STUDY ON THE EVOLUTION OF DEFENSE EXPENSES IN NATO MEMBER STATES FOR THE PERIOD 2010-2020. "FREE RIDER" BEHAVIOR AMONG ALLIES

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Abstract: *This paper proposes a longitudinal study on the analysis of defense spending of NATO member states in the years 2010-2020. It also aims to identify the emergence of a possible "free-rider" behavior among alliance members. This behavior occurs when some members may be tempted to allocate a low level of defense spending. Defense spending is an important component of each state's budget, which ensures a vital function of states, namely the national defense function. When the defense is carried out in military-type alliances, and the number of members is large, there is an increased possibility of observing a "free-rider" type behavior between the members of the alliances. To observe this behavior, we tried to identify the best evaluation indicator, which according to the literature could be "the share of defense spending in GDP." The paper is divided into five parts as follows: the first point considers the introductory part of the paper and the setting of objectives; the second chapter describes the study database, as well as the research methodology and methods used in the study to obtain the results; in the third chapter is analyzed the literature with impact on the studied subject; in the fourth chapter the case study is carried out; and in the last chapter mentioned the conclusions of the study.*

Keywords: defense expenses, NATO, free-rider, asymmetry coefficient, econometric study

1. Introduction

The main objective of this article is to carry out a longitudinal study consisting in the analysis of the defense expenses of NATO member states, as well as the identification of a possible "free-rider" type behavior between the members of the alliance. To present a level of balance in setting defense budgets, all the information in the NATO economic reports, available on the official website, was studied [1]. Other aspects of defense financing in NATO member states were also analyzed, represented by indicators related to the field of defense. The most representative indicator, with

influence on military spending, which can help at the same time to determine the "free-rider" behavior was observed to be the share of defense spending as a percentage of GDP.

2. Methodology

In this article has been used as research methodologies: the longitudinal method of studying phenomena over time (which was performed by the case study method, and the panel study method), as well as the cross-sectional method that helps to identify the relationships between links and aspects analyzed phenomena (observation and

analysis). Other methods used were: analysis of the literature; economic analysis; and empirical analysis.

To achieve the objectives, the study uses the latest data from military spending reports as follows: NATO Secretary-General's annual reports (PR / CP.2020) on defense spending; military / civilian budget / NSIP 2020; NATO defense spending reports. The data necessary for the research were also taken from other economic situations published on the NATO website, but also from open access databases, provided by the EU, OSCE, SIPRI or found on the websites of the ministries of defense of the Member States.

The database conducted in this study lists 28 NATO states.

The following states are excluded from the study: Iceland - because this state does not have its own army and does not achieve a significant level of military spending; and the State of Northern Macedonia, - since it does not have a complete set of data, which was established in 2013). Thus, the panel database covers a longitudinal period of 11 years (between 2010 and 2020) and totals 308 elements / objects per variable. To process the data, the statistical-mathematical software Excel and EViews has been used.

3. Literature review

Traditionally, there have been two conceptual approaches most commonly used to analyze defense spending: *the pure public goods model* and *the common product model*. The first approach argues that the defense of allied states is a pure public good, which is closely linked to the strategy adopted in ensuring mutual defense. This model identified a less correct aspect (behavior), namely that "poorer" nations, which do not have nuclear weapons, for example, benefit from the protection (deterrent) of nuclear-weapon states. Thus, the "poorer" states, while making lower defense expenditures compared to states that have nuclear

weapons, enjoy a similar level of protection. This fact (or behavior) became known as the "*exploitation hypothesis*", in which smaller or poorer NATO states benefited and exploited the advantages (capabilities) held by rich states [2].

The second approach seeks the effects of a state's membership in a military alliance, in terms of the benefits of the alliance on all members. In this case, a „*spill-in*” effect was observed among allied nations which later leads to „*free rider*” behavior among lower-income nations [3]. That is, some countries will try to "*travel for free*" with other members of the alliance for maximum benefits, while offering only the minimum contribution. In other words, it can be said that a common product such as the 'deterrent', which is provided by the richest (or strongest) country, spills over to all members, and results in them relying on commitments and capabilities of the richest member [4], [5], [6]. In his study, Sweeney noted that in NATO, there is no truly effective sanction to discourage "*free rider*" behavior [7]. This phenomenon results in the chance of small states to use for their benefit the defense expenses of richer nations [8], [9].

However, despite permanent international changes, the demand for defense spending has been mainly influenced by changes in social behavior and changes in the preferences of developed societies. Thus, it was observed that in the developed countries the interest in investments in the fields of defense diminished, and the citizens no longer wanted to bring increases to the military expenses. Obviously, the political environment must respond appropriately to the demands and wishes of voters, as a means of obtaining votes. This causes the political environment not to make significant increases in defense spending [10]. To understand the consequences of this paradigm shift, including the implications of increased security dependence on the European-US relationship, it is important to look at what

kind of policy (in terms of security) the US and European countries are pursuing. It is observed in the literature that since the collapse of the Soviet Union, and until now, the USA occupies the first position in the world, in terms of international economic power and military power held.

