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II. THE IMPACT OF DEFENSE EXPENDITURE ON ECONOMIC GROWTH

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Abstract

The goal of this paper is to analyze the relationship between defense expenditures and economic growth in Romania, trying to find out the existence, direction and intensity of this connection. The methods which I used are cluster analysis, quintile analysis, regression technique and Granger causality. The results suggest that in Romania there is a negative correlation. A potential cause of the negative effect of defense expenditures on economic growth in Romania is the high proportion of the spending on equipment and other operational spending. Also I have considered the implications of the budgetary restriction – the limited resources might be given priority for other programs.

Keywords: fiscal policy, public expenditures, defense expenditures, economic growth, budget constraint

JEL Classification: E62, H41, H56, H6

Research questions:
Is defense expenditure related to economic growth?
If it is, what are the sign and direction of the correlation between defense expenditure and economic growth?
Does the structure of defense expenditure matter?

1. Introduction

For policy purposes, it is very important to determine the channels by which defense expenditures influence the economic growth process. For the policy makers, the impact of defense expenditures on economic development, which can be positive or negative, can have different implications with respect to what strategy to apply to stimulate economic growth.

A positive relationship between defense expenditures and growth ("guns and butter") and the direction of causation that runs from defense expenditures to economic

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growth implies that defense expenditures stimulate economic growth. This relationship may be explained, especially in the less developed countries, by the fact that defense expenditures have benefic effects on economic growth, by engaging in research and development, providing technical skills, educational training and generating an infrastructure necessary for economic development.

A negative relationship between defense expenditures and growth ("guns or butter") and the direction of causation that runs from defense expenditures to economic growth implies that defense expenditures crowd-out private investment, by distorting resource allocation and diverting resources from productive activities.

The goal of this paper is to analyze the relationship between defense expenditures and economic growth in Romania, trying to find out the existence, direction and intensity of this connection.

The paper is structured as follows: in the second section which contains the theoretical background for the impact of defense expenditure on economic growth, I deliver the possible explanations for defense expenditures and I analyze the arguments that sustain a positive/negative correlation between defense expenditures and economic growth. The third section contains a listing of the empirical studies that sustain a positive/negative/no correlation between defense expenditures and economic growth. There are also tests of this correlation for Romania in the period 1990-2007, using quintile analysis, regression technique and Granger causality. The last section concludes.

2. The impact of defense expenditure on economic growth – Theoretical background

There is a large literature on this issue, but the most frequently approaches are in the context of "guns or butter" vs. "guns and butter". The impact of defense expenditure on growth might be dependent on the threats posed by foreign countries and other external forces – threats without defense expenditure would reduce growth, defense expenditure without threats would reduce growth, while defense expenditure in the presence of sufficiently large threats increases growth.

What causes a country's investment in defense expenditures to vary? What are the motivations behind a state's decision to raise spending on defense? If a state decides to raise defense expenditure, there will be an impact on economic growth?

These issues are addressed in the context of a state's broader foreign policy goals, and the explanation of the defense expenditures is based on the following hypotheses[2]:

- Hypothesis 1 (Ambition) - states are ambitious and economic growth produces forward-looking foreign policies and thus greater military expenditures; as a consequence, a state's military spending varies with its economic power

Ambition hypothesis contends that military expenditures are both directly and indirectly a positive function of economic growth; it is based on five assumptions about

[2] *Castillo, J., Lowell, J., Tellis, A., Munoz, J., Zycher, B.,* Military Expenditures and Economic Growth*, RAND, 2001.*

international politics: (a) the international system lacks a central authority to arbitrate disputes among states; (b) states cannot discern the intensions of other states with any amount of certainty; (c) all states possess some form of military capabilities giving them the ability to inflict harm on their neighbors; (d) the pursuit of additional economic and military power represents the highest goal of states; (e) a state's wealth shapes its foreign policy objectives.

- Hypothesis 2 (Fear) - states are fearful and they increase their military expenditures in response to threats

Fear hypothesis contends that military expenditures are a function of a state's insecurity. It is based on the following assumptions: (a) the international system lacks a central authority to arbitrate disputes among states; (b) states cannot discern the intensions of other states with any amount of certainty; (c) all states possess some form of military capabilities giving them the ability to inflict harm on their neighbors; (d) a state's foreign policy is not driven by the lust for power, but instead is motivated by a search for survival

In order to determine whether their neighbors are threatening, states look at the following indicators[3]: the aggregate economic and military capabilities of other states, geography, the threat-defense balance, perception of aggressive intentions.

- Hypothesis 3 (Legitimacy) - states use aggressive foreign policies and high levels of military expenditures to deflect domestic troubles

Legitimacy hypothesis contends that government leaders use foreign policy to deflect problems at home; when governments perceive a potential loss to their legitimacy, they will implement an expansionist foreign policy and increase military expenditures. It is based on the following assumptions: (a) the foremost goal of governments is maintaining their political power; (b) a state's interest group attempt to alter foreign policy to their advantage; (c) policymakers consider both domestic and international threats to their security when deciding on an appropriate foreign policy.

In order to determine the important channels through which public revenues and expenditures, including defense expenditures, may affect economic growth, we consider the production function:

$\mathbf{Y_t = F(A_t \cdot K_t, B_t \cdot L_t)}$, where: K_t =capital, L_t =labor, A_t = technical progress, measuring the quality of capital, B_t = function (of educational level, health, nutrition, security), measuring the quality of labor.

