EMPIRICAL STUDY ON THE FINANCING OF THE DEFENSE IN STATES OF THE EUROPEAN UNION, NATO MEMBERS

Alin Teodor HUSERAŞ[1], Nicolae BALTEŞ[2]

[1]Lucian Blaga University, Faculty of Economics, Sibiu, Romania
[2]Lucian Blaga University, Faculty of Economics, Sibiu, Romania

Abstract: *In the economic policy of the European Union, the expenses for the defence and security of the Community bloc must be correctly delimited. NATO's functioning, strengthened over seven decades, can be maintained at immediate response, only by the existence of adequate financial, human, material, logistical or other resources necessary to achieve the military capabilities established by agreements. Starting from this desideratum, the question arises: what is the cost of maintaining peace, borne by EU citizens?*
The paper aims at a theoretical and pragmatic approach to highlight the practice used in NATO financing, the financial contribution of EU member states and the interest shown in financing their own defence budgets. NATO membership is the guarantee of national defence and the maintenance of peace and the responsibility for defence, security and safety remains with each Member State. The way in which Member States comply with NATO recommendations, ensure adequate funding, employ well-trained staff, have high-performance defence equipment and infrastructure, and contribute to peacekeeping.
The study, based on the literature review, information from reports and economic situations provided by NATO, Eurostat, Globalfirepower, Sipri, as well as other open sources, was conducted for a number of 21 EU member states that are part of the NATO, in the period 2010-2019. The study starts from two research hypotheses. These assumptions are followed by the implementation of the recommendations of the 2014 Wales summit. At the same time, we aimed to highlight the efficiency and effectiveness of defence expenditures.
The conclusion from the research highlights that, the level of allocations to the defence budget is influenced by the options of political decisions, rather than analysis based on economic indicators and the level of expenditures made from defence budgets for the purchase of military equipment, is affected by the size of the military and implicitly by personnel costs.

Keywords: *the cost of peace, financial resources, efficiency, the European Union, NATO*

JEL classification: *(P43; H56; H60; H61*

1. Introduction

In the economic policy of the European Union, the expenditures for the defense and security of the Community bloc amount to significant amounts and therefore these expenditures must be made efficiently. As 21 of the 27 EU Member States are also part of the North Atlantic Alliance, such a study can be considered well-founded to highlight the effectiveness of the use of defense spending. NATO, an alliance whose functioning has been consolidated over seven decades, can be maintained at immediate response, only by the existence of sufficient financial, personnel, material, logistical, or other resources necessary to achieve the capabilities established military.

The main objective of the study is to highlight the defense costs, borne by the citizens of the EU member states NATO, in order to benefit from peace, defense and collective security. NATO is the body responsible for collective defense, crisis management and security-based cooperation.

The data needed for the research were taken from reports and economic situations published by NATO, as well as from economic reports provided by the EU, the OSCE or found on the websites of the

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ministries of defense of the Member States. In order to process the data and obtain the results, the EViews software and the Excel statistical-mathematical software were used.

The paper is structured in four sections. The first introductory part presents the theme, purpose and main objective pursued. The second section presents the review of the specialized literature. The third section presents the research hypotheses, methodology and data used. The fourth section presents the NATO budget system, the study conducted and the empirical results obtained. The last section presents the conclusions of the article.

2. Review of specialized literature

Regardless of their typology and nationality, the fundamental role of defense systems is to ensure the peace, security and national security of each state. A state without military power will try to compensate by consolidating and developing other components of power. A strong, stable and balanced economy ensures all the conditions for the development of outstanding military potential, by supporting the defense industry, scientific research, defense infrastructure and adequate funding. (Doina Mureșan, 2009). Therefore, only a successful national economy can provide the necessary conditions to generate an equally successful military power. On the other hand, a significant military power, but without economic support, will disintegrate over time. Maintaining a certain level of military power is extremely difficult and expensive without adequate financial support. An actor with economic resources should be able to increase his military power and security at the same time (this statement does not seem to be valid in the case of the EU, which, although it has become one of the world's largest economic powers, has not developed an independent military power). Sustainable military power cannot exist without a healthy economy (Cristian BĂHNĂREANU 2009).

In table no. 1, the main empirical studies that deal with aspects of defense financing are summarized (Table 1).

