



ASSESSING ECONOMIC RESILIENCE IN NATO COUNTRIES: A COMPREHENSIVE DEFENCE PERSPECTIVE

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Economic resilience, considered in this paper as the ability to withstand and recover from economic shocks and disruptions, has become a linchpin of ensuring national security and stability. As demonstrated by conflicts such as the one in Ukraine, where economic sanctions were deployed to diminish an adversary's capacity to sustain its war efforts, it has become evident that military power alone is insufficient in today's complex security landscape. A comprehensive approach to defence must incorporate economic considerations, as the economic well-being of a nation is intrinsically linked to its overall security.

The main research objectives of this paper are to investigate the concept of economic resilience, from the perspective of the concept of comprehensive defence and the ways it is interconnected with other resilience domains, through the development of an economic resilience index outlining the relative economic resilience of the 29 European countries that are NATO members and to propose a methodology for identifying the main factors that influence the economic resilience from a comprehensive defence point of view.

Keywords: economic resilience; index; ranking; countries, recommendations;



INTRODUCTION

In recent years, the use of economic warfare as a strategic tool in conflicts has underscored the paramount importance of economic resilience within the broader framework of a comprehensive approach to defence. Economic resilience, considered in this paper as the ability to withstand and recover from economic shocks and disruptions, has become a linchpin of ensuring national security and stability. As demonstrated by conflicts such as the one in Ukraine, where economic sanctions were deployed to diminish an adversary's capacity to sustain its war efforts, it has become evident that military power alone is insufficient in today's complex security landscape. A comprehensive approach to defence must incorporate economic considerations, as the economic well-being of a nation is intrinsically linked to its overall security. Building and maintaining a robust and resilient economy is not just a fiscal matter but a strategic imperative for procuring the necessary resources to support defence capabilities, ensuring a credible defence posture, and effectively countering evolving threats in an interconnected world.

The main research objectives of this paper are to investigate the concept of economic resilience, from the perspective of the concept of comprehensive defence and the ways it is interconnected with other resilience domains, through the development of an economic resilience index outlining the relative economic resilience of the 29 European countries that are NATO members and to propose a methodology for identifying the main factors that influence the economic resilience from a comprehensive defence point of view. The results of the study are used to outline and provide recommendations for increasing the economic resilience of Romania, within the concept of comprehensive defence.

The hypothesis of this study is that economic resilience is a crucial component of ensuring a country's resilience in an uncertain and volatile international environment and categories of factors

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such as Economic complexity, Economic openness and foreign trade, Energy independence, Logistics and infrastructure, Stability and sustainable growth, Innovation and IT, Human capital and Governance effectiveness contribute in a significant manner to achieving economic resilience.

The paper uses qualitative research methods, based on the analysis of existing specialized literature regarding the concept of economic resilience, and quantitative methods the analysis for the development of the economic resilience index from the comprehensive defence perspective, using data regarding selected resilience indicators in the 29 NATO countries selected to generate ranking.

The index employs a z-approach to normalize data, which assesses the relative resilience of the sample countries in comparison to one another rather than providing an absolute resilience measurement. As a result, this index is not suitable for determining the absolute level of resilience of a specific country. However, it can serve as a valuable foundation for crafting shared resilience enhancement strategies within selected countries, which could be subsequently adapted to their specific needs.

THE CONCEPT OF ECONOMIC RESILIENCE AS FOUNDATION OF A COMPREHENSIVE DEFENCE

The concept of economic resilience has gained attention from scholars in the past decade, consequently in the economic literature, economic resilience is examined from several key perspectives. A substantial number of studies (Dhawan, Jeske, pp. 21-32, 2006; Simmie&Martin, 2010; Hill et al., 2008; Briguglio, 2016; Akberdina, 2023) focus on the economic resilience to external shocks of mainly economic and financial nature. From this perspective, economic resilience is defined as “any change to fundamental macroeconomic variables or relationships that has a substantial effect on macroeconomic outcomes and measures of economic performance, such as unemployment, consumption, and inflation... which are often unpredictable and are usually the result of events thought to be beyond the scope of normal economic transactions” (Investopedia, 2023). The complex nature of the current economic and security environment has highlighted the need to extend this narrow approach to include

the analysis of economic shocks caused by various other factors including military conflicts, migratory flows, natural disasters, technological advancements, demographic changes, and more.

