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# A CAUSAL ANALYSIS OF THE DEFENCE-GROWTH RELATIONSHIPS: EVIDENCE FROM THE BALKANS

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**Abstract**

The causal relationships between military burden and economic growth have attracted considerable interest of academics, scholars and practitioners during the last three decades. This survey is hoping to contribute to the existing pool of literature by investigating the causal links between defence spending and economic growth for three developing Balkan countries (Bulgaria, Romania and Albania) and their mature counterpart in the Balkan Peninsula (Greece) during the period 1988-2009. Empirical results imply that there are no bilateral links between the tested variables for any of the tested countries. However, findings indicate the presence of one-way causal links running from military expenditures to GDP only for Bulgaria and Albania, implying the significant impact of defence burden on growth for these countries. On the other hand, empirical results for Greece and Romania suggest that defence spending and GDP growth are independent, which favours neutrality hypothesis. Nevertheless, it should be mentioned that we would expect to find significant links especially in the case of Greece, due to the fact that the country presents the highest defence expenditures in the Balkan region for the last fifteen years. These contradictory results could be due to different levels of maturity between the tested countries but it could also be attributed to temporary changes of accounting practises (i.e. recording expenses when military material was ordered rather than received, as evidenced in the case of Greece in the late 1990's by government officials). These accounting changes could be the obstacle in some cases (e.g. Greece) to provide empirical evidence of the links between defence burden and economic growth.

**Keywords:** Cointegration, Granger Causality, Balkan Countries.

## 1.Introduction

Since the seminal work of Benoit (1973, 1978) the relationship between economic growth and defence spending has been the subject of extensive theoretical and empirical work presenting however contradictory evidence. This survey focuses on the investigation of the causal links between defence spending and economic growth for three developing countries (Bulgaria, Romania and Albania) and one developed country (Greece) located all four in the Balkan region. The Balkans (often referred to as the Balkan Peninsula, although the two are not coterminous) is a geopolitical and cultural region of south-eastern Europe. The peninsula has a combined area of 550,000 square kilometers and a population of over 50 million people.

The economy of Greece is the 27$^{th}$ largest in the world by nominal gross domestic product (GDP) and the 34$^{th}$ largest at purchasing power parity (PPP), according to data by the World Bank for the year 2009. Per capita, it is ranked 24th by nominal GDP and 23$^{rd}$ at PPP according to the 2009 data. A developed country with the 22$^{nd}$ highest human development and quality of life indices in the world, Greece is a member of the European Union, the Eurozone, the OECD, the World Trade Organization and the Black Sea Economic Cooperation Organization. The public sector accounts for about 40 percent of GDP. The service sector contributes 78.5 percent of total GDP, industry 17.6 percent, and agriculture 4 percent. Greece is the 31$^{st}$ most globalized country in the world and is classified as a high-income economy.

Greece was accepted into the Economic and Monetary Union of the European Union by the European Council on 19 June 2000, based on a number of criteria using 1999 as the reference year. After an audit commissioned by the government in 2004, Eurostat revealed that the budgetary statistics on the basis of which Greece joined the Eurozone had been under-reported. Most of the differences in the revised numbers were due to a temporary change of accounting practices by the new government, (i.e. recording expenses when military material was ordered rather than received). This method, in conjunction with the retroactive application of ESA95 methodology by Eurostat, led to a reference year budget deficit of 3.4 percent of GDP in 1999, leading to claims that Greece had not actually met all the accession criteria. The Greek minister of finance stated nonetheless that even the revised 1999 budget deficit was below the prescribed 3 percent limit when calculated with the ESA79

methodology in force at the time of Greece's application, and thus the criteria had been met. To complicate things further, the original accounting practice for military expenses was later restored in line with Eurostat recommendations, lowering the 1999 Greek budget deficit to well below 3 percent.

The civilian authority for the Greek military is the Ministry of National Defence. Furthermore, Greece maintains the Hellenic Coast Guard for law enforcement in the sea and for search and rescue. Greece has universal compulsory military service for males, while females (who may serve in the military) are exempted from conscription. As of 2009, Greece has mandatory military service of nine months for male citizens between the ages of 19 and 45. However, as the armed forces had been gearing towards a complete professional army system, the government had promised that the mandatory military service would be cut or even abolished completely. Greek males between the age of 18 and 60 who live in strategically sensitive areas may be required to serve part-time in the National Guard. Service in the Guard is paid. As a member of NATO, the Greek military participates in exercises and deployments under the auspices of the alliance.