Table 1: Empirical studies on the effects of national defense spending

The authors of the study	The objective of the study	Method used	Sample / period	The results of the study
Daniel Albalate, Germà Bel, Ferran Elias (2012)	Învestigate the effects on military spending of government form and democracy, electoral rules and concentration of parliamentary parties	OLS regression	157 countries were considered for this study between 1988 and 2006	The analysis shows that countries with presidential democracy spend more on defense than countries with parliamentary democracy, because the interaction with the electoral majority rule reduces the burden of defense spending.
Aynur Alptekin, Paul Levine (2012)	The study establishes four empirical hypotheses about the link between defense spending and economic growth. The assumptions are: (H1) Military spending reduces economic growth; (H2) Military spending is detrimental to economic growth in less developed countries; (H3) The effect of military spending on economic growth is positive (H4) The effect of military spending on economic growth is nonlinear.	Meta-analysis	32 empirical studies with 169 estimates of the effect of military expenditure on economic growth.	Based on the meta-analysis of the literature on military spending, the study's findings are as follows: (H1) and (H2) are rejected, but (H3) and (H4) are accepted.

Vincenzo Bove, Roberto Nisticò (2014)	The study investigates the effect of military involvement in politics and defense budget allocations	Use a variety of econometric specifications, including: pooled OLS, panel data with fixed effects and IV estimates.	22 variables	The empirical results of the study confirm a degree of difference in the behavior of democratic and authoritarian regimes in allocating money to the armed forces, depending on the level of military involvement in policy-making. High levels of military engagement in policy-making increase the chances of military systems to obtain more resources and more generous allocations.
Vladan Holcner (2016)	The paper analyzes 6 NATO member states in terms of the stability and predictability of defense spending and examines the effectiveness of the measures taken. These objectives are considered prerequisites for the effective development of defense and the fulfillment of alliance commitments.	Methods of descriptive statistics	6 countries NATO members	The study concludes that the stability of defense spending is a result of the long-term attitude and responsibility of national policy towards the real needs of developing defense capabilities rather than the specific stabilization measures implemented by national governments.
Hagiu Maria, Crețan Georgiana (2017)	Analysis of the efficiency versus inefficiency of the distribution of existing financial resources to the public budget (health, education, infrastructure and national defense)	The Data Envelopment Analysis" (DEA)	20 state UE	The study shows that in 2009 and 2012 there were five effective countries: Estonia, Hungary, Slovakia, Slovenia and the Czech Republic. In 2012, Romania also reaches the frontier of efficiency. For both periods Greece has the minimum efficiency score.
Herman Matthijs (2019)	The study examines the evolution of NATO member countries' defense spending over the past 10 years.	Longitudinal data analysis	29 member states of the NATO, but not Iceland.	The article analyzed the trends in military spending of NATO members. The first conclusion is that the US continues to be by far NATO's largest funder and has the largest military budget in the world. Another objective of the study was to pursue the implementation of the Wales summit objectives.

Source: processing by the authors

The main directions of empirical research focus on the impact of the type of political system as well as the effects of the economy on defense budgets. However, the share of empirical studies dealing with the situation of defense financing in EU NATO member countries is low, as a result we propose a study focused on the situation of the 21 EU NATO member countries.

3. Research hypotheses, methodology and data used

The main objective of the study is to highlight the costs of defense, borne by citizens of EU member states NATO, in order to benefit from peace, defense and collective security.

In achieving the main objective, some secondary objectives have been set, as well:
- reflecting the real situation of military spending in these states;
- Member States' achievements and progress towards the goals of the 2014 NATO summit in Wales;
- reflecting the level of the defense budget as a percentage of Member States' GDP;
- highlighting the evolution of other specific indicators;

The empirical study started from the following research hypotheses:

General Statement 1: EU member states NATO recorded an inadequate level of the defense budget as a percentage of GDP in 2010-2019, experiencing difficulties in meeting commitments, the 2014 Wales summit.

The first research hypothesis: The level of allocations to the defense budget is influenced by the options of political decisions, rather than by an analysis based on economic indicators.

General statement 2: the level of investments made in defense budgets for the purchase of military equipment in most states does not reach at least 20% of defense spending, contrary to NATO recommendations.

The second research hypothesis: The level of expenditures made from defense budgets, for the acquisition of military equipment, is negatively influenced by the increased level of personnel expenditures as well as by the size of military personnel.

To test the hypotheses, a database was built consisting of indicators taken from open sources, such as: Eurostat, reports and economic situations published by NATO, EU, OSCE, SIPRI, Globalfirepower, or found on the websites of the Ministries of Defense , for the period 2010-2019.

The empirical study on defense financing, in the EU member states NATO, used a panel type model made with the help of statistical software EViews 10. The methods used were Pooled Least Squares (OLS), to capture the correlations between the defense indicators of the 21 countries included in the research. The research methodology also involved other methods, such as: economic analysis, case study and dynamic analysis, in the realization of which the Excel statistical-mathematical software was used.

