European NATO Fiscal Space before and under the Russo-Ukrainian War[1]

Gábor KUTASI – Ádám MARTON* – Grzegorz WASZKIEWICZ***

Abstract

The threat of war limits the fiscal space via direct fiscal items and indirect macroeconomic flows. The Russo-Ukrainian war has edged the fiscal challenge of the growing need for military spending in different regions of Europe. This study examines the impact of war-related threats on the fiscal capacity of European NATO countries. The research employs cluster analysis to evaluate the preparedness of these countries to reallocate fiscal resources in response to these pressures. Furthermore, the paper utilizes a dynamic panel Generalized Method of Moments (GMM) regression model to assess the influence of fiscal space determinants and geopolitical risk factors on military expenditure. The cluster variables are: military expenditures per capita in USD, public finance risk expressed as the credit default swap (CDS) spread, gross public debt representing the original sin, tax wedge as a mitigating items of reallocation of expenditures, the Gini coefficient as the origin of social spending needs, and finally distance from Russia as the pressure of military threat on the public finances. The GMM regression is extended with geopolitical risk indicators, development indicator and economic growth. The findings suggest that while a country's level of development is a primary determinant of its per capita military spending in USD, the fiscal space exerts a particular influence on these expenditures, too.

Keywords: *war, budget, fiscal space, cluster analysis, GMM, NATO*

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Introduction

In the last ten years, the geopolitical landscape has altered the fiscal objectives of EU nations. Halmai (2023a and 2024) uncover the channels of war shock on economy, among others, tightening financial conditions and increasing uncertainty, which are directly negative factors of fiscal opportunities. The conflict between Russia and Ukraine, which started in February 2022, ultimately eliminated any uncertainties among European countries over the necessity to allocate a minimum of 2% of GDP to military expenditures. This was especially true for the eastern EU member states near the conflict zone, which are the most susceptible to the Russian threat (Waszkiewicz and Taksás, 2023). The NATO countries in Europe were motivated to increase their military spending. Poland, for example, considers 4 percent of GDP and Hungary 2.4 percent of GDP to be the level of military spending to be achieved. We will investigate whether European NATO countries are fiscally prepared for the impact of the war. To determine it, the preparedness will be placed into fiscal space context. At the 2014 NATO Wales Summit, European members committed to contribute at least 2% of their GDP to military. The start of the Russo-Ukrainian war, however, prompted European nations to increase their military spending, not only out of alliance solidarity but also as a result of their support for Ukraine and the growing threat to their communities' security. The issue of national military capabilities involves increased expenditures on both people and equipment.

Economics explicitly prefers to examine and quantify the trade-off issues that arise as a result of the choice between alternatives. In the case of budgetary decisions, it is assumed that, ceteris paribus, spending more on one objective means spending less on others. In economic policy, this involves, among other things, a choice between different uses of public funds (Pierson, 1996). Given the limited resources of government, fiscal reallocations between different fiscal policy areas are likely (Looney, 1986).

The current paper rises from the theory of fiscal space to analyse *ex post* the fiscal capability, readiness and adaptability for increasing international security threat originated from the Russian attack against the Ukraine. Heller's (2005) definition for fiscal space: „availability of budgetary room that allows a government to provide resources for a desired purpose without any prejudice to the sustainability of a government's financial position". Schick (2009) defined fiscal space as financial resources available to a government for policy initiatives. The fiscal space theory originally focused on economic growth purpose. However, the financing of militarization and war can be understood, too, as a public finance purpose demanding fiscal space.

This paper aims to identify the classification of European NATO countries and their fiscal readiness for fiscal reallocation in the context of the Russo-Ukrainian war. To do so, we use cluster analysis to explore the war zone affiliation of NATO member states with distance, their preparedness for war with the level of military spending. Lentner and Kolozsi (2019) established that crisis enforce innovative solutions in economic policy making. In the current case, the adaptive factors are extended, as follows, with various dimension of fiscal space:

- First, the per capita military spending to represent the pre-war awareness for war. The absolute per capita USD value is used to proxy the initial military power, since in case of a Russian war threat, the military spending in GDP ratio is not relevant and does not expresses the need and pressure for extension of the military expenditure after the attack against the Ukraine.
- Second, the CDS premium, to demonstrate the accessibility of loan market as an extension of fiscal space.[2]
- Third, tax wedge to demonstrate the room for cushioning of fiscal redistribution among expenditure purposes.
- Fourth, the public debt-to-GDP ratio as an expression of past dependency in the fiscal path.
- Fifth, the Gini coefficient representing the social inequalities which determines the need for fiscal redistribution and, thus, social spending according to the policy dilemma on efficiency vs. equity.
- Sixth, the distance from the war zone which represents the need for military spending after 2021.

1. Framework of Fiscal Space

To increase fiscal space, governments can implement tax reforms or strengthen tax administration to generate additional revenue. Lower-priority expenditures can be reduced to allocate resources to more critical areas. Domestic or external borrowing can provide additional funds, and governments can also utilize seigniorage. It's crucial to maintain a medium-term expenditure framework that prioritizes spending and ensures the availability of present and future budgetary resources. This flexibility allows governments to respond to unexpected fiscal challenges. When automatic spending (regular, guaranteed by law) consumes a significant portion of the budget, options of discretionary spending (one time, based on current decision of policy makers) are limited.

[2] Role of the low and high interest rate on public debt is detailed by Czeczeli (2023) from sustainability focus, adapted to recent macroeconomic developments.

Therefore, future budget projections should avoid overcommitting resources. Additionally, significant inflows of external funds earmarked for specific sectors can create future spending obligations, potentially limiting the growth of domestic budgetary resources (Heller, 2005).

A few years before the war, Botev et al. (2016) already surveyed the fiscal space in OECD countries including several European NATO members. They concluded about the fiscal space that interest rates on government debt were very low in advanced economies due to exceptional monetary stimulus, which has led to savings through reduced interest payments. Consequently, measures of fiscal space – defined by the gap between actual debt and levels that would compromise market access – have increased in most OECD countries since 2014, as lower interest rates have outweighed the effects of lower potential growth and higher debt.[3] Additionally, measures accounting for projected long-term aging-related spending pressures suggest there is some fiscal space in the largest advanced economies, although the situation is more uncertain in Italy depending on the focus of the fiscal analysis. Structural reforms can further enhance fiscal space, and the current increase in fiscal space provides an opportunity for countries to engage in long-term borrowing and fiscal initiatives aimed at boosting productivity and long-term growth, tailored to their specific economic conditions which meant significant buffer for financing. However, since this conclusion, the financing of Covid crisis has already burned a significant part of the fiscal space for borrowing money and ruined the growth potential (Halmai, 2023b).

