

Analysis of Relationship between Military Expenditure and Economic Growth

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Military Expenditure, Economic Growth, Security, Gross Domestic Product, SIPRI.

Abstract

Nowadays people live in the world where security is one of the most important things. For each country it is necessary to ensure internal and external security and that is why many politicians have to make a decision how much money they spend on military expenditure. Military spending is an inseparable part of national deficit spending and many countries spend about 2 or 3% of GDP. However, we have to neglect major military players like USA. There is generally a significant inconsistency in society to whether the military expenditures have positive or negative influence on economic growth. "Guns vs. Butter" model is a typical example of production possibility frontier. People have to choose between two options – to either buy guns (invest in military or defence) or to buy butter (invest in production of other goods), or both of them. Thus, the paper attempts to find out if there is any relationship between military expenditure and gross domestic product. Data used for analysis are mostly collected from SIPRI websites.

Introduction

The 21st century is the era when security of each human is one of the most important and essential needs. All states of the world must ensure internal and external security for its inhabitants and that is why politicians have to make a decision how much money they spend on military expenditure. Military spending is an inseparable part of national deficit spending and many countries spend about 2 or 3% of GDP. However, we have to neglect major military players like USA. There is generally a significant inconsistency in society to whether the military expenditures have positive or negative influence on economic growth. "Guns vs. Butter" model is a typical example of production possibility frontier. People have to choose between two options – to either buy guns (invest in military or defence) or to buy butter (invest in production of other goods), or both of them. The amount of military expenditure realized for ensuring security is obviously determined by political decisions. The public spending done for this purpose is joined with the reduction of expenditure for other public goods.

The main aim of this paper is to analyze potential relationship between military expenditure and gross domestic product. Data used for this analysis are mostly collected from Stockholm International Peace Research Institute (SIPRI) websites. The first part of this paper examines basic definitions of military expenditure represented by well-known international organizations like NATO, OSN or IMF. Then there is considerable debate in society over the effects of military expenditure on economic growth, especially in developing countries. That is why the next part of this article examines the potential influence of military spending on economic growth. Regression analysis in the last part tries to estimate the relationship among two variables.

Military Expenditure Characteristic

It is possible to say that military expenditures have many definitions. It is said that military spending represents the economic or financial burden of each country. There is quite a

big difficulty related to its delimitation because every single country can characterize military expenditure according to their needs. There will be consequently significant discrepancy, if we take the world-wide comparison. Because of this reason, some of the international organization acceded to unification of definitions. It is mainly talked about NATO, SIPRI or IMF. However, these one use a little bit different characteristic. For example, NATO defines the military expenditure as a total measure of financial burden caused by military operation. Generally said it is amount spending by NATO on their military in order to keep international military dominance. But NATO prioritizes using of this just for internal needs. Defence expenditures are calculated on the basis of the revised NATO definition agreed in 2004, which excluded expenditure on paramilitary forces. Even those with a national defence function in time of war. It means the expenditure on other forces that are structured, equipped and trained to support defence forces. However, there are differences between this and national characteristic of military expenditure. It may diverge considerably from those which are quoted by national authorities or given in national budgets (NATO, 2013). Let's say that almost similar definition has SIPRI. They say there is no generally accepted definition of military expenditure world-wide. SIPRI seeks to include all costs incurred as a result of current military activities. According to them these actors and activities are included:

- the armed forces (including peacekeeping forces),
- defence ministries and other government agencies engaged in defence projects,
- paramilitary forces, when judged to be trained and equipped for military operations,
- military space activities that includes all current and capital expenditure on:
 - a) military and civil personnel (including retirement pensions of military personnel and social services for personnel),
 - b) operations and maintenance,
 - c) procurement,
 - d) military research and development,
 - e) military aid (in the military expenditure of the donor country – but it does not include civil defence and current expenditure for past military activities, such as for veteran's benefits, demobilization, conversion and weapon destruction).

As it was said, SIPRI definition is so closed to NATO definition. The main difference is in excluding of expenditure on paramilitary forces. The International Monetary Fund's collects expenditure data for its Government Financial Statistic Yearbook (GFSY) according to a functional classification typically place military pensions within the social security function. IMF's data are also widely used by World Bank. Other organizations and countries employ varying definitions. Media reports on military expenditure, including in specialist publications, tend to report simply the defence budget of the country in question, although many countries have significant military expenditure in other budget line. For example UK (different to NATO or SIPRI) with a lot of another governments have moved to a system of Resource Account Budgeting across all areas of government, which involves accounting for expenditure on an accrual rather than a cash basis, and including items such as a charge for capital employed based on an assumed return that could be obtained were the capital otherwise employed (SIPRI, 2013).