On the other hand, Bulgaria has an industrialized, free-market economy, with a large moderately advanced private sector and a number of strategic state-owned enterprises. The World Bank classifies the country as an "upper-middle-income economy". Bulgaria has experienced rapid economic growth during the 2000's, even though its income level remains one of the lowest within the EU. According to Eurostat data, Bulgaria's PPS GDP per capita stood at 45 percent of the EU average in 2009, while the cost of living in the country was 51 percent of the EU average in 2010. The Bulgarian lev is the country's national currency. In 2010, GDP (PPP) was estimated at 96.778 billion U.S. dollars, with a per capita value of 12,851 U.S. dollars. The services sector accounts for 63.7 percent of the GDP, followed by the industry with 30.3 percent and agriculture with 6 percent. The military of Bulgaria, an all-volunteer body, consists of three services; land forces, navy and air force. As a NATO member, the country maintains a total of 913 troops deployed abroad. Following a series of reductions beginning in 1990, the active troops in 2009 number about 32,000, down from 152,000 in 1988, and are supplemented by a reserve force of 303,000 soldiers and officers and paramilitary forces, numbering 34,000. Military spending in 2009 cost 1.19 billion U.S. dollars.

Romania has a developing, upper-middle income market economy, the 11th largest in the European Union by total nominal GDP and the 8th largest based on purchasing power parity. Romania entered the 1990's as a relatively poor country by European standards,

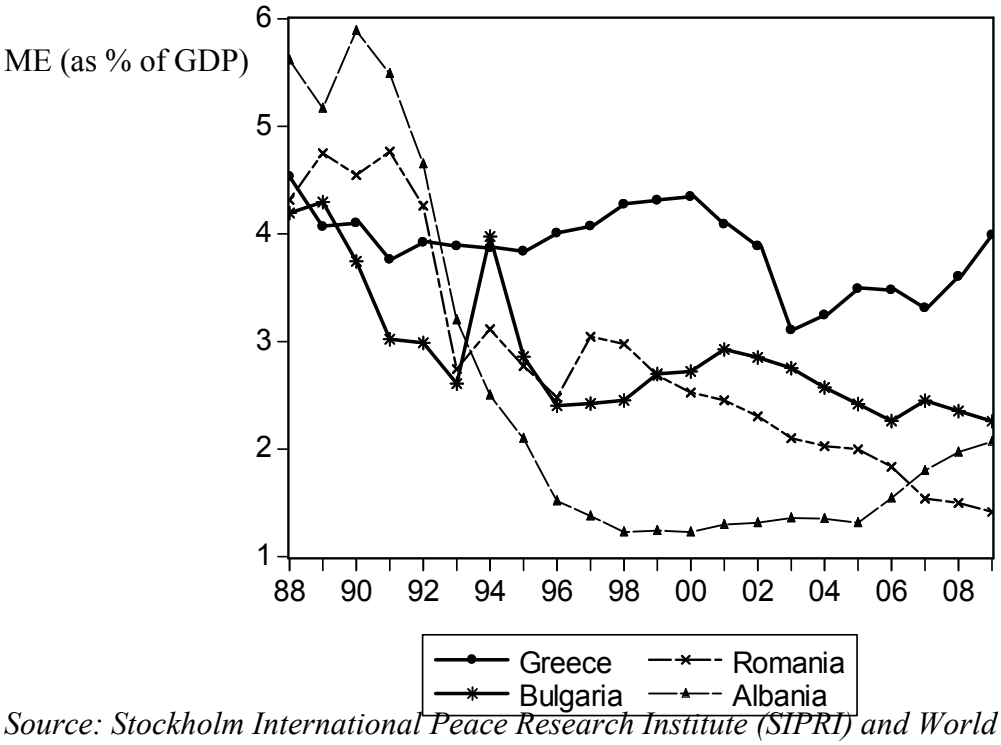
largely a result of the failed socialistic economic policies in the 1970's and of the failures of privatization in Romania during the 1990's, which decreased the GDP by almost 50 percent and ruined the industry because of corruption. However the collapse of the Communist regime in 1989, reforms in the 2000's and its recent entry to the European Union (i.e. 2007) have led to an improved economic outlook. Romania has experienced growth in foreign investment with a cumulative FDI totaling more than 100 billion U.S. dollars since 1989, and has experienced high growth rates and rapid development during the last decade. Until 2009, Romanian economic growth was among the fastest in Europe (officially 8.4 percent in 2008 and more than three times the EU average). The country is a regional leader in multiple fields, such as IT and motor vehicle production, and is expected to join the Eurozone by 2014. Bucharest, the capital city, is one of the largest financial and industrial centers in Eastern Europe. The Romanian Armed Forces consist of Land, Air, and Naval Forces, and are led by a Commander-in-chief who is managed by the Ministry of Defence. Of the 90,000 men and women that comprise the Armed Forces, approximately 15,000 are civilians and 75,000 are military personnel. The total defence spending in 2007 accounted for 2.05 percent of total national GDP, or approximately 2.9 billion U.S. dollars (39th in the world), and a total of about 11 billion U.S. dollars spent between 2006 and 2011 for modernization and acquisition of new equipment. The Land Forces have overhauled their equipment in the past few years, and today are an army with multiple NATO capabilities.

