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Towards a weighted comparison of nations' defence expenditure

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Abstract:

At the North Atlantic Treaty Organisation (NATO) summit to be held in The Hague (Netherlands) from 24-26 June 2025, several issues will be discussed. Among these is likely to be the question of the percentage of Gross Domestic Product (GDP) that the Organisation sets for member nations to spend on defence, as well as the timeframe to achieve it. This article argues that a nation's contribution to the Atlantic Alliance should not only be determined by the simple indicator of percentage of GDP, but also and especially by composite indicators. In any case, the aim is not to provide an exhaustive study of either comparative military spending or management indicators, but mainly to offer suggestions on the way forward in the proper comparison of defence spending among both NATO and EU nations.

Keywords:

Defence expenditure, NATO, European Union, simple and composite indicators, indicators of economy, efficiency and effectiveness.

How to quote:

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***NOTE:** The ideas contained in the Opinion Papers shall be responsibility of their authors, without necessarily reflecting the thinking of the IEEE or the Ministry of Defense.

Introduction

The title of this paper includes a number of terms that should be clarified in order to focus its scope. First, the term 'weighted' suggests, from the outset, that the comparison to be made of defence spending at the international level includes several parameters, since weighting is not possible with only one.

Secondly, the framework to be used to carry out the 'comparison' is the one used by the performance audits of economy, efficiency and effectiveness of the International Organisation of Supreme Audit Institutions (INTOSAI). On the other hand, both simple and composite performance indicators will be used.

Third, and finally, the definition of 'defence spending' to be taken is that adopted by NATO, as payments made by a national government specifically to meet the needs of its armed forces, those of Allies or those of the Alliance.

In what follows, we briefly elaborate on the content of the preceding paragraphs to serve as a basis for offering suggestions on the way forward in properly comparing defence spending among both NATO and European Union nations.

NATO's definition of defence expenditure

NATO has, rather than a definition, a statement of the items that constitute defence spending. Its official website points out that[1]: "Defence expenditure is defined by NATO as payments made by a national government (excluding regional, local and municipal authorities) specifically to meet the needs of its armed forces, those of Allies or of the Alliance. For the purposes of this definition, the needs of the Alliance are considered to consist of NATO common funding and NATO-managed trust funds. The list of eligible NATO trust funds is approved by all Allies.

"A major component of defence expenditure is payments for Armed Forces financed from within the Ministry of Defence budget. Armed Forces include land, maritime and air forces as well as joint formations, such as Administration and Command, Special Operations Forces, Medical Service, Logistic Command, Space Command, Cyber Command. They

[1] https://www.nato.int/cps/en/natohq/topics_49198.htm

might also include parts of other forces such as Ministry of Interior troops, national police forces, coast guards etc. In such cases, expenditure is included only in proportion to the forces that are trained in military tactics, are equipped as a military force, can operate under direct military authority in deployed operations, and can, realistically, be deployed outside national territory in support of a military force. Expenditure on other forces financed through the budgets of ministries other than the Ministry of Defence is also included in defence expenditure.

“Retirement pensions made directly by the government to retired military and civilian employees of military departments and for active personnel is included in the NATO defence expenditure definition.

“Expenditures for stockpiling of war reserves of finished military equipment or supplies for use directly by the armed forces are included.

“If expenditures for operations, missions, engagements, and other activities are appropriated under the defence budget, they are included in the NATO definition. Expenditure for peacekeeping and humanitarian operations, paid by the Ministry of Defence or other ministries, the destruction of weapons, equipment and ammunition, and the costs associated with inspection and control of equipment destruction are included in defence expenditure.

“Expenditure for the military component of mixed civilian-military activities is included, but only when the military component can be specifically accounted for or estimated. For example, these include airfields, meteorological services, aids to navigation, joint procurement services, research and development.

“Research and development (R&D) costs are included in defence expenditure. R&D costs also include expenditure for those projects that do not successfully lead to production of equipment.

“Military and financial assistance by one Ally to another, specifically to support the defence effort of the recipient, should be included in the defence expenditure of the donor nation and not in that of the recipient.

"With respect to military and financial assistance to a partner country, Allies can report their contributions to eligible NATO-managed trust funds related to defence projects. Military equipment and weapons donated from national stocks to a partner country, as well as assistance by military personnel in training are already included. Money provided by other government departments than the Ministry of Defence, through other international organisations, or in the form of direct military aid, is not eligible.

"Expenditure on NATO common infrastructure is included in the total defence expenditure of each Ally only to the extent of that country's net contribution. War damage payments and spending on civil defence are both excluded from the NATO definition of defence expenditure".

As can be seen in this last paragraph, certain types of expenses are expressly excluded. It should be noted that there are many other expenses that are also excluded and are those that do not fit clearly within the concepts mentioned in the previous paragraphs.