4. Results, discussions and interpretations
4.1. NATO's budgetary system and the financial contributions of each EU NATO member state

NATO's budget system is structured around three internal budgets, namely: the civilian budget; the military budget and the investment budget. These budgets are financed by the contributions of the 29 Member States, by applying an agreed cost-sharing formula based on the GDP of each state.

The civil budget finances staff costs, operating costs, and expenditures on international and NATO headquarters personnel. Approved by the "North Atlantic Council" (NAC), a decision-making body made up of the permanent representatives of the 29 Member States on diplomatic missions. For 2019, the civil budget amounted to 250.5 million euros. Staff costs had the highest share (60.40%), followed by maintenance costs (28.5%) and costs related to certain programs (11.1%). The civilian budget for 2019 was 1.9% higher than in 2018, including: funding allocated for the implementation of functional reviews of NATO Headquarters; measures to strengthen information capabilities; measures to anticipate and plan hybrid and cyber challenges; and so on.

The military budget covers the operating expenses of the headquarters of the command structure, programs, missions and operations of commands around the world. It consists of several separate budgets (sub-budgets), all of which have as a source of funding contributions from national defense budgets, calculated according to the cost-sharing formula. In 2019, the military budget amounted to 1.39 billion euros (7.2% higher than in 2018). Funding from the NATO command and control structure was allocated from the budget; aerial control and early warning systems (AWACS); alliance operations and missions; and so on.

The third budget of this military organization is the "NATO Security Investment Program" (NISP) which supports missions by providing jointly funded capabilities. The NSIP budget in 2019 amounted to 700 million euros and accumulated a total of 7.6 billion euros on projects / programs under implementation. The main programs funded were: AWACS (30.1%); logistical support for the deployment of forces (25.6%); opportunities for consultation, command and control throughout the alliance (17.7%); ensuring deployable forces (13.7%); etc.

In 2019, the three budgets of the alliance formed by the contribution of the Member States amounted to 2.34 billion euros, with an increase in absolute amount of 144 million euros (+ 6.52%), compared to 2018 (table no. 2).

Table 2: Member States' contribution to the NATO budget for 2019

No	Member State	Percent	Contribution mil. €	No	Member State	Percent	Contribution mil. €
	COST-SHARING OF THE CIVIL BUDGET, THE MILITARY BUDGET AND THE NATO SECURITY INVESTMENT PROGRAM "(NISP)						
1	Germany	14,8	346,3	17	Hungary	0,7	16,5
2	France	10,5	246,2	18	Slovakia	0,5	11,2
3	UK	10,5	245,3	19	Bulgaria	0,3	8,0
4	Italy	8,1	190,9	20	Croatia	0,3	6,5
5	Spain	5,6	130,3	21	Lithuania	0,2	5,6
7	Turkey	4,4	102,8	22	Slovenia	0,2	4,9
8	Netherlands	3,2	75,0	23	Luxembourg	0,2	3,7
9	Poland	2,8	64,9	24	Latvia	0,1	3,5
10	Belgium	2,0	45,8	25	Estonia	0,1	2,7
11	Norway	1,6	38,6	26	Albania	0,1	2,0
12	Denmark	1,2	28,5	27	Iceland	0,1	1,4
13	Romania	1,1	26,7	28	Montenegro	0,0	0,6
14	Greece	1,0	23,0		**EU NATO Members**	**54,8**	**1.286,0**
15	Czech Republic	1,0	23,0		NATO Europe	71,5	1.676,7
16	Portugal	1,0	22,8		NATO Total	100	2.345,5

Source: processing by the authors, based on the official NATO site (highlighted EU NATO member stables are highlighted in blue)

From table no. 2 it can be seen that Germany is the EU's largest contributor to the financing of the NATO budget. Also, the four largest European states contribute together with over 49.41% to the NATO budget. The top ten European countries contribute 63.4% to the NATO budget and the other 17 European members contribute less than 8.1%. EU allies contribute 54.8% of the NATO budget.

4.2. Study on evolution in defense spending of EU countries

In table no. 3 presents the level of defense expenditure in the Member States, in the period 2012-2019, expressed in current prices and exchange rates, having as a unit of measurement $ million. The last column of the table shows the relative change in the volume of expenses expressed in the percentage by which the defense expenses varied during the analyzed period, according to the calculation formula (Văcărel I., 2007 p. 146-148):

$$\%\Delta D.exp._{n/n-1}^{n} = \frac{D.exp._{n}^{n} - D.exp._{n-1}^{n}}{D.exp_{n-1}^{n}} \times 100 \qquad \text{eq. 1}$$

Table 3: Evolution of defense spending in NATO member states, period 2012-2019 (million $)

