DOES THE FUNDING OF THE DEFENCE SECTOR DEPEND ON ECONOMIC FACTORS IN THE LONG RUN? THE CASES OF ESTONIA, LATVIA, AND LITHUANIA

Gitana DUDZEVIČIŪTĖ

General Jonas Žemaitis Military Academy of Lithuania,
Šilo g. 5A., Vilnius, Lithuania

Abstract. *The purpose of this publication is to study the dependence of defence funding on economic factors, namely the prosperity of the country, economic growth, the budget deficit, gross government debt, and inflation rate. The investigation uses secondary data obtained from the Eurostat database and covers the period from 1997 to 2021. The author analyses three Baltic countries such as Estonia, Latvia, and Lithuania, to ascertain which economic factors have a statistically significant effect on defence sector funding. For this purpose, the author applies correlation analysis and automatic linear modelling (ALM). The findings of the investigation showed differences and similarities between the countries under consideration. In the case of Estonia, defence funding is significantly affected by the prosperity of the country, which is expressed in real GDP per capita, and gross government debt. These economic factors explain 92.6 per cent of defence funding. The cases of Latvia and Lithuania are very similar in terms of the influence of economic factors on defence spending. In these countries, the tendencies of real GDP per capita significantly effect on defence funding. This influence is slightly different and amounts to 76.2 and 78.4 per cent, for Latvia and Lithuania, respectively. The insights of the research can be useful to the governments of these nations when making decisions about defence funding aimed at ensuring security in the Baltic region.*

Keywords: *defence funding, defence expenditure, economic factors, Estonia, Latvia, Lithuania.*

Reikšminiai žodžiai: *gynybos finansavimas, gynybos išlaidos, ekonomikos veiksniai, Estija, Latvija, Lietuva.*

Introduction

The world is presently facing major security and economic challenges. Russia's ongoing war in Ukraine, the highest inflation rates in decades, and disrupted global supply and production chains are the most significant challenges for the Baltic nations and Europe as a whole. Russia's unjustifiable military aggression against Ukraine has made security a priority for the Baltic countries, Estonia, Latvia, and Lithuania, forcing a review of national budgets and unplanned major economic decisions. In the face of Russia's war in Ukraine, the Baltic countries have been forced to strengthen their defence capabilities and budgets. While before the Russian invasion of Ukraine, there were divergent and contradictory views on increasing defence spending, it has now become a vital decision, unquestioned at the level of political parties and citizens. Geopolitical, strategic, and economic factors drive the increase in defence sector funding (Hartley, 2011). Presently, the majority of scholars would undoubtedly agree that all three sets of factors simultaneously have direct and pronounced, and indirect and less pronounced effects on the increase of the Baltic defence burden. In the context of today's threats, when an increase in defence funding is inevitable, the question arises of where to get the funds from, what are the main sources of defence funding, to

what extent defence funding depends on economic factors in the Baltic countries. This study answers the above questions by examining the cases of Estonia, Latvia, and Lithuania.

The object of the investigation: the dependence of defence funding on economic factors.

The aim of the investigation: to examine the dependence of defence funding on economic factors in Estonia, Latvia, and Lithuania during the period from 1997 to 2021.

Based on secondary statistics, this research is limited to the impact of economic variables on defence funding in the period of 1997 to 2021. It should be noted that this study does not highlight the impact of Russia's war in Ukraine on economic decisions; rather, it reveals a general trend concerning the impact of economic factors on defence financing decisions over the last twenty-five years in Lithuania, Latvia, and Estonia.

According to economic theory, defence spending can be increased at the expense of civilian spending, economic growth, or government debt. Once these economic resources have been allocated to increasing defence funding, countries may be tempted to reduce spending in social security, health, education, and other civilian spending avenues. Alternatively, defence spending may be increased through economic growth, or the government may decide to borrow funds from international markets. This proposes several questions: what are the most common economic factors identified by researchers as contributing to the increasing defence funding? Have the sources of defence funding in the Baltic States become more evident over the last twenty-five years? This investigation answers these questions.

The investigation consists of a literature review on the interlinkage between defence financing and economic determinants, methodological and research sections, discussion, and conclusions.