The indicators of economy, efficiency and effectiveness in defence sector

Performance auditing, according to INTOSAI, examines and controls the degree of economy, efficiency and effectiveness achieved in the management of the public sector bodies of any nation. The principles of economy, efficiency and effectiveness can be defined as follows[2]:

1. The principle of economy means minimising the costs of resources. The resources used should be available in due time, in and of appropriate quantity and quality and at the best price.

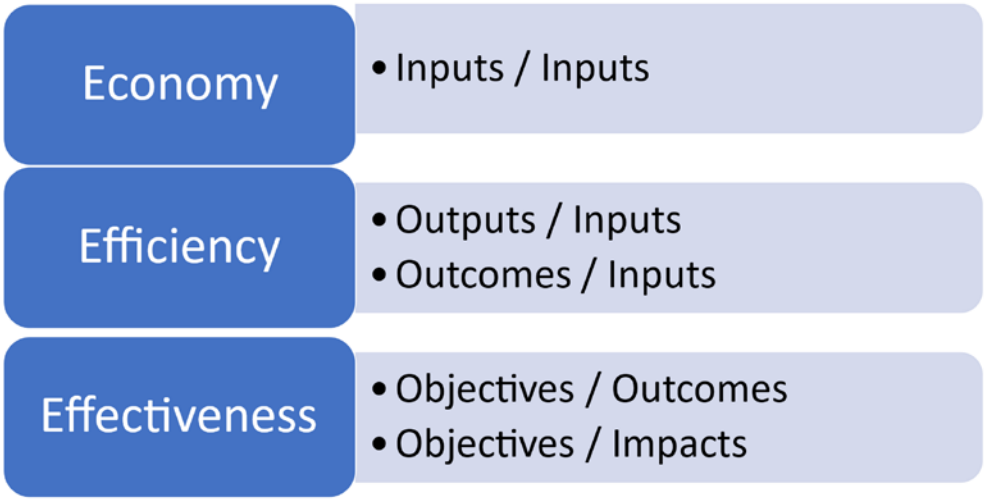
2. The principle of efficiency means getting the most from the available resources. It is concerned with the relationship between resources employed and outputs delivered in terms of quantity, quality and timing.

[2] ISSAI 300, *Performance Audit Principles,* paragraph *11. https://www.issai.org/wp-content/uploads/2019/08/ISSAI-300.pdf*

3. The principle of effectiveness concerns meeting the objectives set and achieving the intended results

Furthermore, the INTOSAI policy evaluation guide[3] complements these principles by adding the concepts of outcome and impact. Output is the immediate result, and outcome is what the business wants or needs to achieve, Outcome also has another meaning, which will be discussed in the paragraph 2 ("outcomes vs impacts" and objectives). Taking into account these concepts and the previous ones, the three principles can be translated into the following indicators, which are discussed below:

Figure 1.- Own elaboration based on INTOSAI definitions.



"Outcomes vs outputs" and resources

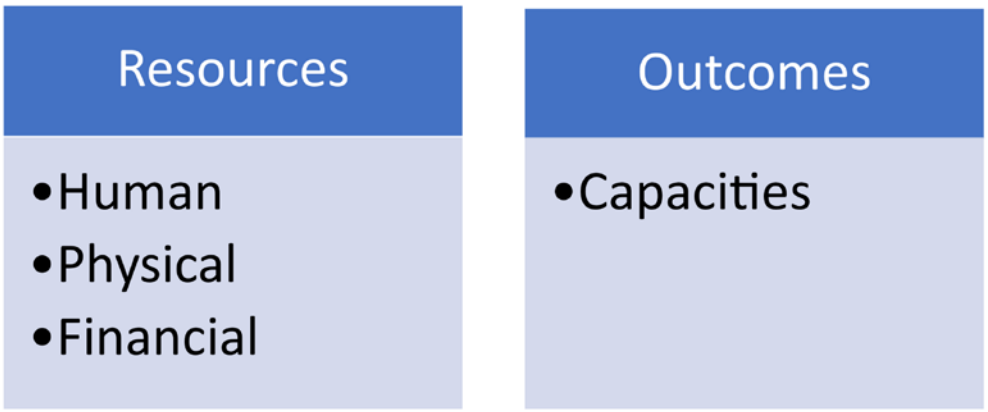
Resources or inputs can be classified in three ways: human, physical and financial. In the field of defence, human resources are the personnel of the armed forces and other forces, as defined by NATO. Physical military assets are the tangible and intangible movable and immovable assets, both tangible and intangible, that are used for defence purposes. And financial resources are those that come from general government budgets, national loans or those pooled with other nations.

