Mert Topcu[1], Ilhan Aras[2]

ECONOMIC IMPACTS OF MILITARY EXPENDITURES: A COMPARATIVE ANALYSIS ON SUPERPOWERS OF THE WORLD

Dunne and Nikolaidou (2005) pointed out the importance of relatively homogenous countries in sampling on economic impacts of military spending. In this regard, our paper aims at investigating long-run causal relationship between military expenditures and economic growth among the superpower countries of the world using ARDL approach and Toda Yamamoto technique over the period 1973-2011. The most remarkable findings of the paper are the one group of countries composed of 7 members of G8 and the general tendency in the split of causality which can be described as developed and developing countries.

Keywords: *military expenditures; economic growth; superpowers; cointegration; causality.*

JEL Classificiation: *H56; C22.*

Мерт Топчу, Ільхан Араш

ЕКОНОМІЧНІ НАСЛІДКИ ВІЙСЬКОВИХ ВИТРАТ: ПОРІВНЯЛЬНИЙ АНАЛІЗ НАДДЕРЖАВ СВІТУ

У статті відмічено, що вибірка країн для визначення економічних наслідків військових витрат має бути відносно однорідною. Вивчено довгостроковий і причинно-наслідковий зв'язок між військовими витратами і економічним зростанням серед наддержав світу. Використано метод авторегресивного розподіленого лагу і технологію Тода-Ямамото для даних за 1973-2011 роки. В результаті виділено групу з 7 країн, що входять в "велику вісімку", і визначено загальну тенденцію в розділенні причинності, яка може бути описана окремо для розвинених країн і країн, що розвиваються.

Ключові слова: *військові витрати, економічне зростання, наддержави, коінтеграція, причинність.*

Мерт Топчу, Ильхан Араш

ЭКОНОМИЧЕСКИЕ ПОСЛЕДСТВИЯ ВОЕННЫХ РАСХОДОВ: СРАВНИТЕЛЬНЫЙ АНАЛИЗ СВЕРХДЕРЖАВ МИРА

В статье отмечено, что выборка стран для определения экономических последствий военных расходов должна быть относительно однородной. Изучена долгосрочная и причинно-следственная связь между военными расходами и экономическим ростом сверхдержав мира. Использованы метод авторегрессивного распределённого лага и технология Тода-Ямамото для данных за 1973-2011 годы. В результате выделена группа из 7 стран, входящих в "большую восьмерку", и обнаружена общая тенденция в разделении причинности, которая может быть описана отдельно для развитых и развивающихся стран.

Ключевые слова: *военные расходы, экономический рост, сверхдержавы, коинтеграция, причинность.*

[1] Corresponding Author, Research Assistant, Department of Economics, Faculty of Economics and Administrative Sciences, University of Nevsehir, Turkey.

[2] Research Assistant, Department of International Relations, Faculty of Economics and Administrative Sciences, University of Nevsehir, Turkey.

1. Introduction. The main concern about the issue of military expenditures is that the world is continuing to devote large amounts on military sector. Hirnissa and Baharom (2009) claimed that higher military expenditures tend to be associated with higher economic growth and also as a protection to maintain the peace of the world. However, the public belief on this issue is expenditures will lead to war. In addition, higher taxation is needed to finance higher military expenditures, thus, reducing economic growth in the long run. This difference in the arguments has led to different opinions on whether military expenditures have positive or negative effect on economic growth. Hassan et al. (2003) emphasized 4 arguments about the effect channels. However, the causal relationship between these variables is also important to reach a general conclusion about the structure of the countries as well as effect channels.

In this paper, the impact of military expenditures on economic growth is examined over the period 1973-2011 for the superpower countries of the world. Dunne and Nikolaidou (2005), studying European peripheral economies - Greece, Portugal and Spain, denoted the importance of relatively homogenous countries in sampling on economic impacts of military spending. From this viewpoint, the countries in the paper were selected due to military expenditures rankings in 2011. Selected countries are the first 15 in the world by defence spending. These mentioned countries are almost the top ones in terms of GDP ranking in 2011, too.

