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A New Look at Military Expenditure-Growth Nexus in the EU: Old Members vs. New Members+

Abstract:
Unlike previous milex-growth studies in the EU, this paper investigates this issue in context of the older and the newer members by providing a comparative analysis within a panel framework. Annual data ranging from 1988 to 2012 are used for the two panel groups in the presence of capital stock. Pedroni's heterogeneous panel cointegration results indicate the existence of a long-run equilibrium between military expenditures and economic growth both for the new and the old members. The findings from panel error correction model show that one size fits all in the short-run whereas the difference stems from the long-run. Once the validity of feed-back hypothesis is confirmed in the old members, results of new members provide a support of growth detriment hypothesis as such in the short-run results. The implications of these results are further discussed.

Keywords: military expenditures, economic growth, panel unit root and cointegration, panel causality, the EU.

JEL Classification: C33; H56.

1 Introduction

Defense economic literature includes a great amount of studies on the relationship between defense spending and economic growth since 1970s. The first study on this issue was made by Benoit (1973, 1978). Although there is an extended literature on the economic impact of military spending, the results of these studies are lack of consensus and debates continue.

As one might intuitively expect, defense spending is not a clear determinant of economic growth. Dunne et al. (2005) emphasized that, however, while the mainstream growth literature has not found military expenditure to be a significant indicator of growth; bulk of the defense economics literature has found significant effects via control variables suggested by Feder-Ram model[1]. Theoretically, defense expenditures might affect economic activity in two ways. In other words, military expenditures have both costs and benefits to the economy. Yıldırım et al. (2005: 283) explain the costs of defense expenditures are generally opportunity cost while the potential benefits are higher aggregate demand, production and employment. Table 1 presents these arguments detailed regarding correlation analyses. In addition to the correlation analyses, most of the empirical papers have started to employ causality analyses to find out the relation between variables in question. Chang et al. (2013) developed a theoretical framework regarding related literature that adopts causality analyses. The framework consists of four items: (i) growth hypothesis where the direction of causality is from military expenditures to economic growth, (ii) growth detriment hypothesis where the direction is

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[1] See Yıldırım et al. (2005), p. 287-288 for extensive discussion.

from economic growth to military expenditures[2], (iii) feedback hypothesis where bi-directional causality exists, and (iv) neutrality hypothesis where no causality is detected.

Much of the defense economics literature regarding EU has composed of either case studies or panel evidences. Topcu and Aras (2013a), in particular, investigated milex-growth nexus in the 21 EU countries using times series causality methodologies and concluded that a split is found between the newer and the older members. The goal of this paper is therefore to make a comparative analyze between the EU's older and the newer members in a panel framework[3]. In addition, this paper not only examines milex-growth issue in a comparative panel system, but also extends the member countries with the inclusion all members. Thus, it is hoped that present paper covering EU28 for the first time will allow for a benchmark between the two groups and contribute to the empirical literature.

Table 1: Reflection channels how military expenditures affect growth

Positive arguments	Negative arguments
1. The defense expenditures can have a stimulating effect on the economy through the Keynesian multiplier mechanism. This impact will be stronger in developing countries.	1. Higher defense expenditures can crowd out both public and private investment that may be more growth-oriented and need-based then those of defense spending. This crowding out of essential investment may have an adverse impact on the long run economic growth.
2. Nations can experience positive externalities from the state-of-the art technologies, which can be adopted in producing civilian goods.	2. Defense expenditure can cause balance of payments problems if hard-carned foreign exchanges are used to purchase arms and defense hardware.
3. A significant part of the overall defense budget usually goes to the development of infrastructure (roads, highways, airports and information technology), which will promote growth.	3. Defense can inhibit growth by diverting resources from the export sector, which is often considered an engine of growth.
4. Defense expenditure supports economic growth by maintaining internal and external security, and this creates a positive trade and investment climate for domestic as well as foreign investors.	4. The defense sector limits growth through inefficient bureaucracy and excess burdens created by taxes necessary to finance military spending.

Source: Hassan et al. (2003), p. 276-277.