[3] GUID 9020, *Evaluation of Public Policies*, paragraph 2.2. https://www.issai.org/wp-content/uploads/2019/08/GUID-9020-Evaluation-of-Public-Policies.pdf

The outcome is the so-called military capabilities. Military capabilities define the military power that a nation can deploy in the event of a crisis or conflict situation with other nations or potential adversaries. In other words, these capabilities establish the degree of coercion and deterrence that a nation can exert on others to carry out its foreign and security policy. This is particularly necessary when its principles, values or interests do not coincide and collide with those of other nations and there are no mechanisms to arbitrate a peaceful solution.[4]

Examples of these capabilities are the planning, direction and coordination of operations; force projection; anti-submarine warfare; anti-aircraft defence; intelligence-gathering capabilities; and so on. These capabilities require a series of means, such as personnel, land, naval or air materiel, as well as communication and information equipment.

Figure 2.- Military resources and outcomes.



It should be noted that the output or product of one process can serve as a resource or input into another. For example, the Gross Domestic Product (GDP) refers to the nation's output, but it can also act as a starting point for determining the inputs or resources to be used in national defence.

[4] MARTÍ SEMPERE, Carlos, "La Defensa europea y la Europa de la Defensa", Informe 2022, Director: Diego López Garrido, p. 61. https://fundacionalternativas.org/wp-content/uploads/2022/07/b66371307b630b4ad6ae23f7b184d10e.pdf

Conversely, one or more resources may constitute part of an output, product or outcome from another point of view, as is the case with the 'military capability outcome', which includes not only the 'military physical resource', but also the 'personnel resource' that employs this physical resource, together with appropriate training, doctrine, leadership, organisation, planning, infrastructure and so on. It follows that what we have called outcome of military capabilities comprises both a tangible and an intangible part[5]. The tangible is easy to measure, but the intangible is not. In view of this problem of measurement, we will see later on how to solve it, albeit partially.

"Outcomes vs impacts" and objectives

There are other terms in Figure 1 that are among the INTOSAI principles, such as the above-mentioned 'outcome', and the 'impact' and 'objective'. The first two point to the effects that an action or event has on something. When the effect is in the short or medium term we call it an outcome, while if it is in the long term it is called an impact. For example, the outcome and the impact on international politics that a nation's defence policy can have by projecting its military capabilities abroad.

Finally, it remains to define the 'objective' in Figure 1. The objective is the ultimate goal or end towards which the actions or operations of any mission are directed. In this case, it is national defence and security, which involves not only defence resources but also those from foreign policy and, in a general sense, all policies that protect the nation and its population.

In a broad sense, a large part of budgetary expenditure is indirectly directed towards this protection, such as that allocated by the State and regional and local treasuries to improving infrastructure, health, agriculture, housing, etc., which enable the population to defend its land and home with the means and health it needs. This does not imply, of course, that such a high percentage of GDP constitutes defence spending, but only that which falls within the aforementioned NATO definition of military spending, where it is

[5] Cfr. CORDERO APARICIO, José María, *El gasto militar y el producto militar (Military expenditure and military output)*, "Aeronáutica y Astronáutica" Journal, nº 588, December 1989, pp. 1359-1361.

quite clear which concepts are included.

In Spain, according to the National Defence Directive[6], 'the primary objective of defence is to protect Spanish society as a whole, its Constitution, and the values, principles and institutions it enshrines for the full exercise of the rights and freedoms of all citizens, as well as to guarantee the sovereignty, independence and integrity of Spain and the constitutional order. It is also a priority objective of Defence to contribute to the preservation of international peace and security within the framework of Spain's commitments.

Tangible and intangible

Just as physical resources can be tangible and intangible, so can other resources, outputs, outcomes, impacts and objectives. In the case of intangibles, the difficulty of measuring them arises. This, in turn, leads to the temptation not to try to measure them and to reduce the number and type of indicators that could be used to compare defence spending between nations.

In this respect, so as not to be limited to what is measurable, we can recall what William Bruce Cameron said[7]: "'Not everything that can be counted counts, and not everything that counts can be counted'. And follow the advice attributed to Galileo Galilei (1564-1642): 'Measure what can be measured and make measurable what cannot be measured'.

One way of ensuring that the intangible is measurable is to try to find parameters that are similar or can be substituted for it, even if accuracy is lost, because something is better than nothing. In this respect, the Spanish Court of Auditors' manual on performance auditing (p. 22) states[8]: "It is better to be vaguely right than to be exactly wrong".

Therefore, one should not fall into the comfort zone of using only indicators with easily measurable parameters, nor limit oneself to selecting only one of them. To be more realistic, it is advisable to use several indicators of any kind, whether they express the

[6] Directiva de Defensa Nacional 2020. https://www.defensa.gob.es/Galerias/defensadocs/directiva-defensa-nacional-2020.pdf

[7] CAMERON, William B. https://www.goodreads.com/quotes/250497-not-everything-that-can-be-counted-counts-not-everything-that