Other authors approach economic resilience from the crisis and disaster management standpoint, assessing the economy’s ability to cope, recover, and reconstruct after a disaster, from a macroeconomic perspective or from a combined microeconomic and macroeconomic perspective (Hallegatte, 2014; Pinkwart et al., 2022). Economic resilience is also approached in the literature from the point of view of the protection and resilience of critical infrastructure, especially from a governmental perspective (Australian Government, 2015; Roshanaei, 2021; Government of Canada, 2015). In a broader sense, economic resilience is approached in the literature as a vital component of human security and sustainable development, as a comprehensive and multidimensional process that underpins the stability and prosperity of nations (World Economic Forum, 2022; Atkinson, Grandi and Vaklinova, 2022).

Still, despite the recent interest in the concept of economic resilience from organizations such as the European Union (Hafele, Bertram, Demitry, Le Lannou, Korinek, Barth, 2023) and NATO (Roepke, Thankey, 2019) there is no agreement in the literature in regard to a common definition of economic resilience or the scope of the concept. While differing viewpoints, debates, and disagreements can help illuminate the nuances of the concept, this lack of a common definition poses practical and operational challenges. Vagueness in the definition of economic resilience can lead to the implementation of generic measures and policies that may have limited real-world impact.

The concept of economic resilience from the point of view of comprehensive defence is one line of research that should be further explored, especially in the light of the recent war in Ukraine, the COVID 19 pandemic or the resurgence of the interest of various states to use economic tools as a weapon of war. Top of Form

After a period of falling into oblivion following the end of the Cold War, concepts like societal security, total defence, whole of nation defence or comprehensive defence have been brought again in the public attention, in the light of the events in the past decade, culminating with Russia’s attack on Ukraine in 2022, and the concept



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of economic resilience needs to be considered as an integral part of these approaches.

The concept of economic defence shall be approached in this paper from the point of view of the comprehensive defence as outlined by the NATO Special Operations Headquarters NSHQ, defined as an official Government strategy, which encompasses a whole-of-society approach to protecting the nation against potential threats (NATO Special Operations Headquarters, 2020). From this perspective, the concept of resilience supports the six main pillars of defence: Social and Psychological Defence, Economic & Essential Services, Military Defence, Cyber Defence, Civil Defence and Internal and Border Security. As outlined in above mentioned document, resilience in the general sense, and economic resilience in the more specific sense, is the foundation for reducing national vulnerabilities that could affect all six pillars of defence and ensuring the availability of the resources required for the generation of the capabilities.

The concept of resilience supports the six main pillars of defence: Social and Psychological Defence, Economic & Essential Services, Military Defence, Cyber Defence, Civil Defence and Internal and Border Security.

A COMPARATIVE ANALYSIS OF ECONOMIC RESILIENCE IN NATO COUNTRIES USING AN ECONOMIC RESILIENCE INDEX

Methodology

From the point of view of the above-mentioned document, securing economic resilience is the result of a collaborative endeavours involving governments, the private sector, and individuals (Comprehensive Defence Handbook Vol. I, 2020, p. 15). Governments play a crucial role in crafting and implementing policies that foster a stable and adaptable economic environment. They includes measures such as fiscal responsibility, regulatory frameworks that encourage innovation and competitiveness, and investments in critical infrastructure. Businesses, on the other hand, contribute by diversifying their operations, investing in research and development, and maintaining financial prudence to withstand economic shocks. They also play a role in job creation and economic growth. Individuals, as consumers and workers, contribute to economic resilience through financial literacy and responsible saving, which can provide a cushion during economic downturns. The participation of the country's citizens in the workforce

and their adaptability in acquiring new skills are also essential for economic resilience, as they help drive innovation and productivity.

These considerations have been the foundation for the selection of the eight categories of variable deemed relevant for the construction of the economic resilience index (Economic complexity, Economic openness and foreign trade, Energy dependence, Logistics and infrastructure, Stability and sustainable growth, Innovation and IT, Human capital and Governance effectiveness), based on the following research assumptions:

❖ *Economic complexity* is a relevant factor in ensuring economic resilience because it reflects a nation's ability to adapt, diversify, and innovate. A country with a low degree of economic complexity (which relies on just a few economic sectors for its development, such as tourism or export of a specific type of commodity) will have a lower capacity to withstand and recover from external shocks and disruptions.

❖ *Economic openness* can impact a country's economic resilience as it increases exposure to international markets, making it susceptible to global economic fluctuations and trade disruptions, while also providing opportunities for diversification and resilience-building through international trade and cooperation. *Foreign trade vulnerabilities* (such as overreliance on a specific trade partner, especially for imports of strategic commodities, or a chronic deficit of the trade balance) can undermine a country's economic resilience.

❖ *Energy dependence* can significantly impact a country's economic resilience by rendering it vulnerable to supply disruptions, price fluctuations, and geopolitical tensions in the energy sector, potentially causing economic instability and constraints on its capacity to respond to shocks.

