Defence Expenditure in Greece: Imports Against a Sound Defence Industrial Base

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Abstract. This paper aims at exploring the possibilities that spending on defence equipment may contribute to the economic growth of Greece during a period in which a series of austerity measures have been imposed following the on-going economic crisis. The conclusion drawn is that as long as expenditure on defence equipment to its overwhelming percentage reflects import payments it can, by no means contribute to the growth of the Greek economy. This is a finding pointing the way to implementing import-substituting policies on the issue of defence procurement, to the best possible extent, aiming at both restricting import payments and contributing to reviving the economic activity in the framework of the present adverse economic and geopolitical environment.

Keywords: Growth, Defence Spending, Import Substitution
JEL codes: F45 H56 H60

INTRODUCTION

This paper aims at assessing the extent to which defence spending can contribute to the growth of the Greek economy in an environment outlined by repeated austerity measures which have led to a severe recession and the loss of about 25% of the pre-crisis country's GDP. The European Central Bank (ECB), the International Monetary Fund (IMF), and the European Commission (the three known as "Troika" which has recently turned to a "Quartet" with the addition of the European Stability Mechanism, ESM), do not seem to share Greece's geopolitical concerns over the Turkish expansive ambitions and the management of the energy resources in the area while suggesting closing down almost all defence industries in the country given the long history of losses of some of these firms. Such policy recommendations, however, lead to the minimization of the contribution of the Hellenic Defence Industrial Base (DIB) to the procurement programmes of the Hellenic Armed Forces (EMPAE), which is already more or less negligible, measured in one-digit percentage figures of the total value of these programmes. The environment outlined above suggests that the economy is doomed to rely more and more on importing expensive defence equipment to support the EMPAE requirements in an arms-race environment against Turkey.

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Under the circumstances it would be interesting to consider the extent to which this environment would compromise between austerity and national security[1] while in parallel contributing to the country's economic growth by aiming at collecting the so-called "peace dividend" i. e. the possible benefits reaped by closing down most domestic DIB firms following the Troika policy suggestions and shifting resources from defence to non-defence production. Alternatively, however, one would propose embarking in an import-substitution policy concerning the production of selected defence equipment items of the Hellenic Armed Forces. To assess the validity of such policies and following a brief literature review (Section II) together with some points of interest concerning the Greek defence industry (Section III), the paper describes the technical approach used for considering such policy options (Section IV). The next part of the paper (Section V) deals with the description and assessment of the results before conclusions can be drawn in Section VI.

II. LITERATURE REVIEW

Since the publication of the so-called "Benoit hypothesis" that resorting to military expenditure can have a positive direct effect on growth (Benoit, 1978), there has been a large number of contributions in the literature referring to the peace dividend issue, that is the question that faces the possibility of reaping economic benefits when shifting resources from defence to non-defence production. Leading contributions to the issue can be considered those by Intriligator (1996) and Hartley (1997), with the former regarding the peace dividend as an investment activity the short – term costs of which during the conversion process are eventually followed by long – run benefits in the form of increase rate of growth and employment. Hartley, on the other hand, points to the fact that a thorough study of the peace dividend question requires a reliable and comprehensive data base on a variety of variables like labour market conditions, transferability of skills and arms imports and exports. This necessarily implies that case studies are more useful under these circumstances compared to sophisticated econometric models, a point that appears to be in direct confrontation with Adams and Park (1996) who attribute the variety of views expressed in the literature on the peace dividend issue to techniques of analysis reasons. In addition to these, Hartley enriches the list of the two misconceptions or myths on the peace dividend issue mentioned by Intriligator to include the problem of resources adaptability as well as political and social considerations. Additional geopolitical, strategic and social criteria are mentioned by Dunne et al. (2005), who emphasise on geopolitical rather than economics variables and concluding that the impact of defence expenditure on growth is affected by the threat facing the economy of each country. In addition, Davoodi et al. (2001) find that the easing of international and regional tensions together with the help of IMF – supported adjustment programs lead to both decreased defence expenditure and higher non-defence government outlays while Chan and Sommer (1996) underline the role of social institutions and political cultures in reallocating the benefits derived following a defence expenditure cutback. Finally, in a rather original approach, Cowton (1993) introduces a moral dimension in the peace-dividend literature examining the relative importance of military contracting as one area of possible concern to `ethical' or `socially responsible' investors.

Turning to panel-data contributions Knight et al. (1996) consider a generalized view on the extent and the way in which changes in national defence burdens affect the economic growth while Heo (1998) has employed an 80-country non-linear defence – growth model which reveals that the majority of the countries in the sample should expect to earn a peace dividend following

[1] National security is a public good with its assessment relying on the hypothesis that is can be considered as being a monotonic function of defence expenditure, an assumption which has been repeatedly questioned (e. g. Sandler and Hartley, 1995).

their defence expenditure reduction. Mintz and Stevenson (1995) consider the issue via a diametrically opposite perspective, using a sample of 103 countries to show that military spending brings about a positive effect on growth in just 10% of the cases examined. While Okamura (1996) considers the peace dividend issue through the theory of Alliances in order to underline the US benefits following the NATO disarmament treaty.

