence supporting that, even the domestic political changes that took place during the tested period, had a positive impact on defence spending. Finally, they implied that previous studies testing military expenditure demand functions for Greece concentrated on security and economic determinants, however, they ignored domestic political factors that could potentially have an impact on defence spending.

Most of the previous studies that used this approach found evidence of a negative relationship between defence spending and economic growth. One of the most important limitations of this approach is that focuses only in the demand-side and ignores the consideration of suppy-side effects such as technology spin-offs and externalities.

Neoclassical school

The neoclassical theoretical framework considers defence spending as a pure public good provided by the state. In accordance to this framework, the state appears to maximise the national interest by evaluating the opportunity costs and security benefits of military expenditure. According to Smith (1989), this approach supports the view that military spending is based on the notion of a state, reflecting some form of social democratic consensus, and recognising the national interest. Military expenditure also seems to be vital in a dynamic context, which can provide shocks to the system. For instance, Hall (1988) used military spending as an exogenous instrument in order to examine the degree of monopoly in the U.S.A, while Barro (1990) implied that increase in defence spending has a significant real effect on output. The Neoclassical or supply-side model of defence spending and economic growth is based on the work of Feder (1983), Ram (1986) and Biswas & Ram (1986).

Feder (1983) introduced a model which included economic growth, investment, labour force growth, and export growth in order to investigate the relationship and the externalities between the export and the non-export sector in LDCs. Ram (1986) applied the same model and tested the relationship between the government sector and the non-government sector in 115 countries. Biswas & Ram (1986) used a Feder model (1983) to investigate the relationship between the military and non-military sectors, and tested whether relative factor productivity differed significantly across these sectors. They did not find evidence of significant factor productivity in the tested LDCs and concluded that the military spending does not have any positive or negative impact on economic growth.

In this theoretical framework, national output Y can be expressed as a function of labour, capital and technology which is usually proxied by defence spending.

$$\boldsymbol{Y = f\ (L, C, T)} \qquad (2)$$

Where L stands for labour, C for capital and T for technology

Similarly, Linden (1992) applied an augmented two-sector growth model and examined the impact of the military burden and government expenditure on the economic growth in Middle Eastern countries. His empirical results indicated that military spending has a negative impact on economic growth in the tested period of 1974-85. On the other hand, the size of the government, oil prices and capital formation has positive impact on economic growth. He claimed that the difference in marginal productivity in different sectors is small and the positive externality effect of the government on private consumption is large. Finally, he concluded that country-specific factors had a minor effect on the empirical results.

The majority of neoclassical models used in previous studies point out a positive relationship between defence spending and national output, through the positive effects of technological developments, which are generated in the military sector. Smith (1977) claimed that the neoclassical models have a very poor explanatory power because they do not deal with the complexity and uncertainty of international relations, and the conflicting interest of groups within the society. Finally, Dunne (1996) stated that "being ahistoric, for placing unrealistic requirements of computation and information on the `rational actors', for concentrating on the supply-side and for ignoring internal political and military factors" (Dunne, 1996, pp. 445).

Mintz & Stevenson (1995) used time-series data for 103 countries in order to investigate the relationship between economic growth and military spending. They used a neoclassical model of the defence-growth trade-off that accounted for the externality effects of defence spending. They found evidence that non-military spending has a significant and positive effect on military spending while the impact from military spending is insignificant and, therefore, governments should not expand military spending for economic purposes.

The study of Mancair (1995) used a supply model which contained the civilian, the non-military and the military public sector. They excluded the export sector because is unlikely to provide externalities to other sectors. They found evidence that the investment, defence spending and non-defence spending have a significant and positive impact on economic growth in the NATO allies.

Finally, Antonakis (1997) made an attempt to investigate the relationship between military spending and economic growth in Greece for the period of 1960-1990. He claimed that military spending may affect economic growth through the whole host of direct and indirect spinoffs, the reallocation of resources, and finally the creation of new sources. He used a simultaneous equation supply model comprising three equations; growth, savings and military burden. There was

evidence that the impact of military spending on economic growth is negative. Thus, he suggested that policy makers should leave military spending for security purposes only and reallocate government resources from the military sector toward civilian purposes.

2.2. Previous empirical work

Military spending and economic growth

After 1970's, when Benoit found a positive cross-country relationship between military expenditures rate and economic growth rates in less developed countries (LDCs), a multiplicity of studies have been published on the impact of military spending on economic growth. Benoit (1978) made an attempt to explain the relationship between economic growth and defence spending on LDCs. One of his main findings, contrary to his expectations, was that countries with more military spending have the most rapid growth rate, while countries with the lowest military spending have the lowest growth rates. He stated that "It has been usually been supposed by economists that defence expenditures reduce the resources available for investment and so slow down growth. The evidence available for developed countries is at least not inconsistent with that view" (Benoit, 1978, pp. 271).