Literature review

Defence spending plays an important primary role in preserving peace and security throughout nations. Scholars see several arguments to explain the demand for defence spending. The first argument concerns the country's macroeconomic trends. The stronger a country is economically, the more it can spend on defence. However, this is not the only argument that determines the financing of the country's defence sector. Another argument relates to the geopolitical situation, characterised by emerging internal and external threats to public security. The country is then forced to increase its defence budget, regardless of economic trends, to protect itself from its enemies and its citizens from dangers that arise. The third argument involves strategic factors linked to technical progress (Hartley, 2011; Fonfria & Marin, 2012). In assessing and comparing the military power of countries, it is proposed that the quantity and quality of military equipment and potential of defence personnel including competences, attitudes, skills, knowledge, social and cultural capacities be considered. Macroeconomic tendencies show a country's economic power, which is usually expressed in GDP.

Most scientists have studied the association between defence funding and economic determinants in their works (Biswas & Ram, 1986; Dakurah et. al., 2001; Alptekin & Levine, 2012; Chen et. al., 2014; Qiong & Junhua, 2015; Manamperi, 2016; Azam & Feng, 2017; Caruso & Domizio, 2017; Zhang et. al., 2017; Dimitraki & Win, 2020; Su et. al., 2020; Odehnal et. al., 2020; Odehnal et. al., 2021), revealing different results across the nations. It is notable that the majority of investigations focus on analysing the effect of defence spending on economic factors such as inequality, unemployment rates, government debt, economic growth, private investments, and others. The author found only a few studies (Sezgin &Yildirim, 2002; Nikolaidou, 2008; Odehnal et. al., 2020; Odehnal et. al., 2021; Dudzevičiūtė & Šimelytė, 2022) examining the dependence of defence expenditure on economic determinants. Although the dependence of defence funding on economic variables has been little studied in a scientific context, there is no doubt about their impact. Economically strong nations often possess a strong defence potential. The importance of the economic environment for defence was also noted by Blackaby & Schmidt (1987), who stated that macroeconomic determinants are the basis for defence decisions. The author noticed that so far, only a few studies examining the dependence of defence funding on economic indicators have been conducted

in the Baltic states. Odehnal et. al. (2020) focused on the Baltic countries in the period from 2001 to 2018. The results informed that measures aimed at reducing the government budget deficit did not diminish defence funding in the Baltic states analysed. Moreover, budget deficits have an impact on defence spending in Estonia and Lithuania. The study also showed the dependence of Estonian defence spending on GDP trends and inflation. In another study covering the period from 1993 to 2019, Odehnal et. al. (2021) found a positive association between GDP and defence spending in Latvia and Lithuania. Dudzevičiūtė et. al. (2021) explored the nexus between defence expenditure and government debt in small European Union countries, including the Baltic nations in the period between the years 2005 and 2019. The findings show that defence expenditure correlates negatively with gross government debt in all examined nations. Scientists do not reach a unanimous opinion on which macroeconomic factors affect defence funding or the demand for defence spending. Researchers (Nikolaidou, 2008; Bernauer et. al., 2009; Polat, 2020; Odehnal et. al., 2020) use different economic indicators in their studies when assessing the dependence of defence expenditure on economic factors. The most common economic determinants used in research are GDP, economic growth, national income, inflation, government debt, budget deficit and public spending.

To summarise the results of the studies undertaken so far in different nations and over different time periods, there is a tendency for researchers to focus more on the influence of defence spending on economic performance, leaving aside the impact of economic factors on defence financing. The economic situation in different countries affects defence financing decisions. Therefore, in this study, the author will assess the effects of certain economic variables on defence funding in Estonia, Latvia, and Lithuania.

Methodology of the investigation

Hypothesis. Based on Wagner's approach (1893) (Ampah and Kotosz, 2016) and Hartley's insights (Hartley, 2011) of the government spending – economic variables nexus, this study tests the hypothesis that defence financing dependent on economic factors.

Data. The investigation uses secondary data drawn from Eurostat (Economy and finance, 2021) online database. The study examines a 25-year observational sample period from the years 1997 to 2021.