The channels of influencing the economic growth consist of policies that increase capital per labor, increase the productivity (quality) of capital and labor. In order to stimulate the economic growth by means of the fiscal policy, the state has more instruments[4]: (a) financing of direct investments, which the private sector would not provide in adequate quantities; (b) efficient supply of certain public services which are necessary to ensure the basic conditions to display the economic activity and the long-term investments; (c) financing of public activities so as to minimize the

[3] *Walt, S.,* The Origins of Alliances*, Ithaca, NY, Cornell University Press, 1987.*

[4] *For more details, see Obreja Braşoveanu, L. (2007)* Impactul politicii fiscale asupra creşterii economice*, Editura ASE, Bucureşti.*

distortions to come up with the decisions to spend and invest properly in the private sector.

The channels of fiscal policy's influence on economic growth are: increase the labor's productivity (state invest in capital and labor only when it completes private sector's activities, situation that is necessary because of the externality or market imperfections), increase the capital's productivity (state might offer social and economic infrastructure that facilitate private sector's activity), increase the quantity of labor and capital factors (state might finance the public activities in a way that minimize the possible distortions over the demand or supply of capital and labor).

Theoretical background offers arguments for both positive and negative relationship between defense expenditures and economic growth. Arguments that sustain a ***positive correlation*** between defense expenditures and economic growth ("guns and butter" approach) are**:**

- **Research and development in the defense sector**

Research and developments in defense sector may have positive effects through externalities on the civilian part of economy. Defense spending may create social infrastructure and other forms of public goods. Military research and defense expenditures may also create technological innovations with broader applicability, enhancing economic growth.

In the less developing countries, military may help in creating a socioeconomic structure conducive to growth[5]; military may engage in research and development, provide technical skills, educational training and create an infrastructure necessary for economic development.

- **Security**

Defense spending can generate economic benefits because it provides security which promotes a stable business environment, a necessary condition for encouraging foreign investment. It also enforces the property rights and market dynamics that produce growth in a global capitalist system.

Considering that defense expenditures increase security, it may stimulate economic growth. Adam Smith noted that the first two duties of the state were 'that of protecting the society from the violence and invasion of other independent societies….that of protecting, as far as possible, every member of society from the injustice or oppression of every member of it'. In many poor countries, war, corruption[6] and lack of security are major obstacles to development.

- **Demand**

The effect is positive through an expansion of aggregate demand (Keynesian effect), the increased demand leads to an increase of utilization of the idle capital, higher

[5] *Deger, S. (1986)* Military Expenditure in Third World Countries*, London: Routledge and Kegan Paul*

[6] For an empirical study for Romania concerning the effects of investments and corruption on economic growth, see Semenescu, A., Cataramă, D., Pele, D., Dragotă, V., Obreja Braşoveanu, L. (2008) and Dragotă, V., Obreja Braşoveanu, L., Semenescu, A. (2008).

employment and profits, therefore higher investment, all of which causing economic growth.

Defense expenditure may be considered a tool of fiscal policy and can therefore be increased to stimulate demand or decreased to dampen demand. This impact depends on the multiplier effect, assuming there is not a corresponding increase in taxation to finance the spending and the extent of crowding out caused by the spending.

- **Labor**

Defense spending may increase the skill set of the population through training and education of military personnel. It has a growth-stimulating effect if it moves the economy closer to full employment, creates human capital, promotes stability, and provides infrastructure.

It is often argued that expenditure on defense training in developing countries may contribute to improving the educational level of the labor force and may act as a stabilizing influence in the society.

- **Investment**

Capital expenditure can have productive uses: private sector benefits from the transport networks that are originally constructed for military purposes. Investment in the defense sector generates positive externalities for the civilian sector, like public infrastructure development, technology spillovers and human capital formation.

Arguments that sustain a ***negative correlation*** between defense expenditures and economic growth ("guns or butter" approach) are**:**

- **Crowding out effect**

Military spending can have an adverse effect on economic growth by crowding-out private investment - higher defense spending generates a distortion in resource allocation and the diversion of resources from productive activities to the accumulation of armaments and the maintenance of military forces.

The International Monetary Fund[7] claims that, in general, military spending may reduce resources available for investment in "productive capital, education, and market-oriented technological innovation." In this context, military expenditures may adversely affect investments, savings, human capital, infrastructure programs. The extent and form of crowding out of an increase in defense spending will depend on prior utilization and how the increase is financed.

- **Opportunity cost**

Trying to explain the negative correlation between military expenditure and growth, economists focus on the opportunity cost of defense spending, military expenditures hinder economic development by reducing savings and misallocating resources away from more productive use in the public or private sector. In the same context, R&D in the defense sector may divert R&D from the private sector where it may receive more practical application.

[7] *Kentor, J., Kick, E. (2008) "Bringing the Military back in",* Journal of World-Systems Research.

Government expenditures on national defense carry an opportunity cost, because of lowering economic output and slowing rates of GDP growth. The International Monetary Fund and the World Bank suggest that resources spent on preparation for war and on war-fighting could be better employed elsewhere. This argument is considered stronger in the case of the less developed countries.

- **Increased taxation**

The government budget constraint requires that an increase in defense expenditure might be financed by cuts in other public expenditure, increased taxes, increased borrowing or expansion in the money supply[8]. The way the increase in defense expenditure is financed will have further effects, which feeds back on the economy.

Defense expenditure, if financed by non-distorting revenues, has a positive effect on economic growth; if financed by distorting revenues, it might have a positive or negative effect on economic growth, depending on the level of the defense expenditure.

- **Efficiency of resource allocation**

Another channel by which defense expenditures may affect the economic growth is through their direct impact on the efficiency of resource allocation. Military spending is not governed by market processes, so it tends to create distortions in relative prices. Policies implemented to support a military program might be detrimental to efficient resource allocation and economic growth.