Table 1. **Top 15 countries with the highest military expenditures in 2011**

Rank	Country	Spending MER ($b.)	Change, 2002-2011 (%)	Share of GDP (% est.)	World share (%)	Spending PPP ($b.)
1	USA	711	59	4.7	41	711
2	China	[143]	170	[2.0]	[8.2]	[288]
3	Russia	[71.9]	79	[3.9]	[4.1]	[93.7]
4	UK	62.7	18	2.6	3.6	57.5
5	France	62.5	-0.6	2.3	3.6	50.1
Sub-total top 5		**1.051**			**61**	
6	Japan	59.3	-2.5	1	3.4	44.7
7	S. Arabia	48.5	90	8.7	2.8	58.8
8	India	46.8	59	2.5	2.7	112
9	Germany	[46.7]	-3.7	[1.3]	[2.7]	[40.4]
10	Brazil	35.4	19	1.5	2.0	33.8
Sub-total top 10		**1288**			**74**	
11	Italy	[34.5]	-21	[1.6]	[2.0]	[28.5]
12	S. Korea	30.8	45	2.7	1.8	42.1
13	Australia	26.7	37	1.8	1.5	16.6
14	Canada	[24.7]	53	[1.4]	[1.4]	[19.9]
15	Turkey	[17.9]	-12	[2.3]	[1]	[25.2]
Sub-total top 15		**1422**			**82**	
World		**1735**	**42**	**2.5**	**100**	

Source: SIPRI Military Expenditure Database, http://www.sipri.org/research/armaments/milex/resultoutput/milex_15/the-15-countries-with-the-highest-military-expenditure-in-2011-table/view, 28.06.2012.

Spending figures are in USD, current prices and exchange rates. Countries are ranked according to military spending at Market Exchange Rates (MER). Figures for military spending at Purchasing Power Parity (PPP) exchange rates are also given for information. [ ] signifies the estimated figures.

Table 1 and 2 respectively show the rankings of military expenditures and the highest GDP list detailed.

Table 2. **World Rankings of GDP (PPP), 2011**

Ranking	Country	mln USD	Ranking	Country	mln of USD
1	U. States	15,094,025	9	France	2,217,900
2	China	11,299,967	10	Italy	1,846,950
3	India	4,457,784	12	S. Korea	1,554,149
4	Japan	4,440,376	14	Canada	1,396,131
5	Germany	3,099,080	16	Turkey	1,073,565
6	Russia	2,383,402	18	Australia	914,482
7	Brazil	2,293,954	23	S. Arabia	682,753
8	U. Kingdom	2,260,803			

Source: International Monetary Fund, World Economic Outlook Database, accessed 28.06.2012.

Although there exists a large amount of defence economics literature, to our knowledge, there is no other study which explores this issue in the case of a combination of some countries consisting of economic and military powers of the world. Hence, this study aims to fulfill this gap and contribute to the empirical literature.

This study is composed of 4 sections. Following the introductory part, related literature was analyzed in the second part and the methodology of the study and econometric model were put forth in the third part and finally the findings were interpreted and a general review was made.

2. Review of Literature. The present literature has included a plethora of studies on the relationship between military expenditures and economic growth since 1970s. Although there exists an extended literature on this issue, the results of these studies lack consensus and debates continue.

Dakurah et al. (2001) examined the causality relationship in 62 developing countries over the period 1975-1995. The results showed that unidirectional causality was found for 23 countries, from either defence expenditures to economic growth or vice versa, while bidirectional causality existed in 7 countries. There also exists no causality relationship in 18 countries.

Dritsakis (2004) examined the empirical relationship between defence spending and economic growth for Turkey and Greece over the period 1960-2001 by employing cointegration and error correction model. Findings proved that there is no cointegration and there exists a bidirectional causality running between defence spending of two countries.

Kollias et al. (2004) examined the relationship between military expenditure and economic growth for the EU15 members using cointegration and causality tests over the period 1961-2000. The apparent prevalence of the causality direction is from economic growth to military expenditure in the related countries.

Mehenna (2004) investigated the link between military spending and economic growth in the United States over the period 1959:1-2001:1 using VAR approach. Findings reveal that the variables in question have neither a statistical, nor an economic impact on each other.

Yildirim et al. (2005) focused on the effects of military expenditures on economic growth for Middle East countries and Turkey over the period 1989-1999 by using cross-section and dynamic panel estimation methods. Findings indicate that military expenditures enhance economic growth in these countries.

Yildirim and Ocal (2006) examined the relationship between arms race and economic growth over the period 1949-2003 using VAR method for India and Pakistan.

Their results suggest that even though military expenditure does not Granger cause growth in Pakistan, there is a causality running from military expenditures to economic growth in India.