Method. The variables were chosen on the basis of studies carried out by Nikolaidou (2008) and Odehnal et. al. (2020). Budget deficit, GDP growth, inflation rate and government debt are among the most important indicators describing the macroeconomic situation and are also used in Mawejje and Odhiambo's (2022) investigation. The dependent variable in this study is defence expenditure. Meanwhile, the independent variables are economic factors, such as the prosperity of the country (real GDP per capita), economic growth (real GDP growth rates), the budget deficit, gross government debt, and inflation rate (Table 1).

Table 1. *Variables selected for the analysis*

Variables	Abbreviation
Defence expenditure (dependent variable)	DE
Prosperity of the country (independent variable)	PC
Economic growth (independent variable)	EG
Budget deficit, (independent variable)	BD
Gross government debt (independent variable)	GD
Inflation rate (independent variable)	IR
Defence expenditure (dependent variable)	DE

Source: made by the author.

The association between the variables in question can be expressed as a function, which is given below:

$$DE=f\ (PC,EG,BD,GD,IR) \tag{1}$$

The author starts with the investigation of the interdependence between defence expenditure and economic factors (prosperity of the country, economic growth, the budget deficit, gross government debt, and inflation rate). As practical research experience shows, economic data are often non-normally distributed; therefore, the author uses Spearman correlation for the detection of the inter-linkages between the variables. For the second step, only those economic variables that have a statistically significant relationships with the defence expenditure are selected. The correlation can range from -1 to 1. The closer to 1, regardless of whether the sign is positive or negative, the stronger the interrelationship between the variables. The third step of the analysis involves Automatic Linear Modelling (ALM) (Yang, 2013), which helps to select the most appropriate combination of economic factors with a 95 per cent confidence level that has an impact on defence financing. According to Yang (2013), ALM has distinct advantages compared to the traditional modelling approach. This method differs from traditional linear regression by automatically selecting and preparing variables for analysis, which allows for avoiding multicollinearity between the factors under consideration. In the final stage, an econometric model suitable for forecasting was created to test the hypothesis (Kennedy, 2008):

$$Y=a_0+b_1\ x_1+b_2\ x_2.\ldots\ldots b_5\ x_5 \tag{2}$$

Where:

Y - dependent variable (defence expenditure),

a_0 is constant (y-intersect),

$b_1,\ldots,b_5$ - regression coefficients of the according variables x_i, when i = 1,…5.

x_1 - independent variable (prosperity of the country),

x_2 - independent variable (economic growth),

x_3 - independent variable (budget deficit),

x_4 - independent variable (gross government debt),

x_5 - independent variable (inflation rate).

The calculations are made using Statistical package for the social sciences (SPSS) v. 27.0.

Results of the investigation

Correlation between defence funding and economic factors. Correlation analysis made it possible to detect significant relationships between defence expenditure and economic factors (Table 2). In Estonia,

Table 2. *Spearman's Correlation between Defence Expenditure and Economic Determinants*

Economic Determinants	Estonia		Latvia		Lithuania	
	Correlation coefficients	Significance (p), (2-tailed)	Correlation coefficients	Significance (p), (2-tailed)	Correlation coefficients	Significance (p), (2-tailed)
Real GDP per capita	0.947**	0.000	0.972**	0.000	0.941**	0.000
Economic growth	-0.424*	0.035	-0.400*	0.047	-0.268	0.194
Budget deficit	-0.389	0.054	-0.089	0.671	0.501*	0.011
Gross government debt	0.694**	0.000	0.505**	0.010	0.527**	0.007
Inflation rate	-0.454*	0.022	-0.099	0.639	0.061	0.773

*Source: calculations based on SPSSv27. Note: ** $p \le 0.01$, * $p \le 0.05$.*

real GDP per capita, economic growth, government debt, and inflation rate correlate significantly with defence expenditure. In Latvia, real GDP per capita, economic growth, and government debt have significant relationship with defence financing. In Lithuania, the author found that defence financing significantly correlates with real GDP per capita, the budget deficit, and government debt.

ALM for the Estonian case. In a further step, after applying the ALM to the case of Estonia, real GDP per capita and gross government debt appeared to have a significant effect on defence funding. The aforementioned factors explain 92.6 per cent of the variation in defence spending (Table 3).