Finally, Albania remains a poor country by Western European standards. The country's GDP per capita (expressed in Purchasing Power Standards, PPS) stood at 26 percent of the EU average in 2010. Still, Albania has shown potential for economic growth, as more and more businesses relocate there and consumer goods are becoming available from emerging market traders as part of the current massive global cost-cutting exercise. Albania, Cyprus and Poland are the only countries in Europe that recorded economic growth in the first quarter of 2009. International Monetary Fund (IMF) predicted 3.2 percent growth for Albania in the end of 2011. There are signs of increasing investments, and power cuts are reduced to the extent that Albania is now exporting energy. Agriculture is the most significant sector, employing some 58 percent of the labour force and generating about 21 percent of GDP. The Euro-Atlantic integration of Albania has been the ultimate goal of the post-communist governments. Albania's EU membership bid has been set as a priority by the European Commission. Albania, along with Croatia, joined NATO on 1 April 2009 becoming the 27th and 28th members of the alliance. The workforce of Albania has continued to migrate to Greece, Italy, Germany, other parts of Europe, and North America. However, the

migration flux is slowly decreasing, as more and more opportunities are emerging in Albania itself as the country's economy steadily develops.

Figure 1 illustrates the trends in military expenditure (ME) as a percentage of GDP for the sample of the four Balkan countries (i.e. Greece, Bulgaria, Romania and Albania) during the period 1988-2009. Collectively, during the late 1980's and the early 1990's Albania presents the highest ME to GDP ratio recording a pick of 5.89 percent in 1990. Second ranks Romania during the same period by presenting a historical high rate of 4.76 percent in 1991. Furthermore, Bulgaria shows a relatively smaller pick of 4.3 percent in 1989. Since the mid 1990's, all three countries' ME to GDP ratio significantly decreases. On the other hand, Greece's ME to GDP ratio has not presented a significant downward trend and especially from the mid 1990's until 2009 the country continues to hold the highest by far ME to GDP ratio in the region. Taking into account that Greece is a NATO member since 1952, an EU member officially since 1981 and a member of the Eurozone since 2001 these high figures of military expenditure can only be attributed to the enduring dispute with Turkey regarding cases such of Cyprus and the Aegean Sea.

**Figure 1: Trends in Military Expenditure to GDP (1988-2009)**




*Source: Stockholm International Peace Research Institute (SIPRI) and World Development Indicators (World Bank Database)*

In this spirit, the central objective of this study is to investigate the causal links between military expenditures and economic growth for three developing Balkan countries (Bulgaria, Romania and Albania) and their mature counterpart, Greece. This paper is motivated by a number of factors. First, there is a lack of comparative studies investigating the presence of interdependence between military burden and economic growth for these Balkan countries. Second, this survey is hoping to enrich the existing literature on the causal links between defense expenditure and growth by analyzing these four neighboring Balkan countries, which although are located in the same region they present interesting structural and financial differences. Third, it covers a period, which includes some of the most important macroeconomic and political transformations leading to more open and therefore more globalized and EU-oriented Balkan economies.

The rest of the paper is organized as follows. Section 2 reviews the literature on defence spending by analysing theoretical (2.1) and empirical (2.2) studies. Section 3, presents the data and methodology employed. Section 4 presents the empirical results, while concluding remarks with some policy implications are presented in Section 5.

## 2.Review of Related Literature

### 2.1 Economic theories on defence spending

To interpret the empirical results it is necessary to present the basic theoretical background regarding the role of military spending. Regardless the fact that the literature has adopted three basic positions (i.e. the neoclassical approach, the Keynesian approach and the Marxist approach), none of them has achieved to provide an explicit role for defence expenditure as a distinctive economic activity.