- **Increased political power of the military**

Defense expenditure may be driven not by security needs, but by a rent seeking military industrial complex, and may cause arms races or damaging war. Many of these effects are contingent, depending on the degree of utilization, the externalities from defense spending and the effectiveness in countering the threat.

3. The impact of defense expenditure on economic growth – Empirical studies

There is a large literature containing empirical studies that analyze the correlation between defense expenditures and economic growth; their conclusions are sensitive to the database and the method used to measure this effect.

The following studies conclude that there is **a positive correlation** between public defense and economic growth:

- Benoit (1978) analyzed the correlation for 44 less developed countries over the period 1950-1965 and concluded that defense spending may stimulate aggregate demand leading to economic growth;
- Babin (1986) used data from 88 developing countries from 1965 to 1981; he found a consistently positive relationship and concluded that military stability is an important precondition for economic advancement;

[8] *For an empirical study for Romania concerning the correlation between fiscal policy and economic growth in Romania, see Obreja Braşoveanu, L., Braşoveanu, I. (2008).*

- Atesoglu and Mueller (1990) used a two sector Feder-Ram model for the US over the period 1949 to 1989. They found a positive effect from the defense sector to the civilian sector;
- Stewart (1991) applied a Keynesian demand function to a group of less developed countries. He founds that both defense and non-defense expenditure have positive effects on growth, but the effect of non-defense spending is stronger;
- Ward, Davis, Penubarti, Rajmaira and Cochran (1991) used a three sector Feder-Ram model with separate externality and productivity effects for India over the period 1950 to 1987. Defense expenditure was found to have a positive effect on growth.
- Mueller and Atesoglu (1993) incorporated technological change into a two sector Feder-Ram model using US data for the period 1948 to 1990. They found a significant relationship from defense to growth.
- Ando (2008) used data from 109 countries, including 30 OECD countries, over the period 1995-2003. The result showed that defense expenditures has a positive impact on the rate of economic growth; the military sector goes up positively, so does economic growth;
- Bose, Haque, Osborn (2003) for a panel of thirty developing countries over the period 1970-1990, suggested a positive and significant association between defense spending and growth.

The following studies conclude that there is **a negative correlation** between public defense and economic growth:

- Mintz and Huang (1990) using a three equation model for the US found that defense expenditure negatively impacts on investment and, therefore, growth;
- Scheetz (1991) used pooled cross-section time series data for four Latin American countries over the period 1969 to 1987. He found defense expenditure has a negative effect on investment;
- Ward and Davis (1992) used a three sector Feder-Ram model for the US over the period 1948 to 1990. They separated the effects of defense spending into productivity and externality effects. They found defense spending has a negative effect on economic growth, with a negative productivity effect but a positive externality effect;
- Sezghin, Yildirim (2002) used data from Turkey, over the period 1951-1998. They found that the share of military spending in Turkey decreases as the growth rate increases in the long-run;
- Galvin (2003) used 2SLS and 3SLS to estimate a demand- and supply-side model for 64 less developed countries using cross-section data. He concluded that defense spending has negative effects for both economic growth and the savings-income ratio;
- Guaresma, Reitschuler (2003) found that the partial correlation between defense spending and economic growth appears robust and significantly negative only for countries with a relatively low military expenditure ratio;

- Kentor, Kick (2008) explored a new dimension of military spending, military expenditures per soldier, which captures the capital intensiveness of a country's military organization. The cross-national panel regression and causal analyses of developed and less developed countries from 1990 to 2003 showed that military expenditures per soldier inhibit the growth of per capita GDP, with the most pronounced effects in least developed countries;
- Abu-Bader, Abu-Quarn (2003) investigated the causal relationship between government expenditures and economic growth for Egypt, Israel, Syria for the past three decades; they found that the share of military expenditures in GDP negatively affects economic growth.

The following studies conclude that there might be a **positive and also** a **negative correlation** between public defense and economic growth:

- Chowdhury (1991) undertaken Granger causality testing using defense burden time series for 55 less developed countries. He found positive causality from defense to growth for seven countries, negative causality for 15 countries, no causality for 30 countries and bi-directional causality for three countries;

Guaresma, Reitschuler (2003) used data from 105 developed and developing countries, for the period 1960-1990.They found evidence of a robust negative partial correlation between military expenditures and growth for countries with relatively low levels of defense expenditure share. Using a dataset that includes more recent observations, they found additional evidence for a level-dependent effect of defense spending on growth and were also able to explain the sources of the negative growth effect of military expenditures on growth for the subsample of countries with a low military burden - the negative productivity differential between the military and civilian sector;

Wilkins (2004) estimated pooled model explaining GDP growth as a function of labor, capital and defense, for 85 countries over the period 1988-2002. The defense variable is positive and significant for 39 countries, negative and significant for eight countries and insignificant for the remaining 38 countries. While a minority of countries do have a negative coefficient, for the most part it can be concluded that defense has a positive coefficient within the growth framework considered here and therefore would not be considered to have a detrimental effect on growth.