Table 3. *Estimation of Coefficients: the Estonian Case*

Model Terms	Coefficients	Significance	Importance
Intercept	-395.583	0.000	
Real GDP per capita (transformed)	0.046	0.000	0.760
Government gross debt (transformed)	19.374	0.000	0.240
R Square adjusted	0.926		

Source: calculations based on SPSSv27

Real GDP per capita and government debt have positive effects on defence financing. This means that as real GDP per capita grows and public debt increases, defence financing tends to increase. We can assume that Estonian defence funding is increasing mostly at the expense of economic development and government debt.

In the case of Estonia, the dependence between the considered factors can be expressed by the following regression model:

$$Y = -395.58 + 0.046\,X_1 + 19.374\,X_4 \tag{1}$$

Given that Estonia is one of the least indebted countries in the EU and is characterised by efficient debt management, these research insights do not pose a risk to economic security.

ALM for the Latvian case. The case of Latvia indicated that there was a significant correlation between defence spending and real GDP per capita, economic growth and government debt. However, after applying ALM, only the dependence of defence funding on real GDP per capita turned out to be statistically significant (Table 4).

Table 4. *Estimation of Coefficients: the Latvian Case*

Model Terms	Coefficients	Significance	Importance
Intercept	-342.251	0.000	
Real GDP per capita (transformed)	0.069	0.000	1.000
R Square adjusted	0.762		

Source: calculations based on SPSSv27

Real GDP per capita positively impacts on defence financing and explains 76.2 per cent of its variation. This means that as real GDP per capita increases, defence funding tends to grow.

In the case of Latvia, the dependence between the considered factors can be expressed by the following regression model:

$$Y = -342.251 + 0.069\,X_1 \tag{2}$$

It can be assumed that Latvian defence funding is increasing mostly at the expense of economic development.

ALM for the Lithuanian case. The case of Lithuania showed that a statistically significant correlation exists between defence spending and real GDP per capita, budget deficit and government debt. However, after applying ALM, only the dependence of defence financing on real GDP per capita was statistically significant (Table 5). This Lithuanian case reflects the situation in Latvia.

Table 5. *Estimation of Coefficients: the Lithuanian Case*

Model Terms	Coefficients	Significance	Importance
Intercept	-337.084	0.001	
Real GDP per capita (transformed)	0.081	0.000	1.000
R Square adjusted	0.784		

Source: calculations based on SPSSv27

Real GDP per capita positively impacts on defence financing and explains 78.4 per cent of its variation. This means that as real GDP per capita grows, defence financing tends to increase.

In the case of Lithuania, the dependence between the considered factors can be expressed by the following regression model:

$$Y = -337.084 + 0.081 \, X_1 \tag{3}$$

It can be assumed that Lithuanian, as well as Latvian defence funding, is increasing mostly at the expense of economic development.

Summarising the results of the investigation, it should be noted that defence spending correlates with certain economic factors in all three Baltic countries. In Estonia, a significant positive correlation has been found between defence spending and real GDP per capita, and government debt. This means that with the increase of real GDP per capita and public debt, defence funding often grows. A negative correlation has been detected between defence funding and economic growth rates, and inflation rates. This suggests that as the economy grows and the inflation rate increases, defence funding often decreases.

After applying ALM, which automatically prepares data for regression analysis, eliminating the effect of relationships between independent variables and selecting the most suitable model for forecasting, it was found that real GDP per capita and government debt has a significant influence on defence financing trends. The mentioned factors explain 92.6 per cent of the fluctuations in defence funding. In Latvia, as in the case of Estonia, there were significant positive correlations between defence financing and real GDP per capita, and public debt. A negative relationship with the economic growth rate was also observed. However, ALM showed that only real GDP per capita has a significant effect on defence financing. The impact of this indicator on defence financing was estimated at 76.2 per cent. The case of Lithuania showed significant positive relationships between defence financing and real GDP per capita, situation in the government budget, and gross government debt. When applying ALM, only real GDP per capita can be treated as a factor with a significant impact on defence financing. This effect was estimated at 78.4 per cent.

Figure 1 summarizes the results of this investigation.