Several studies (Deger & Smith, 1983; Deger, 1986; Faini, Annez & Taylor, 1984; Lim, 1983) have pointed out empirical evidence of a negative relationship between military spending and economic growth. They focused on two kinds of trade-offs: the allocation effect (the guns and butter trade-off) and the growth effect (the guns vs. growth effect). The first strand of studies suggested that defence spending allocates scarce resources away from productive civilian investment and fails to create any additional savings; hence, we have a shortage of funds for public welfare projects, such as education and health. The second strand of studies implied that defence spending has a negative impact on investment which decreases economic growth. The study of Dunne et al. (2001) deployed a demand and supply model in order to investigate the relationship between military spending and economic growth over the period of 1960-1996. The estimations were derived from a Keynesian simultaneous equation model with a supply side, which allows for indirect effects. Their empirical results indicated that the major determinants of Greek military spending are not economic but strategic (threat of war with Turkey) and that the direct and indirect effects of this spending on economic growth are negative and harmful to the Greek economy.

Another group of researchers such as Benoit (1978), Kaldor (1976), Kennedy (1983), Weede (1986), has indicated a positive relationship between military spending and economic growth. They suggested that military spending stimulates economic growth, directly and indirectly, by increasing the purchasing power, producing positive externalities, and finally enhancing aggregate demand. Moreover, military spending through the defence programs increases employment, education and technological training. Balfoussias & Stavrinos (1996) investigated the main interconnections of military expenditure with fiscal policy and macroeconomic performance in Greece by using a simultaneous equation model for the period of 1960-1992. Empirical results indicated that real military spending exerts a positive effect on real economic activity and unemployment. They also used a large-scale model and attempted to investigate the macroeconomic implications of alternative disarmament scenarios over the period of 1995-2000. They found that the reallocation of government resources from the military sector toward civilian use would result to a higher domestic output, greater employment level, and finally an improvement in balance of payments. Additionally, Sezgin (2001) investigated the relationship between economic growth and military spending in Turkey for the period of 1956-1994. He applied a demand and supply

model using 2SLS and 3SLS simultaneous equation method. The empirical results indicated a positive impact of military spending on economic growth during the tested period; however, there is no impact of military spending on saving. He concluded that "determinants of Turkish defence expenditure are mainly its income level, the conflict with PKK and Greece's defence spending" (Sezgin, 2001, pp. 84).

Several studies did not find any empirical evidence of the relationship between economic growth and military spending (Biswas & Ram, 1986; Hill, 1978; Mintz & Stevenson, 1995). Mintz & Stevenson (1995) used time-series data for 103 countries in order to investigate the relationship between economic growth and military spending. He used a model of the defence-growth trafe-off that is grounded in the neoclassic theory of growth which took into account the externality effects of defence spending. They concluded that non-military spending has a significant and positive effect on military spending, while the impact from military spending is insignificant. Therefore, governments should not expand military spending for economic purposes.

Finally, he could not rule out the possibility that the defence spending has an indirect negative effect on economic growth and that this type of spending may disturb the economic growth in the long run through deficit, investment or export. Thus, in his second approach he focused on these indirect affects (see figure 2), the effects of defence spending on economic growth through investment or export. In this approach he re-tested the case of South Korea for the period of 1954-1995 through a three equation model. His results showed that there is an indirect, delayed effect of defence spending on economic growth via investments and an indirect immediate impact through exports. Moreover, the impact of defence spending via investments may take some years to materialize and that reductions in military spending may encourage exports. According to the author, the reduction in defence spending may generate more capital sources, which help economic growth.