Turning to the issue on an individual-country basis one can focus on the cases of Greece and Turkey, two traditional arms race rivals (Andreou and Zombanakis, 2000 and 2011). Thus while the literature seems to converge on a positive effect of defence spending on Turkey's economic growth (Sezgin 2001), Yildirim and Sezgin (2002), it concludes, in addition, that the possibility of earning a substantial peace dividend is distinct once resources are directed to non-military investment activities (Ozmukur, 1996). To assess the importance of these findings, however, one must take into consideration the fact that the Turkish defence industry is prospering supplying a substantial percentage of the country' s required defence material. In the case of Greece, on the other hand, in which the findings on the defence-spending to growth relationship being rather contradicting (e. g. Kollias, 1995, Stavrinos and Zombanakis, 1998, Antonakis, 1996 and 1997), there are no visible prospects for a peace dividend (Balfousias and Stavrinos, 1996). The approach followed by Andreou et a. (2002) which approximates the peace dividend as any defence expenditure over and above the calculated optimal level converted to a non-military equivalent may provide a plausible assessment. Such conclusions must be weighted together with the fact that the bulk of the armed forces equipment procurement requirements is imported which accounts for the findings by Sezgin (2003) according to whom equipment defence spending entails adverse repercussions on the economic growth of Greece. This conclusion that distinguishes between defence equipment procurement and the overall defence budget shall be examined in detail in this paper.

III. THE HELLENIC DIB

It has already been pointed in the literature (Brauer 2003, Zombanakis 2009) that the Hellenic DIB supports only a negligible percentage of the Hellenic Armed Forces equipment requirements (a one-digit percentage figure in most cases), thus failing to contribute to the country's economic growth. The situation seems to have deteriorated since the beginning of the economic crisis, with the reduction of the resources allocated to defence projects, the absence of specialized technical and administrative personnel, as well as the restrictions imposed on the use of patents and the technical production documents (TPD) owned by the original equipment manufacturers (OEM).

This environment is certainly inadequate to contribute to the maintenance and support of the Hellenic Armed Forces equipment[1]. As a direct consequence, the relevant NATO Support and Procurement Agency (NSPA) return industrial index for Greece has never exceeded 0.4 during the last few years.[2]

[1] A notable exception in this environment of inadequacy seems to be the Hellenic Aerospace Industry (HAI) which supports the depot – level maintenance (DLM) of the entire fleet of flying NATO Radar. The recent history of the HAI cooperation with NATO involves a total of 279 maintenance and 750 units of engines components.

[2] The industrial return position of each NSPO member nation is determined using the ratio between the value of contracts placed in the country and the value of sales made to the country. Depending on their ratio, countries fall into one of the following categories: - well placed; - less-well placed; - poorly placed. For example during 2011 Greece has placed with the NATO Maintenance and Supply Agency (NAMSA) contracts amounting to a total of €36 mil. against just €4 mil. contracts offered, this leading to an index of 0.1. The corresponding figure for most of the other NATO members exceeds 1.

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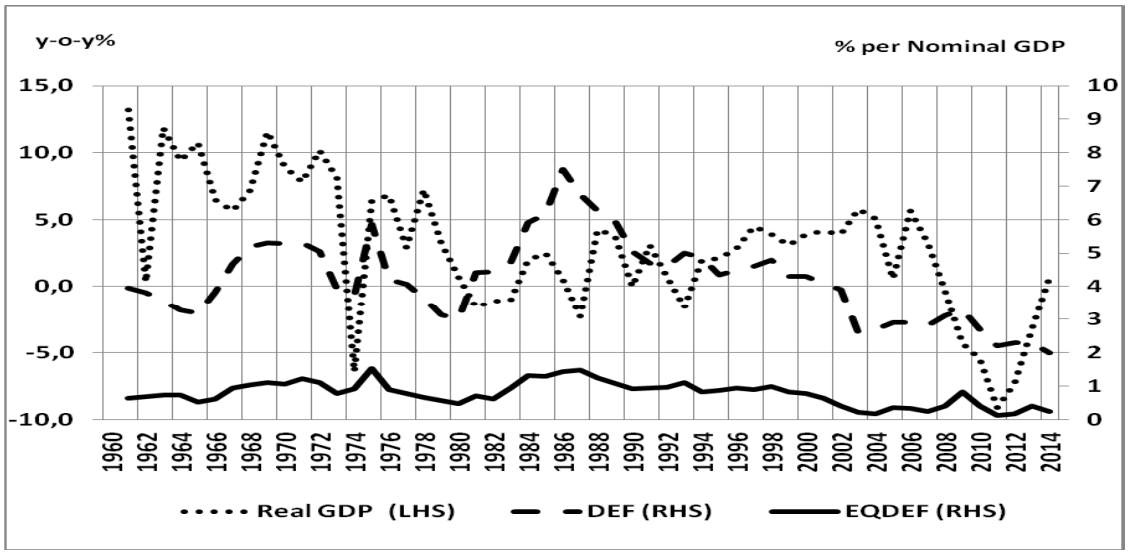
But the main cause of the inadequacy of the domestic DIB to contribute to the country's economic growth is the profound involvement of the Greek inefficient public sector in the defence industry of the country, a fact that leads to corruption, public - spending wasting and eventually, considerable delays in basic equipment deliveries (Andreou et al. 2013). This environment has led to the minimization of the contribution of the domestic defence industrial base to the procurement programmes which inevitably compel the Hellenic Armed Forces to resort to extensive expenditure on imports of equipment that can guarantee their readiness. In addition, there have been numerous cases in the past, in which resources diverted to non-defence activities aiming at earning a peace dividend have eventually been wasted rather than channeled to production (Kyriazis and Somakos 1999).