Review of Previous Research

Benoit (1978) in his work on *"Growth and Defence in Developing Countries"* is considered to be the first who proposed the thesis that military expenditures are not necessarily detrimental to national growth. The dependent variable is the average annual growth rate. The independent

variables are private investment as a proportion of GDP, net economic assistance and defence spending. All have a positive impact on growth. However, defence spending is significant only at the 80 percent level of confidence.

Hewitt (1991) and his paper under IMF named "*Military expenditure: International Comparison of Trends*" deals with econometric analysis of political and economic influences in 125 countries during the period of 1972 - 1988. He examines the trends in world military expenditure by analysing the shares of different country groups and the ratio to GDP of individual nations. This work also compares military expenditures as a proportion of central government expenditures, examines the budgetary trade-off between military, social, and development expenditures.

Dunne et al (2005) published a paper named "*Models of Military Expenditure and Growth: A Critical Review*" evaluates some of the theoretical and econometric issues involved in estimating growth models that include military expenditure. They say that while mainstream growth literature has not found military expenditure to be a significant determinant of growth, much of the defence economics literature has found significant effects. The paper argues that this is largely the product of the particular specification, the Feder-Ram model that has been used in the defence economics literature but not in the mainstream literature.

Aizenman and Glic (2006) found out in their study on "*Military expenditure, threats, and growth*" that the impact of military expenditure is frequently found to be non-significant or negative, yet most countries spend a large fraction of GDP on defence and military. Then they examine non-linear interaction between military expenditure, external threats, corruption, and other relevant controls. While growth falls with higher levels of military spending, given the values of the other independent variables, they show that military expenditure in the presence of threats increases growth.

Cuaresma and Reitschuler (2006) found positive externality effect in their paper named "*Guns or Butter? Revisited: Robustness and Nonlinearity Issues in the Defence-Growth Nexus*" but overall effect turns negative due to the size effect of the military effect. Using cross-country growth regression and Feder-Ram model, the partial correlation between defence spending and economic growth appears robust and significantly negative only for countries with a relatively low military expenditure ratio.

Alptekin and Levine (2010) in their work on "*Military Expenditure and Economic Growth: A Meta-Analysis*" reviewed 32 empirical studies with 169 estimates to find the combined overall effect of military expenditure on economic growth. It is desirable to say that meta-analysis is mostly used in statistic and refers to methods focused on contrasting and combining results from different studies, in the hope of identifying patterns among study results. In their article they used meta-fixed and random effects and regression analysis and results showed that there exists net effect of military expenditure on economic growth. The net combined effect is according to their study positive, magnitude is very small.

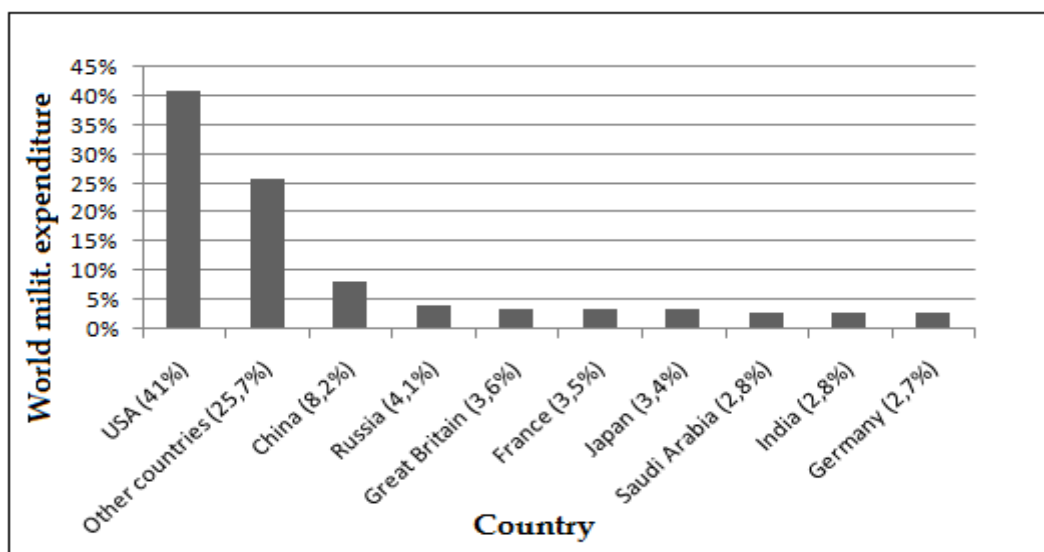
Wijeweera and Webb (2012) in the work on "*Using the Feder-Ram and military Keynesian models to examine the link between defence spending and economic growth in Sri Lanka*" deal with using the Feder-Ram and military Keynesian model to examine the nexus between defence spending and economic growth in Sri Lanka. They found that the Keynesian aggregate demand