The following studies conclude that there is **no correlation** between public defense and economic growth:

- Benoit (1973), studying 44 developing countries, found not evidence that defense spending has an adverse effect on growth;
- Alexander (1990) used a four sector Feder-Ram model for nine developed countries over the period 1974 to 1985 using cross section time series data. He found no effect of defense spending on economic growth;
- Huang and Mintz (1990) estimated a three sector Feder-Ram model using annual data for the US over the period 1952 to 1988. They did not find any relationship between defense and growth;

- Adams, Behrman and Boldin (1991) used a three sector model (defense, nondefense and export) with cross section and time series data for a group of less developed countries over the period 1974 to 1986. They found defense spending has no effect on growth, and exports have a positive effect;
- Huang and Mintz (1991) analyzed the impact by separating the defense effect into productivity and externality effects; they found no relationship;
- Gerace (2002) used a spectral analysis type methodology to investigate movements in US military expenditure, US non-military expenditure and US GDP. He found evidence that non-military expenditure is used as a counter-cyclical stabilization tool, but that military expenditure is not;
- Aizenman, Glick (2006), using data for 90 countries, analyzed the effect the ratio of military spending to GDP on economic growth. The estimated coefficient is negative but highly insignificant; adding the threat measure as an explanatory variable, increases the magnitude of the coefficient on military spending, but it is still not significant at conventional levels. The coefficient of threat, though very significant, is positive, implying that external conflicts have a positive effect on growth, contrary to their expectation;
- Habibullah, Law, Dayang-Afizzah (2008) examined the relationship between military expenditure and economic growth in selected Asian countries for the period 1989 to 2004. Empirical results showed that defense spending and economic growth in the Asian countries in the period under study are not related.

In the following part of the paper, we analyze Romania's defense expenditure in a broader context, by comparing it with the other member countries of NATO and EU. The correlation between defense expenditures and economic growth is measured by a regression using average values for the period 1990-2007. We use cluster technique for the average values of defense expenditures and economic growth in order to determine if there is a common pattern for countries considered in the database. For Romania in the period 1990-2007 I perform cluster and regression analysis, Granger causality to test the existence and the sign of the correlation between defense expenditures and economic growth.

The following table contains defense expenditures, in nominal values:

Table 1

Defense expenditure (in constant 2005 US$ mil) - NATO and EU members

		1998-2007					1998-2007		
Country	2007	mean	Stdev	CV	Country	2007	Mean	Stdev	CV
Austria	3,168	2,758	211	7.63%	Luxembourg	[319]	223	36	16.37%
Belgium	4,398	4,499	213	4.73%	Malta	38.4	39	2	5.13%
Bulgaria	631	602	57	9.48%	Netherlands	9,853	9,495	287	3.03%
Cyprus	239 (2006)	280	71	25.41%	Poland	6,973	5,694	702	12.32%
Czech Rep	2,144	2,150	169	7.87%	Portugal	[3,343]	3,507	189	5.40%
Denmark	3,666	3,662	99	2.69%	Romania	2,303	1,845	224	12.12%
Estonia	329	186	74	39.69%	Slovakia	925	776	80	10.26%

		1998-2007		
Country	**2007**	**mean**	**Stdev**	**CV**
Finland	2,677	2,450	268	10.95%
France	53,579	51,881	1,542	2.97%
Germany	36,929	39,602	1,746	4.41%
Greece	[9,346]	8,336	309	3.71%
Hungary	1,255	1,495	182	12.14%
Ireland	1,152	1,150	31	2.70%
Italy	33,086	33,349	1,314	3.94%
Latvia	390	198	115	58.03%
Lithuania	372	318	36	11.35%

		1998-2007		
Country	**2007**	**Mean**	**Stdev**	**CV**
Slovenia	602	465	90	19.27%
Spain	14,628	11,828	1,349	11.41%
Sweden	5,272	5,784	363	6.28%
United Kingdom	59,705	53,922	5,798	10.75%
Canada	15,155	12,377	1,231	9.94%
Norway	4,920	4,789	337	7.04%
Turkey	11,066	13,118	2,252	17.17%
United States	546,786	421,503	84,801	20.12%

Convention: US$ m. = Million US dollars; . . = Data not available or not applicable, ( ) = = Uncertain figure, [ ] = SIPRI estimate.
Source: SIPRI (Stockholm International Peace Research Institute), http://www.sipri.org/contents/webmaster/databases.

Average value of defense expenditure in Romania represents 3.4% of the maximum, 4706% of the minimum and 25% of the EU average. But this measure of defense expenditures does not permit an international comparison, because of the differences in countries' dimensions and characteristics.

In order to investigate the correlation between defense and economic growth, I use the following indicators:

- the real rate of gross domestic product growth (GDP growth rate) for economic growth
- the ratio of defense expenditure to the gross domestic product (also called defense burden)

The next table contains these two variables – values for 2007, mean values and standard deviations for the period 1990-2007 and for the last ten years.

Table 2

Ratio of defense expenditure to GDP and real rate of GDP growth (in %) - NATO and EU members

Country	2007		1990-2007				1998-200			
	GDP growth rate	Defense exp/GDP	GDP growth rate		Defense expenditure/GDP		GDP growth rate		Defense expenditure/GDP	
			Mean	Stdev	Mean	Stdev	Mean	Stdev	Mean	Stdev
Austria	3.40	0.95	2.44	1.15	1.01	0.10	2.40	1.12	0.93	0.06
Belgium	2.80	1.11	2.11	1.24	1.49	0.34	2.21	1.11	1.26	0.13
Bulgaria	**6.20**	**2.00**	0.78	**5.95**	**2.56**	**0.44**	**5.06**	1.36	**2.43**	**0.21**
Cyprus	4.04	1.35	**4.11**	2.28	**2.82**	**1.45**	**3.95**	1.11	**1.88**	**0.67**
Czech Rep	**5.65**	1.58	2.02	**4.28**	**1.94**	0.21	3.50	**2.30**	**1.90**	0.15
Denmark	1.80	1.36	2.18	1.38	1.64	0.20	2.00	1.15	1.49	0.10
Estonia	**7.11**	**1.88**	**2.70**	**8.52**	1.30	**0.40**	**7.22**	**3.02**	1.56	**0.24**
Finland	**4.40**	1.24	2.40	3.26	1.48	0.22	3.66	1.38	1.32	0.10
France	2.20	**2.37**	1.94	1.11	**2.83**	0.37	2.31	0.99	**2.53**	0.11
Germany	2.50	1.28	1.94	1.59	1.62	0.32	1.57	1.14	1.42	0.08