❖ *The quality of logistics and transport infrastructure* can significantly impact a country's economic resilience by influencing its ability to efficiently move goods and services, respond to disruptions, integrate its economy in the international trade and maintain smooth supply chains, which are essential for economic stability and adaptability. It can also profoundly impact a country's defence, by directly influencing the rapid deployment of military assets,



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Governance effectiveness is crucial for enhancing economic resilience in particular and resilience in general, as it ensures efficient decision-making, the implementation of policies to address economic challenges, and the maintenance of a stable regulatory environment.

the efficiency of supply chains, and the overall logistical capabilities critical for effective defence operations and national security.

❖ Ensuring *macroeconomic stability, financial stability, and a sustainable economic growth* (with a judicious use of available resources) is paramount to a country's economic resilience because it provides a strong foundation for withstanding shocks, maintaining investor confidence, and fostering the resources needed to respond effectively to crises (including the resources for defence), ultimately safeguarding the nation's economic stability and adaptability.

❖ *Innovation and a robust IT sector* can significantly impact a country's economic resilience by enhancing its ability to adapt to changing economic conditions, diversify its industries, and leverage technological advancements, which in turn bolsters its capacity to weather disruptions and maintain competitiveness in a rapidly evolving global economy.

❖ *Human capital* is a crucial factor in impacting a country's economic resilience as a well-educated and skilled workforce enhances adaptability, innovation, and productivity, fortifying the nation's capacity to withstand economic shocks and thrive in an ever-changing economic landscape. Brain drain can significantly impact a country's economic resilience by depriving it of skilled professionals and innovators, potentially weakening its ability to respond effectively to economic challenges and innovate in the face of adversity. On the other hand, a skilled and educated population can enhance economic resilience, by increasing the overall productivity and competitiveness of the private sector and the quality of the services offered by the public sector. A population with high levels of financial and digital education and skills can enhance economic resilience by promoting sound financial decision-making, digital adaptability, and the ability to leverage technology for economic stability and innovation, while being better equipped to critically assess information, protect digital assets, and respond effectively to cyber threats and less vulnerable to disinformation, cyber attacks and bad financial decisions.

❖ *Governance effectiveness* is crucial for enhancing economic resilience in particular and resilience in general, as it ensures efficient decision-making, the implementation of policies to address economic challenges, and the maintenance of a stable regulatory environment.



The economic resilience index developed in this paper is aimed at ranking the European NATO member countries in terms of economic resilience, within a regional hierarchical system, and to determine the influence of the chosen factors on the overall economic resilience index.

The paper focused on analysing data related to the 29 European NATO countries. The United States of America and Canada were excluded from the analysis as the economic, political, military and social circumstances of the two countries are quite different from their European counterparts. The economic resilience index developed in this paper is aimed at ranking the European NATO member countries in terms of economic resilience, within a regional hierarchical system, and to determine the influence of the chosen factors on the overall economic resilience index. This influence should not be considered from the perspective of a relation of causality, as of the factors that drive resilience in each of the analysed countries are specific and should make the object of further research in developing national resilience measures.

The economic resilience index has been developed using the methodology outlined below:

1. Selection of the 78 quantitative factors considered relevant to economic resilience;
2. Assigning the identified factors into 11 intermediate categories and 8 main categories, as outlined in *table 1*;
3. Identifying the corresponding data and normalizing the indicators values; the sources for the data are presented in the references.
4. Assigning weight coefficients to each quantitative indicator, intermediate categories of factors and main categories of factors, with the sum of the weight on each category being 1, as per *table 1*.
5. The calculation of the index for each country selected, using an additive expression. The analysis covers the 2017–2022-time frame, depending on the availability of data for each specific indicator. Assigning higher weights to specific indicators, such as Innovation and IT or Logistic and infrastructure was considered reasonable, due to the higher influence these factors have on other components of resilience.

The economic complexity index was considered to be more relevant for the overall economic complexity than the market concentration index. In terms of foreign trade vulnerabilities, Food imports and fuel imports as % of total merchandise imports are considered the most important, as a high dependence on this type of strategic imports has negative implication on resilience. Trade with the Russian Federation as % of total trade (exports and imports, respectively) is considered



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to be more relevant in the short term, due to the current security situation, than trade partner concentration, which is more relevant in a long-term approach to economic resilience. In terms of energy independence, energy dependency as net energy imports as % of energy use is considered the most relevant factor of influence, followed by oil reserves and the percentage of oil production compared to oil consumption, as the short- and medium-term access to oil remains a critical factor of influence for economic resilience. In the long term, the diversification of energy sources could be a more relevant factor of influence. In terms of logistics and infrastructure, the logistic performance index for 2022, the quality of trade and transport related infrastructure, the competence and quality of logistic services and the efficiency of customs clearance process are considered the most relevant factors of influence.