Subsequent to introductory part, rest of the paper proceeds as follows: previous studies in milex-growth literature on the EU or member countries will be reviewed in the second part, data and econometric model of the study will be described in the third part, empirical methodology and findings will be presented in the fourth part, the implications of the study will be discussed in the fifth part and a general review will be made in the last part.

2 Literature review

Over the last three decades, there have been impressive amount of qualitative and quantitate studies on milex–growth relationship in the case of the EU employing various models.

[2] According to Chang et al. (2013), the second form covers negative uni-directional causality from military expenditures to economic growth. A negative causality from military expenditures to economic growth probably leads to a uni-directional causality from economic growth to military expenditures on the condition that military expenditures are financed by taxes or borrowing. Therefore, the second item of this framework is formed from growth to military expenditures in the paper.

[3] The older members of the EU are referred to EU15 while the newer members refer to the thirteen countries that joined in 2004, 2007 and 2013 enlargements.

Fontanel and Smith (1991) discussed the economic evaluation of a possible European Defense Union in a political base. The results only make some suggestions about how to achieve a 'Defense" Union in the Europe.

Fontanel (1996) aimed to investigate military expenditures in CEEc and concluded that the disarmament process needs a special analysis of the arms industry.

Hartley (2003) attempted to put forward how economic principles can be used to derive guidelines for the building of European defense policy. He showed that there is a scope for efficiency improvements in EU's defense industries with efficiently organized military alliances offering benefits to the member states of the union.

Kollias et al. (2004), employing cointegration and causality approaches, examined the relationship between military expenditures and economic growth among EU15 over the period 1961-2000. The causality direction obtained from the analysis runs from economic growth to military expenditures in the countries in question.

Dunne and Nikolaidou (2005) analyzed the relationship between military expenditures and economic growth covering the peripheral economies of Europe, namely, Greece, Portugal and Spain over the periods 1960-2002.VAR results fail to show a general conclusion for the countries in question due to their heterogeneous structure.

Kollias et al. (2007) revised the paper of Kollias et al. (2004) on the same issue by considering a panel framework in the context of the EU15 over the period 1960-2000. The results show a positive impact of military expenditures on growth in the short-run and indicate the existence of a positive feedback between the two in the long-run.

Mylonidis (2008) investigated the impact of military spending on economic growth in the EU15 using panel analysis for the period of 1960-2000. It is found that military spending has a negative influence on growth and the magnitude of this impact tends to rise over time.

Nikolaidou (2008), using ARDL approach, studied the determinants of military expenditures in EU15 over the period 1961. Very little uniformity in the factors that determine each country's demand of military expenditure is found, according to the empirical results and they are interpreted for the Common European Security and Defense Policy.

Kollias and Paleologou (2010) examined the linkage among growth, investment and defense spending in the EU15 over the period 1961-2002 employing fixed panel models, random coefficients models and trivariate VAR model. The empirical results imply that growth has a positive impact on military expenditures and investment. On the whole, however, the findings prove any consistent quantitative relation between defense spending and neither growth nor investment.

Hartley and MacDonald (2010) attempted to model the demand function of the UK's military expenditures during 1970-2008 periods. ARDL results indicate for the UK that it faces some defense choices for future policy issues.

Chang et al. (2011), using GMM, investigated military expenditures-economic growth relationship for 90 countries in Africa, Europe, the Middle East-South Asia and Pacific Rim over the periods 1992-2006. It is concluded that military spending negatively affects economic growth for low income countries and negative causality from military spending to economic growth is detected in Europe and Middle East-South Asia regions.

Dunne and Nikolaidou (2012) investigated the link between defense spending and economic growth in the case of EU15 over the period 1961-2007 by employing an augmented Solow-Swan model. Empirical findings obtained from both times series and panel data analyses

indicate that military burden does not have a positive impact on the economies of EU15; hence, military expenditures do not enhance growth in the region.

Bojnec (2012) carried an analysis out of the characteristics of the macroeconomic structure of the Slovenian defense industry on the micro-level Slovenian defense enterprise market outlets. Findings show that the Slovenian defense technological and industrial base enterprises are highly correlated with the domestic market in primary production, supply-in-return and subcontracting activities.