Kollias et al. (2007) examined the nexus between economic growth and military spending in the EU15 using panel data method for the period from 1961 to 2000. Their findings indicate to the presence of a positive feedback between the variables in question in the long run and military spending has a positive effect on growth in the short run.

Mylonidis (2008) focused on the influence of military spending on European economic growth using panel data analysis over the period 1960-2000. He found that military spending has an overall net negative influence on economic growth and as cross section regression results show, the magnitude of this negative impact tends to rise over time.

Hirnissa and Baharom (2009) investigated the relationship military spending and economic growth for ASEAN-5 countries by using ARDL approach over the period 1965-2006. They found that in Indonesia, Thailand and Singapore there exists long run relationship between the variables. There is a bidirectional causality relationship for Singapore and unidirectional relationship from military spending to economic growth in Indonesia and Thailand. For Malaysia and Philippines no meaningful results could be obtained.

Pradhan (2010) investigated whether there is any long run relationship between China, India, Nepal and Pakistan's defence expenditures and examined the long run link between defence spending and economic growth in these 4 countries over the period 1988-2007. It is found that there exists uni-directional causality from defense spending to economic growth in China and Nepal and cointegration test suggested that defense spending of a particular country can effect the defense spending of other countries.

3. Model and Data. In this paper, the long-run causal relationships between military expenditures and economic growth are investigated for superpower countries which are the leaders of the world in both economic and military fields.

The general econometric specification is as follows for each country:

$$gdpt = \alpha_0 + \alpha_1 milex_t + e_t. \quad (1)$$

In the model, economic growth is represented by GDP per capita[3] in the US dollars as measured by expenditure approach on GDP at constant prices. The representative variable is in logarithmic form and denoted by GDP. On the other hand, right-hand-side variable is military expenditures as measured by the share of GDP[4], which includes all expenditures on armed forces. This variable is also in logarithmic form and denoted by milex. The data used in this paper were gathered from the OECD Statistics, SIPRI yearbooks (various issues), NATO Annual Press Releases and CHASS Data Centre. The data are annual and the sample period is 1973-2011.

4. Methods and Findings. It is necessary to test the stability of series before identification of the relationship between the variables. Granger and Newbold stated that

[3] The same analysis was also carried out by using the growth rate of the GDP instead of GDP per capita but insignificant results were obtained for most countries.

[4] Since military expenditure data of the related countries is not valid in their national currencies for a comparative analysis, military expenditures measured by the share of GDP are taken as a common determinant for all the countries.

the regression analysis between the variables would not be consistent and spurious regression problem would occur if unstable data are used (1974: 111-120). Dickey-Fuller (DF) (1979), Augmented Dickey-Fuller (ADF) (1981) and Phillips-Peron (PP) (1988) tests are commonly used for stationary in empirical applications. In this paper, ADF and PP conventional tests, reported in Table 3, are used for unit root. Findings indicate that all the variables are not stationary in their levels, while they are stationary in first difference, except Japan.