Year / Country	2012	2013	2014	2015	2016	2017	2018	2019	2019/2012
Albania	183	180	178	132	131	144	176	198	8,18%
Belgium	5.169	5.264	5.192	4.202	4.256	4.431	4.840	4.921	-4,81%
Bulgaria	722	811	747	633	671	723	961	1.079	49,40%
Croatia	865	850	1.064	883	837	924	1.045	1.072	24,01%
Czech Republic	2.185	2.148	1.975	1.921	1.866	2.255	2.746	2.969	35,86%
Denmark	4.423	4.217	4.057	3.364	3.593	3.780	4.559	4.760	7,62%
Estonia	437	480	513	463	497	540	607	669	53,30%
France	50.245	52.316	51.940	43.474	44.191	46.036	50.459	50.659	0,83%
Germany	46.470	45.931	46.102	39.813	41.590	45.580	49.473	54.113	16,45%
Greece	5.633	5.309	5.226	4.517	4.635	4.748	4.853	4.844	-14,01%
Hungary	1.322	1.280	1.210	1.132	1.289	1.468	1.791	2.080	57,33%
Italy	26.468	26.658	24.448	19.566	22.373	23.852	25.004	24.482	-7,51%
Latvia	248	281	293	281	403	530	701	724	191,89%
Lithuania	324	355	427	471	636	816	1.056	1.084	234,79%
Luxembourg	214	234	253	249	236	325	373	391	82,35%
Montenegro	68	65	69	57	62	66	84	92	35,35%
Netherlands	10.365	10.226	10.332	8.668	9.108	9.622	11.115	12.419	19,82%
Norway	7.143	7.407	7.337	5.816	6.064	6.463	7.067	7.179	0,49%
Poland	9.574	9.007	10.104	10.596	9.405	9.938	11.856	11.971	25,04%
Portugal	3.040	3.262	3.003	2.644	2.615	2.702	3.220	3.358	10,43%
Romania	2.100	2.452	2.691	2.581	2.645	3.643	4.359	5.043	140,17%
Slovak Republic	1.020	968	997	986	1.003	1.053	1.297	1.905	86,72%

Slovenia	543	507	486	401	449	476	550	581	6,87%
Spain	13.912	12.607	12.614	11.090	9.971	11.864	13.186	13.156	-5,43%
Turkey	13.895	14.427	13.583	11.957	12.649	12.972	14.145	13.919	0,17%
United Kingdom	58.016	62.258	65.658	59.492	56.154	55.672	60.446	60.376	4,07%
EU member of NATO	185.279	185.162	183.674	157.939	162.268	175.306	194.051	202.280	9,18%
NATO Europe	264.517	269.434	270.430	235.336	237.267	250.624	275.970	284.043	7,38%
North America	732.941	699.077	672.092	659.938	673.770	666.640	694.323	752.034	2,60%
NATO Total	997.459	968.512	942.522	895.274	911.037	917.263	970.293	1.036.077	3,87%

Source: processing by the authors, based on the official NATO website
(https://www.nato.int/cps/en/natolive/topics_111582.htm)

From what is presented, it can be seen that the North American continent (USA and Canada) has the largest defense budget in NATO, totaling over 2.5 times the military budgets of all European members. It can also be seen that the top 3 European states (UK, Germany and France) together accumulate greater financial resources than all other European members combined.

Regarding the dynamics of national defense expenditures of European states, it is found that in the period 2012-2019, 4 states decreased their expenditures by values between 4.81% and 14.01%; 2 states (Turkey and Norway) they kept about the same level of spending; 19 states increased their expenditures by percentages between 0.83% and 86.72% and 3 states increased their defense expenditures by percentages between 140% and 235% (Romania; Latvia; Lithuania).

At the end of 2019, the top three EU states in order of defense budget size were: Germany ($ 54.1 billion), France ($ 50.6 billion) and Italy ($ 24.48 billion). Of the EU states, only Spain ($ 13.1 billion), the Netherlands ($ 12.4 billion) and Poland ($ 11.97 billion) allocated more than $ 10 billion to the defense budget and all other states allocated individuals were under $ 5 billion. The cumulative defense budget of the EU states at the end of 2019 was $ 202 billion, which represents 19.52% of the cumulative defense budgets of NATO member states.

Another significant aspect of the study aims to highlight the evolution of the share of defense spending of NATO member states (as a percentage of GDP), in the period 2010-2019 (table no. 4).