IV. DATA AND ECONOMETRIC METHODOLOGY

The sample period used ranges from 1975 to 2014 starting after the Cyprus crisis when the Hellenic Armed Forces turned to purchasing mostly newly - built equipment preferably from Germany and France rather than profiting from the second - hand US FMS credits. The model denotes defence equipment purchases using the variable **eqdef** as opposed to **def** which represents the total defence expenditure item of the budget allocated to the Ministry of Defence. Comparing the performance of these two the analysis aims at showing the bias introduced using the latter its major part includes personnel remuneration items, the cost of the Hellenic Armed Forces participation with NATO and other international peace-keeping forces and piracy-protection requirements. Under these circumstances, the GDP percentage of the Greek aggregate defence expenditure is clearly overestimated, given that according to the SIPRI, data spending on defence equipment procurement hardly reaches about one quarter of the corresponding total. Figure 1 highlights the difference in the behaviour of the variables concerned.



Source: AMECO Eurostat, SIPRI and IISS.

FIGURE 1: Real GDP and Defence Expenditure Developments.

Bearing these in mind the model uses the following four variables:

- **rgdp** denotes the annual growth rate of real gross domestic product as provided by the Hellenic Statistical Authority (ELSTAT) and AMECO.
- **def** is the ratio of military expenditure to nominal gross domestic product.
- **eqdef** is the ratio of expenditure on military equipment to nominal gross domestic product. The sources of both these variables are the SIPRI and the IISS annual reports.
- **ndef** is the ratio of non-military expenditure to nominal gross domestic product. In this case I have followed Malizard (2013) to determining non-defence expenditure as the difference between the Budget data of total public (government) spending, including defence, and the data of defence expenditure[1].

Turning to the econometric methodology used, this includes the following steps:

First, it examines the rank of integration for the series of rgdp, def, eqdef and ndef using the DF-GLS[2] (Elliot, 1996) and Phillips-Perron[3] (PP) unit root tests.

Second, it considers all variables as being endogenous and investigate the existence of a cointegration relationship among them using the Johansen's cointegration technique (1988, 1991, and 1992). For this purpose an unrestricted vector autoregressive model (VAR) is estimated using the maximum likelihood estimation method.

Third, in case that a cointegration relationship exists, it will follow a vector error correction model (VECM) analytical framework in order to capture the short-term dynamics of the variables in the system. If this is not the case one must resort to an unrestricted VAR model, arguing, following Malizard (2013), that among all the estimation methods, a VAR model is the most suitable econometric technique for our purposes given that a.It helps overcoming problems of endogeneity and multi-collinearity among variables, b. It reveals the direction of Granger[4] causality among variables and c. It provides impulse response functions[5] and a variance decomposition analysis of the system.

[1] The shares of defence spending in these sources are offered in nominal rather than in real terms. In fact, opting for the latter would involve an impossible task because the methodology required would involve deflating the nominal values by the prices of defence goods and services which, however, vary considerably on a case-by case basis depending on the purchase agreement signed; the military offsets provided et c.

[2] Elliot et al. (1996) proposed a simple modification of the ADF tests in which the data are detrended so that explanatory variables are "taken out" of the data prior to running the test regression.

[3] Phillips and Perron (1988) propose an alternative (nonparametric) method of controlling for serial correlation when testing for a unit root. The PP method estimates the non-augmented DF test equation, and modifies the t-ratio so that serial correlation does not affect the asymptotic distribution of the test statistic.

[4] Granger causality examines the forecasting relation between two variables. It was proposed by Granger (1969) and popularized by Sims (1972). Testing causality, in the Granger sense, involves using F-tests to test whether lagged information on a variable Y provides any statistically significant information about a variable X in the presence of lagged X. If not, then "Y does not Granger-cause X."

[5] The VAR model is commonly used for analyzing the dynamic impact of random disturbances on the system of variables.

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V. EMPIRICAL RESULTS

The hypothesis of a unit root in the levels of the series cannot be rejected (see Table 1). By contrast, the hypothesis of a unit root in the first differences is rejected in all cases in favour of the alternative of stationarity. These results suggest that all series are I(1).