Table 3. **ADF and PP Unit Root Results**

H_0: series have unit root					
Countries	**ADF**		**PP**		**Decision**
	τ_τ	τ_μ	τ_τ	τ_μ	
Australia					
milex	-1.314[0.61]	-1.827[0.67]	-1.356[0.59]	-1.888[0.64]	H_0: Accept
gdp	0.415[0.98]	-2.519[0.31]	0.471[0.98]	-2.610[0.27]	H_0: Accept
Δmilex	-5.613[0.00]***	-5.540[0.00]***	-5.622[0.00]***	-5.546[0.00]***	H_0: Reject
Δlngdp	-5.112[0.00]***	-5.020[0.00]***	-5.296[0.00]***	-5.164[0.00]***	H_0: Reject
Brazil					
milex	-1.268[0.63]	-2.553[0.30]	-1.346[0.59]	-2.920[0.28]	H_0: Accept
gdp	0.333[0.97]	-2.478[0.33]	-1.137[0.69]	-2.485[0.33]	H_0: Accept
Δmilex	-4.372[0.00]***	-4.359[0.00]***	-5.867[0.00]***	-5.627[0.00]***	H_0: Reject
Δlngdp	-5.046[0.00]***	-4.929[0.00]***	-4.969[0.00]***	-4.860[0.00]***	H_0: Reject
Canada					
milex	-1.415[0.56]	-1.194[0.89]	-1.444[0.55]	-1.370[0.85]	H_0: Accept
gdp	-0.792[0.80]	-2.816[0.20]	-0.901[0.77]	-1.829[0.66]	H_0: Accept
Δmilex	-3.288[0.02]**	-3.226[0.09]*	-6.077[0.00]***	-6.201[0.00]***	H_0: Reject
Δlngdp	-3.719[0.00]***	-3.702[0.03]**	-4.132[0.00]***	-4.109[0.01]**	H_0: Reject
China					
milex	-1.617[0.46]	-0.008[0.99]	-1.426[0.55]	-0.540[0.97]	H_0: Accept
gdp	1.086[0.99]	-1.856[0.65]	2.436[1.00]	-3.199[0.10]	H_0: Accept
Δmilex	-4.467[0.00]***	-4.882[0.00]***	-4.597[0.00]***	-4.954[0.00]***	H_0: Reject
Δlngdp	-2.707[0.08]*	-5.059[0.00]***	-4.170[0.00]***	-4.338[0.00]***	H_0: Reject
France					
milex	0.744[0.99]	-1.687[0.73]	1.034[0.99]	-1.520[0.80]	H_0: Accept
gdp	-1.586[0.47]	-1.207[0.89]	-2.186[0.21]	-1.226[0.89]	H_0: Accept
Δmilex	-7.150[0.00]***	-7.509[0.00]***	-7.127[0.00]***	-7.490[0.00]***	H_0: Reject
Δlngdp	-4.839[0.00]***	-5.112[0.00]***	-4.896[0.00]***	-5.074[0.00]***	H_0: Reject
Germany					
milex	-0.705[0.83]	-1.189[0.89]	-0.721[0.82]	-1.538[0.79]	H_0: Accept
gdp	-1.633[0.45]	-1.242[0.88]	-2.609[0.11]	-0.858[0.95]	H_0: Accept
Δmilex	-3.349[0.02]**	-3.417[0.06]*	-5.734[0.00]***	-5.740[0.00]***	H_0: Reject
Δlngdp	-5.062[0.00]***	-5.353[0.00]***	-4.972[0.00]***	-6.903[0.00]***	H_0: Reject