Romer and Romer (2019) represent a more various image about European fiscal space. Their multidimensional methodology includes financial distress, CDS spreads (as the proxy of market access), debt-to-GDP etc. They establish that a nation's fiscal response to a crisis is contingent upon its pre-existing debt-to-GDP ratio. Over the past four decades, both market access and the decisions made by policymakers have been pivotal in shaping fiscal responses to crises. However, the choices made by policymakers have been somewhat more influential. As they concluded, the fiscal response of a country to a crisis is significantly influenced by its pre-crisis debt-to-GDP ratio. Countries with lower pre-crisis debt levels adopt more expansionary fiscal policies compared to those with higher debt levels. The study reveals that the debt-to-GDP ratio impacts policymakers' decisions beyond its effect on market access, as evidenced by long-term government bond yields and sovereign debt ratings. Additionally, narrative evidence from the Economist Intelligence Unit highlights that both market access and policymakers' choices play crucial roles, with the latter one being significantly influenced by the

[3] The strong causality between debt and economic growth is explained and verified by Marton (2021).

debt-to-GDP ratio. Aizenman et al. (2013) examined the determinants of sovereign risk pricing in South European countries in years 2000s, focusing on fiscal space – defined by the debt-to-tax revenue and deficit-to-tax revenue ratios, in a GMM regression model to estimate CDS spreads. The study highlights fiscal space as a pivotal factor in sovereign risk assessment but notes differing market perceptions for currency union members versus those with independent monetary policies. Besides, they verified that the expectations can hijack the risk pricing in CDS both in case of unfounded optimism and pessimism.

Several analyses have been conducted to examine the effects of reprioritizing spending and to determine if previous objectives were crowded out of financing. Russett's pioneering research in 1969 scientifically formulated the reallocation between military and social spending. He posited that public expenditure on army hampers economic growth by limiting the budget available for expenditures that enhance human capital's health and skills. Peroff (1976) demonstrated that welfare-oriented public expenditure programs are constrained by excessive military spending, negatively impacting economically disadvantaged groups. Dabelko and McCormick (1977) provided evidence of the opportunity costs of military spending, noting significant negative effects in certain periods, which varied depending on the political or governmental system. Ikegami and Wang (2023), in their examination of 166 countries, found that military spending crowds out health spending, with GDP growth mitigating this effect. They also noted that the negative trade-off was more pronounced in lower-income countries.

Conversely, some studies suggest that fiscal space does not always result in a reallocation of spending priorities but rather an addition of new military spending alongside existing social targets. Apostolakis (1992) found mixed positive and negative trade-offs in the elasticity between military and social spending – specifically health, education, social security, and public works – in Latin American countries. Lin et al. (2015) illustrated a trade-off between protection burdens and social expenditures (education and health) by analysing 29 OECD countries, finding that the demand for social welfare programs in developed countries creates a positive trade-off between military spending and social expenditures. The trade-off can be absorbed with debt financing or tax increase. However, discretionary policy actions are excluded from cushioning the reallocation since Eller et al. (2015) demonstrated that the non-mandatory, *ad hoc* fiscal decisions are rather causing output volatility than absorbing shocks.

An early recognition of European fiscal caused by the Russo-Ukrainian conflict still in a civil war version in the 2010s, Christie (2017) created the fiscal capacity concept and indicator to capture the fiscal space in military spending context. The index created correlation between change of public debt level and future

military spending capacity, while incorporated the necessity of military spending with a geographical distance variable and a border dummy. The random effects panel regression resulted in that, first, increasing fiscal capacities (namely growing GDP) is not a necessity of increasing real military spending. However, in case of existence of devotion to increasing military spending, the improving fiscal capacity is needful. And the devotion is raised simply by the geographical proximity to Russia.

Reprioritization of expenditure as a shift in fiscal space recognizable during the war. According to analysis made by Prohorovs (2022), the Russo-Ukrainian war has significantly reprioritized public expenditure structures in the European countries. This trend rearranged their fiscal space massively. Many NATO members have increased military spending to bolster their military capabilities and deter potential aggression. This reallocation of funds has implications for other areas of public expenditure. Countries bordering Ukraine and those hosting Ukrainian refugees have incurred significant costs related to humanitarian aid, refugee support, and social services. The war has disrupted global supply chains, increased energy prices, and fuelled inflation, leading to economic uncertainty. Governments have had to allocate resources to mitigate these impacts and support economic recovery. Many countries, particularly in Europe, have accelerated their transition to renewable energy sources and sought to diversify their energy supplies to reduce reliance on Russian energy. This requires substantial investments in renewable energy infrastructure and energy efficiency measures.

2. Cluster Analyses

2.1. Methodology and Data

In the empirical analyses, homogeneous clusters were formed, based on which a hierarchical cluster analysis was applied due to the number of elements in the sample. The aim of the study is to explore the extent and economic circumstances of exposure to Russia in European Union member states and non-EU European NATO member states.

These factors determine the need for increased military spending and the scope for cushioning the welfare sacrifice. The segmentation of country groups provides an opportunity to identify similarities and differences between member countries that influence the elasticity of reallocation between social and military spending. The EU Member States form a small sample, which justifies the use of hierarchical clustering. The clustering was based on six input variables. These variables have the following characteristics:

Financial preparedness for and commitment to war threats in public spending. This expresses the influence of proactive defence thinking after Russia's annexation of Crimea and local armed struggle in Eastern Ukraine. Fiscal space is based on country risk spreads measured by CDS. This shows how liquid a country's government bond market is, i.e. how much debt financing can substitute the reallocation among expenditure items. Fiscal space to maintain welfare or military spending through tax revenues as a measure of policy options to offset trade-offs. Demonstrate how much room for manoeuver in tax increases can be an alternative to redistribution. (Note that this room for manoeuver may be further constrained by fiscal rules. The dynamics and redesign is detailed by Blanchard et al. (2021) or Darvas et al. (2024), while the role of national rules are explained among others by Barbier-Gouchard et al. (2021), Beetsma (2022) or Benczes (2019). Moreover, in historical perspective of the dynamics can be clarified from in Hallerberg et al. (2007), Benczes (2011) and Benczes and Váradi (2011)).