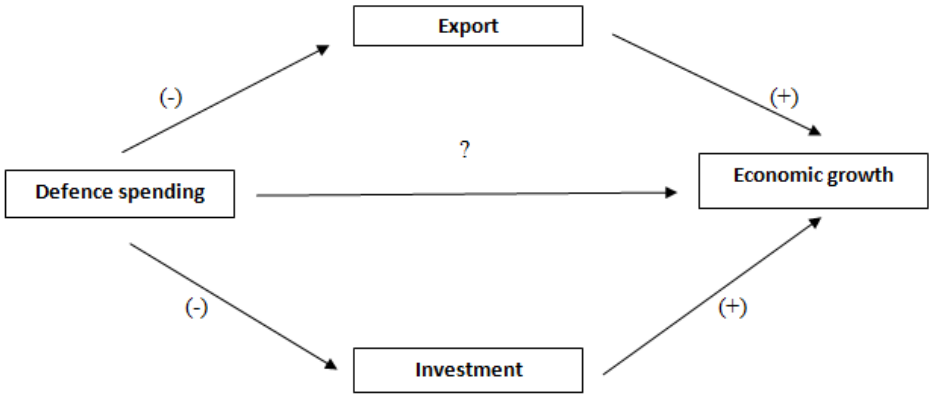

Figure2. *Indirect link between defence spending and economic growth.*

There are also several studies focused in single countries, and examined the impact of military spending on economic growth. Atesoglou (2002) made an attempt to examine the relationship between military spending and economic growth in the U.S.A. He used the Engle-Granger cointegration technique and found that there is evidence of a significant and quantitatively positive relationship between military spending and aggregate output. He implied that an increase or decrease of military spending will bring substantial changes in the long-run equilibrium path of the macro economy in the U.S.A. Correspondingly, Kollias et al. (2004) examined the effects of excessive military spending on fiscal policy in

Greece during the period of 1960-2000. They suggested that central government debt (external and internal) has been negatively influenced by increased military expenditure. However, they stated that in comparative terms, partisan effects on public debt appear to be more pronounced.

Karagol & Palaz (2004) made an attempt to test the impact of defence expenditure on economic growth for the case of Turkey during 1955-2000. They deployed unit root, cointegration and Granger causality tests, and found that there is a long run relationship between the variables. Furthermore, the causality is running from defence expenditure to economic growth. Finally, they noted that the existence of causality in the defence expenditure output relationship may be due to resources being misallocated or wasted on defence expenditures.

Additionally, several studies have focused on a group of countries, and focused mostly in EU and NATO countries. Gadea (2004) analysed the long-run demand for defence output through a homogeneous treatment of 15 NATO member countries between 1960 and 1999. They applied time series analysis techniques to test the interactions between either defence spending or defence burden and their main determinants, such as income, external threat and allied military spending. They noted that they "have tried to avoid ad hoc variables in order to obtain good individual fits, preferring instead to concentrate on a homogeneous treatment based on common variables that makes it possible to draw comparisons" (Gadea, Pardos & Pérez-Forniés, 2004, pp. 244). In accordance, Nikolaidou (2008) examined the demand for military expenditure in EU15 during the period of 1961-2005. She applied a simple demand model and found that the results show clear differences in the determination of military spending in the long and the short-run. Military expenditure responds positively to changes of the output in both the short-run and long-run in almost all EU15 countries. As far as the crowding-out effect is concerned, there is evidence of verification both in the short- and in the long-run in Greece, Denmark, Finland, and Sweden, while in Luxembourg only the long-run.

According to Brito & Intriligator (1995) arms race is the competitive, resource constrained, dynamic process of interaction between two countries in the acquisition of arms. The arms race between the U.S.A and the U.S.S.R. dominated the interest of politics during the last century. Some of the most important regional interactions nowadays are Greece and Turkey, Iran and Iraq, India and Pakistan and finally South and North Korea.

The first model that examined the arms race between two countries was the Richardson model (1960). He suggested three possible motives which lead a nation in peace to increase or decrease the military spending. He stated that: "First, there is the motive of revenge or hostility which is independent of existing armaments, and which tends to be enduring and constant. Second, there is the very strong motive of fear, which moves each group to increase its armaments because of the existence of those of the opposing group. Finally, there is always a tendency for each group to reduce its armaments in order to economise expenditure and effort" (Richardson 1960, pp. 13).

A strand in the literature has examined the arms race between Greece and Turkey. However, there is no common pattern in empirical results of previous studies. Majeski & Jones (1981) applied the Richardson model for twelve pairs of countries which proposed as rivals in arm races. Their argument was that Richardson model of arm races is unjustifiably restrictive. In 7 cases they found that military spending of the two nations are independent, in 5 cases they found some form of independence. Finally, the dyad members, Arab-Israel, Greece-Turkey and NATO-WTO show evidence of an interesting relationship, where each nation is responding to the actions of the opponent.