Table 1

Main category	Intermediate category	Weights	Factors of influence
Economic Complexity	Economic Complexity	0.6	Economic Complexity Index
		0.4	Market concentration HH index
Economic openness and Foreign trade	Economic openness Weight 0.30	0.25	Ratio of international trade to GDP
		0.25	Exports as % to GDP 2021
		0.25	Imports as % GDP 2021
		0.25	FDI % of GDP 2021
	Foreign trade vulnerabilities and dependence Weight 0.70	0.1	Export partner concentration – main three leading destination markets for commodity exports as share of commodity exports (percentage)
		0.1	Import partner concentration – main three trading partners for commodity imports as share of commodity imports
		0.15	Exports to Russian Federation as % of total exports 2021
		0.15	Imports from Russian Federation 2021
		0.09	Trade balance as % of GDP
		0.05	Export of high-tech goods, compared to overall exports, %, 2021
		0.15	Food imports as % of total merchandise imports



Main category	Intermediate category	Weights	Factors of influence
		0.15	Fuel imports as % of total merchandise imports
		0.06	Trade balance (exports minus imports) in basic food as a ratio to total imports, 2017-2021, percentage
Energy independence	Energy independence	0.13	Energy dependency as net energy imports as % of energy use
		0.11	Reliance on Russian coal imports percent of consumption 2021
		0.11	Reliance on Russian oil imports percent of consumption 2021
		0.11	Reliance on Russian natural gas imports percent of consumption 2021
		0.12	Oil reserves billion barrels, 2021
		0.12	Oil production/oil consumption, percentage
		0.05	Fossil fuels electricity capacity, million kilowatts, 2021
		0.05	Wind electricity capacity, million kilowatts, 2021
		0.05	Solar electricity capacity, million kilowatts, 2021
		0.05	Hydroelectricity capacity, million kilowatts, 2021
Logistics and infrastructure	Logistics and infrastructure	0.05	Nuclear electricity capacity, million kilowatts, 2021
		0.05	Geothermal electricity capacity, million kilowatts, 2021
		0.15	Logistic performance index 2022
		0.15	Quality of trade and transport related infrastructure 2022
		0.15	Competence and quality of logistic services 2022
		0.15	Efficiency of customs clearance process 2022
		0.10	Quality of railroad infrastructure 2019
		0.10	Quality of road infrastructure 2019



Main category	Intermediate category	Weights	Factors of influence
Stability and sustainable growth		0.10	Quality of port infrastructure 2019 (for landlocked countries, access to port facilities and inland waterways were used)
		0.10	Quality air transport infrastructure 2019
	Financial stability Weight 0.30	0.15	Banking system z score
		0.15	Non-performing loans as percent of all bank loans, 2021
		0.15	Banking system concentration % of bank assets held by top three banks, 2021
		0.15	Foreign exchange reserves including gold, as % of GDP
		0.10	Domestic credit to private sector (% of GDP)
		0.15	Household debt, loans and debt securities % GDP 2021
		0.15	Mortgage credit as % of GDP
	Macroeconomic stability Weight 0.35	0.14	Fiscal balance-to-GDP ratio 2022
		0.14	Unemployment rate, total (% of total labour force) 2022
		0.14	Inflation rate 2023, average consumer prices annual percent change
		0.14	Government debt as percent of GDP 2021
		0.14	Capital investment as percent of GDP 2022
		0.15	Current account balance as % GDP 2023
		0.15	Gross domestic savings (% of GDP) 2022
	Sustainable development Weight 0.30	0.125	Economic freedom, overall index (0-100) 2021
		0.125	Remittances as % GDP
		0.125	Unequal economic development index
		0.125	Shadow economy as % of GDP
0.125		Cost of starting business	
0.125		Economic decline 2007-2023	