The welfare challenge posed by inequality as a social public expenditure need. Social spending and financing of education and health care is more necessary the wider the social strata of the society that are left behind. Conversely, the greater the extent of guns or butter opportunity cost redistribution, the more significant its impoverishing effect. Our interpretation is that greater inequality creates greater social demand for welfare spending. (For example, with lower levels of employment, a lot of people do not have independent income or a solvent demand for private health services, so there is a greater need for unemployment benefits, social assistance and financing of public health.) Since the study includes medium and highly developed European countries, absolute poverty indicators are not relevant, and we derive the social need for welfare benefits from the level of social inequality.

The geographic gravity of Russia's war against Ukraine as an indicator of the level of threat of war for that country. Proximity to the conflict zone increases the likelihood that a country will be part of an armed conflict, either of its own volition or as a result of provocation or attack, and raises the sense of threat from Russia's great power ambitions.

Based on the literature, it would be possible in principle to use additional variables. Based on Whitten and Williams (2011), governments with a hawk or dove orientation could be considered. European governments did not have a hawkish stance in the period before the war against Ukraine, but by 2024 almost all of them had adopted it.

This is therefore not an appropriate criterion for differentiation. Instead of a binary variable, the level of military spending is more differentiating and presumably reflects this political attitude to some extent. Following Dabelko and McCormick

(1977), government structures might also be of interest, but this study worked on a broad spectrum of countries, with centralized communist planned economies, dictatorships, parliamentary and presidential democracies. European countries are currently more homogeneous than this. There are also examples of other institutional variables of governance, such as the number of coalition partners in the study by Czeczeli et al. (2024), which does not seem to be relevant in the case of a war challenge.

Within the framework of this research, the distance was calculated by squaring the Euclidean distance as follows:

$$d(x,y)^2 = \sum_{k=1}^{n} (x_k - y_k)^2 \tag{1}$$

where x represents the coordinates of the first point in space, while y represents the coordinates of the second point. The distance is obtained by taking the difference between the two points in the given dimension and squaring it and these are aggregated. Due to the nature of the measurement scale of the variables, the Ward procedure (which is a clustering hierarchical clustering method) was used for clustering. The Ward method is based on the basis of the increase in the standard deviation, and the clusters are merged where the increase in the standard deviation within the cluster is the smallest. Based on the pre-calculated and aggregated distance values, the country groups were constructed in such a way that the smallest increase in variance within the cluster was obtained. When using a hierarchical clustering method, outliers should be considered and filtered out before clustering. One possible way of doing this is the *nearest* neighbour method (Simon, 2006; Sajtos and Mitev, 2007). The framework of analysis was improved by Kutasi et al. (2024) in a different fiscal context.

The cluster analysis includes 24 countries. Some methodological limitations had to be taken into account when selecting the pool of the countries. The Ward procedure is very sensitive to outliers. The Western Balkan NATO members (Albania, North Macedonia and Montenegro) was excluded necessary due to a lack of data on risk premia. Luxembourg was excluded, too, because of outlier economic data, as well as Iceland because of zero military spending. Türkiye, as the owner of the second biggest NATO army behind US, would have been reason to be the part of the database, but could not fit into any cluster because of its outlier CDS. Although, this country is a statistical outlier and was excluded from the cluster analysis, its data characteristics are presented in the descriptive statistical figures, moreover, are included in the panel regression analysis. Austria, Ireland, Malta and Cyprus are not NATO members that is why they were originally out of the pool. Unlike Finland and Sweden which became NATO members merely in 2023

and 2024 respectively, but are included in the database. It is reasonable to include them in a retrospective analysis, since it is known *ex post* that the two countries ads their military capacity to the NATO and share the risk of the organization. Besides, they have cooperated strongly with the NATO since the re-emergence of the Russian threat in 2014.

In defining the data, an attempt was made to reflect the baseline situation at the end of 2021. On this basis, the input fiscal space variables adapted for the clustering on war challenge are as follows (Table 1).

Direct budget variables:

- Military expenditures per capita (MILEX_CAP): Data for military expenditure per capita, in current USD, presented according to calendar year, 2021, SIPRI data.
- CDS spreads (CDS): the risk premium (basis points) on a country's sovereign debt, averaged over the four quarters of 2021, Bloomberg data.
- Tax wedge (WEDGE), percentage of labour costs in 2021, DG-ECFIN and OECD data.
- Gross public debt (DEBT), % of GDP in 2021, Eurostat data.

Off-budget variables:

- Gini coefficient (GINI), scale from 0 to 100 in 2021, Eurostat data.
- Distance of the country from the war zone (Russia or Ukraine) (DIST): the value of the variable is 0 for a direct neighbour, 1 for an indirect neighbour if there is one state between the two countries, 2 if there is more than one.[4]

The relationship between the variables was tested using Pearson's correlation. (Table 2). Due to the different scales of measurement, the variables were standardized in z-scores: $z = \frac{x - \mu}{\sigma}$.

T a b l e 1

Input Variables for Clustering

	Median	Std. deviation	Minimum	Maximum	Source
MILEXP_CAP	454.05	322.78	0	1561.19	SIPRI
CDS	45.09	75.24	7.90	400.70	Bloomberg
TAX_WEDGE	39.69	4.99	30.79	52.40	DG-ECFIN, OECD
DEBT	64.5	42.25	17.6	34.4	Eurostat
GINI	20.15	6.63	8.9	201.2	Eurostat
DIST	1	0.89	0	2	Authors

Source: Own calculations based on figures from the databases cited.

[4] It must be noted that in case of Norway, the distance variable got value 2, although the country has land border with Russia. However, this direct connection is very far from the war zone and so up in the North in a very low density wilderness that does not have any importance in the Western expansion of Russia. It can have importance in an Arctic geostrategic race for Russia, but this strategic competition is a separate clash of powers for the future.