The study of Kollias (1991) included a multiple regression analysis in order to test if there is an arms race between Turkey and Greece. He hypothesized that when suitable variables are introduced, it is possible to capture the way that Greek military expenditure is influenced by the Turkish threat. He claimed that these variables have to allow for the strategic environment within which decisions are made by Greek military authorities. He found evidence that because of differences in size and quantitative of military disadvantage, Greece tries to offset this by gaining a qualitative advantage over Turkey. Kollias & Paleologou (2002) examined if there is a Greek-Turkish arms race for the period of 1950-1999. They applied the causality methodology employed by Hendry & Ericsson (1982). Their empirical results support the view that there is an arms race between the two countries, since there is a bi-directional causality between military spending of these countries. However, they implied that military spending is a function of many determinants (economic constraints, alliance membership, external and internal concerns), which can have an impact on the level of military spending.

Another attempt of examining the arms race between Greece and Turkey made by Ocal (2003), and used data for the period 1956-1994. He assumed that if there are two regimes that characterize the low and high growth of military spending periods, there is a possibility that military spending of one country have distinct impact on the military spending regimes in the rival. His empirical results indicate that Greece does not want to fall behind Turkey; however, he mentioned there are many factors affected these variables. Finally, Ocal & Yildirim (2009) tested the long-run relationship between the military spending of Greece and Turkey by using linear cointegration techniques. They argued that if the adjustment towards long-run equilibrium is asymmetric there should be applied nonlinear co-integration models. They included a threshold autoregressive (TAR) and momentum threshold autoregressive (M-TAR) models as substitute adjustment processes for the cointegration relationship. There was evidence that military spending in Turkey adjusted to discrepancies from the long-run equilibrium, while in the case of Greece did not. Furthermore, there was not any evidence of clear-cut bidirectional causality and implied that there is an arms race. They stated that the conflicting results of earlier literature probably occurred because some authors ignored the nonlinear specifications.

3. Data

The examination of the relationship between military spending and economic growth for Greece is particularly insightful, as it is a small economy, with many economic problems (huge deficits and public debt), and with many security concerns (especially with Turkey and Albania). Another interesting characteristic of the Greek case is the geographic situation of the country and the fact that it is the only EU country which does not have borders with another EU country. The Greek economy had increased economic growth especially since 1950s. The period 1950-1970 was considered as a “Greek Economic Miracle” because the country faced an average annual rate of economic growth of 7%. However, by the end of 1960s the country faced many problems due to the international recession and the increased price of oil. Moreover, in 1974 the relationship with Turkey worsened and the government spending on defence increased, as a result of the Turkish invasion of Cyprus.

It is important to mention the geopolitical and economic significance of the country since the birth of the nation attracted the interest of the Great Powers (the U.S.A., the U.K., France and Germany). Since 1829, Greece was dependent on international economic relationship (loans) with the Great Powers. Many

politicians and historians, in Greece and Turkey highlighted the significant impact of Great Powers in the tension between Greece and Turkey across time. Military spending in Greece as a share of GDP in 2000 was double in comparison to the NATO counties and more than twice the average of NATO European countries. The explanations for this difference are straightforward. Greece was not only a front-line NATO state during the Cold War, but also faced troubled relations with Turkey, which maintained high levels of defence spending after the Cold War ended.

Our empirical analysis has been carried out using annual data for Greece for the period 1957-2010. We employ the following variables: LMIL (military spending as a share of GDP), LGDP (real GDP). The data that we use in our paper has been obtained from several issues of the National Accounts of Greece published by the National Statistical Service of Greece. For Turkey we used data for the same period, which was obtained from Stockholm International Peace Research Institute (SIPRI).

As we noticed in the previous section, many authors found some empirical evidence for the arms race between Greece and Turkey. According to Brito & Intriligator (1995), the arms race is the competitive, resource constrained, dynamic process of interaction between two countries in their acquisition of arms. Kollias (1991) found evidence that Greece tries to offset this by gaining a qualitative advantage over Turkey, because of differences in size and the quantitative of military disadvantage. Ocal (2003) suggested that Greece does not want to fall behind Turkey; however, he mentioned there are many factors affecting these variables. Thus, it is crucial to investigate if the arms race hypothesis is valid for the case of Greece-Turkey.

Figure 3 reports the military spending in these two countries as a share of GDP during 1957-2013. During the period 1957-1974 the Turkish military spending was higher than Greek. However, during the period of dictatorship in Greece (1967-1974) there was an upward trend in Greek spending. The first break in our series is reported in 1975, one year after the Turkish evasion in Cyprus, a period of tension between the two countries. For the period 1980-1995 the Greek military spending overstepped the Turkish military spending. This period can be characterised as a period with increased public deficits and spending for Greece. Finally, during the last 15 years Turkey increased the government spending for military purposes and Greece tries to not fall behind.

