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GROWTH, TAXES AND GUNS: A MULTIFACETED ANALYSIS OF MILITARY EXPENDITURE DRIVERS

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Abstract: *This study aims to validate assumptions established by primary literature regarding the bi-directional causality between military spending and economic growth, and further develop the analysis of the main drivers of military expenditures in NATO countries. The empirical analysis is based on a sample of 30 NATO countries, with the main objective of investigating the role of other factors that might influence military spending. In addition to the common view that economic growth and population are the main drivers, we propose additional exogenous factors, such as fiscal policy determinants, that could play a key role in enhancing or reducing military spending. Our findings support the existence of a bi-directional causality between GDP and military spending. Additionally, we find that military expenditure is highly responsive to tax revenues collected for public coffers.*

Keywords: military expenditure, economic growth, fiscal policy, tax revenues.

1. Introduction

The current geopolitical context, with Russia's invasion of Ukraine starting in February 2022 and the strong opposition of NATO countries against such acts upon sovereign countries, has reignited the debate regarding the need for military spending and its' main drivers. While not directly implicated, the indirect support of NATO's countries towards Ukraine has raised once again the issue of military expenditures and restarted the arms race, especially in these countries. In this context, policy makers are under pressure to increase military spending, mainly to enhance military capacity which in turn leads to potential harmful effects on economic growth and the balance of public budgets. On opposite side, military spending increase could trigger beneficial effects on economic growth, through investment in infrastructure. However, we consider that military spending depends not only on economic growth, but also the fiscal policy plays a major role as exogenous determinant.

There are two main opposite views regarding the relationship between military spending and economic growth, outlined by extant literature. The first view assumes a positive effect of military spending on economic growth, starting with [1] and [2], and on opposite side, the latest findings of [3] which underline that military expenditures have a negative effect on economic growth. The lack of consensus regarding the bi-directional causality between economic growth and military spending stems mainly on the biased emphasis on economic growth as the main determinant of military spending.

We propose a more inclusive approach, adding other potential factors to the empirical analysis of military spending determinants. Fiscal policy, proxied by tax revenues collected by each NATO state, is

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one such factor. Given that military expenditures are primarily funded through public budgets, tax revenues represent a key determinant of defence spending, which in turn is influenced by economic growth.

Our methodology builds on primary literature, aiming to validate the bi-directional causality between GDP and military spending. However, we extend this by proposing a new model that includes tax revenues as an explanatory variable to investigate their impact on defence spending.

This study offers a novel contribution. To our knowledge, no existing research assesses the relationship between military spending and tax revenues. By considering tax revenue capacity alongside economic growth, our findings provide a more comprehensive picture for policymakers planning future defence spending.

2. Literature Review

The study of [4] analyses the military expenditures across world countries taking into account the economic characteristics and political circumstances of nations. One common assertion is that defence spending is highly dependent on financial constraints such as economic growth and public debt. Another set of exogenous factors that influence the military expenditures, pertaining to the political factors, is the political organization of each country (i.e., multi-party democracies, monarchies) which tend to influence the share of GDP allocated to defence. The third set of factors that influences military spending is the land area border length and geopolitical position of each country. [4] proposes an empirical analysis of military spending taking into consideration economic factors as well as the size of public sector of each selected country. The author finds an alternative result regarding the main determinants of military spending, where financial factors play a central role. Moreover, [4] underlines that governments view defence and military spending more like a luxury item than a necessity. Therefore, any financial assistance to low-income countries would enhance military spending.

The traditional view on military expenditures and economic growth, starts with works of [1] and [2], where an increase in military spending leads to an increase of GDP per capita. On the other hands, [5] found that increasing military spending has a positive impact on economic growth only in resource rich countries and a detrimental effect on resource poor nations.

The bilateral relationship between economic growth (i.e., proxied by GDP) and military spending has been extensively analysed by early papers of [6] and [7]. The main finding is that there is a Granger causality between military spending and economic growth in both ways in majority of world countries. [8] uses co-integration and error-correction model to test whether there is a bilateral influence between GDP growth and military spending using annual data for Pakistan and India. The author finds a bi-directional causality between military spending and economic output in both selected countries. [9] study the direction of causality between GNP and defence spending in Turkey between 1955-2000. The authors find that in the long-run there is a bi-directional causality, while in the short-run there is only uni-directional causality between GNP growth and defence spending.