Table 4: Share of defense expenditures in GDP, period 2010-2019

Real GDP distribution (%)	2010	2012	2013	2014	2015	2016	2017	2018	2019
Albania	1,56	1,49	1,41	1,35	1,16	1,10	1,11	1,17	1,26
Belgium	1,64	1,04	1,01	0,98	0,92	0,91	0,90	0,91	0,93
Bulgaria	1,64	1,34	1,46	1,32	1,26	1,26	1,24	1,48	1,61
Croatia	1,54	1,53	1,46	1,84	1,78	1,62	1,67	1,72	1,75
Czech Republic	1,28	1,05	1,03	0,95	1,03	0,96	1,04	1,12	1,19
Denmark	1,40	1,35	1,23	1,15	1,11	1,15	1,15	1,30	1,35
Estonia	1,70	1,90	1,91	1,93	2,02	2,07	2,03	2,00	2,13
France	1,96	1,87	1,86	1,82	1,78	1,79	1,78	1,82	1,84
Germany	1,35	1,31	1,22	1,18	1,18	1,19	1,23	1,24	1,36
Greece	2,64	2,29	2,21	2,21	2,30	2,38	2,34	2,23	2,24
Hungary	1,03	1,03	0,95	0,86	0,92	1,02	1,05	1,15	1,21
Italy	1,35	1,32	1,27	1,14	1,07	1,18	1,21	1,21	1,22
Latvia	1,06	0,88	0,93	0,94	1,04	1,45	1,74	2,01	2,01
Lithuania	0,88	0,76	0,76	0,88	1,14	1,48	1,72	1,98	1,98
Luxembourg	0,47	0,38	0,38	0,38	0,44	0,40	0,52	0,54	0,55
Montenegro	1,80	1,66	1,47	1,50	1,40	1,42	1,36	1,54	1,65
Netherlands	1,34	1,24	1,17	1,15	1,13	1,16	1,15	1,21	1,35
Norway	1,51	1,52	1,52	1,56	1,50	1,58	1,59	1,66	1,70
Poland	1,77	1,74	1,72	1,85	2,22	1,99	1,89	2,02	2,01
Portugal	1,49	1,41	1,44	1,31	1,33	1,27	1,23	1,35	1,41
Romania	1,24	1,23	1,28	1,35	1,45	1,40	1,72	1,82	2,04
Slovak Republic	1,27	1,09	0,98	0,99	1,12	1,12	1,10	1,22	1,74
Slovenia	1,61	1,17	1,05	0,97	0,93	1,01	0,98	1,01	1,04
Spain	1,03	1,04	0,93	0,92	0,92	0,81	0,90	0,92	0,92
turkey	1,83	1,59	1,52	1,45	1,39	1,46	1,52	1,85	1,89
United Kingdom	2,47	2,16	2,26	2,16	2,05	2,11	2,11	2,14	2,13

EU member NATO	1,53	1,53	1,50	1,26	1,27	1,34	1,46	1,50	1,49
NATO Europe	**1,63**	**1,55**	**1,52**	**1,47**	**1,45**	**1,46**	**1,48**	**1,53**	**1,58**
North America	4,46	**4,11**	**3,78**	**3,51**	**3,34**	**3,33**	**3,16**	**3,14**	**3,26**
NATO Total	3,03	**2,94**	**2,76**	**2,59**	**2,48**	**2,49**	**2,40**	**2,42**	**2,51**

Source processing by the authors, based on the official NATO website
https://www.nato.int/cps/en/natolive/topics_111582.htm)

It should be noted that at the NATO Summit in Wales (2014), based on the consensus of all Member States, some decisions were taken, such as:

the defense budget to have at least 2% of the national GDP;

investments made from defense budgets, for the purchase of military equipment, to reach at least 20% of total defense expenditures;

Regarding the issues pursued in the first research hypothesis, regarding the recommendation to allocate 2% of GDP to the defense budget, from table no. 4 it is noted that in 2019 this recommendation was met by only 5 EU countries: Estonia, Greece, Latvia, Romania and Poland. Lithuania was close to the target, allocating 1.98% of GDP.

The collective average of the defense budgets of NATO member states (as a share of GDP), in the period 2010-2019 registered the following dynamics in the period 2010-2019:

EU NATO member states: from 1.53% (2010) to 1.49% (2019);

European countries: from 1.63% (2010) to 1.58% (2019);

North America: from 4.46% (2010) to 3.26% (2019);

NATO total: from 3.03% (2010) to 2.51% (2019)).

We also noticed that the military budgets of several small states are closer to reaching the 2% GDP target. On the other hand, it is noted that the military budgets of the great European powers have also made progress, but not as significant as in the case of small states. Thus, in 2019, Turkey reached the level of 1.89%, France 1.84%. Germany 1.36%. The fourth European military power, respectively Italy, fell continuously from 1.35% in 2010 to 1.22% in 2019 (remaining well below the European average and below the NATO recommendation of 2% of GDP).