model is better suited to analyse the link than the Feder-Ram model for the case of Sri Lanka. Based upon their results they expected a higher economic growth rate in Sri Lanka if more public resources are diverted from the defence to civilian sectors of the economy. The conclusion of their article is that the optimistic predictions of their economic analysis are entirely dependent upon the political decisions of the Sri Lankan government for their realization.

Effects on Economic Growth (Example of USA)

There are many opportunities defined through which military expenditure could have effect on economic growth. It depends if it takes a theoretical or empirical approach. Neoclassical models are generally supply side with a focus on trade-off between mentioned “guns and butter”. Keynesian models see military expenditure as on part of military spending and focus on demand side, although when used in econometric models an aggregate production function does give them neoclassical flavour (Dunne, 2002). USA has the biggest military budget in the world. It is federal budget that is divided into the Department of Defence and the part of the budget goes to any military-related expenditure. The military budget pays the maintains arms, equipment and facilities, salaries, funds operations, training, health care of uniformed and civilian personnel, and develops and buys new equipment. The budget funds all branches of the U.S. military – the Army, Navy, Air Force, Marine Corps and Coast Guard. Most Americans believe the US government spends far more on defence than it actually does. Defence spending is near historic lows, however, and the Administration’s proposed five-year budget plan would further reduce defence spending to levels unprecedented during wartime. Between 2010 and 2015, total defence spending is set to fall from 4.9 percent to 3.6 percent of gross domestic product (GDP), even though the nation has assigned more missions to the military over the past two decades (Mackenzie, 2010). As we can see from Graph 1, U.S. military expenditures are five-times higher than second China’s one.

Graph 1 Countries with the highest military expenditure in 2011



Source: SIPRI, 2012

It is generally said that military expenditures are getting higher but with lower rate than before. Mackenzie has argued that Congress should maintain current levels of defence spending to allow the military to reset and do recapitalization. Congress needs to control entitlement growth, domestic spending, and public debt, which are beginning to threaten the national

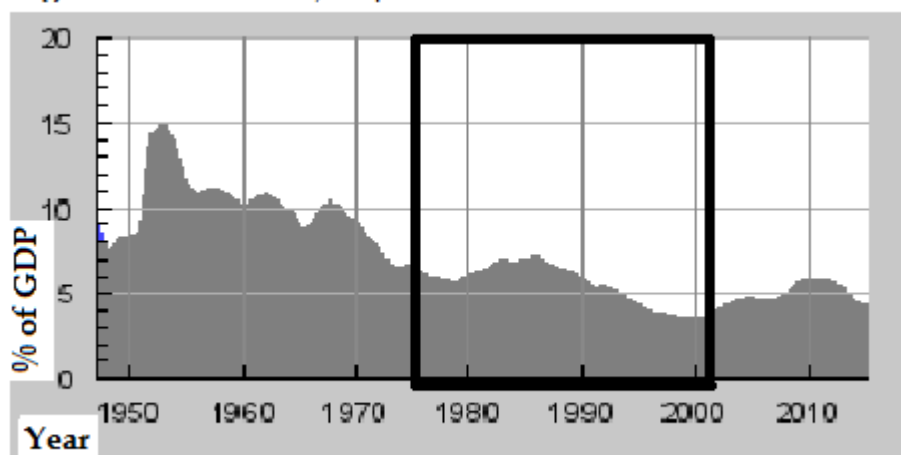
security. And she says that Congress also needs to reform military compensation to ease strains within the defence budget.