Main category	Intermediate category	Weights	Factors of influence		
Innovation and IT	Innovation and IT	0.125	Tax revenue as % of GDP 2021		
		0.125	Competitiveness		
		0.18	Expenditure on R&D as % GDP 2021		
		0.20	Information technology exports, percent of total goods exports, 2021		
		0.20	ICT sector share in GDP		
		0.21	Digital skills gap index		
Human capital	Human capital	0.21	Innovations index (0-100) 2021		
		0.05	Financial literacy %		
		0.05	Digital skills among population		
		0.10	Government expenditure on education, total (% of GDP) 2020		
		0.20	Human Capital Index (HCI), Upper Bound (scale 0-1)		
		0.20	Human flight and brain drain index		
		0.20	GINI index degree of inequality in the distribution of income/wealth		
		0.20	Human development index		
		Governance effectiveness	Governance effectiveness	0.125	State legitimacy index
				0.125	Public services index
0.125	Factionalized elites index				
0.125	Rule of law index				
0.125	Government effectiveness index				
0.125	Control of corruption				
0.125	Political stability index				
0.125	Corruption Perceptions Index, 100 = no corruption				

Results

The results of the analysis are presented in *figure 1*, with the 29 NATO countries analysed ranked according to the Economic Resilience Index from the highest level to the lowest. The results allow the classification of the countries into 5 distinct groups, taking as reference the average resilience index of the 29 states of 0.526:

- countries with very high resilience (index over 0.700) – Germany;



The categories Logistics and infrastructure, Governance effectiveness, and Innovation and IT display a high correlation with the Economic Resilience Index, outlining the contribution of these factor to economic development, adaptability and resilience, but also to multiple other areas of resilience (especially military, civil and societal resilience).

- countries with high economic resilience (index between 0.600 and 0.700) – Norway, Denmark, Netherlands, Finland, UK, France and Iceland
- countries with relatively high economic resilience (index between 0.530 and 0.600) – Belgium, Luxembourg, Estonia, Spain, Slovenia, Portugal and Italy
- countries with medium economic resilience (index between 0.400 and 0.530) – Czech Republic, Poland, Lithuania, Hungary, Slovakia, Latvia, Greece, Turkiye, Croatia, Bulgaria and Romania
- countries with low economic resilience (index between 0.333 and 0.285) – Montenegro, North Macedonia and Albania.

Correlation coefficients between the economic resilience index from a comprehensive defence perspective and the main categories of factors selected were calculated and are presented in table 2. As per the results, the categories Logistics and infrastructure, Governance effectiveness, and Innovation and IT display a high correlation with the Economic Resilience Index, outlining the contribution of these factor to economic development, adaptability and resilience, but also to multiple other areas of resilience (especially military, civil and societal resilience). The high positive correlation coefficient for Stability and sustainable growth category confirms that sound financial and macroeconomic policies, combined with measures designed to ensure sustainable economic growth, are the foundation of a strong and resilient economy.

Human capital category displays a slightly lower, but still significant correlation to the economic development index, confirming the research hypothesis that measures aimed at developing an educated, skilled and competitive society enhances economic resilience, adaptability, innovation, and productivity.

Economic complexity, economic openness & foreign trade vulnerabilities and economic independence categories display low correlation coefficients with the economic resilience index, but it does not necessarily mean independence or lack of causality between these factors. Considering the fact that the index proposed in this paper focuses on a broader approach to economic resilience, from a comprehensive defence approach, the result is reasonable, as economic diversification can contribute to an economy’s resilience