A more recent paper of [10] analyses the main determinant of military expenditures in EU-15 countries between 1961-2005. The model adopted by [10] assumes three types of exogenous factors that could have an impact on military spending, namely: economic, political and strategic factors. The main exogenous variables are GDP, population, total government expenditure, share of trade balance, average burden of military spending and NATO specific country dummies. The author finds that GDP is unequivocally the main determinant of military spending, the literature considers that the increase of population is not necessarily a main enhancing factor. Population inclusion in this modelling

strategy, takes a more indirect role, where an increase of population is seen as a factor that will rise the demand for defence. In this context, defence is deemed as a perfect public good, where an increase in population will lead to decrease in tax costs and thus enhancing public expenditures as whole.

[10] finds that there is a long-run difference in military spending across analysed countries, where a major role is played by economic and strategic factors.

[11] analyze the bi-directional causality between economic growth and military spending in South Africa using yearly data between 1998-2012. The authors find that there is a long-run relationship between aforementioned variables. [12] replicate the mainstream model of estimating the causality analysis between military spending and economic growth using data pertaining to NATO countries between 1964-2006. The results obtained show a uni-directional causality for seven NATO countries, no relationship is found for five NATO countries and a bi-directional causality is found for Turkey.

The common assumption proposed by the literature is that military spending may enhance economic growth in two ways. The first way, as pointed out by [13], an increase in defence spending leads to an increase of total demand which stimulates output and leads to a higher economic growth. The second way by which military spending contributes to economic growth is related to improvement in infrastructure which has a positive spillover effect on world economies. [11] find that only military expenditure has a positive effect on economic growth, meaning there is only a uni-directional causality. According to their model, the authors argue that economic growth per se does not have a visible effect on military spending in South Africa.

One of the latest study regarding the issue of military spending and economic growth, [14] proposes an even more detailed approach in analysing this relationship. The authors propose a disaggregated approach, using the latest data for NATO countries, analysing the impact of different types of military spending, i.e., - personnel, equipment, infrastructure, and other spending on economic growth. Contrary to the mainstream literature, [14] find that personnel and other military spending have a negative effect on GDP, while equipment and infrastructure spending have a positive impact on GNP growth. [15] argue that there is enough empirical evidence produced by primary literature to sustain the fact that defence spending promotes economic growth. However, the authors point that a change from defence spending to infrastructure spending would have a greater positive impact on economic growth. This reallocation of funds, from defence to infrastructure, would increase economic growth in the long-run. One important issue raised by [15] is the lack of preoccupation of the literature to research the influence of tax policy on defense spending and in turn their combined effect on economic growth.

[16] analyses the relationship between military spending and economic growth and investment, using data provided by Stockholm International Peace Research Institute (SIPRI) data for the period of 1960-2014. The author finds that there is not strong evidence of causality between military spending and economic growth. Moreover, military spending is found to be even less significant in enhancing investment.

The latest work of [17] delve in the issues of military personnel versus equipment spending, comparing the all-volunteer armies with conscript armies. The authors find that all-volunteer armies tend to have higher personnel costs than with equipment in comparison with conscript armies.

[18] argues that a novel approach such as instrumental variable regression is necessary if one intends to analyse the impact of military spending on economic growth. According to the author, this is necessary because of the endogeneity of military expenditures in a growth model.

[18] proposes a IV regression with arms imports and inter-state violence as main instruments. The author finds that in case of developing countries, a 1% increase in military expenditure has a negative impact on economic growth, leading to a 1.10% decrease of economic growth.
[3] provide an opposite view regarding the impact of military spending on economic growth, which goes against the mainstream assumption. Using data for 97 world countries and yearly data for a rather long period of time, which spans between 1960-2014, the authors find that military expenditures have a negative impact on economic growth.

3. Methods and Tools of Analysis

The main source of data is SIPRI and Eurostat, for the period between 2014-2022. We collect the yearly data for 30 NATO members, such as: Albania, Belgium, Bulgaria, Canada, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Turkey, the UK and the US.
The main dependent variable is military spending, expressed in million USD and the explanatory variables are the total tax revenues collected by each NATO state, the economic growth proxied by GDP expressed in million USD and total population on yearly basis.
Our methodological approach seeks to test the mainstream rationale, which argues that economic growth has a positive impact on military spending. Consequently, our model adopts a panel data OLS regression which analyses the impact of GDP and population on military spending of NATO countries between 2014-2022. Moreover, the empirical analysis goes beyond the traditional approach and investigates whether the total tax revenues influence military expenditure.