The End of *Table 3*

Countries	H_0: series have unit root				Decision
	ADF		PP		
	τ_τ	τ_μ	τ_τ	τ_μ	
India					
milex	-1.877[0.33]	-3.198[0.12]	-1.986[0.29]	-2.824[0.19]	H_0: Accept
gdp	3.095[1.00]	-0.642[0.97]	5.058[1.00]	-0.462[0.98]	H_0: Accept
Δmilex	-5.228[0.00]***	-5.170[0.00]***	-5.463[0.00]***	-5.605[0.00]***	H_0: Reject
Δlngdp	-5.871[0.00]***	-7.369[0.00]***	-5.934[0.00]***	-7.489[0.00]***	H_0: Reject
Italy					
milex	-1.091[0.70]	-2.517[0.31]	-1.091[0.70]	-2.611[0.27]	H_0: Accept
gdp	-2.445[0.13]	0.515[0.99]	-2.609[0.12]	1.464[1.00]	H_0: Accept
Δmilex	-6.116[0.00]***	-6.028[0.00]***	-6.141[0.00]***	-6.060[0.00]***	H_0: Reject
Δlngdp	-4.860[0.00]***	-6.020[0.00]***	-4.910[0.00]***	-6.021[0.00]***	H_0: Reject
Japan					
milex	-4.543[0.00]***	-4.433[0.00]***	-4.544[0.00]***	-4.434[0.00]***	H_0: Reject
gdp	-1.955[0.30]	-0.279[0.98]	-1.817[0.36]	-0.454[0.98]	H_0: Accept
Δmilex	-6.774[0.00]***	-6.968[0.00]***	-12.27[0.00]***	-17.10[0.00]***	H_0: Reject
Δlngdp	-4.204[0.00]***	-4.933[0.00]***	-4.251[0.00]***	-4.907[0.00]***	H_0: Reject
Russia					
milex	-0.601[0.85]	-1.503[0.81]	-0.708[0.83]	-1.751[0.70]	H_0: Accept
gdp	-2.610[0.11]	-3.112[0.12]	-1.354[0.59]	-1.400[0.84]	H_0: Accept
Δmilex	-4.582[0.00]***	-4.514[0.00]***	-4.589[0.00]***	-4.521[0.00]***	H_0: Reject
Δlngdp	-2.705[0.08]*	-3.209[0.08]*	-2.612[0.09]*	-3.203[0.08]*	H_0: Reject
S. Arabia					
milex	-1.736[0.40]	-2.999[0.14]	-1.736[0.40]	-3.038[0.13]	H_0: Accept
gdp	-1.907[0.32]	-0.571[0.97]	-1.535[0.50]	-1.106[0.91]	H_0: Accept
Δmilex	-6.204[0.00]***	-6.157[0.00]***	-6.325[0.00]***	-6.282[0.00]***	H_0: Reject
Δlngdp	-2.844[0.06]*	-4.142[0.01]**	-4.162[0.00]***	-4.157[0.01]**	H_0: Reject
S. Korea					
milex	-0.370[0.90]	-3.041[0.13]	-0.597[0.85]	-2.985[0.14]	H_0: Accept
gdp	-1.784[0.38]	-0.694[0.96]	-1.916[0.32]	-0.701[0.96]	H_0: Accept
Δmilex	-5.450[0.00]***	-5.396[0.00]***	-5.445[0.00]***	-5.386[0.00]***	H_0: Reject
Δlngdp	-5.062[0.00]***	-5.391[0.00]***	-5.046[0.00]***	-5.359[0.00]***	H_0: Reject
Turkey					
milex	-0.169[0.93]	-1.554[0.79]	-0.391[0.90]	-1.554[0.79]	H_0: Accept
gdp	-0.765[0.81]	-3.132[0.11]	-0.706[0.83]	-3.200[0.10]	H_0: Accept
Δmilex	-4.860[0.00]***	-5.123[0.00]***	-4.810[0.00]***	-5.065[0.00]***	H_0: Reject
Δlngdp	-6.519[0.00]***	-6.407[0.00]***	-6.638[0.00]***	-6.421[0.00]***	H_0: Reject
UK					
milex	-0.947[0.76]	-1.098[0.91]	-0.968[0.75]	-1.401[0.84]	H_0: Accept
gdp	-1.162[0.67]	-3.119[0.11]	-0.594[0.85]	-1.401[0.84]	H_0: Accept
Δmilex	-3.052[0.03]**	-3.204[0.09]*	-5.592[0.00]***	-5.636[0.00]***	H_0: Reject
Δlngdp	-3.498[0.01] **	-3.518[0.05]*	-3.303[0.02]**	-3.269[0.08]*	H_0: Reject
USA					
milex	-1.701[0.42]	-0.414[0.98]	-1.517[0.51]	-1.247[0.88]	H_0: Accept
gdp	-0.919[0.77]	-2.891[0.17]	-0.912[0.77]	-2.072[0.54]	H_0: Accept
Δmilex	-3.330[0.02]**	-3.490[0.05]*	-3.475[0.01]**	-3.773[0.02]**	H_0: Reject
Δlngdp	-4.245[0.00]***	-4.471[0.00]***	-4.304[0.00]***	-4.485[0.00]***	H_0: Reject

Note: Probability values of t-statistics are in brackets.
***, ** and * denote significant at 1%, 5% and 10% respectively.
Δ signifies the first difference of the questioned variable.

When a series possesses structural break(s), the conventional unit root tests such as ADF and PP would present inconsistent results. In order to solve this problem,

Zivot and Andrews (ZA) (1992) unit root test is employed in the paper. The ZA unit root test involves 3 different regressions (Model A, B and C). In Model A, a dummy variable is included into the regression such that the intercept can shift at certain point in time. Model B allows for one-time change in slope of trend function, and Model C combines both A and B.