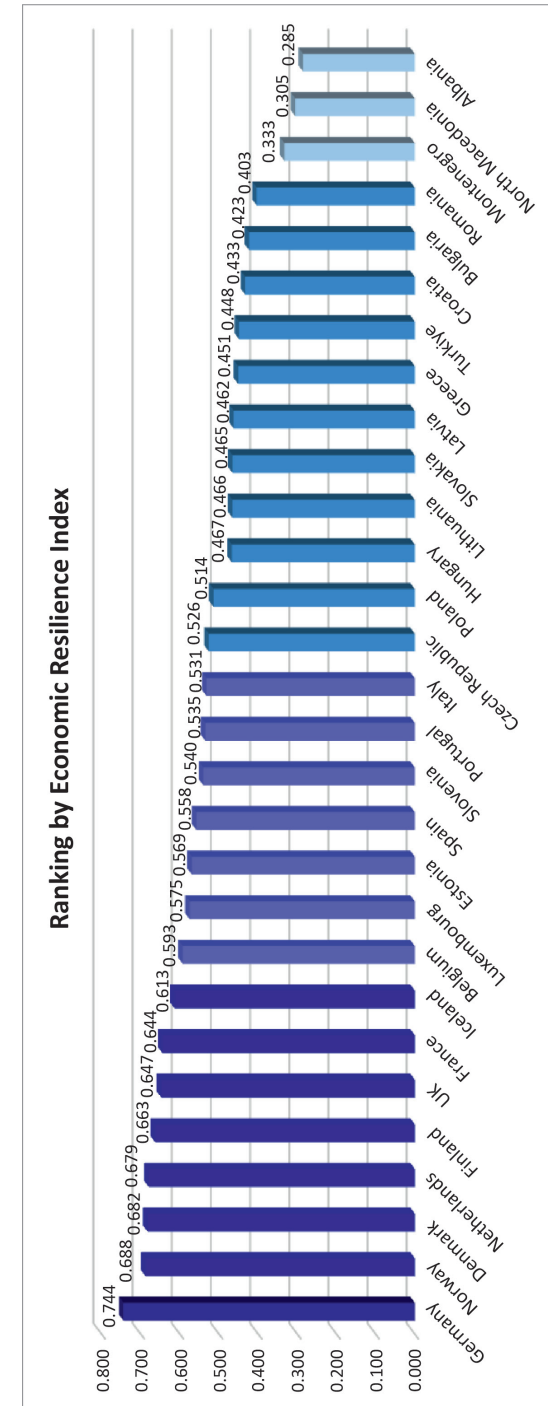


Figure 1



Energy independence is a very important factor in ensuring a country's resilience, but is not a guarantee of economic resilience. For example, the oil reserves available to a country can contribute significantly to a country's energy resilience in the long term, but only if the country has the capacity to exploit them and extract the oil at a reasonable price, otherwise, from an economic point of view, it would make more sense to import cheaper oil.

to economic shocks, but it cannot shelter it completely from other types of shocks, such as disruption of supply chains that affect many economic activity areas or multiple price shocks as the ones generated by the conflict in Ukraine.

The low correlation coefficients for energy independence should not be interpreted in the sense that it has no contribution in building economic resilience, but in the sense that, in the overall picture of economic resilience and from a comparative point of view, a sound and stable economy can withstand the effects of shocks and crisis better, even in conditions of energy dependence. Energy independence is a very important factor in ensuring a country's resilience, but is not a guarantee of economic resilience. For example, the oil reserves available to a country can contribute significantly to a country's energy resilience in the long term, but only if the country has the capacity to exploit them and extract the oil at a reasonable price, otherwise, from an economic point of view, it would make more sense to import cheaper oil. This conundrum was visible in the case of Germany, where the development of many industries (and indirectly the country's stable macroeconomic indicators) was partly based on a policy that generated increased dependence on the cheap Russian gas and oil. On the other hand, if Germany were to turn back its nuclear energy production facilities, the level of energy independence would increase significantly. Consequently, energy independence should be analysed in more detail, including various other indicators, in the framework of a different resilience area, namely energy resilience.

Economic openness and foreign trade vulnerabilities category also displays a low positive correlation with the economic resilience index. One of the reasons for this low correlation is that the selected countries (with the exception of Albania, Montenegro and North Macedonia) have a relatively limited contribution of the trade balance to the GDP formation, making them less vulnerable to this factor of influence. Another reason is that most of these countries are also members of the European Union, and intra-EU trade makes up a large part of their trade balance, resulting in a lower vulnerability to external factors. In the case of countries with a higher dependence on foreign trade (especially outside the EU), the results may be different, so this category of indicators should not be automatically excluded as a component of an economic resilience index.



Factors such as Food imports as % of total merchandise imports, Fuel imports as % of total merchandise imports or Trade balance (exports minus imports) in basic food as a ratio to total imports, 2017-2021, percentage, in addition to the effect of price shocks on specific strategic commodities, could make the subject of further studies, perhaps in a specific category (strategic commodities dependence). The present paper was limited by the available data in this respect.

Table 2: Correlation coefficients of factors determining the Economic Resilience Index of European NATO countries

	Kendall rank coefficient	Pearson's r	Spearman's r
Economic resilience/Economic complexity	0.1998	0.5571	0.3126
Economic resilience/Economic openness and foreign trade	0.2660	0.2867	0.3685
Economic resilience/energy independence	0.2562	0.3792	0.3488
Economic resilience/Logistics and infrastructure	0.7192	0.8996	0.8906
Economic resilience/Stability and sustainable growth	0.6897	0.8275	0.8626
Economic resilience/Innovation and IT	0.6847	0.8889	0.8616
Economic resilience/Human capital	0.5714	0.7470	0.7739
Economic resilience/Governance effectiveness	0.7537	0.8948	0.9192

The contributions of each main category of factors to the overall economic resilience of each of the selected countries, reflecting the specific national situations, is presented in figure 2.

According to the results presented in figures 2 and 3, Romania's rank derives from the following considerations:

- Romania ranks higher than the average of the selected countries on *Economic openness and foreign trade*, *Energy independence* and very close to average on *Economic complexity*, but unfortunately these categories of factors are not so relevant to the economic resilience index, as outlined above.
- Romania ranks marginally lower than the average on *Stability and sustainable growth*.