TABLE 1: DF-GLS and PP Unit-Root Tests.

DF-GLS Statistics	(rgdp)	Δ(rgdp)	(def)	Δ(def)	(eqdef)	Δ(eqdef)	(ndef)	Δ(ndef)
Intercept	-1.947	-3.159**	-1.575	-7.281**	-2.043	-7.333**	-0.765	-5.015**
Lags	1	0	0	0	0	0	0	0
Trend and Intercept	-3.18	-4.427**	-1.931	-7.437**	-2.474	-7.441**	-2.454	-4.953**
Lags	1	0	0	0	0	0	0	0
PP Statistics	**(rgdp)**	**Δ(rgdp)**	**(def)**	**Δ(def)**	**(eqdef)**	**Δ(eqdef)**	**(ndef)**	**Δ(ndef)**
Intercept	-1.786	-3.290**	-1.638	-7.290**	-2.098	-7.389**	-0.002	-5.104**
Bandwidth	4	3	3	1	1	4	3	3
Trend and Intercept	-1.186	-3.457**	-2.014	-7.362**	-2.713	-7.507**	-1.829	-5.088**
Bandwidth	4	3	2	0	0	5	3	3
None	-0.860	-3.033**	-0.802	-7.340**	-0.938	-7.459**	-2.031	-4.690**
Bandwidth	5	3	1	1	3	4	3	4

** Denotes rejection of the null hypothesis for the 5% significance. Critical values being provided by MacKinnon (1996).The selected lag length for no serial correlation of the DF-GLS residuals based on Swartz Information Criterion. Newey-West algorithm selects automatic Bandwidth for PP using Bartlett kernel.

The results of the Johansen's cointegration technique provide clear evidence of no cointegration between the endogenous variables of the system. In fact, cointegration rank test of trace statistic and maximum eigenvalue statistic indicate no cointegration at the level 5% (see Table 2) which means, as earlier stated, that the use of a vector error correction model (VECM) analytical framework is not recommended.

TABLE 2. Cointegration Results

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.484939	62.20274	63.87610	0.0686
At most 1	0.389368	35.66391	42.91525	0.2188
At most 2	0.232475	15.93350	25.87211	0.4979
At most 3	0.125195	5.350152	12.51798	0.5469

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.484939	26.53883	32.11832	0.2061
At most 1	0.389368	19.73041	25.82321	0.2589
At most 2	0.232475	10.58335	19.38704	0.5567
At most 3	0.125195	5.350152	12.51798	0.5469

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Having verified that the variables are not cointegrated, the analysis can be based on an unrestricted vector autoregressive model (VAR) model. The unrestricted VAR (*p*) model is consists of four equations and its specification takes the following form:

$$gdp_t = c_1 + \sum_{i=1}^{p} a_i gdp_{t-i} + \sum_{i=1}^{p} \beta_i def_{t-i} + \sum_{i=1}^{p} \gamma_i ndef_{t-i} + e_{1t} \quad (1)$$

$$eqdef_t = c_2 + \sum_{i=1}^{p} \delta_i eqdef_{t-i} + \sum_{i=1}^{p} n_i gdp_{t-i} + \sum_{i=1}^{p} \theta_i ndef_{t-i} + e_{2t} \quad (2)$$

$$def_t = c_2 + \sum_{i=1}^{p} \delta_i def_{t-i} + \sum_{i=1}^{p} n_i gdp_{t-i} + \sum_{i=1}^{p} \theta_i ndef_{t-i} + e_{3t} \quad (3)$$

$$ndef_t = c_3 + \sum_{i=1}^{p} \varphi_i gdp_{t-i} + \sum_{i=1}^{p} \zeta_i def_{t-i} + \sum_{i=1}^{p} \omega_i ndef_{t-i} + e_{4t} \quad (4)$$

where *p* refers to the lag length and e_{1t}, e_{2t}, e_{3t} and e_{4t} to the errors terms. In the context of this representation, one can also check for causality using the Granger causality test. Knowing that

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the estimation of VAR[1] models is "sensitive" to the number of time lags (Banerjee et.al., 1993) using the information criteria[2] LR, AIC, and HQ, and Sim's Test indicates that the optimal number of lags included in the VAR is k=3 (see Table 3). All variables of the system are stationary in their first differences in order to avoid a spurious estimation.

TABLE 3. Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Exogenous variables: C
Sample: 1975 2014
Included observations: 40

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-294.7772	NA	36.13969	14.93886	15.10775	14.99992
1	-223.6922	124.3986	2.312575	12.18461	13.02905	12.48993
2	-204.8654	29.18154	2.060804	12.04327	13.56326	12.59285
3	-185.1821	26.57257*	1.832012*	11.85910*	14.05465*	12.65294*
4	-175.4006	11.24865	2.854084	12.17003	15.04113	13.20813
5	-157.7575	16.76100	3.327112	12.08787	15.63452	13.37023

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The system equations reveal good fitness while the system passes all diagnostic χ^2 tests successfully concerning the hypotheses of no serial correlation, of a residual - normal distribution (see Table 4), of absence of Heteroscedasticity and autoregressive conditional Heteroscedasticity. All equations of the VAR indicate that the residuals are Gaussian as the Johansen method presupposes.