The neoclassical approach sees the state as a rational actor which balances the opportunity costs and security benefits of military spending in order to maximise a well-defined national interest reflected in a social welfare function. Military expenditure can then be treated as a pure public good and the economic effects of military expenditure are determined by its opportunity cost, with a clear trade-off between civil and military spending. This approach allows consistent formal theoretical models to be developed to inform empirical work and has had a major influence on the literature. It can, however, be criticised for being concentrated on the supply side, ignoring the internal role of the military and military interests, implying a national consensus and requiring extreme knowledge and unrealistic computational abilities of the rational actors (Smith, 1977). The most influential

neoclassical model was the Feder-Ram model (Biswas and Ram, 1986) but this has recently come under intense criticism by Dunne et al (2005). Other developments saw new classical economists using military expenditure as an important shock to the system, which can have dynamic real effects on real output and more recently attempts to introduce military spending into endogenous growth models.

On the other hand, the Keynesian approach saw a proactive state using military spending as one aspect of state spending to increase output, through multiplier effects in the presence of ineffective aggregate demand. Military spending can then lead to increased capacity utilisation, increased profits and hence increased investment and growth (Faini et al., 1984). It has been criticised for its failure to consider supply side issues, leading many researchers to include explicit production functions in their Keynesian models (Deger and Smith, 1983). More radical Keynesian perspectives have focused on the way in which high military spending can lead to industrial inefficiencies and to the development of a powerful interest group composed of individuals, firms and organisations that benefit from defence spending, usually referred to as the Military Industrial Complex, (MIC). The MIC increases military expenditure through internal pressure within the state even when there is no threat to justify such expenditures (Dunne and Sköns, 2010).

Finally, the Marxist approach sees the role of military spending in capitalist development as important though contradictory. There are a number of strands to the approach which differ in their treatment of crisis, the extent to which they see military expenditure as necessary to capitalist development, and the role of the MIC in class struggle. One variation of this approach has provided the only theory in which military spending is both important in itself and an integral component of the theoretical analysis, the under-consumptionist approach. Developed from Baran and Sweezy (1966) this sees military expenditure as important in overcoming realisation crises, allowing the absorption of surplus without increasing wages and so maintaining profits. No other form of government spending can fulfill this role. While this approach has been extremely influential in the general economic development literature, empirical work within this approach has tended to be limited to developed economies (Smith, 1977).

### 2.2 Brief review of empirical studies

The inability of the theoretical analyses (as analysed briefly in the previous section) to produce a unified theory that interprets the explicit role of military spending as an

independent macroeconomic tool is in line with the contradictory empirical evidence produced by the rich empirical literature.

Deger (1986) suggests, economic growth may also be stimulated through spin-off effects such as the creation of a socio-economic structure conducive to growth. On the other hand, however, such spending has been shown to have growth-retarding effects, mainly through investment crowding-out, inflationary pressures and the reduction of available public funds for spending and investment in other, potentially more productive and growth inducing, areas. All these channels through which military spending can influence – promote or retard – growth assume that such expenditures are causally prior to economic growth.

However, as Joerding (1986) notes, economic growth may be causally prior to defence spending. Thus, although military expenditures may affect growth through the mechanisms mentioned earlier, it is also plausible that economic growth may be causally prior to military spending. For example, a country with high growth rates may wish to strengthen its external as well as internal security by increased defence spending (Dakurah et al., 2001). Furthermore, it is equally plausible that countries with high growth rates may divert resources from defence to other more productive uses.

Regarding causality analysis there are four possible outcomes when it comes to the causal ordering between growth and military spending: bi-directional causality between the two time-series, unidirectional causality from growth to defence expenditure or vice versa and the absence of any causal relationship. In the context of the preceding brief discussion of the issues involved, the causal relationship between economic growth and military spending has been the subject of extensive empirical work (e.g. Dakurah et al., 2001; Castille et al., 2001; Dunne et al., 2001; Madden and Haslehurst, 1995; Kusi, 1994; Kollias and Makrydakis, 1996, 2000; Nadir, 1993; Heo, 1998; Chowdhury, 1991; LaCivita and Frederiksen, 1991; Joerding, 1986). A survey of this literature reveals little consensus on the existence of such a relationship or, when it exists, its nature and direction varies. Unidirectional causality (from military expenditure to growth or from growth to military expenditure), bilateral causality and no-causality have been reported.

Taking into consideration the generated empirical evidence and its lack of consistency, one may reach the conclusion that this relationship cannot be generalized across countries and over time since, among other things, it depends on the level of socio-economic development of the country (or countries) involved, the sample period as well as the methodology employed (Kollias et al., 2004).