Topcu and Aras (2013a) investigated the nexus between military expenditures and economic growth for the 21 members of the EU. Their findings do not show consistent results across the EU and it is also indicated that end of Cold War has significant negative impact on defense spending of former east-European countries.

3 Empirical specification and data

In this paper, economic growth is described as a function of capital stock and military expenditures. Equation (1) monitors econometric form of this relationship.

$$y_{i,t} = \alpha_{0i} + \alpha_{1i} k_{i,t} + \alpha_{2i} milex + \varepsilon_{i,t} \quad (1)$$

In the model above, economic growth is measured using GDP per capita at constant prices (2005) in US$ and denoted by y. Capital stock is measured using gross fixed capital formation at constant prices (2005) in US$ and denoted by k. Military expenditures are measured using overall military expenditures in US$ at constant prices (2011) and denoted by milex. All variables are in natural logarithms and the annual data are spanning from 1988 to 2012.

Dataset used in this panel framework are strongly balanced and come from two sources. Military expenditure data were taken from SIPRI military expenditures database. Capital stock and economic growth data, on the other side, were obtained from World Bank World Development Indicators (WDI) database.

4 Methodology and results

In panel data literature, several unit root techniques (see the methods, for example, Maddala and Wu, 1999; Breitung, 2000; Levin et al., 2002; Im et al., 2003) have been implemented in the recent years. In present paper Breitung test was employed in order to examine the existence of a possible unit root in panel data series. The reason why we choose Breitung (2000) approach is that it has the highest power and smallest size distortions among the others.

The Breitung (2000) approach for panel unit root testing can be formalized as follows:

$$y_{it} = \alpha_{i,t} + \sum_{k=1}^{p+1} \beta_{ik} X_{i,t-k} + \varepsilon_{i,t} \quad (2)$$

Equation (2) tests the null hypothesis assuming that the process is a difference stationary against the alternative assuming that the process is stationary. Testing procedure includes individual effects and individual linear trends as exogenous variables.

Table 2: Panel unit root results

Variables	Old members	New members
y	0,125	-0,905
k	1,182	0,275
milex	-1.089	-0,151
Δy	-8,791***	-6,721***
Δk	-5,456***	-7,061***
Δmilex	-11,49***	-6,129***

Note: Δ is the first difference operator. *** denotes significance at 1%. The maximum lags were set to 5 and SIC was used to identify optimal lag length.

The results of Breitung tests are reported in table 1. Findings show that the null indicating the existence of a unit root can be rejected for all variables for two groups. These results confirm the integration of I(1).

As the variables are integrated of order one, the heterogeneous panel cointegration test proposed by Pedroni (1999) seems better to be performed. Algebraic form of this method is formulized as follows:

$$y_{i,t} = \delta_i + \kappa_{i,t} + \lambda_i k_{i,t} + \theta milex_{i,t} + \varepsilon_{i,t} \quad (3)$$

where t=1,…..,T and i=1,…,N. The fixed effects λ_i and slope coefficients λ_i and θ_i are allowed to vary across individual countries.

Pedroni (1999) develops seven statistics in order to test of the null of no cointegration in heterogeneous panels. While four of these statistics (panel v, panel rho, panel PP and panel ADF) comprise the within dimension approach; other three statistics (group rho, group PP and group ADF) comprise the between dimension approach.

Table 3: Panel cointegration results

		Old members		New members	
Dimension	**Test**	**intercept**	**intercept&trend**	**intercept**	**intercept&trend**
Within dimension	Panel v-stat	0,403	1,405*	3,583**	1,597*
	Panel ρ-stat	1,913	1,712	-1,237*	3,212
	Panel pp-stat	-1,846*	-1,435*	-1,347*	2,462
	Panel ADF-stat	-5,973***	-1,311*	-7,641***	-4,279***
Between dimension	Group ρ-stat	1,979	2,076	-1,390*	0,244
	Group pp-stat	-2,853***	-2,790***	-5,687***	-5,597***
	Group ADF-stat.	-2,156**	-1,577*	-7,538***	6,919***

Note: Tests were carried out with three lags. The statistics are asymptotically distributed as standard normal. The panel v-stat. is a right-tailed test whereas the others are right-tailed. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 3 propounds Pedroni's panel cointegration results under the null of no cointegration. The tests were performed for intercept as well as intercept plus trend. Test statistics imply the rejection of null hypothesis both for the newer and the older members. Therefore, it can be inferred from the table that there is a co-movement among military expenditures, capital stock and economic growth in the long-run.