Figure 1, using data published by NATO, shows the situation of the military budget of the North American states together with the aggregate military budget of the European

members. During the analyzed period (2010-2020), it is observed that the USA and Canada spent in the military field, more than double the military expenses of all European NATO states. This considerable expenditure of financial resources, made by American statutes (in the period 2010-2020) shows an average of over 3.9% of GDP, while the military expenditures of European states are on average 1.5% of GDP.

Figure 1: The evolution of the defense budget of the European and North American states, during the years 2010-2020

Source: authors' own processing based on information provided on the NATO website: https://www.nato.int/cps/en/natohq/topics_49198.htm

However, as explained in the Fritz & Zimmermann study, the factors that define the demand for defense spending are essentially of three types: economic, political and military [11]. Regarding the factors used to explain the defense costs, the different theoretical and empirical approaches highlighted different aspects, depending on the historical time interval (periods) of the analysis. Thus, during the "arms race" the approach focused on studying the action-reaction between two rivals, which act as rational agents with different power levels. In this respect, the amount of financial resources allocated to self-defense was dependent on the level of spending of the rival country (reaction effect), but also on the level of own resources allocated in previous years as described in the Bernauer & Koubi study [12].

After the analysis of the literature, it was observed that the model most used in the analysis of the explanatory factors behind defense spending is based on what Smith calls "the rational behavior of an actor"

[13]. That paper is primarily concerned with obtaining information on the factors influencing defense spending. The most used indicators in studies addressing the evolution of nations' defense spending are usually the volume of defense spending and the percentage of GDP allocated to defense spending (see Figures 1 and Figure 2).

It can be said that the share of defense spending in GDP (or the specific weight of defense spending in GDP) reflects the political orientation that a state manifests towards the field of defense. However, in an appropriate approach to the analysis of defense spending, it should be noted that there is no standard (correct) percentage of a nation's size of military spending. This depends primarily on social behavior, national priorities and policy, as well as national, regional and international issues.

It is noted that between 2010 and 2020, the evolution of defense spending (defense spending as a share of GDP) among NATO members showed an upward trend until 2011, after which this indicator tended to

decrease by the end of 2016. Since 2017, this indicator has maintained an upward trend, evident in the North American states

and an upward trend but more moderate in the case of European states (see Figure 2).

Figure 2: Evolution of the share of defense expenditures in the GDP of European and American states (period 2010-2020)

Source: authors' own processing based on information provided on the NATO website: https://www.nato.int/cps/en/natohq/topics_49198.htm

This constant gap between European and North American allies reflects the different security and defense views of the two sides of the Atlantic. Thus, the North American states are based and invest more in military power (the concept of warfare), while in European states they are more oriented by the social nature (the concept of wellbeing). This distinct behavior towards the "public good of defense" implies an imbalance both in the NATO budget as a whole and in the share of defense spending in the GDP of each state [14].

In the case of Europe, the strategy adopted, and the main military objectives are generally based on the maintenance of peace and the conduct of humanitarian operations, or crisis management tasks, etc. whose purely military component is minor (relative to the type of US interventions). These aspects meet both the requirements of voters (European citizens) and the strategy established within the EU. However, this phenomenon does not necessarily lead to an optimal or balanced situation for Europe, for two reasons: firstly, there is a huge difference in the level of military capability between the two areas of the Alliance (European and American), which implies a high military dependence of European members on the US [15]; the second reason is geostrategic in nature. The location of European members near conflict

zones, and near the Russian Federation (which has permanently carried out a series of hybrid or provocative actions on regional security) should lead European states to both allocate more resources to defense and as well as their more efficient use.

The major funding gap between the North American states and the European states between 2010-2011, seems to have diminished, only due to the decrease of the defense expenses of the North American states, and not as an increase of the defense expenses among the European states. would have been expected. US and Canada, stopped the downward trend of the defense budget, starting with 2015, year preceded by the Crimean conflict. Both North American and European states maintained a constant trend during the years 2015-2018. After this period, all members of the alliance began to allocate increasing financial resources to the field of defense, an aspect that may be caused by the increased tensions in Eastern Europe, caused by Russian-Ukrainian relations.

Hans Binnendijk has historically explored the issue of "free-rider" behavior within NATO [16]. He analyzed the advantages and disadvantages of the alliance since its inception and discussed how the US has constantly tried to address, along with its other allies, issues related to the alliance's budget. He concluded that the recent

Russian aggression against Ukraine (Crimean Peninsula 2014) was the turning point in which the US put more pressure on European allies to engage in larger defense budgets. The US intention was to reduce the existing financial burden (pressure) on its defense budget. Binnendijk has also developed policy proposals that would help close the gap between NATO partners on both sides of the Atlantic and deepen the burden-sharing of burden and cost. On the other hand, as already mentioned, the level of state revenues (GDP) is one of

the factors most often associated with the level of defense spending. Based on this indicator, the following study tried to identify a possible "free-rider" behavior in NATO member states.