Table 4. **ZA Unit Root with one Structural Break**

Countries	Model A	Model C	Countries	Model A	Model C
Australia			**Japan**		
milex	-4.913[1994]*	-4.217[1994]	milex	-3.396[1981]	-3.762[1984]
GDP	-3.980[1997]	-3.673[1997]	GDP	-1.741[1998]	-5.139[1988]*
Brazil			**Russia**		
milex	-4.193[1988]	-3.805[1988]	milex	-6.253[1991]*	-5.431[1991]*
GDP	-4.566[1990]	-5.091[2003]*	GDP	-4.767[1991]	-4.876[1992]
Canada			**S. Arabia**		
milex	-3.700[1994]	-2.204[1994]	milex	-3.512[1982]	-3.742[1988]
GDP	-3.837[1990]	-3.783[1990]	GDP	-4.903[1982]*	-4.518[1982]
China			**S. Korea**		
milex	-2.849[1986]	-3.884[1993]	milex	-3.743[2004]	-4.961[2002]
GDP	-3.585[1989]	-3.671[1981]	GDP	-2.732[1986]	-3.029[1998]
France			**Turkey**		
milex	-3.878[1981]	-3.832[1981]	milex	-3.844[2004]	-7.348[1999]*
GDP	-1.793[1988]	-2.863[2004]	GDP	-3.893[1981]	-4.764[1986]
Germany			**UK**		
milex	-4.537[1991]	-3.656[1991]	milex	-3.034[1993]	-2.298[1993]
GDP	-2.515[2002]	-3.858[1990]	GDP	-3.674[1980]	-3.705[1980]
India			**USA**		
milex	-4.399[1980]	-4.709[1988]	milex	-2.900[1993]	-2.645[1993]
GDP	-2.155[1979]	-2.699[2001]	GDP	-3.313[1986]	-4.279[2004]
Italy					
milex	-3.266[1981]	-3.791[2001]			
GDP	-0.692[2003]	-2.380[2001]			

Note: Critical values for the models A and C are -4.80 and -5.08 at the 5% level of significance respectively and these values are obtained from Zivot and Andrews (1992, p. 256-257).
Breaking years are in brackets.
* indicates the significance at 5%.
Identified lag lengths with regard to SIC are used in the analyses.

The results of the ZA unit root with a structural break are given in Table 4. The ZA results show that while some variables are stationary in their levels, some of them are not and it is found that they are not in the same order. Since the results of ZA unit root test support the results obtained from conventional tests, it is obvious that the most appropriate way to investigate cointegration is ARDL bounds testing approach of cointegration developed by Pesaran (1997), Pesaran and Shin (1999) and Pesaran et al. (2001). The ARDL cointegration approach has numerous advantages when it is compared to other cointegration methods such as Engle and Granger (1987), Johansen (1988) and Johansen & Juselius (1990). The most useful advantage, however, is that it can be applied irrespective of whether relevant regressors are purely I(0), purely I(1) or mutually cointegrated.

The ARDL bound test approach for cointegration can be formulized as follows:

$$\Delta \ln gdpt = \alpha_0 + \sum_{i=1}^{k} \alpha_1 \Delta \ln gdp_{t-i} + \sum_{i=0}^{\ell} \alpha_2 \Delta \ln milex_{t-i} + \alpha_3 \ln gdp_{t-1} + \alpha_4 \ln milex_{t-1} + \nu_t \quad (2)$$

where ν_t and Δ are the white noise term and the first difference operator, respectively. The ARDL method estimates $(p + 1)k$ number of regressions in order to obtain the optimal lag length for each variable, where p is the maximum number of lags to be used and k is the number of variables in the equation.

In equation (2), α_1 and α_2 represent the short-run dynamics while α_3 and α_4 represent the long-run dynamics. The null hypothesis in equation (2) is $\alpha_3 = \alpha_4 = 0$, which means the absence of long-run relationship between the variables in question and vice versa. If the calculated F-test statistics exceeds the upper critical value derived from Pesaran et al. (2001)[5], the null hypothesis of no cointegration relationship can be rejected.

Bound test results, presented in Table 5, indicate there exists a long run relationship between military expenditures and economic growth in India, Italy, Russia, S. Korea, the UK and the USA.

Table 5. **Bound Test Results**

Countries	Lag	F-stat.	χ^2BG	χ^2W
Australia	2	1.151	1.201[0.44]	1.276[0.26]
Brazil	1	2.934	0.460[0.92]	0.427[0.51]
Canada	1	2.746	2.226[0.16]	0.025[0.87]
China	3	2.114	0.888[0.86]	2.580[0.11]
France	1	3.651	1.638[0.19]	0.910[0.34]
Germany	1	3.047	1.712[0.10]	0.685[0.41]
India	1	5.339*	2.709[0.12]	0.832[0.36]
Italy	1	6.852*	0.244[0.63]	2.221[0.14]
Japan	1	1.548	2.494[0.12]	0.647[0.42]
Russia	4	5.750*	1.338[0.23]	0.283[0.59]
S. Arabia	2	1.915	2.721[0.10]	0.785[0.49]
S. Korea	1	12.080*	1.390[0.25]	3.413[0.07]
Turkey	1	2.682	2.414[0.16]	0.060[0.80]
UK	3	6.780*	2.511[0.12]	0.135[0.71]
USA	2	15.021*	2.455[0.15]	0.037[0.84]
Critical Values[a]				
		Lower Bound	*Upper Bound*	
1%		7.41	8.37	
5%		5.43	6.24	
10%		4.54	5.27	
Critical Values[b]				
		Lower Bound	*Upper Bound*	
1%		5.593	6.333	
5%		3.937	4.523	
10%		3.210	3.730	