[1] The VAR approach sidesteps the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all its endogenous variables. Since only lagged values of the endogenous variables appear on the right-hand side of the equations, simultaneity is not an issue and OLS yields consistent estimates. Even though the innovations may be contemporaneously correlated, OLS is efficient and equivalent to GLS since all equations have identical regressors (Pesaran et al.,1998).

[2] Sequential modified LR test statistic (each test at 5% level) [Sims' Test]. AIC: Akaike (1973) information criterion, Schwarz (1978) information criterion, HQ: Hannan-Quinn (1979) information criterion (1978).

*Indicates the appropriate lag length.

TABLE 4 . Normality Test of VAR (3)

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1975 2014
Included observations: 40

Component	Skewness	Chi-sq	df	Prob.
1	-0.150382	0.150765	1	0.6978
2	0.408216	1.110936	1	0.2919
3	-0.072902	0.035431	1	0.8507
4	0.015109	0.001522	1	0.9689
Joint		1.298654	4	0.8616

The VAR stability test shows that no root lies outside the unit circle and the VAR (3) satisfies the stability condition (see Table 5).

TABLE 5. Stability Test: Roots Of Characteristic Polynomial

Roots of Characteristic Polynomial
Lag specification: 1 3

Root	Modulus
0.764236 - 0.549033i	0.941007
0.764236 + 0.549033i	0.941007
0.804237 - 0.210150i	0.831240
0.804237 + 0.210150i	0.831240
-0.471940 - 0.604255i	0.766715
-0.471940 + 0.604255i	0.766715
-0.308042 - 0.628608i	0.700027
-0.308042 + 0.628608i	0.700027
0.020987 - 0.656499i	0.656834
0.020987 + 0.656499i	0.656834
-0.498841 - 0.359930i	0.615136
-0.498841 + 0.359930i	0.615136

No root lies outside the unit circle.
VAR satisfies the stability condition.

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After ensuring on the basis of Table 5 that the stability condition is satisfied, one must investigate the potential bidirectional causality among variables. According to Granger (1988, 1995), it is argued that military expenditure does not cause growth if the following hypothesis cannot be rejected:

$$H_o : \beta_1 = \beta_2 = \ldots = \beta_p = 0 \quad (5)$$

In addition it is also possible to check the hypothesis that growth does not affect military expenditure:

$$H_o : \mathrm{n}_1 = n_2 = \ldots = n_p = 0 \quad (6)$$

The results of the Granger causality test are presented in Table 6.

TABLE 6. Granger Causality Tests

Pairwise Granger Causality Tests
Date: 12/28/15 Time: 23:38
Sample: 1975 2014
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
DEQDEF does not Granger Cause DRGDP	40	0.85883	0.4721
DRGDP does not Granger Cause DEQDEF		0.29950	0.8255
DDEF does not Granger Cause DRGDP	40	0.10433	0.9570
DRGDP does not Granger Cause DDEF		3.28493	0.0328
DNDEF does not Granger Cause DRGDP	**40**	**5.71880**	**0.0029**
DRGDP does not Granger Cause DNDEF		6.94721	0.0009

* Denotes rejection of the null hypothesis for the 5% significance.

According to the Granger causality – test results depicted in Table 6 defence spending is not related in any form of causality with the GDP growth of Greece. By contrast all forms of public spending incorporated in the non-defence expenditure variable appear to affect the growth of the economy in a Granger-causality form, the inverse, however, not being the case. This finding has been more or less expected given the particularly pronounced role of the public sector on the functions of the economy.

However, the paper moves a step further by exploring the impact of one variable on another using impulse response functions (IRF) and variance decomposition techniques (VD). It is well known that with respect to VAR specification a shock on the error terms affects the entire system through the dynamics of the VAR process and the innovations are also correlated. IRF maps out the dynamic response path of one variable to another, due to a one-period standard deviation shock. Thus, the paper employs the method of generalized impulses proposed by Pesaran and Shin (1998) based on which IRF's are invariant to the variable's ordering[1]. In fact, according to

[1] IRF's based on the Choleski decomposition method may be widely used in the literature, it is, however, very sensitive to the variables' ordering, to such an extent that two different ordering choices can lead to

Figure 2 and Table 7, the role of defence expenditure on the GDP growth is negative throughout the simulation period under consideration, tending to a zero impact towards its end. This negative impact on the GDP growth is shown to be considerably more pronounced at the case of spending on defence equipment procurement (compared to the total defence expenditure variable), given that the overwhelming majority of the defence equipment used is imported, thus exerting a negative effect on the GDP. In it interesting to point out, however, that once the negative impact of non-defence spending is higher in absolute terms, one may argue against the possibility of reaping any form of a peace dividend, even in the loss-minimizing sense, as the adverse response of the GDP growth to non-military spending is much higher compared to that due to any form of defence expenditure.