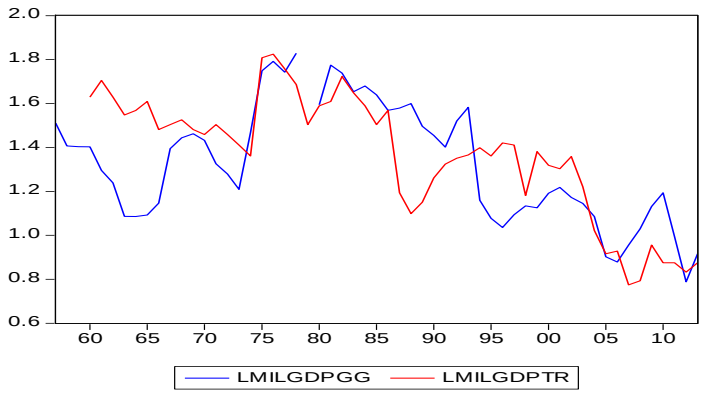

Figure 3. *Military spending as a share of GDP in Greece and Turkey (1957-2013)*

4. Empirical results

In this paper we investigate the relationship between military spending and economic growth in Greece and Turkey during the last 6 decades and examine the validity of arms race hypothesis between these 2 countries. Firstly, we use unit root tests to test for stationarity. Secondly, we apply the cointegration techniques Engle & Granger (1987) and Johansen (1990) to see if there is a long run relationship between military spending and economic growth. Finally, we deploy the Granger causality test to examine the direction of the causality.

4.1. Unit root tests

The first step in our analysis is to verify the order of integration of the variables since the causality tests are valid if the variables have the same order of integration. Augmented Dickey-Fuller (ADF) (1979) and Phillips-Perron (PP) tests are applied in order to determine the order of integration of the tested variables. The tested series are: LMil (military spending as a share of GDP), LGDP (real GDP), in Greece and Turkey for the period of 1957-2013.

Table 2 presents the results of ADF and PP unit root and stationarity test conducted on the logged values of the tested series. These results indicate that all the series are found to have a unit root and are non–stationary at the 5% level. The unit root test for the first difference of the series in both unit root tests shows evidence of stationarity and the rejection of the hypothesis for the existence of a unit root in all the tested series. Thus, is considered that according the ADF and PP with intercept, or with intercept and trend all the series are integrated of first order (I (1)).

Table 2. *Unit root tests for Greece and Turkey, 1957-2013*

Greece 1957-2013, Intercept						
Augmented Dickey Fuller unit root test (ADF)						
Variables	t(ADF)	P-Value	Variables	t(ADF)	P-Value	Critical value (5%)
Lmil(0**)	-0.95	0.76	ΔLMil(1)	-5.49*	0.0000	-2.91
LGDP(1)	-1.50	0.52	ΔLGDP(0)	-4.70*	0.0003	-2.91
Greece 1957-2013, Intercept and Trend						
Augmented Dickey Fuller test (ADF)						
Variables	t(ADF)	P-Value	Variables	t(ADF)	P-Value	Critical value (5%)
Lmil(0)	-2.35	0.39	ΔLMil(0)	-5.48*	0.0002	-3.5
LGDP(0)	1.35	0.99	ΔLGDP(0)	-4.99*	0.0008	-3.5
Turkey 1957-2013, Intercept						
Augmented Dickey Fuller test (ADF)						
Variables	t(ADF)	P-Value	Variables	t(ADF)	P-Value	Critical value (5%)
Lmil(0)	-0.87	0.78	ΔLMil(0)	-6.65*	0.000	-2.91
LGDP(0)	-0.84	0.79	ΔLGDP(0)	-7.61*	0.000	-2.91
Turkey 1957-2013, Intercept and Trend						
Augmented Dickey Fuller test (ADF)						
Variables	t(ADF)	P-Value	Variables	t(ADF)	P-Value	Critical value (5%)
Lmil(0)	-2.65	0.26	ΔLMil(0)	-7.52*	0.000	-3.50
LGDP(0)	-2.47	0.33	ΔLGDP(0)	-7.53*	0.000	-3.50
Greece 1957-2013, Intercept						
Phillips Perron unit root test (pp)						
Variables	PP	P-Value	Variables	PP	P-Value	Critical value (5%)
Lmil(0)***	-1.21	0.66	ΔLMil(4)	-5.81*	0.0000	-2.91
LGDP(4)	-1.26	0.64	ΔLGDP(4)	-4.89*	0.0002	-2.91
Greece 1957-2013, Intercept and Trend						
Phillips Perron unit root test (pp)						
Variables	PP	P-Value	Variables	PP	P-Value	Critical value (5%)
Lmil(0)	-1.60	0.77	ΔLMil(5)	-5.58*	0.0001	-3.5
LGDP(4)	-0.30	0.99	ΔLGDP(3)	-4.98*	0.0008	-3.5