## 3.Data and Methodology

This survey investigates the causal links between military expenditures as a percentage of Gross Domestic Product (GDP) and GDP growth rate by employing a data set of Balkan countries (i.e. Greece, Bulgaria, Romania and Albania) during the period 1988-2009. All selected data are in annual base and gathered from reliable sources; Military expenditures (ME) data are derived from the Stockholm International Peace Research Institute (SIPRI) and the World Development Indicators (i.e. the World Bank database), while economic growth data are gathered solely from the World Development Indicators. Authors' calculations are conducted using the E-views 7.1 software (2010).

Military expenditures (ME) data from SIPRI are derived from the North Atlantic Treaty Organization (NATO) definition, which includes all current and capital expenditures on the armed forces, including peacekeeping forces; defense ministries and other government agencies engaged in defense projects; paramilitary forces, if these are judged to be trained and equipped for military operations; and military space activities. Such expenditures include military and civil personnel, including retirement pensions of military personnel and social services for personnel; operation and maintenance; procurement; military research and development; and military aid (in the military expenditures of the donor country). Excluded are civil defense and current expenditures for previous military activities, such as for veterans' benefits, demobilization, conversion, and destruction of weapons.

Gross Domestic Product (GDP) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

The econometric methodology firstly examines the stationary properties of the univariate time series. Augmented Dickey-Fuller (ADF) test has been used to test the unit roots of the concerned time series variables (Dickey and Fuller, 1979). It consists of running a regression on the first difference of the series against the series lagged once, lagged difference terms, and optionally, by employing a constant and a time trend. This can be expressed as:

$$\Delta y_t = \alpha_1 y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + x_{it}^{'} \delta + \varepsilon_t \quad (1)$$

The test for a unit root is conducted on the coefficient of (yt-1) in the regression. If the coefficient is significantly different from zero then the hypothesis that (y) contains a unit root is rejected. Rejection of the null hypothesis implies stationarity.

Furthermore, the time series has to be examined for cointegration. Cointegration analysis helps to identify long-run economic relationships between two or several variables and to avoid the risk of spurious regression. Cointegration analysis is important because if two non-stationary variables are cointegrated, a Vector Auto-Regression (VAR) model in the first difference is misspecified due to the effect of a common trend. If a cointegration relationship is identified, the model should include residuals from the vectors (lagged one period) in the dynamic Vector Error Correcting Mechanism (VECM) system. In this stage, the Johansen (1988) cointegration test is used to identify a cointegrating relationship among the variables. Within the Johansen multivariate cointegrating framework, the following system is estimated:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_{k-1} \Delta z_{t-k-1} \Pi z_{t-1} + \mu + \varepsilon_t : \text{t} = 1,.., \text{T} \qquad (2)$$

where, Δ is the first difference operator, z′ denotes a vector of variables, εt ~ n iid (0, σ2), μ is a drift parameter, and Π is a (p x p) matrix of the form Π = αβ′, where α and β are both (p x r) matrices of full rank, with β containing the r cointegrating relationships and α carrying the corresponding adjustment coefficients in each of the r vectors. The Johansen approach can be used to carry out Granger causality tests as well. In the Johansen framework, the first step is the estimation of an unrestricted, closed p-th order VAR in k variables. Johansen (1988) suggested two tests statistics to determine the cointegration rank. The first of these is known as the trace statistic:

$$N\{trace(r_0 / k) = -T \sum_{i=r_0+1}^{k} \ln(1 - \hat{\lambda}_i) \qquad (3)$$

where, $\hat{\lambda}_i$ are the estimated eigenvalues $\lambda_1 > \lambda_2 > \lambda_3 > \ldots > \lambda_k$ and $r_0$ ranges from zero to k-1 depending upon the stage in the sequence. This is the relevant test statistics for the null hypothesis $r \leq r_0$ against the alternative $r \geq r_0+1$. The second test statistic is the maximum eigenvalue test known as $\lambda_{max}$; we denote it as λmax ($r_0$). This is closely related to the trace statistic, but arises from changing the alternative hypothesis from $r \geq r_0+1$ to $r = r_0+1$ The idea is trying to improve the power of the test by limiting the alternative to a cointegration rank which is just by one more than the null hypothesis. The $\lambda_{max}$ test statistic is:

$$\lambda_{max}(r_0) = - T \text{ in } (1 - \lambda_i) \text{ for } i = r_0 + 1 \quad (4)$$

The null hypothesis is that there are r cointegrating vectors, against the alternative of r + 1 cointegrating vectors. Johansen and Juselius (1990) indicated that the trace test might lack power relative to the maximum eigenvalue test. Based on the power of the test, the maximum eigenvalue test statistic is often preferred.