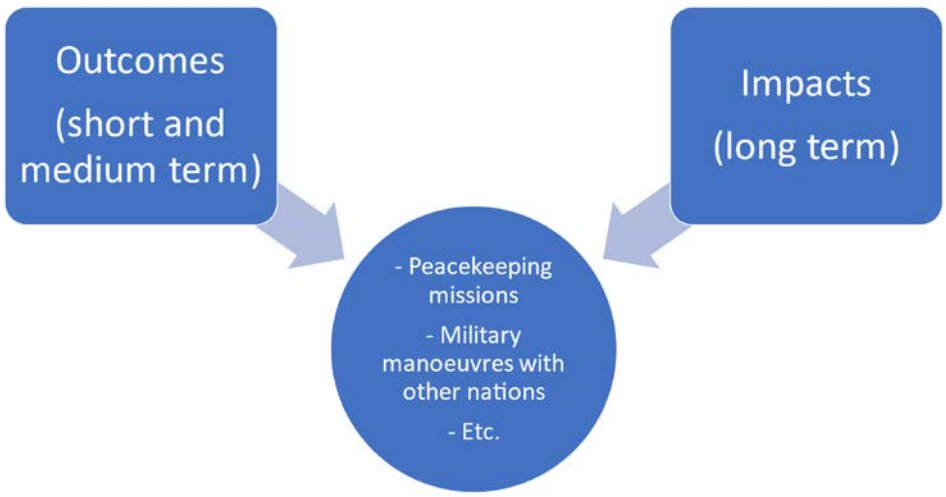
[8] https://www.tcu.es/export/sites/default/.galleries/pdf/NormasManuales/ManualFiscalizacionOperativa.pdf (page 22).

tangible or the intangible, overcoming the obstacle of using the latter.

A partial solution to the issue of measuring the intangible has already been introduced above, when discussing military capabilities. Thus, the aforementioned indicator of the outcome of military capabilities is a combination of tangible and intangible elements, which, in turn, refers to other intangibles, such as defence and military power. Despite its drawbacks, military capabilities can be expressed with the measurable elements that make them up, such as the set of weapons, ships, aircraft, etc., with their respective characteristics, as well as rendering measurable the rest of the intangible resources of which it is comprised.

Some examples of intangibles, this time referring to ‘outcome’ and ‘impact’, which can be made measurable, albeit with certain reservations, are the number of peace missions or participation in military manoeuvres with different nations, insofar as these activities can achieve results and impacts on international policy. Repeating what was said earlier, the process of measuring something unmeasurable has many limitations, but it is necessary to seek ways to translate the intangible into the tangible.

Figure 3.- Outcomes and impacts expressed in tangible activities.



Finally, an indicator of compliance with the intangible ‘objectives’ could be that reflected in surveys of the public's assessment of the armed forces. Further examples are proposed below.

Possible indicators of economy, efficiency and effectiveness in defence sector

As noted above, indicators of economy relate resources to resources. As there are different types of resources, there will also be different economy indicators. The possible relationships are very varied, for example:

- Defence civilian personnel / Defence manpower.
- Reserve military personnel / Total military personnel.
- Other forces personnel / Total military personnel.
- Depreciated defence equipment / Total defence equipment.
- Exports of military material / Total exports of the nation.
- Military equipment of Spanish origin / Total military equipment of the armed forces.
- Military equipment of foreign origin / Total military equipment of the Armed Forces.
- Production of the Military Industrial Complex / Gross Domestic Product.
- Defence financial resources / National financial resources.
- Ministry of Defence financial resources / Defence financial resources.
- Pooled financial resources / Defence financial resources.

Efficiency indicators that relate resources to outputs or outcomes can be, for example:

- Army Force Personnel (resource) / Army Force Capabilities (outcome).
- Air and Space Air Force Transport Aircraft (resource) / Peacekeeping Troop Deployment Capabilities of the ASAF (outcome).
- Navy Logistics Support Headquarters financial resources (resource) / Submarine fleet maintenance capabilities (outcome).

Economy, efficiency and effectiveness indicators can be referred to as macro or micro indicators. The economy and efficiency indicators mentioned above and the effectiveness indicators mentioned below would fall into the macro category. The micro type could be the following efficiency indicators:

- No. of aircraft maintenance hours (resource) / No. of aircraft flight hours (outcome-aircraft maintenance capability).
- No. of flights of a set of drones (resource) / No. of targets destroyed (outcome-drone defence capability).

- No. of counter-tank missile launches of a battalion (resource) / No. of battle tanks destroyed (counter-tank defence capability outcome).
- No. of personnel in a unit dedicated to cyber-attacks (resource) / No. of cyber-attacks repulsed (outcome - cyber-attack capability).
- No. of litres of fuel consumed per vehicle (resource) / No. of kilometres travelled per vehicle (outcome-vehicle tuning capability).