4. Case study

Next, the share of defense spending in relation to the GDP of NATO states is analyzed. Thus, in table no. 1, the share of defense budgets in the GDP of the 28 Member States for 2010 and 2020 is presented.

Table 1: Share of defense budgets in the Gross Domestic Product of NATO member states - (% in percent)

State	2010 %	2020 %	State	2010 %	2020 %
Albania	1.56	1.47	Lithuania	0.88	2.28
Belgium	1.08	1.10	Luxembourg	0.47	0.64
Bulgaria	1.64	1.93	Montenegro	1.80	1.91
Canada	1.16	1.45	Netherlands	1.34	1.48
Croatia	1.54	1.87	Norway	1.51	2.03
Czech Republic	1.28	1.43	Poland	1.77	2.30
Denmark	1.40	1.47	Portugal	1.49	1.63
Estonia	1.70	2.38	Romania	1.24	2.38
France	1.96	2.11	Slovak Republic	1.27	1.86
Germany	1.35	1.57	Slovenia	1.61	1.20
Greece	2.64	2.58	Spain	1.03	1.16
Hungary	1.03	1.33	Turkey	1.83	1.91
Italy	1.35	1.43	UK	2.47	2.43
Latvia	1.06	2.32	United States	4.81	3.87

Based on the data presented, it can be seen how states have allocated defense resources to their own GDP. At the same time, we can see how the states have considered the fulfillment of the commitments made at the "NATO summit in Wales" in 2014. One of the measures of that summit provided for the allocation to the defense budget of at least 2% of the national GDP of the states. The aim of this measure was to achieve a more balanced distribution of defense and security costs between the two sides of the Atlantic. It is noted that in 2020, ten states have met this requirement. Compared to 2010, when only three members achieved this goal (Greece, Great Britain and USA). It can be said that the situation has improved significantly, and NATO member states are closer to achieving their goals. At the same time, it is particularly noticeable

that the countries near the Russian borders have increased their military budget and are in line with the recommendation to allocate 2% of GDP to the defense budget.

Next, descriptive statistics of the defense expenditure data series as a share in GDP were performed, in order to observe the characteristics of this variable.

Descriptive statistics of the variable share of defense expenditures in GDP "Ch_Ap_PIB" is presented in (Figure 3). Regarding the estimators of the central trend of the series data, it is observed that the average (Mean) of the series is 1.51%. The median value (Median), or equilibrium point is around 1.35%, central level value, around which the values of the series are scattered. The standard deviation (Std.Dev.), As an estimator of volatility, captures and reflects the deviations that

occur from the central trend of the data, and in the case of this series the standard deviation between the minimum and maximum series is 0.65. The "elongation" data distribution parameter to the left or right of the mean is captured by Skewness. In this case the asymmetry coefficient, reflects a positive asymmetry, at the middle right. Also, Kurtosis parameter, captures

data vaulting is reflecting the existence of possible extreme values in the data. The empirical value of the vaulting coefficient Kurtosis being 9.03 shows a leptokurtic distribution of the data, which means that the extreme values that appear in the data are more distant from the average, and the series does not necessarily follow a normal distribution. (see Figure 3).

Figure 3: Descriptive statistics of the variable, "share of defense spending in GDP" in 2010-2020
Sursa: authors' own processing

It is thus observed that the median allocation (Median), or the equilibrium point of the series is located around 1.35% of GDP, a central level value, around which the values of the series are scattered. We can observe that states which allocate a share of the defense budget to less than 1.35% of GDP are prone to "free-rider" behavior towards other allies. By 2020, it is noted that five countries are in this situation, namely: Belgium, Hungary, Luxembourg, Slovenia and Spain.

5. Conclusions

Regarding the variable share of defense expenditure in GDP, it is observed that when the defense expenditure of states is related to the variable GDP, a new set of data is obtained. This new series practically reflects the specific weight of defense spending in the GDP of each state, in order to maintain the functioning of the armies and implicitly to benefit from defense. From the econometric study of the influence of the independent variable the share of defense expenditure in GDP on the dependent variable defense expenditure,

estimated by the PLS method, it was observed that between the two variables there is a linear and positive dependence.

The variable share of defense spending in GDP reflects the concept and approach (policy / strategy / doctrine) to the public good of defense, the alliance partners, found by the two sides of the Atlantic. This aspect can be easily appreciated by analyzing the evolution of the data series of the analyzed expenses, as well as by following the policies of international military intervention. The way in which countries determine the share of defense spending in GDP may reflect "free-rider" behavior, in which each country tries to rely on the defense spending of the other members of the Alliance. Consequently, there is an effect of replacing the country's defense spending with that of the entire Alliance. This is especially evident in the case of military spending by European countries compared to the military spending of North American countries, and especially the United States.

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