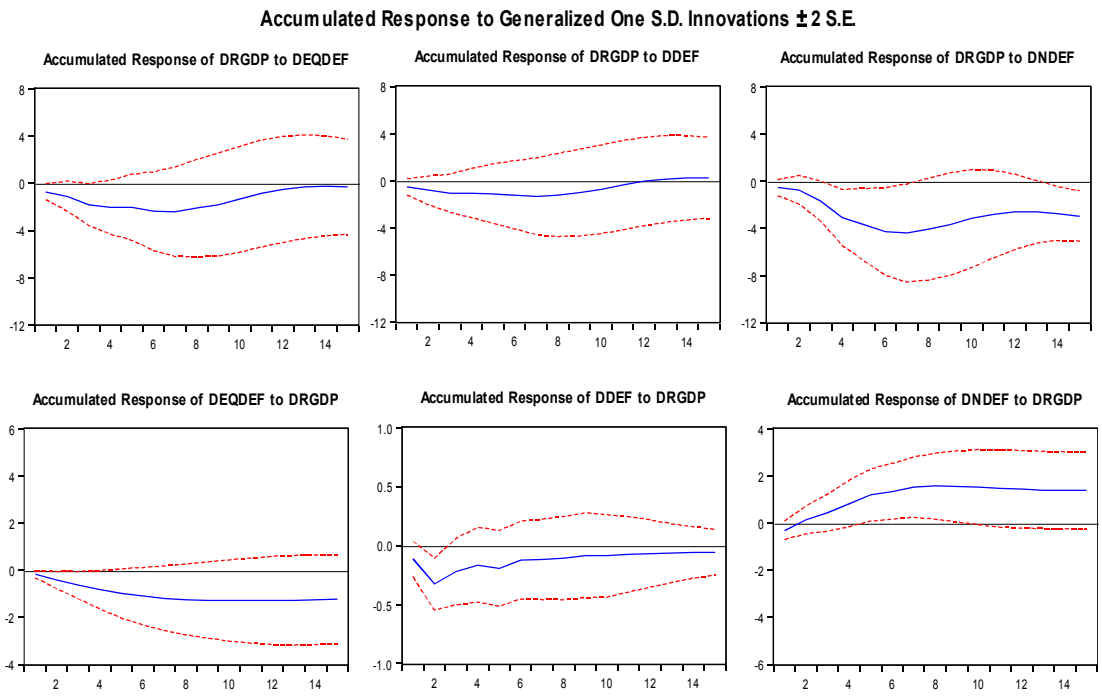

FIGURE 2. Accumulated Impulse Response (IRF's) of Real GDP Growth

This finding which is summarized in Figure 3 points to one of the main issues of this paper, namely the fact that conclusions of the defence expenditure policy of Greece, especially for the short - and medium run horizon, can be more reliable if drawn on the basis of focusing on the defence - equipment spending rather than total defence expenditure, given that the major part of the latter includes wages and salaries of military and civilian personnel, as well as spending on NATO and other international organizations commitments and participation to peace-keeping forces, protection from piracy threats etc.

two different IRF's. By contrast, the Generalized Impulses method as described by Pesaran and Shin (1998) constructs an orthogonal set of innovations that does not depend on the VAR ordering. The generalized impulse responses from an innovation to the j-th variable are derived by applying a variable - specific Cholesky factor computed with the j-th variable at the top of the Cholesky ordering.

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TABLE 7. Accumulated Impulse Response of Real GDP Growth

Period	DRGDP	DEQDEF	DDEF	DNDEF
1	2.214728	0.009635	-0.011510	-0.381565
2	2.936468	-0.298003	-0.382724	-0.933819
3	2.987051	-1.383732	-0.583863	-2.695834
4	3.261899	-2.102784	-0.938122	-4.025782
5	2.682737	-2.689914	-1.648809	-4.357256
6	2.049124	-3.599985	-2.254275	-4.746558
7	1.600154	-3.943977	-2.711842	-4.580240
8	1.200169	-3.617473	-2.698934	-3.820554
9	1.260313	-3.089252	-2.345316	-3.063499
10	1.578598	-2.342747	-1.873735	-2.427026
11	1.930023	-1.620141	-1.255051	-2.123014
12	2.296199	-1.192372	-0.775039	-2.186803
13	2.458520	-1.060815	-0.583793	-2.478518
14	2.372453	-1.236968	-0.612267	-2.890430
15	2.129269	-1.597225	-0.849134	-3.214321