T a b l e 2

Correlation of the Variables

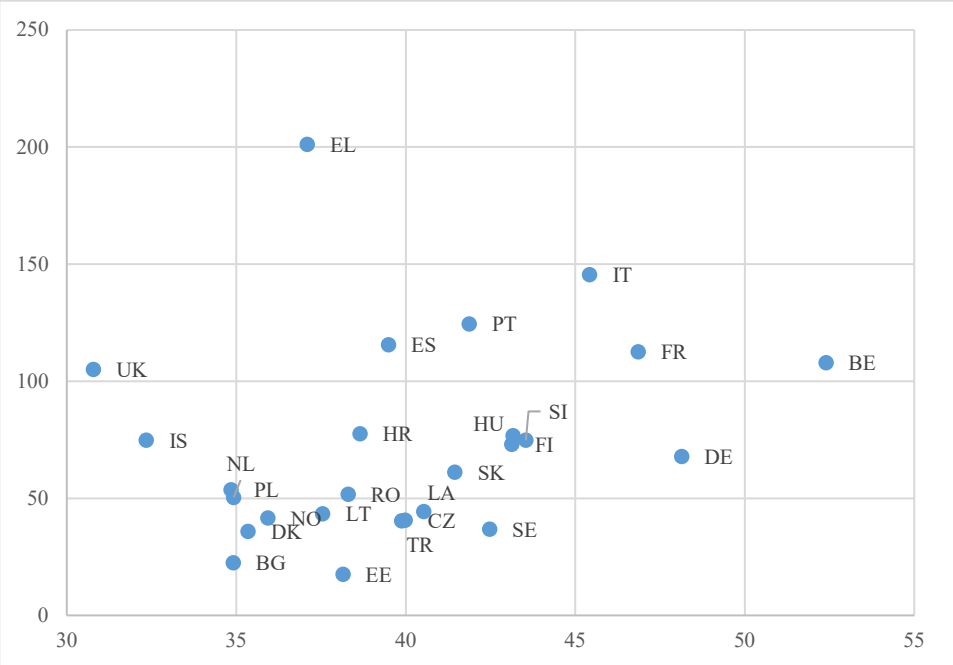
	MILEX_CAP	CDS	TAX_WEDGE	GINI	DEBT	DIST
MILEX_CAP	1					
CDS	–0.39153	1				
TAX_WEDGE	–0.0428	–0.04078	1			
GINI	–0.16551	0.507072	–0.04071	1		
DEBT	0.110308	–0.07094	0.251665	0.126648	1	
DIST	0.448237	–0.34897	0.031116	–0.29119	0.454426	1

Source: Own calculations based on the numbers of databases cited.

The variables represent the exposure of each economy and the pre-war baseline of each country (Figures 1 and 2). The methodological considerations above allow the determination of the distance measures and, in this context, the construction of homogeneous country groups.

F i g u r e 1

Fiscal Margins Based on Tax Wedge (percentage, horizontal axis) **and Public Debt** (% of GDP, vertical axis)

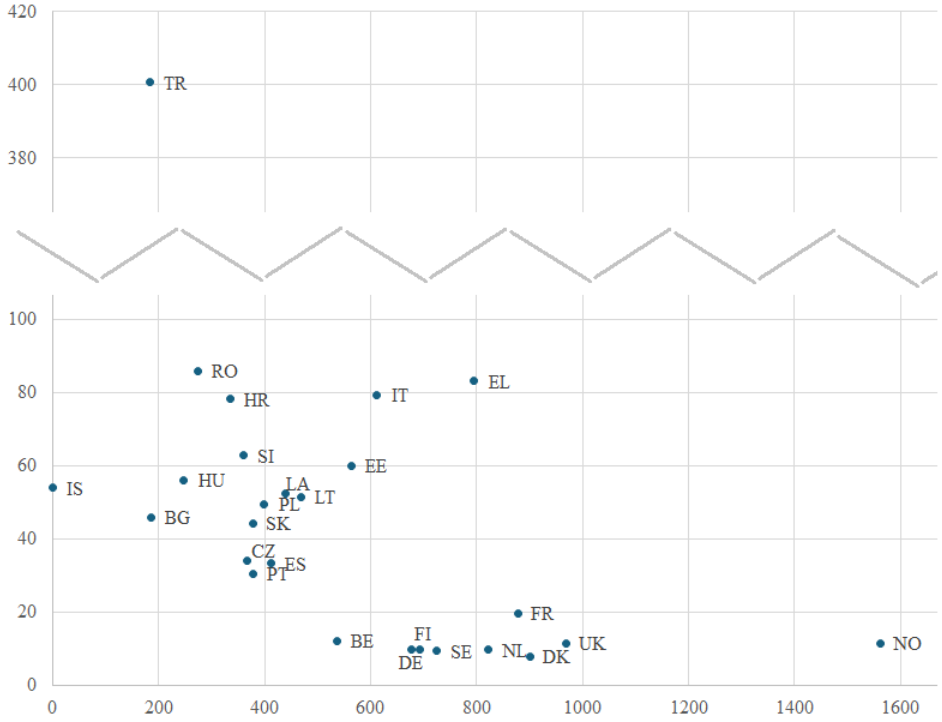


Note: BE – Belgium, BG – Bulgaria, CZ – Czechia, DE – Germany, DK – Denmark, EE – Estonia, EL – Greece, ES – Spain, FI – Finland, FR – France, HR – Croatia, HU – Hungary, IS – Iceland, IT – Italy, LA – Latvia, LT – Lithuania, NL – Netherlands, NO – Norway, PL – Poland, RO – Romania, PT – Portugal, SE – Sweden, SI – Slovenia, SK – Slovakia, TR – Türkiye, UK – United Kingdom.

Source: Own edits based on Eurostat.

F i g u r e 2

Military Expenditure per capita (USD, horizontal axis) **and Government Credit Risk** (CDS, basis point, vertical axis)



Note: Country labels are the same as in Figure 1.

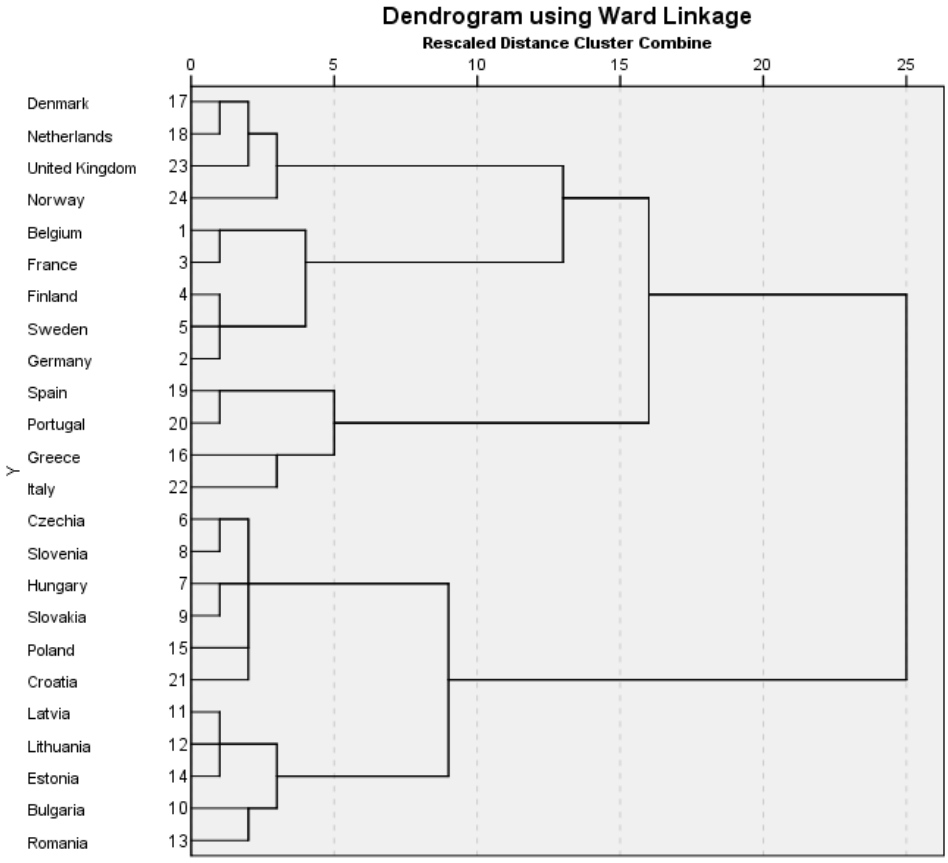
Source: Authors based on Bloomberg and SPIRI data.