Within this hypothesis, an econometric test was performed, using the Pooled Least Squares method with both fixed and random variables, to determine the relationship between the defense budget (DE) dependent variable, and independent variables such as GDP, GDP/capita of military personnel (Mpers), in order to observe how they can influence the level of defense budgets. The results are included in table no. 5.

Table 5: Variable test result

Dependent Variable: DE
Method: Pooled Least Squares
Date: 09/17/20   Time: 19:32
Sample: 2012 2019
Included observations: 8
Cross-sections included: 21
Total pool (balanced) observations: 168

Variable	Coefficient Std. Error	t-Statistic	Prob.
C	96777.48 5976.741	16.19235	0.0000
GDP	0.383317 0.015677	24.45107	0.0000
GDPPC	-18854.96 777.7655	-24.24248	0.0000
MPERS	-483.4214 37.04169	-13.05074	0.0000
Fixed Effects (Cross)			
_BE--C	-4.55E-11		
_BG--C	-4.55E-11		
_HR--C	-4.55E-11		

Dependent Variable: DE
Method: Pooled EGLS (Cross-section random effects)
Date: 09/17/20   Time: 19:32
Sample: 2012 2019
Included observations: 8
Cross-sections included: 21
Total pool (balanced) observations: 168
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	96777.48	5976.741	16.19235	0.0000
GDP	0.383317	0.015677	24.45107	0.0000
GDPPC	-18854.96	777.7655	-24.24248	0.0000
MPERS	-483.4214	37.04169	-13.05074	0.0000
Random Effects (Cross)				
_BE--C	0.000000			
_BG--C	0.000000			
_HR--C	0.000000			
_CZ--C	0.000000			

_CZ--C	-4.55E-11		_DK--C	0.000000
_DK--C	-4.55E-11		_EE--C	0.000000
_EE--C	-4.55E-11		_FR--C	0.000000
_FR--C	-4.55E-11		_DE--C	0.000000
_DE--C	-4.55E-11		_EL--C	0.000000
_EL--C	-4.55E-11		_HU--C	0.000000
_HU--C	-4.55E-11		_IT--C	0.000000
_IT--C	-4.55E-11		_LV--C	0.000000
_LV--C	-4.55E-11		_LT--C	0.000000
_LT--C	-4.55E-11		_LU--C	0.000000
_LU--C	-4.55E-11		_NL--C	0.000000
_NL--C	-4.55E-11		_PL--C	0.000000
_PL--C	-4.55E-11		_PT--C	0.000000
_PT--C	-4.55E-11		_RO--C	0.000000
_RO--C	-4.55E-11		_SK--C	0.000000
_SK--C	-4.55E-11		_SI--C	0.000000
_SI--C	-4.55E-11		_ES--C	0.000000
_ES--C	-4.55E-11			

Effects Specification			Effects Specification		
				S.D.	Rho

Cross-section fixed (dummy variables)			Cross-section random	0.000000	0.0000
			Idiosyncratic random	556.7944	1.0000

R-squared	0.813318	Mean dependent var	12300.00	

Weighted Statistics			

Adjusted R-squared	0.783501	S.D. dependent var	1196.649	
S.E. of regression	556.7944	Akaike info criterion	15.61383	
Sum squared resid	44642886	Schwarz criterion	16.06011	
Log likelihood	-1287.562	Hannan-Quinn criter.	15.79496	
F-statistic	27.27675	Durbin-Watson stat	3.345041	
Prob(F-statistic)	0.000000			

R-squared	0.813318	Mean dependent var	12300.00
Adjusted R-squared	0.809903	S.D. dependent var	1196.649
S.E. of regression	521.7401	Sum squared resid	44642886
F-statistic	238.1665	Durbin-Watson stat	3.345041
Prob(F-statistic)	0.000000		

Unweighted Statistics			

R-squared	0.813318	Mean dependent var	12300.00
Sum squared resid	44642886	Durbin-Watson stat	3.345041

Source processing by the authors

The results obtained show a positive correlation between the DE defense budget and the GDP level. The test shows a negative correlation between the DE defense budget and GDP/capita as well as military personnel (Mpers). Apparently, the defense budget could only increase with GDP growth.

The results of the tests by the OLS method with fixed effects and variable effects highlight an insignificant marginal degree of regression models (R-squared = 0.81 and Adjusted R-squared = 0.78, respectively R-squared = 0.81 and Adjusted R-squared = 0.80) so, from the perspective of the significance of the coefficients, is not a valid model.

Empirical results confirm the research hypothesis that in the period 2010-2019, EU NATO member states did not meet the commitments of the 2014 Wales summit, in the sense of allocating 2% of GDP to the defense budget. The level of allocations to the defense budget is influenced by the options of political decisions, rather than an analysis based on economic indicators, suggesting that the level of indicators such as GDP, GDP/ capita or even military personnel (Mpers) are not enough to influence the size of the defense budget.