Note: Probability values are in brackets.
* indicates the significance at 10% at least. χ^2BG and χ^2W represent the diagnostic tests of Breusch-Godfrey Serial Correlation LM test and white heteroskedasticity test, respectively.
Critical values are obtained from: [a]Pesaran et al. (2001, Appendix: Table C1.ii: Case II) [b]Narayan (2005, Appendix: Case II)

The most common causality type is standard Granger causality in order to investigate causal running following ARDL bound testing approach. In that procedure, the causality between the variables that are found to be cointegrated has to be investigated by employing error correction model while the variables that are not cointegrated

[5] This paper also uses critical values computed by Narayan (2005).

can be estimated by standard Granger test. However, Toda and Yamamoto (1995) procedure has an advantage that it does not require whether the series are in the same order or co-integrated. Toda-Yamamoto approach proposes an augmented VAR model in levels which allows modeling the dynamic relationship among the variables. The procedure applies a modified Wald test to carry out the restrictions on the parameters of the VAR(k) model. The test has an asymptotic chi-square (χ_2) distribution with k degrees of freedom in the limit when a VAR[$k+d$(max)][6] is estimated. The test consists of two steps. The first step determines the optimal lag length and the maximum order of integration (d) of the variables in the system[7]. The second step uses the modified Wald procedure to test the VAR(k) model for causality. Algebraic form of Toda-Yamamoto methodology is represented as follows:

$$\Delta \ln gdp_t = \alpha_0 + \sum_{i=1}^{v} \alpha_1 \Delta \ln gdp_{t-i} + \sum_{i=1}^{v} \alpha_2 \Delta \ln milex_{t-i} + \varepsilon_t, \quad (3)$$

$$\Delta \ln milex_t = \beta_0 + \sum_{i=1}^{v} \beta_1 \Delta \ln milex_{t-i} + \sum_{i=1}^{v} \beta_2 \Delta \ln gdp_{t-i} + \varepsilon_t \quad (4)$$

Toda-Yamamoto causality results, presented in Table 6, indicate that there exist a bidirectional causality in the case of Russia and the USA. There also exists a unidirectional causality running in 12 countries. For Australia, Brazil, China, India, S. Arabia, S. Korea and Turkey, the running is from economic growth to military expenditures; while it is from military expenditures to economic growth for Canada, France, Germany, Italy and the UK. In addition, no causality is detected for Japan.

5. Policy Implications and Conclusions. Empirical findings indicate that there exists a long run relationship between military expenditures and economic growth in the case of India, Italy, Russia, South Korea, the UK and the USA. Two reasons can be addressed why these countries have this long-run relationship. First, the factors inducing mentioned countries to spend on military sector can not be changed in the short run. Second, the structure of international relations shows also similar conditions in the long run.

Causality results let us classify the countries into two groups. In 7 countries namely Australia, Brazil, China, India, S. Arabia, S. Korea and Turkey, unidirectional causality is detected from economic growth to military expenditures. Generally, these countries do not have a powerful military technology and aim at economic development primarily. It could be inferred that they spend on military sector in conjunction with their national income. On the other hand, in the case of 7 countries namely Canada, Germany, Italy, Japan, Russia, UK and the USA, the causality is running from military expenditures to economic growth. For Japan, which is a relatively small defence industry, no causality running is detected. Including Japan into this group comprises G8 Community and this confirms the term of "superpowers" emphasized in the paper. For these countries, being a member of G8 is the indication of advanced economic potential. Thus, it is probable to deduce that military expenditures affect national income through Keynesian multiplier mechanism. Furthermore, a vital part of overall defence budget goes on information technology especially in these advanced economies and affects economic development by this way.

[6] "k" is optimal lag length and "d(max)" is the optimal order of integration for the series in system. "$k+d_{MAX}$" is defined as "v" in equation (3) and (4).

[7] It is possible to determine "k" and "d" by considering information criteria and unit root testing procedure respectively.