Country	2007		1990-2007				1998-200			
	GDP growth rate	Defense exp/GDP	GDP growth rate		Defense expenditure/GDP		GDP growth rate		Defense expenditure/GDP	
			Mean	Stdev	Mean	Stdev	Mean	Stdev	Mean	Stdev
Greece	4.00	**3.02**	**2.98**	1.77	**3.34**	0.32	**4.13**	0.53	**3.27**	**0.41**
Hungary	1.30	1.10	1.79	**4.32**	1.77	**0.44**	**4.10**	1.07	1.51	**0.22**
Ireland	**5.30**	0.54	**6.52**	2.80	0.87	0.26	**6.56**	**2.20**	0.66	0.10
Italy	1.50	**1.79**	1.38	1.07	**1.94**	0.09	1.38	1.06	**1.94**	0.08
Latvia	**10.31**	**1.82**	1.97	**10.82**	1.17	**0.48**	**7.99**	**2.50**	1.37	**0.47**
Lithuania	**8.78**	1.16	1.60	**9.37**	0.98	**0.41**	**6.51**	**3.31**	1.24	0.18
Luxembourg	**4.50**	0.77	**4.56**	2.41	0.75	0.06	**4.94**	**2.39**	0.76	0.06
Malta	3.40	0.70	**3.75**	2.39	0.83	0.14	2.37	**2.47**	0.71	0.05
Netherlands	3.50	1.48	2.67	1.35	1.82	0.34	2.47	1.57	1.57	0.07
Poland	**6.52**	2.00	**3.94**	**3.32**	**2.15**	0.25	**4.21**	**1.77**	**2.00**	0.06
Portugal	1.90	1.76	2.23	1.98	**2.14**	0.22	1.97	1.74	**1.97**	0.08
Romania	**6.18**	1.83	1.21	**6.29**	**2.80**	**0.89**	**3.85**	**4.10**	**2.28**	**0.38**
Slovakia	**10.37**	1.66	2.56	**6.24**	**1.98**	**0.49**	**4.80**	**3.35**	1.73	0.10
Slovenia	**6.07**	1.51	**2.88**	**3.96**	1.53	0.25	**4.30**	1.10	1.41	0.13
Spain	3.80	1.19	**3.10**	1.42	1.32	0.20	**3.81**	0.75	1.16	0.06
Sweden	2.60	1.35	2.19	2.03	**2.02**	**0.38**	3.11	1.23	1.74	**0.25**
United Kingdom	3.00	2.58	2.39	1.35	**2.94**	**0.54**	2.82	0.59	**2.57**	0.11
Canada	2.70	1.34	2.66	1.86	1.41	0.30	3.31	1.28	1.19	0.07
Norway	3.50	1.45	**3.14**	1.24	**2.16**	**0.48**	2.54	0.90	**1.83**	**0.27**
Turkey	**4.45**	2.07	**4.52**	**4.75**	**2.89**	**0.56**	**4.06**	**4.96**	**2.99**	**0.74**
United States	2.20	4.19	**2.90**	1.30	**3.89**	**0.66**	2.95	1.20	**3.59**	**0.47**
Max	10.37	4.19	6.52	10.82	3.89	1.45	7.99	4.96	3.59	0.74
Min	1.30	0.54	0.78	1.07	0.75	0.06	1.38	0.53	0.66	0.05
Average	4.39	1.63	2.70	3.32	1.92	0.38	3.74	1.77	1.75	0.20

Data source: The World Bank.

In 1997, countries that obtain a greater rate of GDP growth than the average are (in ascending order): Finland, Turkey, Luxembourg, Ireland, the Czech Republic, Slovenia, Romania, Bulgaria, Poland, Estonia, Lithuania, Latvia, Slovakia. Countries that obtain a greater rate of defense expenditures on GDP than the average are: Slovakia, Portugal, Italy, Latvia, Romania, Estonia, Poland, Bulgaria, Turkey, France, the United Kingdom, Greece, the United States.

For the period 1990-2007 countries that obtain a greater rate of GDP growth than the average are: Slovenia, the United States, Greece, Spain, Norway, Malta, Poland, Cyprus, Turkey, Luxembourg, Ireland. Countries that obtain a greater rate of defense expenditures on GDP than the average are: Italy, the Czech Republic, Slovakia, Sweden, Portugal, Poland, Norway, Bulgaria, Romania, Cyprus, France, Turkey, the United Kingdom, Greece, the United States.

For the period 1998-2007 countries that obtain a greater rate of GDP growth than the average are: Spain, Romania, Cyprus, Turkey, Hungary, Greece, Poland, Slovenia, Slovakia, Luxembourg, Bulgaria, Lithuania, Ireland, Estonia, Latvia. Countries that obtain a greater rate of defense expenditures on GDP than the average are: Norway, Cyprus, the Czech Republic, Italy, Portugal, Poland, Romania, Bulgaria, France, the United Kingdom, Turkey, Greece, the United States.

Regarding the values of standard deviation, we can say that the more volatile values are for the following countries (for the period 1990-2007):

- Poland, Slovenia, the Czech Republic, Hungary, Turkey, Bulgaria, Slovakia, Romania, Estonia, Lithuania, Latvia (standard deviation of GDP growth rate).
- Sweden, Estonia, Lithuania, Bulgaria, Hungary, Latvia, Norway, Slovakia, the United Kingdom, Turkey, the United States, Romania, Cyprus (standard deviation of defense expenditures/GDP).