Turkey 1957-2013, Intercept

Phillips Perron unit root test (pp)						
Variables	PP	P-Value	Variables	PP	P-Value	Critical value (5%)
Lmil(1)	-1.11	0.7040	ΔLMil(4)	-7.80*	0.00	-2.91
LGDP(2)	-0.77	0.81	ΔLGDP(3)	-7.63*	0.00	-2.91
Turkey 1957-2013, Intercept and Trend						
Phillips Perron unit root test (pp)						
Variables	PP	P-Value	Variables	PP	P-Value	Critical value (5%)
Lmil(0)	-2.65	0.26	ΔLMil(5)	-7.74*	0.000	-3.50
LGDP(1)	-2.49	0.32	ΔLGDP(3)	-7.57*	0.00	-3.50

Note: * indicate rejection of the null hypothesis at the 5% level of significance. ** number in parentheses of ADF indicates the lag length based on SIC.***number in parentheses in PP indicates the Bandwidth, Newey-West using Barlett kernel.

4.2. Johansen approach

We found evidence from ADF and PP test that all the series are integrated of first order (I (1)). For the case of Greece we have one three dimensional VAR (LMIL, LGDP, D1993) and estimated using two lag of the variables in order to obtain non-correlated residuals. We include one[3] dummy variable (D1993) in order to account for specific structural breaks in Greek military spending during the tested period. In our estimated model the dummy is kept in the respective VAR as it turned out to be significant, whereas its absence will mean non normal residuals for the relevant VAR. For the case of Turkey, we have one two [4]dimensional VAR (Lmil, LGDP). Finally, for the arms race hypothesis, we have one four dimensional VAR (LmilGR, LmilTRK, LGDPGR, LGDPTRK).

All the VARs satisfy all the statistical assumptions required for the Johanshen approach and we can apply cointegration analysis. In Table 3 are reported the diagnostic tests for heteroskedasticity and autocorrelation in all the VARs.

Table 3. *Diagnostic tests*

Greece 1957-2013				
	Heteroskedasticity	F-critical	Autocorrelation	
	F(14,30)= 0.59	2,01	LM-STAT	Critical (Chi-sq)(df=4)
			2.27	9.48
		Chi-sq critical		
	Chi-sq(14)=9.76	23.68		
Turkey 1957-2013				
	Heteroskedasticity	F-critical	Autocorrelation	
	F(14,32)= 0.66	2,01	LM-STAT	Critical (Chi-sq)(df=4)
			2.29	9.48
		Chi-sq critical		
	Chi-sq(14)=10.64	23.68		
Greece-Turkey				
	Heteroskedasticity	F-critical	Autocorrelation	
	F(16,25)= 1.77	2,07	LM-STAT	Critical (Chi-sq)(df=16)
			9.61	28.84
		Chi-sq critical		
	Chi-sq(16)=22.34	28.84		

[3] We applied unit root tests with breaks we found more than one structural changes, however when we include them in the VAR, the residuals were correlated and we could not reject the hypothesis of the presence of heteroskedasticity. Thus, we include only the break at 1993, where all the diagnostic tests satisfy all the statistical assumptions.

[4] We applied the dates obtained from Chow test as dummies, however we cannot reject the presence of heteroscedasticity. Thus, we do not include them in the VAR.

Johansen's cointegration approach uses the maximum likelihood estimation in a VAR model. There are two statistics created by this approach: the trace statistic and maximum Eigenvalue. The Trace statistic examine the null hypothesis that there is at most *r* number of cointegrating vectors and the alternative hypothesis of *r* or more than *r* number of cointegrating vectors. The maximum Eigenvalue statistics examine for *r* number of cointegrating vectors against the alternative of *r* + 1 number of cointegrating vectors. The results of Johansen approach for our models are reported in Table 4 and indicate that there is one cointegration vector between military spending and GDP during 1957-2010 in Greece and in arms race hypothesis (Greece-Turkey). This happens because we reject the null hypothesis that *r*=0, so we have at least one cointegration vector. Finally, we cannot reject the null hypothesis of no cointegration in the case of Turkey.