Finally, we mention effectiveness indicators that relate objectives to outcomes and impacts. We do this, for example, by comparing the evolution of the respective indicator over time:

- Nation deterrence and military alliances objective: Cost and type of capabilities acquired in one time period, relative to another time period (outcome).
- Overseas peace support objective: Cost and number of overseas peace operations in one time period, relative to another time period (outcome).
- Naval diplomacy objective: Cost and number of naval presence events in foreign ports in one time period, relative to another time period (outcome).
- Confidence-building measures objective: Cost and number of activities of the Spanish Verification Unit in one time period, compared to another time period (outcome).
- Defence culture objective: Cost and number of activities to raise awareness of the Armed Forces in one time period, compared to another time period (outcome).
- International exchanges objective: Cost and number of military personnel who have participated in military courses abroad in a given period of time, compared to another period of time (impact).
- Objective of promoting knowledge of other mentalities: Cost and number of military personnel who have acquired a good knowledge of a language over a period of time, compared to another period of time (impact).

As can be seen, the indicators relating to objectives are very broad. In some, the aim is to give the population a clear vision of the purpose of the Armed Forces. In others, the aim is to foster international relations, allowing for greater knowledge and understanding of the mentality of other peoples and the historical, political and economic roots of potential conflicts, in order to prevent and resolve them. In short, these are just a few of the many indicators that reflect the objectives pursued by Defence, both internal and

external.

After pointing out a small sample of the universe of possible indicators of economy, efficiency and effectiveness applicable to the Armed Forces, the following section presents some of those provided by NATO and the European Union on their open websites.

NATO economy indicators

This section analyses some of the NATO indicators available on the Web, where data for the years 2023 and 2024 are estimated. We have chosen to keep them as such and not to rely on other sources for consolidated data because this article is intended to emphasise that information providers need to address not only scientists and specialists, but also the general public. This is required by transparency and accountability, two basic principles of INTOSAI[9].

Of the NATO indicators, it is worth noting that economy indicators predominate. It is noteworthy that neither efficiency nor effectiveness indicators are easily accessible. It is not known whether this is due to confidentiality reasons or other circumstances.

The accompanying tables and graphs are drawn from NATO data. The six economy indicators presented here are as follows[10]:

1) ***Economy Indicator: Defence Expenditure / Gross Domestic Product***

Table 1.- Defence Expenditure / Gross Domestic Product

	2021	2022	2023e	2024e
France	1,91	1,88	1,96	2,06
Germany	1,45	1,51	1,64	2,12
Italy	1,54	1,52	1,50	1,49
Poland	2,22	2,23	3,26	4,12
Spain	1,03	1,16	1,19	1,28
United Kingdom	2,29	2,29	2,30	2,33

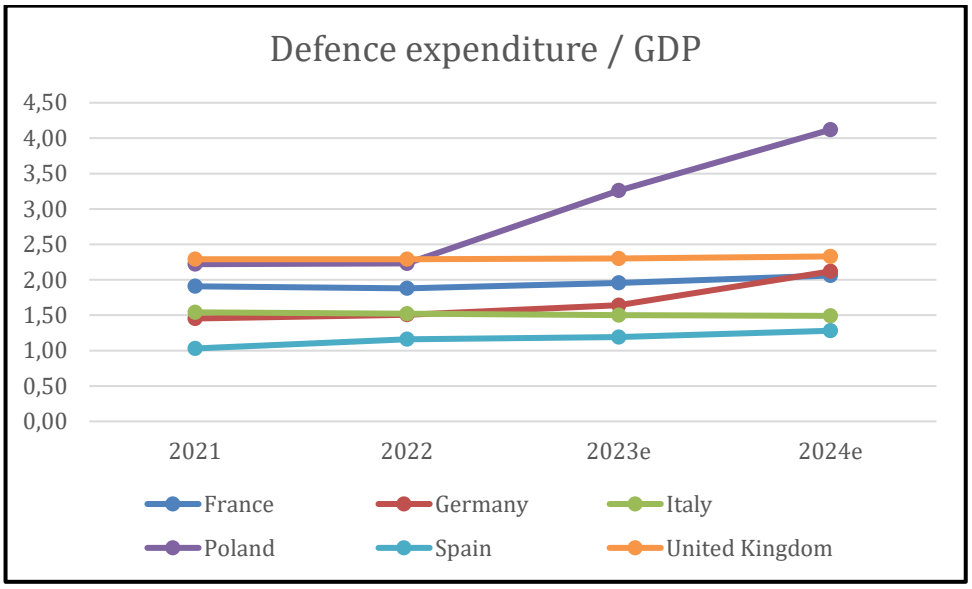
[9] ISSAI 100, "Fundamental Principles of Public-Sector Auditing", paragraph 19. https://www.issai.org/wp-content/uploads/2019/08/ISSAI-100.pdf

[10] Defence Expenditure of NATO Countries (2014-2024). https://www.nato.int/nato_static_fl2014/assets/pdf/2024/6/pdf/240617-def-exp-2024-en.pdf

Note for this and the following seven tables and their resulting graphs: data for the years 2023 and 2024 are estimates.