Regarding the values of standard deviation, we can say that the more volatile values are for the following countries (for the period 1998-2007):

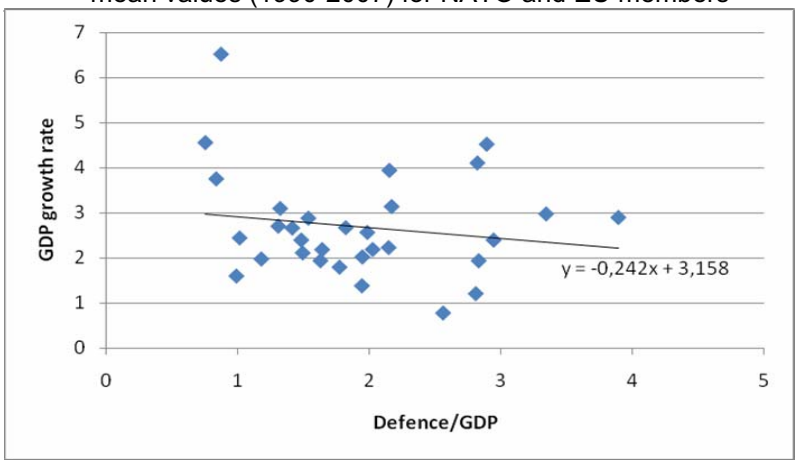
- Poland, Ireland, the Czech Republic, Luxembourg, Malta, Latvia, Estonia, Lithuania, Slovakia, Romania, Turkey (standard deviation of GDP growth rate).
- Bulgaria, Hungary, Estonia, Sweden, Norway, Romania, Greece, the United States, Latvia, Cyprus, Turkey (standard deviation of defense expenditures/GDP).

In order to determine whether there is a relation between defense expenditures and economic growth in the selected countries, the next two figures express the GDP growth rate and defense expenditure/GDP, using average values for the period 1990-2007 and for the period 1998-2007.

Figure 1

GDP growth rate and defense expenditures/GDP

– mean values (1990-2007) for NATO and EU members

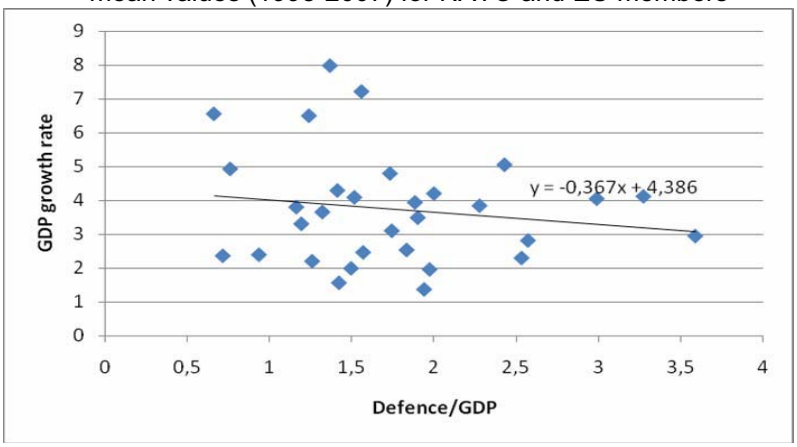


The relationship between defense expenditure and economic growth, using mean values, appears to be negative – countries that have greater defense/GDP obtain lower GDP growth rate. This might be interpreted as a support of the theory "guns or butter", sustained by the arguments: the crowding-out effect on private investment, the opportunity cost of defense spending, the increased taxation in order to finance defense expenditures, the impact on the efficiency of resource allocation, the increase of the political power of the military.

Figure 2

GDP growth rate and defense expenditures/GDP

– mean values (1998-2007) for NATO and EU members



Data source: The World Bank.

In order to investigate the relationship between defense expenditures and economic growth, I perform a pooled least squares regression, using data from 1990-2007, for 32 countries. The coefficient of defense expenditures is negative, indicating a negative correlation between defense expenditure and economic growth for the case of the 32 countries for 18 years, but the regression has a low R squared, so that the defense expenditures explain a very small part of the variation of GDP real growth rate.

Table 3

Pooled Least Squares – Economic growth and defense expenditures

Dependent Variable: GDPGROWTH

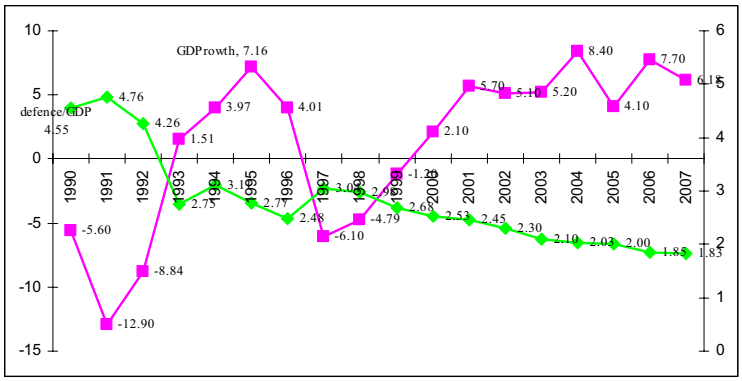
Method: Pooled Least Squares
Sample: 1 558
GDPGROWTH=C(1)+C(2)*DEFENSE_EXPENDITURES

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	4.152742	0.354083	11.72814	0.0000
C(2)	-0.590769	0.166639	-3.545214	0.0004

For the case of Romania, I analyze the possible correlation between defense expenditures and economic growth – the following figure represents the values of defense expenditures, as ratio on GDP, and economic growth, as GDP real rate of growth.

Figure 3

Defense expenditure and economic growth in Romania



Data source: World Bank

In order to obtain the sign of a possible relation, I use the quintile technique: I split the values (in total, 18 data) into three intervals, depending of the level of each variable.