According to Granger (1969), Y is said to "Granger-cause" X if and only if X is better predicted by using the past values of Y than by not doing so with the past values of X being used in either case. In short, if a scalar Y can help to forecast another scalar X, then we say that Y Granger-causes X. If Y causes X and X does not cause Y, it is said that unidirectional causality exists from Y to X. If Y does not cause X and X does not cause Y, then X and Y are statistically independent. If Y causes X and X causes Y, it is said that feedback exists between X and Y. Essentially, Granger's definition of causality is framed in terms of predictability.

To implement the Granger test, a particular autoregressive lag length k (or p) is assumed and Models (5) and (6) are estimated by OLS:

$$X_t = \lambda_1 + \sum_{i=1}^{k} \alpha_{1i} X_{t-i} + \sum_{j=1}^{k} b_{1j} Y_{t-j} + \mu_{1t} \quad (5)$$

$$Y_t = \lambda_2 + \sum_{i=1}^{p} \alpha_{2i} X_{t-i} + \sum_{j=1}^{p} b_{2j} Y_{t-j} + \mu_{2t} \quad (6)$$

Furthermore, an F-test is carried out for the null hypothesis of no Granger causality; $H_0 : b_{i1} = b_{i2} = \ldots = b_{ik} = 0, i = 1,2$ where, the F statistic is the Wald statistic of the null hypothesis. If the F statistic is greater than a certain critical value for an F distribution, then we reject the null hypothesis that Y does not Granger-cause X, which means Y granger-causes X.

A time series with a stable mean value and standard deviation is called a stationary series. If d differences have to be made to produce a stationary process, then it can be defined as integrated of order d. Engle and Granger (1987) state that if several variables are all $I_{(d)}$ series, their linear combination may be cointegrated, that is, their linear combination may be stationary. Although the variables may drift away from equilibrium for a while, economic forces are expected to restore equilibrium. Thus, they tend to move together in the long run irrespective of short run dynamics. The definition of Granger causality is based on the

hypothesis that X and Y are stationary or $I_{(0)}$ time series. Therefore, the fundamental Granger method for variables of $I_{(1)}$ cannot be applied. In the absence of a cointegration vector, with $I_{(1)}$ series, valid results in Granger causality testing are obtained by simply first differentiating the VAR model. With cointegration variables, Granger causality will require further inclusion of an error term in the stationary model in order to capture the short term deviations of series from their long-term equilibrium path. Hassapis et al. (1999) show that in the absence of cointegration, the direction of causality can be decided upon via standard F-tests in the first differenced VAR. The VAR in the first difference can be written as:

$$N\{\Delta X_t = \lambda_1 + \sum_{i=1}^{k} \alpha_{1i} \Delta X_{t-i} + \sum_{j=1}^{k} b_{1j} \Delta Y_{t-j} + \mu_{1t} \quad (7)$$

$$N\{\Delta Y_t = \lambda_2 + \sum_{i=1}^{p} \alpha_{2i} \Delta X_{t-i} + \sum_{j=1}^{p} b_{2j} \Delta Y_{t-j} + \mu_{2t} \quad (8)$$

## 4.Empirical Results

Table 1 reports the descriptive statistics for the data sample of the two macroeconomic variables and for all four tested Balkan countries. Overall calculations indicate that variables are not normally distributed and are characterized as leptokurtic and skewed.

**Table 1: Descriptive Statistics**

| Statistics | Greece | | Bulgaria | | Romania | | Albania | |
|---|---|---|---|---|---|---|---|---|
| | GDP | ME | GDP | ME | GDP | ME | GDP | ME |
| Mean | 2.71276 | 3.87169 | 1.22068 | 2.87479 | 0.74473 | 2.82544 | 3.33054 | 2.51037 |
| Median | 3.39153 | 3.90286 | 4.07907 | 2.71065 | 3.17086 | 2.60565 | 5.88257 | 1.67107 |
| Maximum | 5.94337 | 4.53343 | 10.9446 | 4.29518 | 8.49025 | 4.76428 | 13.5011 | 5.88830 |
| Minimum | -2.28566 | 3.10558 | -9.39713 | 2.25862 | -12.9182 | 1.41672 | -28.0021 | 1.22789 |
| Std. Dev. | 2.04621 | 0.37217 | 6.20440 | 0.61784 | 6.28633 | 1.06319 | 9.63616 | 1.66562 |
| Skewness | -0.97619 | -0.39993 | -0.51841 | 0.25329 | -0.58493 | 0.64477 | -1.84516 | 1.70952 |
| Kurtosis | 3.39694 | 2.50433 | 1.88221 | 2.33058 | 2.10499 | 2.25757 | 2.22585 | 2.05551 |
| Jarque-Bera | 3.63863 | 0.81170 | 2.13075 | 2.09959 | 1.98883 | 2.02961 | 0.87260 | 1.69493 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Probability | 0.16213 | 0.66641 | 0.34459 | 0.35340 | 0.36994 | 0.36247 | 0.58001 | 0.37561 |