With regard to the issues pursued in the second research hypothesis, this refers to the second part of the Wales agreement. Where investments made in defense budgets for the purchase of military equipment were expected to reach at least 20% of total defense expenditure.

Simultaneous analysis of EU member states compliance with the two recommendations of the Wales summit: the allocation of at least 2% of national GDP to the defense budget and the investment in defense budget equipment to reach the maximum at least 20% of the total expenses, at the end of 2019 is presented in chart no. 1.
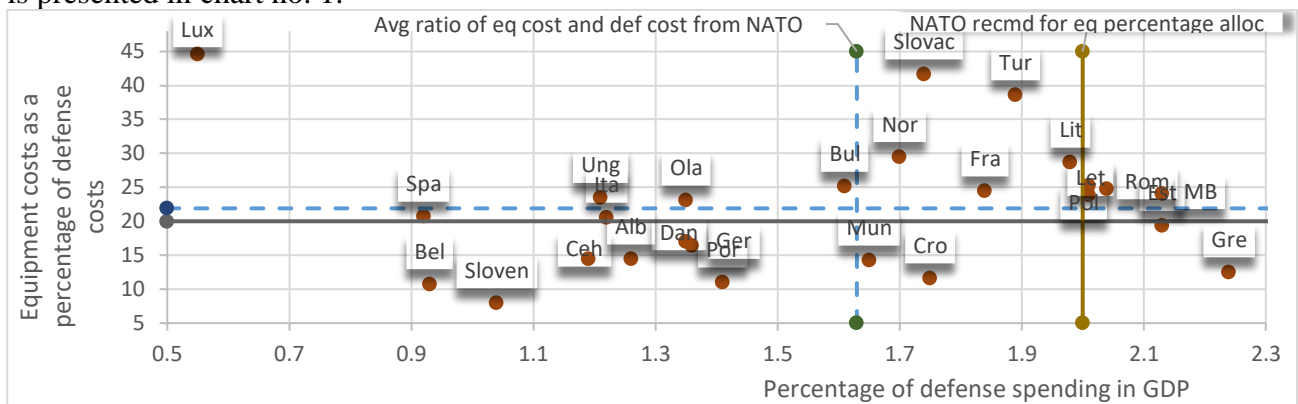

Chart no. 1– The level of allocations of financial resources from GDP to defense budgets and the level of investments in equipment from the defense budget in 2019 (%)
Source: processing by the authors, based on NATO data (https://www.nato.int/cps/en/natolive/topics_111582.htm)

The situation presented in the graph above highlights four distinct dials, namely:

- 4 countries that simultaneously meet the 2% of GDP standard and the level of equipment investments of 20%: Romania, Estonia, Latvia and Lithuania;
- 1 state that meets the 2% of GDP standard but does not meet the 20% equipment investment standard: Greece;
- 8 countries that do not meet the 2% of GDP standard, but meet the 20% equipment investment standard: Bulgaria, France, Hungary, Italy, Luxembourg, the Netherlands, the Slovak Republic, Spain;
- 7 states that do not meet either of the two standards: Denmark, Germany, Czech Republic, Croatia, Portugal, Belgium, Slovenia.

The analysis showed that in 2019, 17 EU NATO member countries complied with this provision.

To confirm or refute the research hypothesis according to which: investments for equipment made from the defense budget to reach at least 20% of total expenditures at the end of 2019, an econometric test was performed, by the Pooled Least Squares method with fixed variables and random variables. The purpose of the test was to determine the relationship between the dependent variable equipment expenditure as a share in the defense budget (Eqp_asDE), and the independent variables: defense budget (DE), personnel expenditure as a share in the defense budget (Pers_asDE) and military personnel (Mpers) - table no. 6.

Table 6: Variable test result

Dependent Variable: EQP_ASDE	Dependent Variable: EQP_ASDE
Method: Pooled Least Squares	Method: Pooled EGLS (Cross-section random effects)
Date: 09/17/20 Time: 20:44	Date: 09/17/20 Time: 20:52
Sample: 2012 2019	Sample: 2012 2019
Included observations: 8	Included observations: 8
Cross-sections included: 21	Cross-sections included: 21
Total pool (balanced) observations: 168	Total pool (balanced) observations: 168
	Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.		Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	108.6555	1.995635	54.44659	0.0000		C	108.6555	1.995635	54.44659	0.0000
DE	0.000401	5.11E-05	7.845675	0.0000		DE	0.000401	5.11E-05	7.845675	0.0000
PERS_ASDE	-1.010320	0.012523	-80.67399	0.0000		PERS_ASDE	-1.010320	0.012523	-80.67399	0.0000
MPERS	-0.266179	0.016466	-16.16539	0.0000						