Table 4. *Johansen Cointegration test*

Greece 1957-2013									
VAR 1: (Lmil GR, LGDPGR, DUM1993), 2 lags									
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r=0	0.466457	44.81772*	29.79707	0.0005	r=0	0.466457	32.66725*	21.13162	0.0008
r=1	0.164146	12.15047	15.49471	0.1499	r=1	0.164146	9.323654	14.26460	0.2602
r=2	0.052911	2.826815	3.841466	0.0927	r=2	0.052911	2.826815	3.841466	0.0927
Turkey 1957-2013									
VAR 2: (LmilTRK, LGDPTRK), 1 lag									
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r=0	0.170801	10.00156	15.49471	0.2806	r=0	0.170801	9.739376	14.26460	0.2296
r=1	0.005029	0.262181	3.841466	0.6086	r=1	0.005029	0.262181	3.841466	0.6086
Greece-Turkey 1957-2013									
VAR 3: (LmilGR, LmilTRK, LGDPGR, LGDPTRK), 1 lag									
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r=0	0.382778	47.54765*	40.17493	0.0077	r=0	0.382778	25.64381*	24.15921	0.0586
r=1	0.236221	23.90384	24.27596	0.0556	r=1	0.236221	13.20435	17.79730	0.2150
r=2	0.194988	10.69948	12.32090	0.0921	r=2	0.194988	10.62801	11.22480	0.0635
r=3	0.001458	0.071475	4.129906	0.8264	r=3	0.001458	0.071475	4.129906	0.8264

Note: * indicate rejection of the null hypothesis at the 5% level of significance.

4.3. Engle-Granger cointegration technique

One other simple method of cointegration is Engle-Gragner (EG) or Augmented Engle-Gragner (AEG) test (1987). This approach is based in the idea that if there is a cointegration between the variables, the residuals that will be obtained from OLS equations, has to be stationary. So, in order to test for long run relationship between military spending and GDP, we are testing the stationarity of residuals with the help of ADF.

Table 5. *Engle-Granger technique (1st step)*

Greece 1957-2013							
Lmil	Coefficient	t-stat	Std.Error	LGDP	Coefficient	t-stat	Std.Error
LGDP	-0.047284	-3.58351	0.01319	LMil	-4.063083	-3.58351	1.133
C	2.472420	7.69490	0.32130	C	29.61676	19.3002	1.534
N	56			N	56		
R-squared	0.912			R-squared	0,92		
Adjusted R-squared	0.177			Adjusted R-squared	0,177		
Durbin-Watson	0.229			Durbin-Watson	0,04		

F-stat	12.84			F-stat	12.84		
	Turkey 1957-2013						
Lmil	Coefficient	t-stat	Std.Error	LGDP	Coefficient	t-stat	Std.Error
LGDP	-0.030562	-7.99553	0.00382	LMil	-18.04379	-7.99553	2.256
C	2.292163	19.2659	0.11897	C	54.98644	17.5053	3.141
N	54			N	54		
R-squared	0.55			R-squared	0.55		
Adjusted R-squared	0.54			Adjusted R-squared	0.54		
Durbin-Watson	0.46			Durbin-Watson	0.36		
F-stat	63.92			F-stat	6392		
	Greece-Turkey 1957-2013						
LmilGR	Coefficient	t-stat	Std.Error	LmilTRK	Coefficient	t-stat	Std.Error
LmilTRK	0.643492	6.3389	0.1015	LmilGR	0.684822	6.3389	0.108
C	0.444709	3.1523	0.1410	C	0.456715	3.1354	0.145
N	53			N	53		
R-squared	0.44			R-squared	0.44		
Adjusted R-squared	0.42			Adjusted R-squared	0.42		
Durbin-Watson	0.39			Durbin-Watson	0.37		
F-stat	40.18			F-stat	40.19		

We are testing if the residuals $e_t = -lMil_t - c - blGDP_t$ have a unit root, by performing a unit root test. The results reported in Table 6 indicate that we cannot reject the null hypothesis that there is unit root in 5% critical value for the tested period. Since the computed t value for the first period is much higher than the critical value, our conclusion is that the residuals from the equations, $lGDP_t = c - blMil_t + e_t lMil_t = c - blGDP_t + e_t$ are stationary. According to Gujarati (2003), hence the equations: $lGDP_t = c - blMil_t + e_t$ and $lMil_t = c - blGDP_t + e_t$ are cointegrating regressions and the regression is not spurious. Hence, we can reject the null hypothesis for the tested period, so ε_t is stationary and there is evidence of long run relationship between military spending and GDP or between the military spending of the two countries.