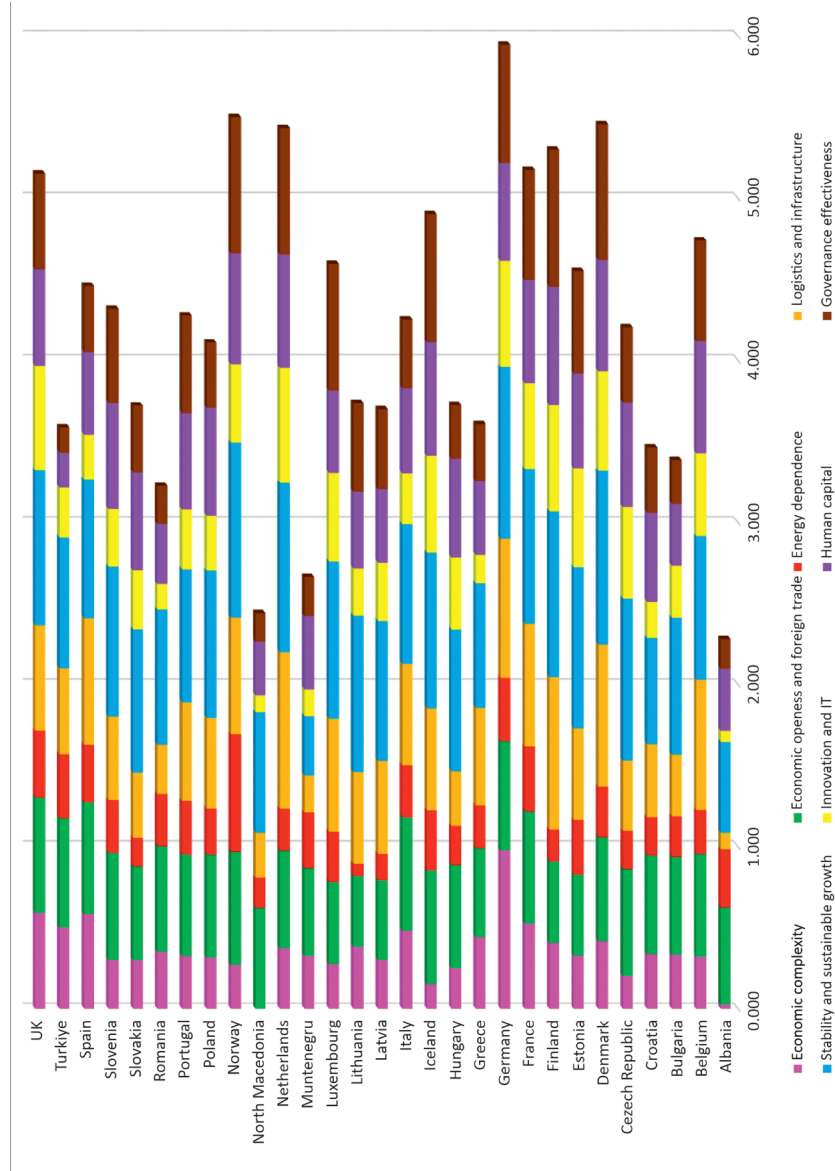


Figure 2



- The most significant factors in determining Romania’s relative economic resilience index ranking are its weak results on *Logistics and Infrastructure, Innovation and IT, Human capital and Governance effectiveness.*

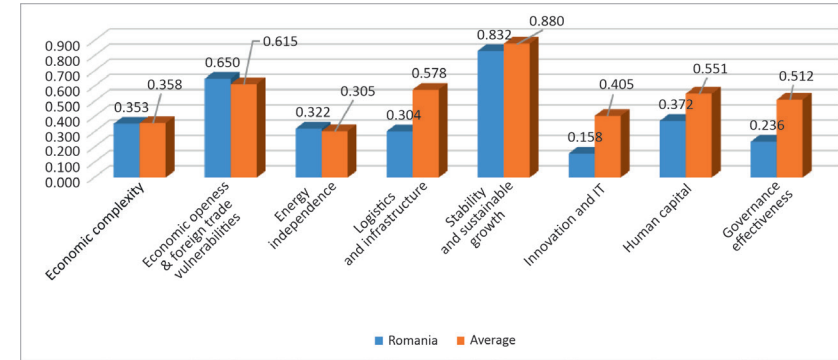


Figure 3

CONCLUSIONS

The results presented in this paper underline the complexity of the concept of economic resilience from a comprehensive defence perspective, with more detailed research needed in order to identify relevant factors of influence and their degree of influence on an economic resilience index.