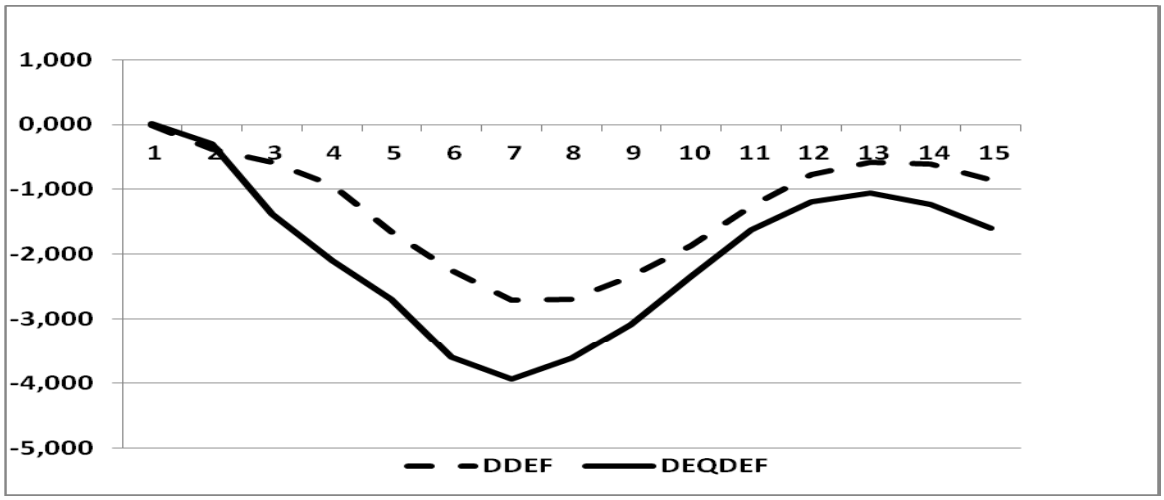

FIGURE 3. IRF's Accumulated Response of D(NGDP) from One Standard Deviation of (DEF) and D(EQDEF).

As regards the rest of the IRF findings, the notorious Greek public sector inefficiency seems to be behind the failure of the non-defence spending to exert a positive influence of the country's economic growth while, by contrast, the reverse case indicates a certain extent of influence of the GDP growth on the non-defence spending of the economy.[1] It seems, therefore, that while the

[1] It should be noted that even though the non-defence expenditures variable appears to affect the growth of the economy in a Granger-causality sense the IRF simulation results do not support this finding for the specific time period.

non-defence public sector does not contribute to economic growth it relies on it to support its functions in the economy with everything that such an imbalance might entail concerning efficiency issues. Finally, the extent to which the state will plan its defence - procurement policy is not affected by the growth of its economy, as the former is influenced to a larger extent by geopolitical issues and the long history of the Greek-Turkish arms race (Andreou and Zombanakis, 2011). This is a point which assumes particular interest in the context of the Greek economic crisis a period during which the procurement defence burden amounts to 0.3% of the GDP for both 2015 and 2016 while it has reached as low as 0.098% in 2012[1].

While impulse response functions trace the effects of a shock to one endogenous variable on to the other variables in the VAR, the variance decomposition (VD) separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR.

The results reported in Table 8 come to reinforce the conclusions earlier derived by pointing to the predominance of the expenditure on equipment, rather than the overall defence spending variable. In fact, Table 8 provides a comparison of the separate variance decomposition[2] for each endogenous variable. The columns give the percentage of the forecasted variance due to each innovation, with each row adding up to 100.

TABLE 8. Variance Decomposition of D(RGDP)

Period	S.E.	DRGDP	DEQDEF	DDEF	DNDEF
1	2.214728	100.0000	0.000000	0.000000	0.000000
2	2.394270	94.65155	1.684856	0.788368	2.875225
3	3.047754	58.44118	13.73581	6.363442	21.45957
4	3.337039	49.42630	16.11608	5.630903	28.82672
5	3.481763	48.16972	17.62346	6.702171	27.50465
6	3.658466	46.62844	22.11288	6.071876	25.18680
7	3.718235	46.59942	22.25390	6.572706	24.57397
8	3.808648	45.51618	21.95267	6.850430	25.68072
9	3.899481	43.44418	22.77499	6.535493	27.24534
10	4.010073	41.71096	24.98881	6.194399	27.10584
11	4.096494	40.70557	27.04405	6.119896	26.13049
12	4.144530	40.54805	27.47817	6.376770	25.59701
13	4.164018	40.32136	27.32032	6.431284	25.92704
14	4.187555	39.91161	27.19027	6.447597	26.45052
15	4.218225	39.66571	27.52146	6.354691	26.45814

[1] Concerning 2015 and 2016: Statement of the Minister of Finance, June 2015. The 2012 figure refers to a statement of the then Defence Minister in the Parliament. The pressure exercised on further defence cuts calls for an extra €200 decrease for 2016 which leaves the margin for equipment procurement to about €300 mil. Needless to point out that such a sum can hardly face a spare -part and ammunition procurement programme given that the average price of e. g. a torpedo use by the Hellenic Navy is about €600 thousand.

[2] The variance decomposition based on the Cholesky factor can change dramatically if you alter the ordering of the variables in the VAR. For example, the first period decomposition for the first variable in the VAR ordering is completely due to its own innovation.