Once cointegration relationship is established, causality among the variables needs to be examined by panel vector error correction model (VECM, hereinafter). The capital stock equation, however, was omitted as our goal was to investigate the relationship between military expenditures and economic growth. The VECM can be formulized as follows:

$$\Delta y_{i,t} = \alpha_{1i} + \sum_{j=1}^{k} \alpha_{1i} \Delta y_{t-j,i} + \sum_{j}^{k} \alpha_{2i} \Delta k_{t-j,i} + \sum_{j}^{k} \alpha_{3i} \Delta milex_{t-j,i} + \lambda ECT_{t-1} + \varepsilon_{1i,t} \quad (4)$$

$$\Delta milex_{i,t} = \beta_{0i} + \sum_{j=1}^{k} \beta_{1i} \Delta milex_{t-j,i} + \sum_{j}^{k} \beta_{2i} \Delta y_{t-j,i} + \sum_{j}^{k} \beta_{3i} \Delta k_{t-j,i} + \theta ECT_{t-1} + \varepsilon_{2i,t} \quad (5)$$

where αs and βs, and are short term coefficients and λ and θ are speed of adjustment coefficients of each equation. The error correction term (ECT) is derived from long run relationship and it measures the magnitude of the past disequilibrium. λ and θ have to be significant and value of these coefficients have to fall within -1 and 0 so as to find out a long-run causal ordering.

Table 4 consists of two panels. Table 4a and 4b reports the results of the panel VECM for the old and the new members, respectively. As is clear from table 4a, while the coefficients of capital stock and ECT are significant on equation 4; the coefficients of growth and ECT are significant at 1% level on equation 5. The results for the old members point out that once economic growth causes changes in military expenditures in the short-run; a mutual causality is found in the long-run. When it comes to the new members, the coefficients of capital stock are significant at the 1% level on equation 4 and the coefficients of economic growth and ECT are also significant at the 1% level on equation 5. These results imply for the new members that there exists both short-run and long-run uni-directional causality from economic growth to military expenditures. In addition, capital stock has significant impacts on economic growth both for the new and the old members in keeping with the mainstream growth theory.

Table 4: Panel causality results

Table 4a: Panel causality results for the old members

	Short-run causality			Long-run causality
Variables	Δy	Δk	Δmilex	ECT
Δy		1,927*	1,805	-0,055***
Δmilex	2,825**	0,319		-0,147***

Table 4b: Panel causality results for the new members

	Short-run causality			Long-run causality
Variables	Δy	Δk	Δmilex	ECT
Δy		4,970***	0,099	-0,018
Δmilex	3,527***	0,256		-0,194***

Note: ↓dependent variables; → independent variables (sources of causation). The optimal lag length was selected considering SIC. ECTs reported herein are coefficient values. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

5 Discussions and policy implications

Countries from all over the world spend on military sector resulting from several reasons like geographical position, foreign policy targets, threat perception etc. Over the last three decades, a large number of empirical studies have attempted to investigate the contribution of military expenditures on economic growth. Regardless of whether the country is developed or developing, policymakers need to analyze the mutual relationship between military expenditures and economic activity in order to develop an appropriate economic or military strategy. This information will be even more useful for the EU where 28 various structured countries come together.