In 2014, NATO heads of state and government agreed to allocate 2 per cent of their GDP to defence spending to help ensure the Alliance's continued military preparedness. This decision was taken in response to Russia's illegal annexation of Crimea and against a backdrop of increased instability in the Middle East. The 2014 Defence Investment Agreement was built on an earlier commitment to meet this 2% of GDP guideline, agreed in 2006 by NATO defence ministers.

Chart 1.- Defence Expenditure / Gross Domestic Product



2) Economy indicator: Military personnel / Population

Information on military personnel is taken from the above-mentioned NATO source, while information on population is taken from the International Monetary Fund database[11].

[11] International Monetary Fund, "World Economic Outlook Database", October 2024. https://www.imf.org/en/Publications/WEO/weo-database/2024/October

Table 2.- Military personnel

	2021	2022	2023e	2024e
France	207,6	207,1	205,3	204,7
Germany	183,9	183,2	181,7	185,6
Italy	170,3	170,0	170,7	171,4
Poland	166,8	176,0	206,5	216,1
Spain	118,7	117,3	116,3	117,4
United Kingdom	148,2	143,6	138,1	138,1

Note: Military personnel are expressed in thousands.

Table 3.- Population

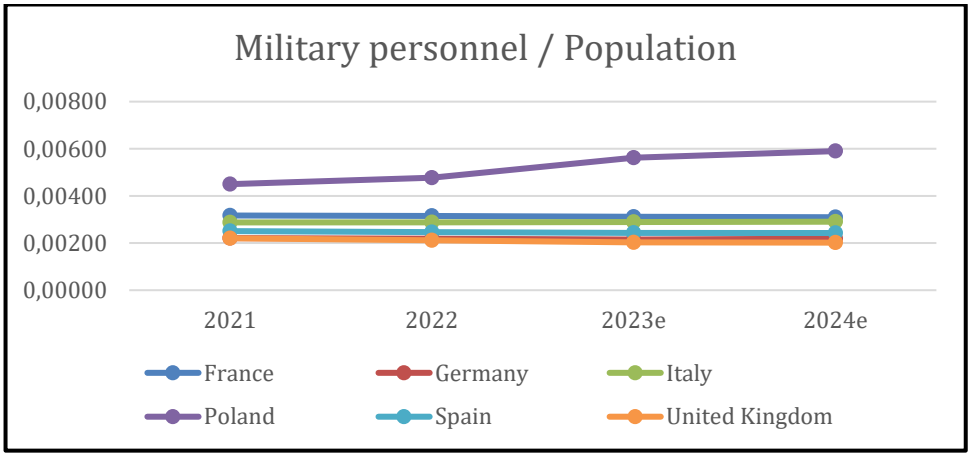
	2021	2022	2023e	2024e
France	65.505	65.722	65.926	66.111
Germany	83.196	83.798	84.514	84.833
Italy	59.236	59.030	58.997	58.990
Poland	37.073	36.890	36.754	36.621
Spain	47.331	47.615	47.810	48.380
United Kingdom	67.280	67.791	68.122	68.434

Note: Military personnel are expressed in thousands.

Table 4.- Military personnel / Population

	2021	2022	2023e	2024e
France	0,00317	0,00315	0,00311	0,00310
Germany	0,00221	0,00219	0,00215	0,00219
Italy	0,00288	0,00288	0,00289	0,00291
Poland	0,00450	0,00477	0,00562	0,00590
Spain	0,00251	0,00246	0,00243	0,00243
United Kingdom	0,00220	0,00212	0,00203	0,00202

Chart 2.- Military personnel / Population



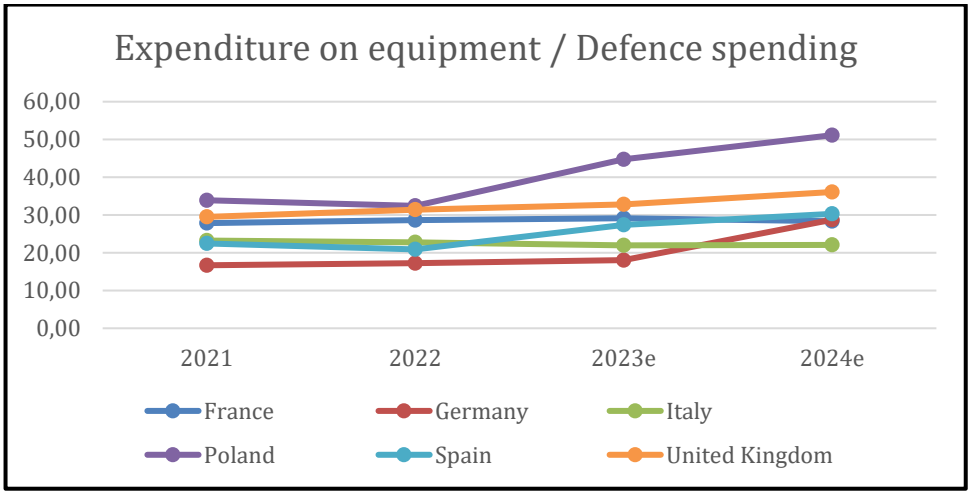
3) Economy indicator: Expenditure on equipment / Defence spending

Table 5.- Expenditure on equipment / Defence spending

	2021	2022	2023e	2024e
Francia	27,85	28,64	29,14	28,36
Alemania	16,69	17,23	18,04	28,75
Italia	23,23	22,77	21,96	22,08
Polonia	33,89	32,42	44,73	51,13
España	22,47	20,89	27,39	30,30
Reino Unido	29,50	31,41	32,80	36,09

Note: Equipment is the main military materiel and research and development expenditure on this materiel.