In summary, it can be stated that in the long-term perspective, the main source of funding for the defence sector in the cases of Latvia and Lithuania is the country's prosperity, expressed in GDP per capita, and in the case of Estonia – the country's prosperity and government debt.
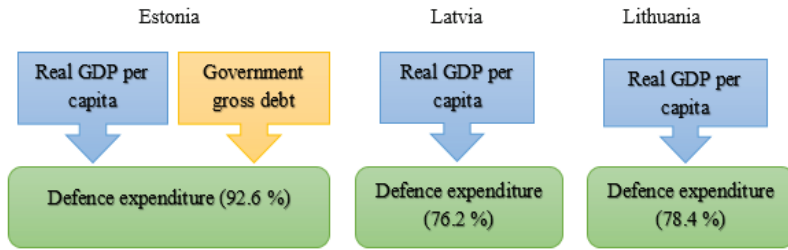
Figure 1. *Economic Factors Affecting Defence Funding*

Source: made by the author.

Discussion

As shown by the current extremely tense situation in the world due to emerging threats to the security of countries, defence financing decisions are most affected by geopolitical and strategic factors related to the acquisition of modern technologies and the improvement of infrastructure. This is related to defence spending, which many countries have increased since the war in Ukraine began. The Baltic countries began increasing their defence funding since 2015 after the annexation of Crimea by Russia, paying special attention to the acquisition of defence technologies (NATO, 2021).

Since 2015, the Baltic nations maintained the proportions of defence expenditure set by NATO: no more than 50 per cent of personnel maintenance costs are allocated to all defence budget and for acquisitions (including acquisitions and modernization of armaments and military equipment) – at least 20 per cent (Ministry of National Defence Republic of Lithuania, 2022). When increasing defence funding, small countries such as Estonia, Latvia, and Lithuania, must answer the question of where additional financial resources for defence will come from. Indeed, it is possible to finance defence at the expense of other civil activities, i.e. redistributing the state budget, but such a method may have an effect; however, it would be short-lived, because research shows that financing other economic activities (e.g. education, health care, public order and safety) generates added value for the countries. Also, defence funding can be increased at the expense of public debt or economic development.

Defence funding is not only influenced by economic factors. They usually play very important role in the case of peace. However, when threats arise, national governments will make every effort to preserve a safe environment for citizens. Therefore, the author agrees with Hartley (2011), who emphasises that defence spending is determined by three large groups of factors, such as political, strategic, and economic.

In this investigation, the author focused only on evaluating the impact of economic factors on defence financing. The author distanced himself from other factors such as strategic and political ones, leaving them for future research. This could be named one of the limitations of the study. However, regardless of this limitation, the insights of the research could be used both in the formation of the general economic development and security policy of the Baltic states and in providing students with new knowledge and a basis for broader discussions in the study process, teaching the disciplines of defence economics and defence and security studies.

Comparing the results of this investigation with the findings of previous studies, it is noticeable that the insights of this study only partially correspond to those of Odehnal et. al. (2020, 2021) findings. Odehnal et. al. (2020, 2021) analysed the Baltic countries across periods. From 2001 to 2018, the researcher revealed the dependence of defence funding on budget deficit in the Baltic countries. In this investigation, the author has not detected any possible impact of the budget deficit on defence funding. Moreover, Odehnal et. al. (2020) found that GDP and inflation rates impacted Estonian defence funding. In this investigation, only GDP per capita had a significant influence on defence expenditure in all three Baltic countries. Another study by Odehnal et. al. (2021), which covered the period from 1993 to 2019, showed a positive re-

lationship between GDP and defence financing in Latvia and Lithuania. This is consistent with the results of this investigation, which showed a significant association between defence funding and real GDP per capita. It is also noticeable that the results of this investigation contradict the previous study conducted by Dudzevičiūtė et. al. (2021) results, when a negative correlation between defence financing and gross government debt was revealed in all the countries examined, including Estonia, Latvia, and Lithuania. Then the authors investigated a much shorter period from 2005 to 2019.

The scientific investigations are inconclusive on how economic factors would affect defence funding. The conducted studies show that the results are very sensitive to the analysed period and methodology applied. As cases of the USA, Greece, and Turkey show, defence funding is more dependent on economic factors in the perspective than in the short period (Dudzevičiūtė & Šimelytė, 2022).

Conclusions

- This research is related to the identification of economic factors that affect defence funding in Estonia, Latvia, and Lithuania. The selection of economic determinants that are examined as independent variables is based on previous investigations. To date, many studies have been conducted examining the effect of defence funding on economic indicators in various nations; however, there is a lack of research on identifying the reverse effect.