Table 4

Quintile analysis for economic growth and defense expenditure

GDP growth (⇩) \ Defense/GDP (⇨)	q1	Q2	Q3
q1		1999	1990,1991, 1992, 1997, 1998
q2	2002, 2005	1993, 1994,1996, 2000	
q3	2003, 2004, 2006, 2007	1995, 2001	

Using quantile techniques, it is obvious that in years with high rate of economic growth the defense expenditures have low values, and vice versa; again, the conclusion is that the relation between defense expenditure and economic growth is indirect.

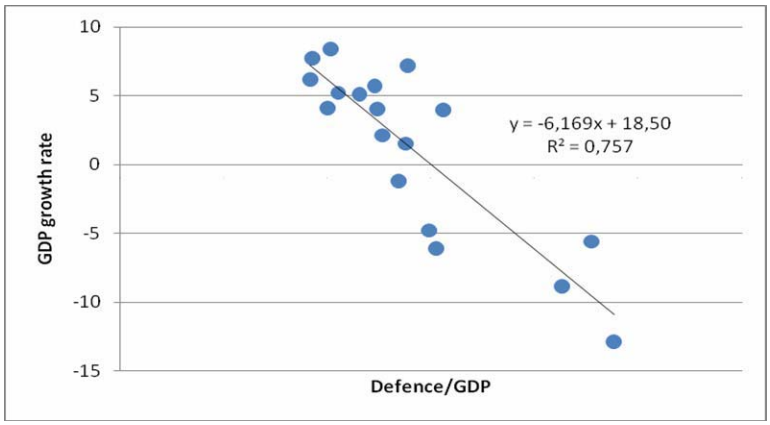
Applying ordinary least squares technique, expressing economic growth as a function of defense expenditures, I obtain a negative coefficient of the ratio of defense expenditures to GDP.

The results might be carefully interpreted – there are objections to applying regression for explaining the impact of defense expenditure on economic growth[9]; this method implies exogeneity of the independent variable, defense expenditure; it might be the case that defense expenditure is determined by economic development, at least through the budgetary restriction – in the recession period, the limited resources are used first for other programs. It might be the case that this specific expenditure is the most sensitive to the budgetary constraint changes, thus its value is not exogenous.

[9] *Joerding, W. (1984) "Economic Growth and Defense Spending: Granger Causality",* Journal of Development Economics.

Figure 4

Regression using annual values for Romania's defense expenditures and economic growth



Studying the correlation between defense expenditures and economic growth, we might obtain one of four possible causality relationships: unidirectional causality from defense expenditures, unidirectional causality from economic growth, bi-directional causality, no causality.

I test how much of the current level of economic growth may be explained by past values of defense expenditures. Economic growth is Granger-caused by defense expenditures if values of defense expenditures help in the prediction of economic growth. The results of the Granger causality tests are presented in the following table:

Table 5

Pairwise Granger Causality Tests

Null Hypothesis:	F-Statistic	Probability
ROM_GROWTH does not Granger Cause ROM_DEFENSE	1.48245	0.26912
ROM_DEFENSE does not Granger Cause ROM_GROWTH	0.89793	0.43529

These results show that the hypothesis that economic growth does not Granger cause defense expenditures cannot be rejected and neither the hypothesis that defense expenditures do not Granger cause economic growth.

The impact of defense expenditure on economic growth might be dependent on the composition of expenditure. SIPRI considers that military expenditures include all current and capital expenditure on: the armed forces, including peace keeping forces; defense ministries and other government agencies engaged in defense projects; paramilitary forces when judged to be trained, equipped and available for military operations; and military space activities. Such expenditures should include: personnel - all expenditures on current personnel, military and civil, retirement pensions of military personnel and social services for personnel and their families; operations and

maintenance; procurement; military research and development; military construction; and military aid (in the military expenditures of the donor country).

NATO categorizes defense expenditures into four: personnel expenditures, equipment expenditures, infrastructure expenditures and other operational expenditures.

Budgetary economic classification of expenditures, categorizes expenditures into three: current expenditures (which contain personnel expenditures, goods and services, interest, transfers and subventions, social assistance and other expenditures), capital expenditures and financial operation.

In this context, for a positive effect on economic growth, the structure of defense expenditure might be in favor of productive expenditures. Expenditures on infrastructure may contribute to development, especially in developing countries, because infrastructure services built for military purposes can also be used for civilian purposes, thus promoting economic growth. As a potential cause of negative effect on economic growth is the spending on equipment and other operational spending.

Table 6

Defense expenditures in Romania

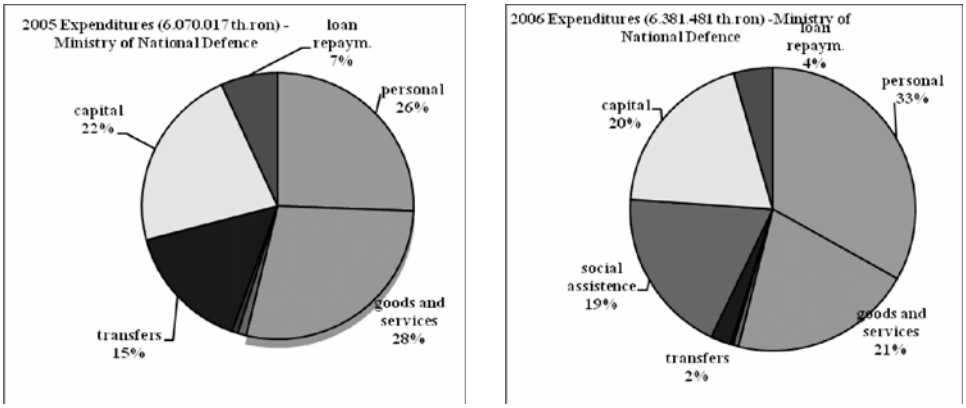
(thou.RON)