The validation of the results obtained by primary literature is done using panel data OLS regression presented in Equation 1 and 2, as follows:

$$\log mil\_exp_{i,t} = \beta_0 + \beta_1\left(\log gdp_{i,t}\right) + \beta_2\left(\log pop_{i,t}\right) + \delta_t + \varepsilon_{i,t} \quad (1)$$

$$\log gdp_{i,t} = \beta_0 + \beta_1\left(\log mil\_exp_{i,t}\right) + \beta_2\left(\log pop_{i,t}\right) + \delta_t + \varepsilon_{i,t} \quad (2)$$

Our enhanced panel data OLS regression is presented in Equation 3.

$$\log mil\_exp_{i,t} = \beta_0 + \beta_1\left(\log tax\_rev_{i,t}\right) + \beta_2\left(\log gdp_{i,t}\right) + \beta_3\left(\log pop_{i,t}\right) + \delta_t + \varepsilon_{i,t} \quad (3)$$

Where *logmil_exp* represent the military expenditure in million USD, transformed in logarithms; *loggdp* represent the economic growth proxied by GDP expressed in million USD, transformed in logarithms; *logpop* represent the total population of each NATO state, transformed in logarithms; *logtax_rev* represent the total tax revenues collected by each NATO state, expressed in million USD, transformed in logarithms. The subscript *i* represent the *i*-th country, where $i = 1 \ldots n$, and *t* time term, δ is the fixed time term and ε is the error term.
We expect a positive bi-directional causality between economic growth and military expenditure.

4. Results and Discussions

As shown in Table 1, we manage to validate the results obtained by primary literature such as [6], [7] and [8]. Running Equation 1 and 2, we find that there is a bi-directional causality between economic growth and military expenditure. The interpretation of our results, presented in Table 1, follows the rationale of log-log regression where the coefficients obtained can be interpreted as elasticities. Hence, in Table 1, where the dependent variable are military expenditures, a 1% increase in

GDP leads to a positive effect, of more than 1% increase in military spending. On the other hand, in second column of Table 1, where GDP represents the dependent variable, a 1% increase in military spending, will lead to 0.217% increase in GDP. This means that there is a bi-directional causality, where economic growth and military spending tend to influence each other. It is important to underline the degree of positive impact is significantly lower as shown in column 2 of Table 1. We also find that population has a negative impact on military spending, confirming the assessment made by extant literature, such as [10].

Table 1 The validation of bi-directional causality between economic growth and military expenditures

	Logmil_exp	**Loggdp**
	(1)	(2)
Loggdp	**1.338*** **	
	(-0.079)	
Logmil_exp		**0.217*** **
		(-0.0118)
Logpop	-0.331***	0.826***
	(-0.101)	(-0.0469)
Time fixed effects	Yes	Yes
R^2	0.94	0.87
N	300	300

Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 2 The impact of tax revenues on military expenditures in NATO countries

	Logmil_exp	**Logmil_exp**
Loggdp	**1.338*** **	**1.442*** **
	(-0.079)	(-0.261)
Logtax_rev		**0.928*** **
		(-0.124)
Logpop	-0.331***	-0.514
	(-0.101)	(-0.516)
Time fixed effects	Yes	Yes
R^2	0.94	0.76
N	300	300

Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

As shown in Table 2, the inclusion of a new explanatory variable, namely the total tax revenues collected by NATO countries, offers interesting insights. While the economic growth and total population keep the same influence on military spending as in Table 1, we find that an increase of tax revenues has a positive impact on military spending. Hence, a 1% increase in tax revenues collected will lead to 0.928% increase in military spending.

5. Conclusions

In this study, we aim to validate the primary literature that established a two-way relationship between economic growth and military spending. Using the latest data from SIPRI, we tested and confirm, within the limitations of this study, a positive impact between the two. However, military spending has a demonstrably weaker positive impact on economic growth compared to the impact of economic growth on military spending.

To provide a more comprehensive picture, we included an additional factor: tax revenues collected by NATO countries. We enhanced the mainstream model by regressing these revenues against military spending. The results show a positive effect, with a 1% increase in tax revenues leading to a 0.928% increase in military spending.

This study suggests that NATO countries can potentially benefit from some level of increased military spending, which could in turn lead to economic growth. However, policymakers should consider the trade-offs involved. Military spending is usually covered through public budgets, where tax revenues play a key role. As a consequence, NATO countries should also take into account the evolution of tax revenues collected when planning future military spending.

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