- In the face of current threats and uncertainties, it is important for national governments to clearly identify the sources of funding and the economic factors on which defence funding depends when making decisions on increasing defence budgets. This investigation is specifically aimed at achieving the above-mentioned purpose. To evaluate this, the author applied automatic linear modelling (ALM), which allowed the selection of the most statistically significant combination of economic factors that effect on defence funding trends.

- In the case of Estonia, the investigation revealed significant relationships between defence funding and real GDP per capita, economic growth rates, government debt, and inflation rate. However, after applying ALM, only real GDP per capita and government debt appeared to be significant factors in predicting defence funding trends.

- The case of Latvia showed significant relationships between defence funding and real GDP per capita, economic growth rates, and government debt. However, after applying ALM, only real GDP per capita could be named as a significant indicator that affects defence funding decisions.

- The case of Lithuania made it possible to identify significant relationships between defence funding and real GDP per capita, the budget deficit, and gross government debt. However, for long-term forecasting, only real GDP per capita proved to be influential.

- Summarising the cases of Baltic nations, it can be observed that defence funding depends on real GDP per capita trends. As real GDP per capita grows, defence funding tends to increase. Real GDP per capita explains 76.2 per cent of the variation in defence funding in Latvia, and 78.4 per cent in Lithuania. Real GDP per capita and government gross debt affect Estonia's defence funding by 92.6 per cent. Considering the fact that during the period from 1997 to 2021, the Baltic countries, in terms of real GDP per capita were more than twice behind the average of the EU countries, the promotion of economic development becomes one of the essential actions of the governments to ensure the funding of the defence of Estonia, Latvia and Lithuania.

- Not all economic indicators examined were found to be significant for defence funding. Therefore, this study confirmed the hypothesis that defence funding depends on certain economic determinants.

Acknowledgement

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Gitana Dudzevičiūtė

AR GYNYBOS SEKTORIAUS FINANSAVIMAS PRIKLAUSO NUO EKONOMIKOS VEIKSNIŲ ILGALAIKĖJE PERSPEKTYVOJE? ESTIJOS, LATVIJOS IR LIETUVOS ATVEJAI

Anotacija. *Šio straipsnio tikslas – išnagrinėti gynybos finansavimo priklausomybę nuo ekonominių veiksnių – šalies gerovės, ekonomikos augimo, biudžeto deficito, vyriausybės bendrosios skolos ir infliacijos. Tyrimas remiasi antriniais duomenimis, gautais iš Eurostato duomenų bazės ir apima laikotarpį nuo 1997 iki 2021 metų. Autorė analizuoja trijų Baltijos šalių atvejus: Estijos, Latvijos ir Lietuvos. Siekiant įvertinti priklausomybę tarp nagrinėjamų veiksnių, darbe taikomas automatinis tiesinis modeliavimas. Tyrimo rezultatai parodė, kad Estijos atveju gynybos finansavimui didelę įtaką daro šalies gerovė, išreiškiama realiu BVP vienam gyventojui ir vyriausybės bendroji skola. Šie ekonominiai veiksniai paaiškina 92,6 proc. gynybos finansavimo dinamikos. Latvijos ir Lietuvos atvejai labai panašūs pagal ekonominių veiksnių įtaką gynybos išlaidoms. Šiose šalyse realaus BVP, tenkančio vienam gyventojui, tendencijos turi didelę įtaką gynybos finansavimui. Latvijai ir Lietuvai ši įtaka šiek tiek skiriasi ir siekia atitinkamai 76,2 ir 78,4 procento. Tyrimo įžvalgos gali būti tikslingai panaudotos, priimant sprendimus dėl gynybos finansavimo didinimo, siekiant užtikrinti saugumą Baltijos regione.*

Gitana Dudzevičiūtė, assoc. professor of Defence Economics and Management research group, General Jonas Žemaitis military academy of Lithuania.
E-mail: gitana.dudzeviciute@lka.lt

Gitana Dudzevičiūtė, Gynybos ekonomikos ir vadybos mokslo grupės docentė, Generolo Jono Žemaičio Lietuvos karo akademija.
El. p: gitana.dudzeviciute@lka.lt