Mehhanna (2010) in his work on *“Econometric Contribution to the U.S. Defence Nexus: Evidence from Error Correction Model”* has examined the parsimonious New Growth model to investigate the link between military spending and economic growth in the United States over the period 1959 – 2001 by adopting a more robust estimation technique. It followed the Johansen co-integration and error correction methodology coupled with vector auto-regression (VAR) and innovation accounting techniques. Findings were robustly substantiated and revealed that military spending and growth have neither a statistical nor an economic impact on each other. That suggests that current U.S. political debates opposing or favouring military spending on the grounds of its economic merit are irrelevant.

Data Analysis, Methodology

For the purpose of this article it is used simple regression analysis which is a statistical technique that attempts to explore and model the effects between two variables (independent and dependent). This is very important part of statistical analysis of the data obtained from designed experiment. In order to study the relationship of research variables it was used the Spearman correlation coefficient. In case of our paper, it is examined the relationship between military expenditure independent one and GDP – dependent one. The 27-year data (1975 – 2001) of U. S. GDP and military expenditure was chosen. Data were collected from SIPRI websites and they use constant 2010 U.S: dollar (in billions). The main reason of selected term is relatively quiet decade as shown in figure 1. It is better said that in this term military expenditures did not unbalance so much (in comparison to wartime).

Figure 1 U. S. Military Expenditure 1947 - 2012



Source: USgovernmentspending, 2012

Assumptions

It was used the Ordinary Least Squares method (OLS) which is a method for estimating the unknown parameters in a linear regression model. This method minimizes the sum of squared vertical distances between the observed responses in the dataset and the responses predicted by the linear approximation. There are some conditions that must be for application of OLS fulfilled:

- Correct Specification (the linear functional form is correctly specified),
- Strict Exogeneity,
- Normality,

- Spherical Errors – which is split into two parts:
 - o Homoscedasticity,
 - o No autocorrelation.

All the assumptions were fulfilled except of No autocorrelation. Very important is to see Durbin-Watson statistic which should have value around 2. That is why it was necessary to differentiate data of dependent variable – GDP. Another possibility is to make data logarithmic. The reason of this could be for example quasia utocorrelation, excessive approximation, using of temporally delayed variables etc. When the each assumption is tested, it is necessary to see the critical p-value. This value must be higher than estimated significance level which is usually 5% (i.e. value is 0,05). Only then the null hypothesis is not rejected and the assumption is fulfilled (see the results below).

Correct Specification => it is regarded to be correctly specified. For being sure, Ramsey reset test was applied. Null hypothesis says that model specification is correct. It is possible to analyze squares and cubes separate or both together. All the p-values (0,168; 0,06; 0,06) are higher. Null hypothesis is not rejected and that is why model specification is regarded to be correct.

Strict Exogeneity => the linear regression function was selected, so that the conditional mean zero is regarded to be fulfilled.

Normality => null hypothesis says that errors have normal distribution. The p-value is 0,789, it is much higher than significance level (0,05) and that is why null hypothesis is not rejected. This assumption is fulfilled.

Spherical Errors (Homoscedasticity) => null hypothesis says that there is no heteroscedasticity. It is used White test and Breusch-Pagan test of Heteroscedasticity. The p-value is 0,618 and 0,767, these are much higher too. The assumption is fulfilled.

Spherical Errors (Nonautocorrelation) => when autocorrelation is found, it means the noncompliance of Gauss-Markov assumptions for possibility of estimating regression parameters. The potential reasons are mentioned above. It could cause the decline of accuracy estimate. In this case the Durbin-Watson statistic is used and the value should be around 2. After data differentiation the value was 1,6 and it is acceptable.

Conclusions and Discussing Results

The p-value 0,0001 of selected statistical model was evaluated to be significant. In this method one independent variable (military expenditure) comes in to analysis and the effects of independent variable on dependent variable (GDP) were tested. The calculated determination factor ($R^2 = 0,46$) shows that military expenditures explain only 46% of the changes of GDP. It shows that military expenditure has no meaningful effect on growth. It is not easy to seek the main reason of this result. It probably might be quite a short run term that was selected. But on the other side, it is kind of difficult to statistically analyze a longer term because there are too many external factors and deflections that often appear. This study was also done by correlation coefficient (-0,68) showed that there is 68% negative relationship between the variables of the military expenditure and GDP. However, the conclusions and results from analysis should be carefully interpreted.

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