2.2. Entry to War Time: Results of the Cluster Analysis

The delimitation of each cluster has created homogeneous groups of countries. In the cluster analysis, homogeneity was measured by the reduction of the standard deviation of each group relative to the total standard deviation (Sajtos and Mitev, 2007), using the SPSS program. Based on these results, the most appropriate cluster design in terms of homogeneity was the five-cluster solution. The result of the clustering is illustrated in the dendrogram in Figure 3. Based on these results, the five clustered version defined in Table 3 is considered to be the most homogeneous. As far as the number of clusters is concerned, the number of elements was roughly similar. The variables that were considered as key indicators in the clusters when constructing the groups were those related to military expenditure, distance and tax revenue.

F i g u r e 3

Dendrogram for Cluster Analysis



Source: Authors based on clustering.

T a b l e 3

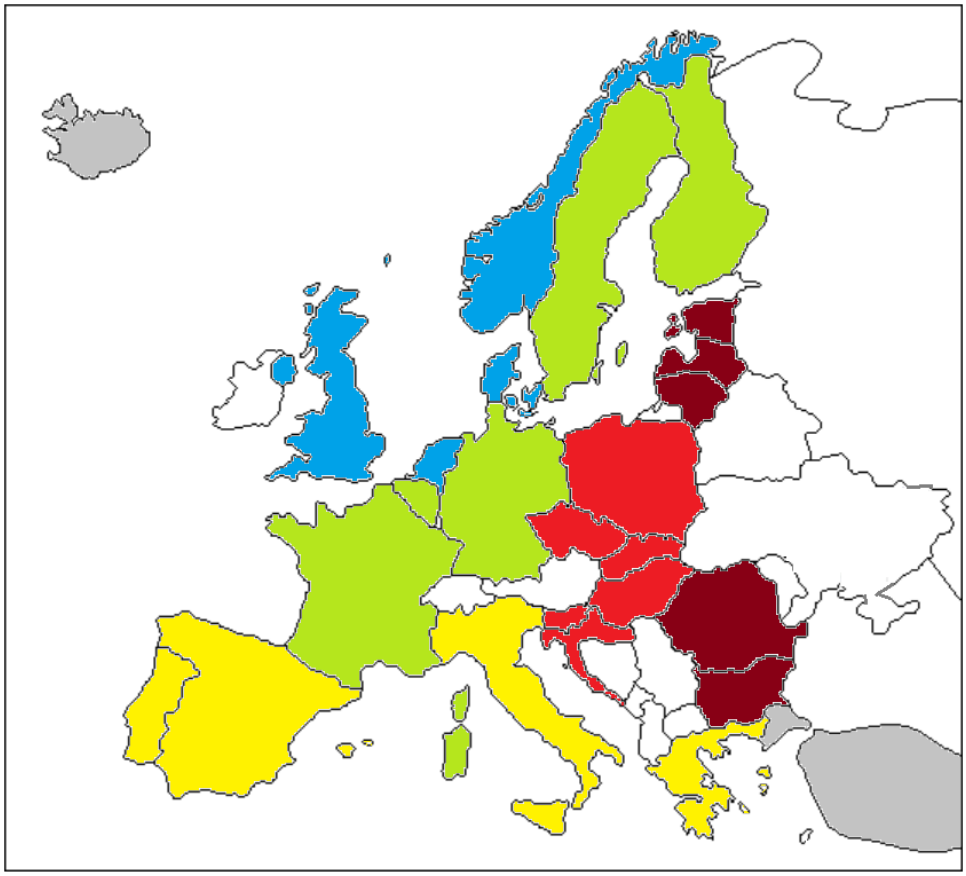
Clusters

Cluster 1: Welfare, low CDS, high military spending, medium debt, high tax	Belgium, Germany, France, Finland, Sweden,
Cluster 2: East-Central-Europe, close to conflict, medium and high CDS, medium military spending, medium debt, medium tax,	Czechia, Hungary, Slovenia, Slovakia, Poland, Croatia
Cluster 3: Baltics and East Balkan, close to conflict, mixed CDS, mixed military spending, very big social inequality, low debt, low tax	Bulgaria, Estonia, Latvia, Lithuania, Romania
Cluster 4: Mediterranean, mixed distance, mixed medium-high CDS, mixed military spending, high debt, medium tax, big social inequality	Greece, Italy, Spain, Portugal
Cluster 5: Far-away, very low CDS, the highest military spending, medium debt, low tax	Denmark, Netherlands, United Kingdom, Norway

Source: Authors based on clustering.

F i g u r e 4

Geographical Location of Clusters, NATO Countries



Notes: Green = cluster 1, red = cluster 2, burgundy = cluster 3, yellow = cluster 4, blue = cluster 5, grey = excluded due to data outliers in clustering, white = missing data (West Balkan) or not NATO member (rest).

Source: Authors based on clustering results.

The dendrogram shows the clustering pattern of clusters based on the variables included in the analysis. Proper delineation of the clusters thus formed is an essential element of the further analytical framework. The five-cluster solution has resulted in well-defined groups (Figure 3), with relatively balanced size, 4 – 6 countries in each. The largest in number of countries is cluster 2 including six Eastern-Central-European countries close to the war conflict and representing medium fiscal space by all of the fiscal indicators. In cluster 3 of the Baltic region and Eastern Balkan close to the conflict and demanding high social redistribution beside low tax burden and public debt, there are five countries, just like cluster 1 of the welfare economies which are not in high risk of war, but had limited fiscal space in 2021 by high debt and high tax burden. Among the northern NATO members of cluster 5,

the majority is far-away from the conflict zone, while they had the highest fiscal space by risk, debt and tax, and they spend the most absolute amount per capita for military purpose. The Mediterranean social model (see Kutasi, 2006, p. 292) prevailed very strongly as cluster 4 collected all of the four countries belonging to the model by their fiscal characteristics. Although their distance from Russian threat and thus their military spending is very various, they were herded together by their common peculiarities as the high public debt, the high CDS, the medium tax burden and big social inequalities.