Table 6. *Unit root tests in residuals (Engle-Granger 2nd step)*

Greece 1957-2013			
LGDP		LMil	
t-statistic	-5.32*	t-statistic	-5.47*
	(0.0000)		(0.0000)
t-critical	-2,92	t-critical	-2,92
Conclusion	Stationary	Conclusion	Stationary
Turkey 1957-2013			
LGDP		LMil	
t-statistic	-6.86*	t-statistic	-7.11*
	(0.000)		(0.000)
t-critical	-2.92	t-critical	-2.92
Conclusion	Stationary	Conclusion	Stationary
Greece-Turkey			
LMilGR		LMilTRK	
t-statistic	-7.065*	t-statistic	-8.12*
	(0.000)		(0.000)
t-critical	-2.93	t-critical	-2.93
Conclusion	Stationary	Conclusion	Stationary

Furthermore, the calculated elasticities from OLS support the view of the economist and politicians that military spending has a negative impact on economic growth of these two countries. Government authorities and politicians should decrease the military spending in order to boost the economic growth in their countries.

4.4. Granger Causality tests

If two variables are cointegrated, we can use the Granger causality test (1969) in order to check the short run relationship between variables. The Granger causality test examine whether variable Y's current value can be explained by its own past value and whether the explanatory power could be improved by adding the past value of another variable X. If the coefficient of X is statistically significant, X is said to Granger cause Y.

We run the Granger causality test by using two lags in order to ensure uncorrelated residuals. The Johansen cointegration approach results indicate that there is one cointegration vector between military spending and economic growth, so we can define the Granger causality tests as joint test (F-tests) for the significance of the lagged value of the assumed exogenous variable and for the significance of the error correction term. The results are reported in Table 7 and indicate that Granger causality is running from military spending to GDP in Greece and Turkey. Finally, there is no evidence of causality between the Greek and Turkish military spending, so we reject the hypothesis of arms race between the two countries.

Table 7. *Granger causality test*

Greece 1957-2013	F-stat	P-value		F-stat	P-value
LGDP causes LMil	3.14	0.052	LMil causes LGDP	5.99*	0.0048
Turkey 1957-2013	F-stat	P-value		F-stat	P-value
LGDP causes LMil	1.33	0.27	LMil causes LGDP	3.25*	0.047
Greece -Turkey 1957-2013	F-stat	P-value		F-stat	P-value
LMilTRK causes LMilGR	1.04	0.35	LMilGR causes LMilTRK	2.98	0.06

5. Conclusion

In this paper we empirically test the relationship between military spending and economic growth for Greece and Turkey during 1957-2013, and examine the validity of arms race hypothesis between the two countries. We deployed unit root tests, unit root tests with structural changes, cointegration techniques and finally Granger causality tests. Greece is a very interesting case in European Union for examining the relationship between military spending and economic growth. Greece is a small, industrialised country, with many economic problems such as huge deficits, an exploding public debt and security concerns such as problems mainly with Turkey.

Our empirical results of both cointegration techniques applied in the case of Greece indicate the existence of long-run relationship between the military spending and economic growth. In the case of Turkey, the Johansen technique shows that there is no long-run relationship between military spending and economic growth. This is in accordance to Dunne et al. (2001), who found long run relationship between military spending and growth in Greece but not in Turkey. The Engle-Granger technique estimations indicate that there is a negative impact of military spending in economic growth in both countries which support the view of most economists and politicians in both countries (Antonakis & Karavidas, 1990; Antonakis, 1997; Andreou, Parsopoulis & Vrahatis, 2002; Kollias, 2004). Especially in Greece, the large military spending during the last

decades had a negative impact on the economic growth of the country. Dunne & Nikolaidou (2001) found that military spending has a positive impact in Greece and negative in Turkey.

Granger causality tests in the case of Greece and Turkey imply that the causality runs from military spending to economic growth. Thus, if these countries want to improve their economic performance and reduce the budget deficits, they have to reduce the huge military burden. When we examine the long run relationship between the Greek and Turkish military spending, we find that these variables are cointegrated, and when we apply the Granger causality tests we find that there is no evidence of causality between Greek and Turkish military spending, which mean that that these countries act independently. Our findings are in accordance with previous studies of Majeski (1981), Kollias (2002), and Ocal (2009), that there is no support of the arms race hypothesis between Greece and Turkey.

However, the rejection of arms race hypothesis was not predictable, since after the period of Turkish invasion in Cyprus in 1974 and the bilateral arguments which was and is still regarded as the main reason for the Greek–Turkish increase of military spending during the last years. Finally, the empirical results indicate that for Greece and Turkey the causality runs from military spending to economic growth and that there is a negative impact of military spending to economic growth. Thus, if Greece and Turkey want to improve their economic performance and reduce their budget deficits, they should decrease the enormous military burden.

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