Fixed Effects (Cross)			MPERS	-0.266179	0.016466	-16.16539	0.0000
_BE--C	1.42E-14		Random Effects (Cross)				
_BG--C	1.42E-14		_BE--C	0.000000			
_HR--C	1.42E-14		_BG--C	0.000000			
_CZ--C	1.42E-14		_HR--C	0.000000			
_DK--C	1.42E-14		_CZ--C	0.000000			
_EE--C	1.42E-14		_DK--C	0.000000			
_FR--C	1.42E-14		_EE--C	0.000000			
_DE--C	1.42E-14		_FR--C	0.000000			
_EL--C	1.42E-14		_DE--C	0.000000			
_HU--C	1.42E-14		_EL--C	0.000000			
_IT--C	1.42E-14		_HU--C	0.000000			
_LV--C	1.42E-14		_IT--C	0.000000			
_LT--C	1.42E-14		_LV--C	0.000000			
_LU--C	1.42E-14		_LT--C	0.000000			
_NL--C	1.42E-14		_LU--C	0.000000			
_PL--C	1.42E-14		_NL--C	0.000000			
_PT--C	1.42E-14		_PL--C	0.000000			
_RO--C	1.42E-14		_PT--C	0.000000			
_SK--C	1.42E-14		_RO--C	0.000000			
_SI--C	1.42E-14		_SK--C	0.000000			
_ES--C	1.42E-14		_SI--C	0.000000			
			_ES--C	0.000000			

Effects Specification (left)

Cross-section fixed (dummy variables)

Left table			
R-squared	0.993345	Mean dependent var	16.64000
Adjusted R-squared	0.992282	S.D. dependent var	5.348596
S.E. of regression	0.469892	Akaike info criterion	1.458935
Sum squared resid	31.79495	Schwarz criterion	1.905215
Log likelihood	-98.55052	Hannan-Quinn criter.	1.640057
F-statistic	934.4858	Durbin-Watson stat	3.670390
Prob(F-statistic)	0.000000		

Effects Specification (right)

	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.469892	1.0000

Weighted Statistics

R-squared	0.993345	Mean dependent var	16.64000
Adjusted R-squared	0.993223	S.D. dependent var	5.348596
S.E. of regression	0.440309	Sum squared resid	31.79495
F-statistic	8159.445	Durbin-Watson stat	3.670390
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.993345	Mean dependent var	16.64000
Sum squared resid	31.79495	Durbin-Watson stat	3.670390

Source: processing by the authors

The results obtained show a positive correlation between equipment expenditure (Eqp_asDE) and defense budget (DE). The test shows, as expected, a negative correlation between equipment expenditure (Eqp_asDE) and personnel expenditure (Pers_asDE), as well as military personnel (Mpers). Apparently, equipment spending could only increase with the increase in the defense budget.

The results of the tests by the OLS method with fixed effects and variable effects highlight a significant marginal degree of regression models ($R^2 = 0.993$ and Adjusted $R^2 = 0.992$, respectively $R^2 = 0.993$ and Adjusted $R^2 = 0.993$) so , and, from the perspective of the significance of the coefficients, is a valid model (Prob F-sta = 0.0).

The empirical results confirm the research hypothesis that the level of expenditures made from defense budgets for the purchase of military equipment is negatively influenced by the increased level of personnel expenditures as well as the size of military personnel

5. Conclusions

The empirical study carried out took into account two of the objectives of the NATO summit in Wales, respectively: the objective of allocating 2% of GDP to the defense budget and the recommendation to invest 20% of the defense budgets in military equipment.

The research showed that in 2019 the situation showed a visible improvement, out of six European countries, four EU countries reached the target of allocating 2% of GDP to the defense budget. However, for many members there is still a long way to go to achieve this goal, the deadline being 2024. The increase in defense budgets and the fulfillment of the requirement to allocate 2% of GDP is observed especially in the smaller states and mainly in the states close to the Russian Federation.

Regarding the recommendation to invest 20% of defense budgets in military equipment, at the end of 2019, 14 European states, of which 12 EU countries have achieved this goal. The main cause is the allocation from the defense budget of a large percentage (over 60%) for personnel expenses, which creates difficulties in the efficient allocation of resources to the other categories of military expenditures.

In this study we analyzed military spending and their trends, made by EU member states NATO, between 2010-2019. The first conclusion regarding this aspect is that Germany has increased its defense budget every year and at the level of 2019 it has the largest military budget in the EU. At European level, Germany is surpassed only by Great Britain. Compared to 2010, the military budgets are still lower, but the lowest level, respectively the period of 2015/2016 was ahead.

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