Table 2 displays the estimates of the Augmented Dickey – Fuller (ADF) test in levels and in first differences of the data with an intercept, with an intercept and trend and with no intercept or trend. The tests have been performed on the basis of 5 percent significance level, using the MacKinnon Critical Values (MacKinnon, 1996). The lag length was determined using Schwarz Information Criterion (Schwartz, 1978). Initially, ADF test with an intercept implies that all variables are not stationary at levels even at 10 percent level of significance. However, at 1st differences ME and GDP growth are all stationary at an accepted significance level (i.e. 5 or 1 percent level) and for all tested countries. Similar results present the unit root test with an intercept and trend, since all variables present no significance at levels but at 1st differences all variables are integrated of order one. Finally, ADF test with no intercept or trend reports that at levels none of the examined variables have a unit root. However, at 1st differences all variables are stationary at 1 percent significance level except ME for Romania and Albania which are integrated of order one at 5 percent.

Collectively, all test results imply that all variables are not stationary at levels at any accepted level of significance. These are stationary at 1st differences. So, robust results derived from three forms of ADF test procedures all indicate that defence expenditure and GDP growth for the sample of four Balkan countries are integrated of order one i.e. I(1).

**Table 2: Augmented Dickey – Fuller Unit Root Test Results**

| Country | Variable | Test with Intercept | | Test with Intercept and Trend | | Test with no Intercept or Trend | |
|---|---|---|---|---|---|---|---|
| | | Levels | 1st Diff. | Levels | 1st Diff. | Levels | 1st Diff. |
| Greece | GDP | -2.1179 | -4.6470*** | 0.2130 | -4.6764*** | -1.2587 | -4.7499*** |
| | ME | -2.2895 | -3.8857*** | -3.0977 | -3.8382** | -0.6365 | -4.0601*** |
| Bulgaria | GDP | -2.3487 | -3.8770*** | -2.1401 | -3.8736** | -1.5041 | -3.9854*** |
| | ME | -2.3356 | -3.8640** | -3.0053 | -3.7660** | -1.5056 | -5.6090*** |
| Roman | GDP | -1.9350 | -3.2952** | -2.0301 | - | -1.4752 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ia | | | | | 3.7589*** | | 3.4042*** |
| | ME | -0.9497 | -5.9532*** | -2.2310 | -4.6829*** | -1.5034 | -2.0168** |
| Albania | GDP | -2.4112 | -4.5081*** | -3.0125 | -4.7836*** | -1.4752 | -4.4199*** |
| | ME | -1.7950 | -3.8693*** | -3.1446 | -3.9148** | -1.4847 | -2.4222** |
| **Note:** *, **, *** denote significance at 10%, 5% and 1% respectively. This note also applies to the subsequent tables. | | | | | | | |

Having established that ME and GDP growth are integrated of same order we now proceed to test whether the series in question move together in the long-run; that is, whether they share a common trend and hence there exists a long-run cointegrating relationship. Table 3 provides the results from the application of the Johansen cointegration test among the data sets. Empirical findings show that the maximum eigenvalue and the trace tests strongly reject the null hypothesis of no cointegration at the 5 percent significance level only for Bulgaria and Albania. So, long run relationships between military expenditure and GDP growth exist for these two Balkan countries at an accepted significance level, since calculations are above critical value estimates. On the other hand, regarding the rest Balkan countries of our data group (i.e. Greece and Romania) we are obliged to accept the null hypothesis of no cointegration since estimations are below the relevant critical values for 5 percent significance level.