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It becomes obvious, therefore, based on these findings that both defence and non-defence public expenditure, each due to their own particular reasons, exercise a considerably adverse impact on the country's economic growth: The former consisting mainly of importables and the latter due to the low productivity and inefficiency of the public sector. It is interesting to see in this case that one cannot argue in favour of the possibility of a peace dividend accumulation, even in a loss-mimimising sense, given that the absolute values of the defence-spending accumulated responses are always lower compared to those of non - defence expenditure. The VD analysis supplements this picture by providing a breakdown of the relative weights of defence as opposed to non-defence public spending when determining the growth rate variance of the economy. In any case the results reported in Table 8 indicate that only about 50% of the growth of the economy is due to the government expenditure, either defence or non-defence, despite the pronounced involvement of the public sector in the economy.

CONCLUSIONS

The conclusions drawn on the basis of the present paper must be given special attention in the context of the ongoing Greek economic crisis and the efforts undertaken by both the government and the Troika aiming at austerity policies without neglecting the issue of national security to the extent that this can be approximated by defence expenditure.

The first is that defence spending and more so, expenditure on defence equipment, under the present circumstances in which the bulk of the procurement represents import payments is not related in any form of Granger-causal relationship with the economic growth of Greece, This means that imports of defence equipment cannot be expected to add to the growth of the economy.

The second conclusion points to the fact that any shock exercised from the part of defence spending on growth in IRF terms assumes negative values throughout the period under consideration. These negative values are certainly more pronounced when the focus shifts on expenditure on defence equipment as its overwhelming percentage is imported leaving a very small fraction of defence equipment manufactured locally. By contrast, shocks exercised by the growth of the economy do not seem to determine developments regarding defence, and more so, equipment defence procurement programmes, the so-called EMPAE, as these are predominantly assessed by geopolitical factors.

The third is that there can be no possibility of earning a peace dividend by switching to non – defence rather than defence spending given the pronounced negative response of growth to public non-defence expenditure.

In terms of applied policy recipes one may be able to suggest the following: Once expenditure on defence procurement can hardly support growth given both the overwhelming predominance of the defence equipment import bill and the impossibility of reaping a peace dividend the paper recommends that the economy proceeds to import substitution to the extent, of course, that such equipment is deemed indispensable for the country's armed - forces needs.

Adhering to this proposal requires the following steps:

1. Restrict defence - equipment imports to the highest possible extent and proceed with importing material only in cases in which import substitution is not possible due to patents, technology transfer obstacles et c. This measure is expected to restrict public - spending wasting to a considerable degree as it is expected to minimize the role of the local agents and the related red-tape procedures involved.

2. Encourage investment in local defence firms, preferably private, as these are not menaced by the public-sector inefficiencies described above. However, to the extent that public sector firms can manage to become relieved from their past inefficiencies their contribution to the

national defence industrial base will also be more than welcome. A way to achieve such an investment may be the cooperation of the DIB with the Original Equipment Manufacturers (OEMs) via Follow On Support (FOS) contracts. Whatever the case may be, such a shift placing emphasis on the domestic defence industrial base represents the only case in which the economy is expected to reap a substantial peace dividend since in most cases the producing firms are able to extend their line of production to the direction of non-defence items as well. A typical example involves the case of one of the largest shipyards in the Mediterranean, which is not allowed to operate following a series of bureaucratic impediments and the authorities' notorious inefficiency[1].

In this case and taking advantage of the Commission's Directive 81/2009/EC, which provides for the promotion of the domestic DIB, Greece is expected to accrue multiple benefits following the operation of such a major producer given its comparative advantage in shipping transportation and merchant marine clusters. It is important to stress at this point that the economic dimension of such benefits (GDP rise, unemployment reduction, technology transfer), will be accompanied by operational ones (immediate availability of equipment and support during crisis periods together with independence from foreign procurement agents, suppliers and firms) in a case in which the specific firm grows to be a producer of both defence and non-defence items.

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[1] The ENAE shipyards cover an area of 832.000m². They are equipped with two major dry docks of 500 and 250 thousand tons, the former being the largest in the Mediterranean, as well as with three smaller ones (72, 60 and 36 thousand tons). This yard uses, in addition, a synchro lift. Yet, it has been kept inactive for a considerable time period following a penalty imposition from the part of the European Commission on account of its past state subsidization. A possible bargain in this case would simply involve a loan arrangement to pay off the €500 million penalty, lifting in return, all prohibitions concerning possible defence and non-defence equipment production and export by the company. One must bear in mind that producing exclusively to satisfy the Hellenic Navy needs is clearly only a short-term option during a period in which export orientation can guarantee the long-term prospects of the largest shipyards in the area. A solution along these lines and in view of the Chinese Cosco proposal to invest in this case will allow, to a large extent, the re-employment of those that have been previously employed in the ENAE, while it will contribute to the country's growth rate through both the firm's own production as well as its support to a cluster of complementary shipbuilding firms.

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