Chart 3.- Expenditure on equipment / Defence spending



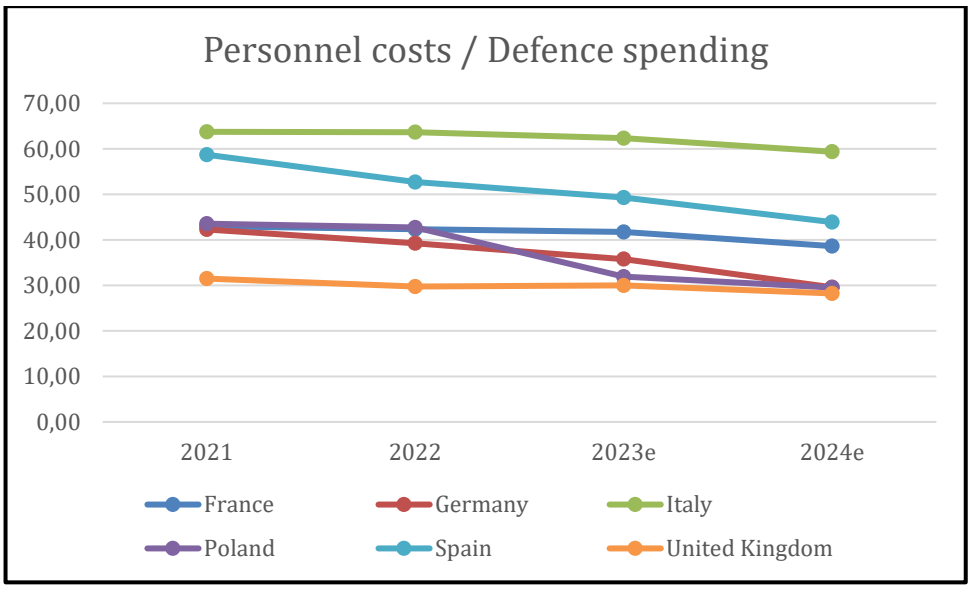
4) Economy indicator: Personnel costs / Defence spending

Table 6.- Personnel costs / Defence spending

	2021	2022	2023e	2024e
France	42,99	42,33	41,74	38,63
Germany	42,28	39,26	35,77	29,58
Italy	63,73	63,67	62,35	59,36
Poland	43,55	42,72	31,92	29,52
Spain	58,70	52,70	49,30	43,90
United Kingdom	31,49	29,74	29,98	28,23

Note: Personnel expenditure includes civilian and military personnel as well as pensions.

Chart 4.- Personnel costs / Defence spending



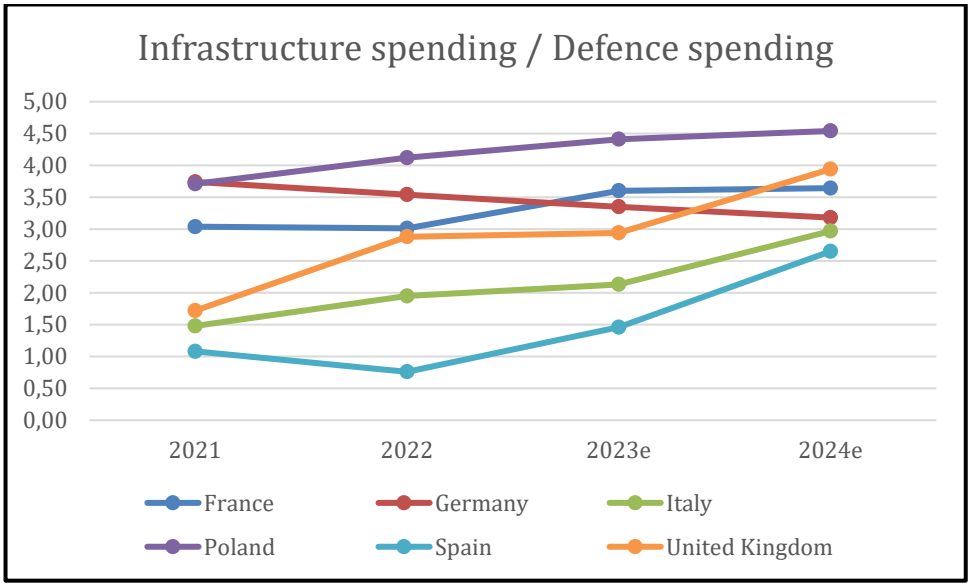
5) Economy indicator: Infrastructure spending / Defence spending

Table 7.- Infrastructure spending / Defence spending

	2021	2022	2023e	2024e
France	3,04	3,01	3,60	3,64
Germany	3,74	3,54	3,35	3,18
Italy	1,48	1,95	2,13	2,97
Poland	3,71	4,12	4,41	4,54
Spain	1,08	0,76	1,46	2,65
United Kingdom	1,72	2,88	2,94	3,94

Note: Infrastructure spending includes both national and NATO common military construction.