Table 6. **Toda-Yamamoto Causality Results**

Countries	Null Hypothesis	F-Stat	Decision
AUST	H_0: milex does not cause gdp	0.496[0.61]	H_0: Accept
	H_0: gdp does not cause milex	5.380[0.00]***	H_0: Reject
BRA	H_0: milex does not cause gdp	0.222[0.80]	H_0: Accept
	H_0: gdp does not cause milex	5.361[0.02]**	H_0: Reject
CAN	H_0: milex does not cause gdp	2.893[0.09]*	H_0: Reject
	H_0: gdp does not cause milex	0.466[0.63]	H_0: Accept
CHI	H_0: milex does not cause gdp	1.041[0.36]	H_0: Accept
	H_0: gdp does not cause milex	8.155[0.00]***	H_0: Reject
FRA	H_0: milex does not cause gdp	5.670[0.00]***	H_0: Reject
	H_0: gdp does not cause milex	1.541[0.21]	H_0: Accept
GER	H_0: milex does not cause gdp	7.234[0.00]***	H_0: Reject
	H_0: gdp does not cause milex	0.839[0.44]	H_0: Accept
IND	H_0: milex does not cause gdp	0.588[0.44]	H_0: Accept
	H_0: gdp does not cause milex	2.817[0.09]*	H_0: Reject
ITA	H_0: milex does not cause gdp	2.839[0.05]*	H_0: Reject
	H_0: gdp does not cause milex	0.515[0.67]	H_0: Accept
JAP	H_0: milex does not cause gdp	2.268[0.14]	H_0: Accept
	H_0: gdp does not cause milex	0.079[0.92]	H_0: Accept
RUS	H_0: milex does not cause gdp	4.011[0.01]**	H_0: Reject
	H_0: gdp does not cause milex	3.228[0.05]*	H_0: Reject
S. ARA	H_0: milex does not cause gdp	0.854[0.43]	H_0: Accept
	H_0: gdp does not cause milex	3.691[0.03]**	H_0: Reject
S. KOR	H_0: milex does not cause gdp	1.702[0.20]	H_0: Accept
	H_0: gdp does not cause milex	6.540[0.00]***	H_0: Reject
TUR	H_0: milex does not cause gdp	0.421[0.65]	H_0: Accept
	H_0: gdp does not cause milex	3.745[0.02]**	H_0: Reject
UK	H_0: milex does not cause gdp	2.874[0.07]*	H_0: Reject
	H_0: gdp does not cause milex	2.199[0.11]	H_0: Accept
USA	H_0: milex does not cause gdp	3.500[0.04]**	H_0: Reject
	H_0: gdp does not cause milex	2.934[0.08]*	H_0: Reject

Note: Probability values of t-statistics are in brackets.
***, ** and * denote significant at 1%, 5% and 10% respectively.

Table 7. **World Largest Arms Exporters / Importers in 2011**[8]

Suppliers	Total (mln USD)	Recipients	Total (mln USD)
United States	9984	India	3582
Russia	7874	Australia	1749
France	2437	South Korea	1422
China	1356	China	1112
Germany	1206	Saudi Arabia	1095
United Kingdom	1070	Turkey	1010
Italy	1046	United States	946
Canada	292	United kingdom	412
South Korea	225	Canada	342
Australia	126	Italy	311
Saudi Arabia	58	Brazil	266
Brazil	27	Japan	254
India	8	Germany	112
Turkey	6	France	43
Japan	0	Russia	12

Source: SIPRI, http://armstrade.sipri.org/armstrade/page/toplist.php.

[8] In Table 7, only questioned 15 countries are expressed to underline either they are arms exporters or importers.

The defence industry indicators such as arms exports and imports, presented in Table 7, also support our findings. According to the table, the countries that have causality running from economic growth to military expenditures are generally arms importers. They should ensure economic growth to create resources for military expenditures. On the other hand, the countries that have causality running from military expenditures to economic growth are generally arms exporters except, Japan. That is, the defence industry is a source of income for these countries and hence military expenditures affect economic potential.

Present structure of international relations and policy implications of this study point out that while military expenditures are mostly considered as an economic tool for advanced countries, it is usually considered as a security tool for emerging countries. The fact that the list of the largest arms exporter/importer countries consisting of the same countries for many years keeps the relationship between developed and developing countries continual. Moreover, it does not seem possible that the situation could change in the short term.

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