**Table 3: Johansen Cointegration Test Results**

| Country | Null Hypothesis | Trace Statistic | 5% Critical Value | Maximum Eigenvalue Statistic | 5% Critical Value |
|---|---|---|---|---|---|
| Greece | $r^* = 0$ | 8.5546 | 15.4947 | 4.6566 | 14.2646 |
| | $r \leq 1$ | 3.5979 | 3.8415 | 3.5871 | 3.8414 |
| Bulgaria | $r = 0$ | 22.3821 | 15.4947 | 17.4360 | 14.2646 |
| | $r \leq 1$ | 4.9462 | 3.8415 | 4.9461 | 3.8414 |
| Romania | $r = 0$ | 8.8697 | 15.4947 | 8.5701 | 14.2646 |
| | $r \leq 1$ | 0.2997 | 3.8415 | 0.2991 | 3.8414 |
| Albania | $r = 0$ | 34.8844 | 15.4947 | 29.5191 | 14.2646 |
| | $r \leq 1$ | 5.3652 | 3.8415 | 5.3451 | 3.8414 |
| **Note:** * r is the number of cointegrating vectors under the null hypothesis. | | | | | |

Furthermore, Table 4 presents the estimations of the Granger causality test. Results indicate that there are no bilateral relations between defence burden and GDP growth for any of the tested countries of the data group. However, the null hypothesis ($H_0$) of "Military expenditure does not Granger-cause GDP" is strongly rejected for Bulgaria and Albania for all tested year lags. On the other hand, the ($H_0$) of "GDP does not Granger-cause military expenditure" is not rejected at any accepted significance level. So, the relationships between ME and GDP for Bulgaria and Albania are unidirectional running from ME to GDP. Regarding the rest Balkan countries Granger causality test found no evidence of bidirectional or unidirectional causal links. So, we are obliged to accept the relevant null hypotheses for Greece and Romania.

**Table 4: Granger Causality Test Results**

| | | F - Statistics | | | |
|---|---|---|---|---|---|
| Country | Null Hypothesis | Lag 1 | Lag 2 | Lag 3 | Lag 4 |
| Greece | ME ≠> GDP | 1.1213 | 0.4478 | 0.9742 | 0.3307 |
| | GDP ≠> ME | 0.2241 | 0.2624 | 0.8790 | 0.7140 |
| Bulgaria | ME ≠> GDP | 6.5083** | 6.2878** | 5.4696** | 4.3670** |
| | GDP ≠> ME | 0.1273 | 0.4234 | 1.1609 | 1.8188 |
| Romania | ME ≠> GDP | 1.3948 | 0.6066 | 0.9912 | 0.3392 |
| | GDP ≠> ME | 1.9742 | 2.3058 | 1.1247 | 0.5889 |
| Albania | ME ≠> GDP | 9.9904*** | 9.7804*** | 9.3999*** | 8.9791*** |
| | GDP ≠> ME | 2.0745 | 2.0630 | 1.9468 | 1.3914 |

## 5.Concluding Remarks and Policy Implications

The aim of this study is to investigate the causal links between military expenditures (ME) and GDP growth (GDP), thus adding to the existing pool of literature evidence from three developing Balkan countries (Bulgaria, Romania and Albania) and their mature counterpart in the Balkan Peninsula (i.e. Greece) during the period 1988-2009.

The results reported and analysed in the previous section of this survey imply that there are no bi-directional causal links between ME and GDP for none of the tested Balkan economies. However, Granger causality test results indicate that during the tested period unidirectional causal relationships exist in the cases of Bulgaria and Albania running from ME to GDP. Although, on the basis of this analysis it is not possible to determine the exact nature of this relationship, it should be noted that no significant domestic defence industrial

capacity exists in these countries, through which military spending can affect positively the real output of Bulgaria and Albania via the aggregate demand channel. Hence, one could tentatively suggest that the downward trend of military burden has contributed positively to the economic prosperity and growth these countries exhibited especially during the last decade.

On the other hand, this survey did not find evidence to support the links between ME and GDP for Greece and Romania. Moreover, it should be mentioned that both Balkan countries presented sharp upward growth trends particularly since the late 1990's by following different macroeconomic policies regarding defence spending. Greece ME to GDP remains significantly the highest in the Balkan Peninsula. This could be attributed to the enduring conflict with Turkey in several issues (i.e. the case of Turkish invasion in Cyprus, the Aegean Sea etc.) and can be justified to the extent that high military budgeting increased deterrence and defence capabilities and the feeling of general security. This, in turn, positively influences economic activity and growth. However, causal links for Greece could not be traced and documented with empirical results. Nevertheless, it could be assumed that due to changes of accounting practices by the Greek governments since the late 1990's, (i.e. recording expenses when military material was ordered rather than received) it is difficult to trace causal links between defence burden and economic growth for Greece.

Moreover, it is important to highlight that results may be sensitive to the choice of sample period, selection of variables and methodology adopted. This also indicates the sensitivity of Granger causality and that is why results based on Granger causality should be interpreted with care. Finally, future research may examine the causal links between military expenditure and external debt on these Balkan economies by covering a switch from a strong bull to a severe bear market situation under the recent global financial crisis.

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