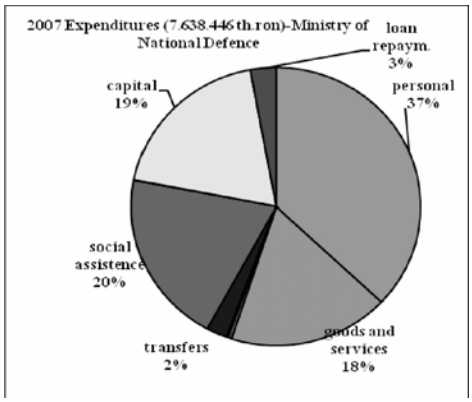
	2005	***2006***	***2007***	***2008***	***2009***
TOTAL EXPENDITURES	**6.070.017**	**6.381.481**	**7.638.446**	**8.342.796**	**7.651.916**
Personal	1.552.913	2.116.715	2.830.238	3.126.952	3.071.493
Goods and services	1.708.499	1.321.264	1.371.479	1.319.993	977.961
Interest	62.143	39.968	30.998	23.912	0
Subventions	44.168	18.500	15.798	18.352	15.599
Transfers	935.436	147.741	175.682	235.217	355.301
Social assistance	0	1.213.690	1.534.078	1.828.267	2.045.277
Other	0	0	4.414	2.500	1.420
Capital	1.355.117	1.241.711	1.455.191	1.610.291	1.184.865
Loan repayments	411.742	281.892	220.568	177.312	0

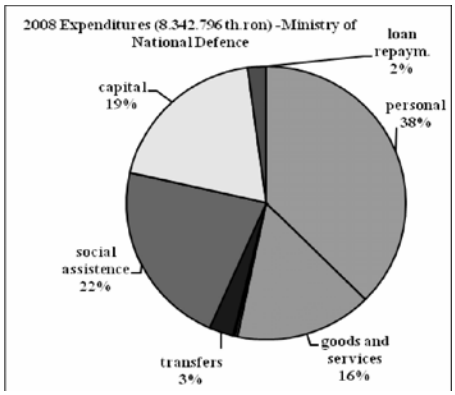
Data source: Ministry of Finance.

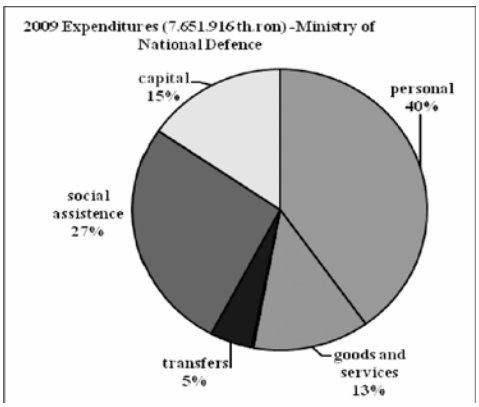
Figure 5

The structure of defense expenditures in Romania









Data source: Ministry of Finance.

Romania's budget for defense reflects a structure of defense expenditures defined by the following hierarchy: personnel expenditures (with an upward trend), social assistance (with an upward trend), capital expenditures (with a downward trend), goods and services (with a downward trend). This might be the explanation for the negative correlation between defense expenditures and economic growth.

This study of the impact of defense expenditure on economic growth has a major limit: we apply simple econometric methods to a very complex process. A further analysis might consider to apply nonparametric linear programming techniques such as Data Envelopment Analysis (DEA)[10] in order to measure the efficiency of defense expenditure. We limit our current analysis because of the restriction regarding tha data required (qualitative and quantitative information for the defense department). The results of the DEA analysis might explain the efficiency or inefficiency of the resource allocation.

[10] *For further details, see Coelli, T.J. (1996), "A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program",* Centre for Efficiency and Productivity Analysis (CEPA) Working Papers*, The University of New England.*

4. Conclusions

The correlation between defense expenditure and economic growth might be interpreted in the context of resources of financing - defense expenditure, as a productive category of public expenditure, if financed by non-distorting revenues, has a positive effect on economic growth; if financed by distorting revenues, it might have a positive or negative effect on economic growth, depending on the level of the defense expenditure.

Arguments sustaining a positive correlation are referring to the effects of research and development in the defense sector, security, demand – Keynesian effect, labor and investment in the defense sector. Arguments sustaining a negative correlation are referring to the effects of crowding out private investment, opportunity cost of the resources used in defense sector, increased taxation for financing defense expenditures, inefficiency of resource allocation, increased political power of the military.

In this paper I analyze the effect of defense expenditure on economic growth in Romania, using the variables: real growth rate of GDP and ratio of defense expenditures to GDP. The regression expressing economic growth as a function of defense expenditures generate negative coefficient, which indicates that the two variables are negatively correlated.

The results might be carefully interpreted; the regression method implies exogeneity of the independent variable, defense expenditure; it might be the case that defense expenditure is determined by economic development, at least through the budgetary restriction – in the recession period, the limited resources are used first for other programs. It might be the case that this specific expenditure is the most sensitive to the budgetary constraint changes, thus its value is not exogenous. The Granger-causality test concludes that the hypothesis that economic growth does not Granger-cause defense expenditure and vice versa cannot be rejected.

The impact of defense expenditure on economic growth might be dependent on the composition of expenditure. For a positive effect on economic growth, the structure of defense expenditure might be in favor of productive expenditures. A potential cause of negative effect on economic growth in Romania is the high proportion of the spending on equipment and other operational spending.

Acknowledgements

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