T a b l e 4

Cluster Means and Deviations

	Fiscal space				**Social need**				**War threat**			
	MILEX_CAP		**CDS**		**TAX_WEDGE**		**DEBT**		**GINI**		**DIST**	
	Mean	*Deviation*	*Mean*	*Deviation*	*Mean*	*Deviation*	*Mean*	*Deviation*	*Mean*	*Deviation*	*Mean*	*Deviation*
Cl.1	701.86	121.67	12.16	4.32	46.60	4.03	79.66	31.23	18.04	2.54	1.20	0.84
Cl.2	348.07	53.35	54.13	15.34	40.27	3.24	64.07	14.96	16.10	3.80	0.50	0.55
Cl.3	386.16	153.25	59.19	15.79	37.89	2.01	35.92	14.94	27.58	5.27	0.00	0.00
Cl.4	619.20	193.75	46.82	28.57	39.85	3.55	124.52	38.43	24.20	2.71	1.80	0.50
Cl.5	1063.18	337.30	10.11	1.68	34.25	2.34	58.23	31.82	18.15	2.59	2.00	0.00

Note: If mean value is green = safe, red = alert, white = middle.

Source: Authors' calculation.

In the absolute finances of military spending, the regions closest to the war zone (cluster 2 and 3, respectively East Central Europe, Baltics and East Balkan) had the lowest input per capita, while the Russian threat has been the highest. Meantime, the other cluster averages indicate two-three times bigger absolute per capita financing which demonstrate stronger military readiness adjusted to the size of the countries in the farther regions. This phenomenon concludes that the war has put the biggest pressure on the closest regions for increasing military spending by two reasons: First, the proximity to the war zone, second, the undermilitarization in sense of force and firepower. In a consequence, it can be assumed that the war has narrowed the fiscal space mostly in cluster 2 and 3 as it enforced more spending on military equipment, innovation and human capacity. Thus, they have been put into the path of arms race the most among the clusters – of course, behind the countries directly at war (Table 4). These two clusters felt the most endangered by Russia and started to spend on army the most intensively later.

Concerning the fiscal space (CDS, tax wedge, public debt), the two regions endangered by the proximity to Russia the most, namely cluster 2 and 3 produced the highest CDS risk premia which exceeded the ones of cluster 1 and 5 by 4 – 5

times. Although, indebtedness of cluster 3 was significantly lower than any other groups, which means bigger fiscal space toward indebtedness. Cluster 2 had more moderate opportunity in debt financing. The most indebted group of countries belonged to cluster 4, which resulted in likewise high CDS as in the highest risk clusters. The tax wedge indicated the smallest opportunity for tax increase to cover war costs and the less opportunity to extend the fiscal space in the welfare group (cluster 1) via tax increase, but low CDS even beside high indebtedness gave the opportunity to broaden the fiscal space through their indebtedness. With the highest tax wedge and the lowest risk premium, the debt-financed armaments are almost exclusively their alternative to avoid reallocation among spending items.

Among the clusters with the biggest need for raising military spending, cluster 2 had less, cluster 3 had more space to mitigate the war shock with tax increase. In the latter one, the relative position of the tax wedge indicated that there was space for tax increases as an alternative to redistribution from non-military spending or debt financing. (This conclusion did not analyse a possible Laffer-curve effect on tax revenues.) Otherwise, cluster 5 had the best starting fiscal space to raise taxes with the lowest tax wedge, moreover, to issue debt with the lowest CDS spread, and the second lowest public debt. At the same time, the governments of the countries in this group did not need to increase military spending so much than other clusters as they had the highest absolute per capita volume and they are (ones of) the farthest from the conflict zone.

According to the social need for fiscal redistribution through social spending, the income inequality represented by Gini coefficient was taken as a basis. Higher inequality assumes more bounded fiscal path. Of course, the importance of equity in the domestic social model can bias the outcome. The highest income differences can be detected in cluster 3, i.e. in Baltic and East Balkan countries. That is why, the social need has limited the fiscal space the most in this region, which is followed very closely by cluster 4 in social inequality. The Mediterranean country group can be considered the least prepared, with a lack of room for manoeuver in terms of fiscal restraint and social inequalities that require welfare spending increases. The other clusters represent a relatively homogenous bunch of means significantly differing from the Gini value of cluster 3 and 4. It is reasonable to highlight the lowest Gini coefficient and inequality of cluster 2, the other region very close to the war zone. Contrary to the Baltic-Balkan group, in the East Central European group, there has been less social need for redistribution concerning the level of inequality. This can be interpreted as a broader fiscal space under war time shock.

Returning to the Mediterranean cluster, concerning the fiscal shock later caused by the Russo-Ukrainian war, the narrow fiscal space is eased by the geographical position, as they felt less threat from Russian invasion. One advantage was that

the region is geographically further away from the war zone, so there was less pressure to arm until not only the Russian threat but also international (US) political pressure has emerged to shift budgets towards military spending. The exemption is the *ab ovo* high Greek military spending originated in the Greek strategic intercontinental NATO position and long-lasting conflict of interest with the neighbouring Türkiye. The turnaround in the US pressure on military spending has already taken place in the meantime during the war years.

Türkiye would be closest to cluster 3 if the risk level included in the CDS spread were not 5 – 8 times the risk of the cluster members. Iceland is an absolute outlier according to the six parameters, merely its distance, tax wedge and public debt is comparable to cluster 5, meanwhile the other fiscal space indicators as CDS and military spending per capita is far from that cluster. (Iceland did not have its own army and therefore did not spend on military expenditures till 2024.)

According generally to fiscal and social indicators, cluster 4 had the narrowest, cluster 5 had the broadest fiscal space for any shock in the snapshot of eve of the war. The two regions endangered by the proximity to Russia the most, namely cluster 2 and 3 were determined to raise their military spending because of their very low initial absolute level. Their fiscal space were limited by the high risk premium and, in case of cluster 2, by the medium indebtedness and tax burden.