Table 5: Average defense spending in the EU28 for 1988-2012 periods (2011 constant prices)

Ranking	Countries	Spending (US$b)	Ranking	Countries	Spending (US$b)
1	France	63900	15	Czech Rep.	3087
2	UK	55689	16	Romania	2489
3	Germany	48925	17	Hungary	1786
4	Italy	39998	18	Croatia	1491
5	Spain	15024	19	Ireland	1353
6	Netherlands	11592	20	Slovakia	1338
7	Greece	8889	21	Bulgaria	982
8	Poland	7761	22	Slovenia	632
9	Sweden	7096	23	Cyprus	555
10	Belgium	5772	24	Lithuania	452
11	Denmark	4656	25	Estonia	319
12	Portugal	4567	26	Latvia	304
13	Austria	3477	27	Luxemburg	295
14	Finland	3286	28	Malta	54

Source: SIPRI Military Expenditures Database.
Note: Averages of each country's spending were calculated by the authors.

Consistent with table 5, empirical findings of this paper reveal an obvious split between the older and the newer members of the EU. As can be seen from the table, while top spenders of the table consist of the old members, new members do not spend as much as the older members. Apart from this generalization, Poland and Czech Republic differ from the new members as they spend much more while the reverse also holds for Luxemburg and Ireland as they spend less.

Causality results indicate that all members need to spend on military to defend both in the short-run and the long-run. That is, all members allocate a share of its income to the military sector. Although this situation does not depend on whether the country is an old or a new member, the amount of the defense expenditure depends on some factors as mentioned above. The difference between the newer and the older members, however, comes from the long-run causality results. There exists a bi-directional causality in the case of the old members. The underlying reason of this is that old members of the EU including France, the UK, Germany, and Italy have a choice to consider defense industry as a tool to make money, which is consistent with Topcu and Aras (2013b). In other words, addressing these members as a defense economics within the EU seems reasonable. New members mostly spend on military sector considering security requirements. Thus, one would expect new members to expend in order to defend.

What defense industry means for a country could be shortly explained via three ways: (i) internal requirements regarding security and defense causes within the border of the country, (ii) external requirements regarding threat perception resulted from the neighbors, the region and the global powers, and (iii) incentive of income generation by exporting defense industry production to the rest of the world. In that sense, majority of the older EU members commonly have the characteristics of all these three unlike the new members in which the third feature has been ignored.

To sum up, policymakers in the older EU countries should consider the feedback between the variables. Financing military expenditures by taxes or borrowing, or in brief, allocating existing resources from some other areas to military expenditures may deteriorate economic growth in the short-run; but this might yield some favorable outcomes in the long-run and pop-up growth. Thus, policymakers in these countries should benefit from the advantage of

military expenditures in the long-run despite of the contractionary impacts in the short-run. Policymakers in the new EU countries, on the other hand, should realize that expenses on military sector may divert resources away from more productive government outlays such as education and health services. As a consequence, while all members need to spend on military sector, only the older ones have an option to drive this as a demand stimulating instrument.

6 Conclusion

Topcu and Aras (2013a) found a split between the newer vs. the older members of the EU by using times-series cointegration and causality approach. The scope of this study is to examine milex-growth relationship between the newer vs. the older members in a panel framework in the presence of capital stock. For this examination, we use annual observations from 1988 to 2012 for 28 member countries. Pedroni's heterogeneous panel causality results show that the variables involved are cointegrated both for the old and the new members. This result does not support the results of Topcu and Aras (2013a) that found a long-run relation only in the case of the relatively strongest countries. Causality results prove an evidence of growth detriment hypothesis in the short-run both for the old and the new members, which is consistent with the results of Chang et al. (2011) that studied on low income, European and Middle East-South Asian countries. The long-run causality results, on the other side, supply a strong support of feed-back hypothesis. This is consistent with the results of Cappelen et al. (1984) and Yılgör et al. (2012). Nonetheless, this finding is not compatible with the results of Kusi (1994) that found the validity of feed-back hypothesis in the case of developing countries.

Even though the results of the paper do not support that one size fits all, a clear cut split between the old and the new members of the EU has been appeared in the long-run. A more extensive study involved various income-level-countries may help following researchers to find out whether this split always exists. Moreover, other growth determinants such as labor force, education and technology could be included in the regressions in order to obtain more efficient outcomes.

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