The study was limited by data availability on specific indicators or specific countries, leading to less refined results. In terms of data collection, the study was limited by the availability of country specific indicators for the same year or the complete unavailability of indicators for some countries, leading to approximations from other sources (which may have different calculation methods). Still, the results of the study confirm the results in the literature, such as those in the Zoe Institute for future-fit economies. (Hafele et al., 2023).

In the case of Romania, the findings of this study outline the need for the state authorities to implement measures aimed at decreasing the gap relative to *Logistic and Infrastructure, Innovation and IT, Human Capital and Governance effectiveness.* Romania’s logistic sector and its transport infrastructure are one of the country’s biggest drawbacks in terms of economic resilience and resilience in general. Romania ranks on the last position in terms of the quality of road infrastructure, and this should be one of the first priorities in respect to increasing economic and military resilience.

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Table 3

Indicators in Logistics and Infrastructure category	Romania's rank of 29 selected countries
Logistic performance index 2022	26
Quality of trade and transport related infrastructure 2022	27
Competence and quality of logistic services 2022	24
Efficiency of customs clearance process 2022	27
Quality of railroad infrastructure 2019	26
Quality of road infrastructure 2019	29
Quality of port infrastructure 2019 (for landlocked countries, access to port facilities and inland waterways was used as proxy)	25
Quality air transport infrastructure 2019	24

Even if Romania ranks on the 15th position in terms of Information technology exports, percent of total goods exports, 2021, it ranks low on government expenditures on R&D as % of GDP, innovations index (0-100) and digital skills gap index.

Despite the fact that the IT sector is one of the thriving economic sectors in Romania (with 220.000 employees, meaning 4% of the total national workforce) (Mihai, 2021), from the point of view of the economic resilience index, the ranking does not reflect Romania's potential in this area. Even if Romania ranks on the 15th position in terms of Information technology exports, percent of total goods exports, 2021, it ranks low on government expenditures on R&D as % of GDP, innovations index (0-100) and digital skills gap index. The digital skills gap index 2021 used as indicator reveals that Romania's economy still has a gap between the demand for digital skills (especially from businesses) and the actual skills level of the workforce, highlighting the shortcomings in terms of ability of policymakers, educational institutions, and corporate trainers to effectively address the shortage of skilled personnel in this domain.

Table 4

Indicators in Innovation and IT category	Romania's rank of 29 selected countries
Expenditure on R&D as % GDP 2021	26
Information technology exports, percent of total goods exports, 2021	15
ICT sector share in GDP	20
Digital skills gap index	28
Innovations index (0-100) 2021	25



In terms of the *Human capital* category, Romania should take measures to improve the financial literacy of the population, government's expenditures on education as % of the GDP. The Human Capital Index, on which Romania is situated on the 28th place, refers to the amount of human capital that a child born in the present can expect to attain by age 18, given the risks of poor health and poor education that prevail in the country where the child lives. This is an important indicator in terms of the quality of the future workforce, but also in terms of future financial vulnerability of a country's population, with serious implications on a country's resilience, which makes it another area where a strong and timely intervention from the government would be desirable.

Table 5

Indicators in Human capital category	Romania's rank of 29 selected countries
Financial literacy %	27
Digital skills among population	19
Government expenditure on education, total (% of GDP) 2020	27
Human Capital Index (HCI), Upper Bound (scale 0-1)	28
Human flight and brain drain index	24
GINI index degree of inequality in the distribution of income/wealth	21
Human development index	25

In terms of the Governance effectiveness category, based on the lowest rank Romania registers in terms of Public Services index, measures to improve the provision of essential services, such as health, education, water and sanitation, transport infrastructure, electricity and power, and internet and connectivity, effective policing are a crucial requirement in terms of increasing resilience. The Government effectiveness index, in which Romania ranks on the 28th place, refers to the index of "the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Globeconomy.org, 2022). It is the foundation not only for economic resilience, but for resilience in general and is another area where improvement measures are critically needed.

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Table 6

Indicators in Governance effectiveness category	Romania's rank of 29 selected countries
State legitimacy index	23
Public services index	29
Factionalized elites index	22
Rule of law index	21
Government effectiveness index	28
Control of corruption	25
Political stability index	21
Corruption Perceptions Index, 100 = no corruption	24

An additional area of research could refer to further refining the concept of economic resilience in the context of comprehensive defence. It entails expanding the analysis to incorporate factors related to national security and defence, such as safeguarding critical industries and assessing the extent to which government policies are interconnected and influence economic resilience, in order to achieve a combined and comprehensive index that could be the basis for policy recommendations.

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