3. War Time Regression Analysis with Panel GMM Model

3.1. Empirical Model and Data

To control the importance of fiscal space in arms competition and rise of military spending, the paper is extended with a dynamic panel general method of Moment (GMM) regression analysis. It is established on a database with 25 European NATO countries[5] in the period of 2013 – 2023. This include pre-conflict years (2013 – 2014), civil war conflict years (2015 – 2021) and war conflict years (2022 – 2023). Iceland was removed from the database due to the nature of its military spending.

Beside the variables from the cluster model (MILEX_CAP, GINI, DEBT, TAX_WEDGE), three more variables were included in the GMM test to represent the development differences in logarithmic value, the physical threat and risk, and the extension of fiscal space by economic growth:

[5] Belgium, Bulgaria, Czechia, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden, Türkiye, United Kingdom. Iceland was left out from the database, as its military spending has been 0 in every year, which would have caused a bias.

- GDP per capita in PPP, constant prices of 2021, in international dollar (GDPCAP_INT$), applied in logarithmic value in the GMM model (ln_GDPCAP_INT$);
- Global Peace Index, 1 – 5 less peaceful, (GPI);
- GDP per capita growth at constant prices (%), (GDPCAP_GROW).

The methodological consideration in using the GMM model is the elimination of endogeneity and causality problems. However, the weakness of the traditional GMM model approach can be structural breaks and cross-sectional dependence in the data series. In these cases, the estimation results of the model can lead to bias. The importance of the problem of cross-sectional dependence will also play a significant role in the present empirical analyses. The empirical analyses is based on the Arellano and Bond (1991) approach, which is specified to the current research.

Based on these methodological considerations and the above variables, the following basic model equation can be written for the empirical tests:

$$\begin{aligned} &\mathrm{MILEX\_CAP}_{i,t} = \beta_1 \mathrm{CDS}_{i,t} + \beta_2 DEBT_{i,t} + \beta_3 TAX\_WEGE_{i,t} + \beta_4 \mathrm{GPI}_{i,t} + \\ &+\beta_5 \mathrm{LN\_GDPCAP\_INT\$}_{i,t} + \beta_6 \mathrm{GINI}_{i,t} + u_{i,t} \end{aligned} \tag{2}$$

Following the Arellano-Bond approach, the first lagged value of the dependent variable ($\mathrm{MILEX\_CAP}_{i,t-1}$) is used as the instrument variable of the model. Besides, the model includes the annual change in GDP per capita growth as an instrument variable with one lag ($GDPCAP\_GROW_{i,t-1}$), which is intended to reflect the change in GDP. Furthermore, based on economic considerations, we examine the previous year's value for the debt, GDP per capita in PPP, and GINI indicators in the model. Based on these considerations, the following specified model equation can be written:

$$\begin{aligned} &\mathrm{MILEX\_CAP}_{i,t} = \beta_1 \mathrm{CDS}_{i,t} + \beta_2 DEBT_{i,t-1} + \beta_3 TAX\_WEGE_{i,t} + \beta_4 \mathrm{GPI}_{i,t} + \\ &+\beta_5 \mathrm{LN\_GDPCAP\_INT\$}_{i,t-1} + \beta_6 \mathrm{GINI}_{i,t-1} + u_{i,t} \end{aligned} \tag{3}$$

In the model specification of the GMM model, the first step is the test of stationarity of the variable. The Levin-Lin-Chu test is executed to test panel stationarity (Levin et al., 2002). If the significance level remains below 5%, there is a lack of a unit root, or the stationarity of the data series. The analysed data are stationary processes in level with one exception, as the CDS variable needs to take its first difference, which makes it to meet the stationarity condition. Pesaran CD test is the other essential test used to affirm the model specification, which analyses the cross-sectional dependence. Based on the significance level of the Pesaran CD test and the Breusch-Pagan LM test (both took a value below 0.05), it can be determined

that there is cross-sectional dependence in the established model environment. To ensure that the estimation results are not biased, this needs to be addressed when running the GMM model. In relationship with the examination of the model specification, the presence of heteroscedasticity in the model is, also, tested. In Eviews, testing for heteroscedasticity in the panel model is done in two ways: panel cross-section heteroscedasticity LR test and panel period heteroscedasticity LR Test. The two tests therefore examine the cross-sectional dependence in cross-sectional and time-series dimensions. The null hypothesis of both tests is that homoscedasticity exists for the given dimension, which we can accept if the p-value is greater than 0.05. Based on the results of the panel cross-section heteroscedasticity LR test ($p = 0.000$), it can be stated that the null hypothesis is rejected, i.e. the condition of homoscedasticity is violated in the cross-sectional dimension. In contrast, the panel period heteroscedasticity LR test ($p = 0.7564$) fails to reject the null hypothesis, which states that there is no evidence that the residuals are heteroskedastic over time. Based on the above, both cross-sectional heteroscedasticity and cross-sectional dependence exist in the model. This implies that the weighting methods used in the traditional GMM structure result in a biased analysis. Therefore, it is necessary to change the weighting methods. In line with this, cross-section weights (PCSE) is applied in the model. The method can handle the problem of heteroscedasticity found in cross-sectional data and the related cross-sectional dependence. The data quality tests are in the appendix (see Table 7, 8, 9). The Table 5 contains the descriptive statistical data of the variables used in the panel database.

T a b l e 5

Descriptive Statistics of Database for Regression Analysis

Variable	Mean	Std. dev.	Min.	Max.	Obs.	Sources
MILEX_CAP	488.51	307.16	86.54	1600.630	275	SIPRI database
CDS	91.23	158.16	7.9	1877.99	275	Bloomberg
DEBT	68.76	39.76	8.5	209.4	275	Eurostat
TAX_WEDGE	40.57	5.34	30.39	55.66	275	DG-ECFIN, OECD
GPI	1.59	0.28	1.2	2.92	275	World Bank
GDPCAP_INT$	45997.93	14513.14	22594.30	90756.9	275	World Bank
GINI	30.32	4.91	20.9	45.3	275	Eurostat
GDPCAP_GROW	2.06	3.37	-11.37	13.65	275	World Bank

Source: Authors' calculations.

3.2. Results of the GMM Regression Analysis

Table 6 presents the results of the dynamic panel GMM regression, where the dependent variable is military expenditure per capita in USD. The analysis covers 25 countries (24 cluster countries and Türkiye) over the period 2015 – 2023, as

differentiation and 1 lag spent years 2013 and 2014. Three determinants are significant. First of all, the expression of development, GDP per capita in logarithmic value and with 1 period lagging (ln_GDP_INT$(–1)) is statistically significant at the 1% level. The coefficient of variable indicates a strong positive and big volume impact on MILEX_CAP. This suggests that wealthier countries with higher GDP per capita tend to have bigger military expenditure per capita in absolute terms.

One fiscal space indicator became significant, the gross public debt with 1 period lagging (DEBT(–1)) at 1% level. The coefficient suggests a positive relationship. This implies that higher levels of public debt in the previous year are associated with bigger military expenditure per capita. Besides, less social equity seems to be a space for military spending, as the indicator of social income differences, the Gini Coefficient with 1 period lagging (GINI(–1)) is statistically significant, too, at the 5% level. The coefficient of GINI(–1) suggests a positive relationship. This implies that countries with higher income inequality (higher Gini coefficient) tend to have higher military expenditure per capita.

The other determinants are not proved to be significant. The CDS spreads (D_CDS), Tax wedge (TW) do not strengthen the role of fiscal space in military spending. The Global Peace Index (GPI) seems to be neither significant, which can be caused by the complexity of the index, including many non-war factors of security. This means that a suitable geopolitical risk indicator has yet to be developed.

The validity of the GMM results depends on the correct specification of the model and the validity of the instruments. The J-statistic (50.37367, Prob (J-statistic) = 0.125988) suggests that the instruments are valid. In conclusion, the analysis suggests that lagged public debt, lagged GDP per capita, and lagged Gini coefficient are significant determinants of military expenditure per capita in this panel of countries.

T a b l e 6

GMM Test Results, Dependent Variable: MILEXP_CAP in USD

Variable	Coefficient	P-value
CDS (1st differential)	–0.316906	0.4509
DEBT(–1)	11.17957***	0.0000
TAX_WEDGE	–30.88048	0.2778
GPI	420.1716	0.3613
ln_GDPCAP_INT$(–1)	1231.267***	0.0000
GINI(–1)	45.09044**	0.0451
Hansen J-test	0.125988	
Instrument rank	46	
number of observations	225	

Note: Significance: *** at 1 %, ** at 5%, * at 10%; The Hansen J-test denotes the probability value of the Hansen overidentification J-test for instruments restrictions.

Source: Authors' own calculations based on Bloomberg, Eurostat, OECD, SIPRI and World Bank data.

Conclusion and Discussion

The paper examined the fiscal space of the majority of European NATO members to demonstrate their level of readiness for the fiscal shock originated in compulsion for militarization caused by the increasing international security risk arising from the Russo-Ukrainian war. We used cluster analysis to explore the extent of threat from geographical proximity, the military preparedness of countries based on the initial level of absolute military spending per capita, the need for social spending based on the level of inequality, and the fiscal space based on indebtedness, debt risk premium, and tax burden.

The literature of fiscal space concludes that, to increase fiscal space, governments can implement tax reforms, enhance tax administration, reduce lower-priority expenditures, or engage in domestic or external borrowing, including seigniorage (Heller, 2005). Botev et al. (2016) found that low interest rates on government debt due to monetary stimulus have increased fiscal space in OECD countries by reducing interest payments, despite lower potential growth and higher debt. Romer and Romer (2019) emphasize that a country's fiscal response to crises is largely influenced by its pre-crisis debt-to-GDP ratio, with lower debt levels allowing for more expansionary policies. Aizenman et al. (2013) highlight fiscal space as a key factor in sovereign risk assessment. Prohorovs (2022) established that the Russo-Ukrainian war has also led to a significant reprioritization of public expenditure in European countries, altering their fiscal space considerably.

Based on the cluster analysis, European countries exposed to the Russian threat possess a degree of fiscal flexibility, allowing them to leverage debt financing or tax increases to mitigate the impact of increased military spending on other spending items. This flexibility may reduce the need for drastic reallocation of spending within their budgets. Countries located further from the war conflict, with the exception of the Mediterranean region, have even greater capacity for debt-financed expenditure.

The dynamic panel GMM regression could validate merely particularly the importance of the play in the fiscal space. Its primary conclusion is that the absolute value of per capita military spending is fundamentally determined by discretional government decisions, and less by fiscal indicators. Development is a relevant factor, indicating that Wagner's law of public expenditures prevails in the case of military spending as well (Wagner, 1983). General government spending, which expands as a share of GDP with development, has an impact on military spending, too. As a result, when economic development increases, the military spending also tends to change in an expanding direction. At the same time, in case of one indicator of fiscal space, the increase in public debt in the previous year leads to an increase in the risk of fiscal sustainability, which in turn can have a negative impact on military spending.

According to the significant impact of public debt, the study suggests that fiscal space, particularly to finance the military expenditures form public debt, can enable governments to increase military spending unilaterally without cutting other expenditure items. This underscores the importance of sound public finances as a buffer against external shocks. Countries with well-managed public finances are better equipped to respond to fiscal shocks emerging form arms race. Besides, the countries which social model afford higher income inequality, i.e. less social redistribution is implemented for equity purpose, they tend to be able or want to spend more on military purposes, regarding the impact of Gini coefficient in the regression analysis. The current panel regression confirms Christie's (2017) results about both the particular importance of fiscal space and the high importance of proximity to Russia as factor of threat.

In terms of future research opportunities, the limitations of the current research (static, pre-war year, inclusion of other factors of fiscal space in dynamics) can be exceeded by bigger time series analysis. It is imperative to validate the current assertions through empirical analysis of data from the war years. The evolution of fiscal space can be assessed both at the country and cluster levels. Additionally, the extent of reallocation within budgets can be analysed. A promising methodological approach would involve investigating causal relationships and differentiating between various country clusters.

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Appendix

Different Tests Related to the Model Specification

Table 7

The Results of the Stationarity Test, Levin-Lin-Chu Test

Variable	Test statistics	Prob.
MILEX_CAP	–8.36100	0.0000
CDS	12.3359	1.0000
D_CDS	–10.8540	0.0000
DEBT	–5.82153	0.0000
TAX_WEDGE	–2.94099	0.0016
GPI	–5.85101	0.0000
LN_GDPCAP_INT$	–7.11203	0.0000
GINI	–3.01711	0.0013
GDPCAP_GROW	–10.5915	0.0000

Source: Authors' own calculations in Eviews.

Table 8

The Results of the Cross-Sectional Dependency Tests

Test	Test statistics	Prob.
Breusch-Pagan LM	952.8309	0.0000
Pesaran scaled LM	26.65171	0.0000
Pesaran CD	22.16561	0.0000

Source: Authors' own calculations in Eviews.

Table 9

The Results of the Heteroskedasticity Tests

Test	Value	df	Prob.
Panel Cross-section Heteroskedasticity LR Test	195.9524	25	0.0000
Panel Period Heteroskedasticity LR Test	19.81649	25	0.7564

Source: Authors' own calculations in Eviews.