Chart 5.- Infrastructure spending / Defence spending



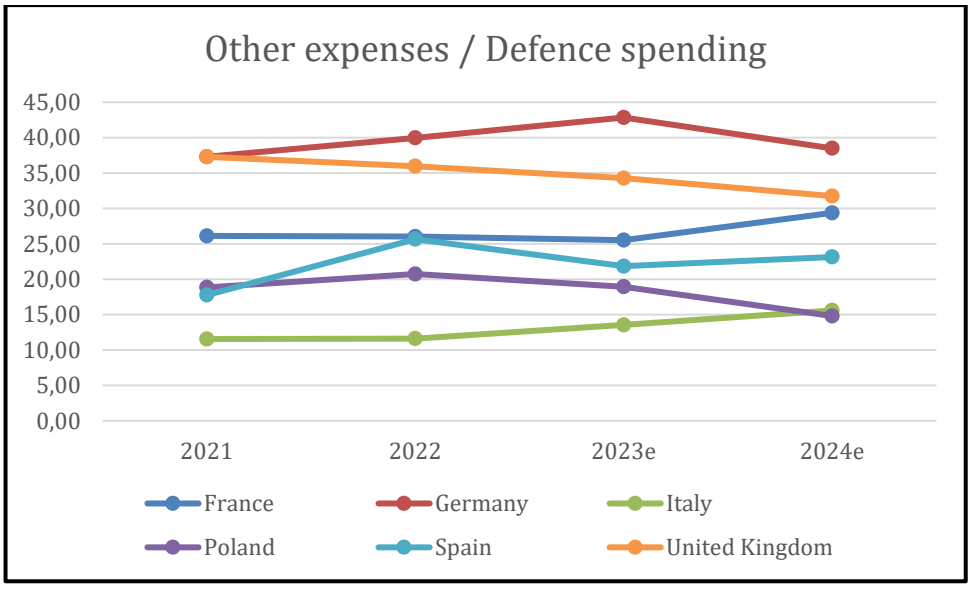
6) *Economy indicator: Other expenses / Defence spending*

"Other expenses" includes operational and maintenance expenses, as well as research and development and other expenses not covered by indicators 3, 4 and 5 above.

Table 8.- Other expenses / Defence spending

	2021	2022	2023e	2024e
France	26,12	26,02	25,52	29,38
Germany	37,29	39,96	42,84	38,49
Italy	11,56	11,61	13,55	15,59
Poland	18,85	20,74	18,94	14,81
Spain	17,76	25,65	21,85	23,14
United Kingdom	37,29	35,96	34,28	31,74

Chart 6.- Other exoenses / Defence spending



European Union economy indicators in defence sector

The question of indicators in the European Union is dealt with on the basis of the information available from the European Defence Agency (EDA), whose main tasks are as follows[12]:

- Supporting the development of defence capabilities and military cooperation among the European Union Member States.
- Stimulating defence Research and Technology (R&T) and strengthening the European defence industry.
- Acting as a military interface to EU policies.

The EDA receives data from the Ministries of Defence of the 27 Member States. In addition, data on GDP, general government expenditure and population are provided by Eurostat.

The data are broken down on the basis of a list of indicators approved by the Agency's Ministerial Steering Board. These indicators are grouped into five sections. Like the NATO

[12] https://eda.europa.eu/who-we-are/Missionandfunctions

indicators, these are also economic indicators[13].

1.-Total Defence Expenditure: Illustrates how defence budgets relate to GDP and overall government spending.

2.- Defence Personnel: Shows the ratio between military and civilian personnel and provides information on defence expenditure and investment per military.

3.- Defence Expenditure Breakdown： Provides data on the major defence expenditure categories – personnel; investment, including research & development (R&D)/research & technology (R&T); operations & maintenance (O&M), and other – to show what defence budgets are spent on.

4.- European collaboration: For defence equipment procurement and R&T, demonstrates to what extent the Agency's participating Member States are investing together.

5.- Deployability: Shows the ratio between the military deployed in crisis management operations and the remaining military personnel, and provides data on deployable and sustainable forces, as well as on costs of deployed operations.

Moreover, in November 2007, the Ministerial Steering Board approved four collective benchmarks for investment. These indicators, which also relate to the economy, are as follows:

1.- Equipment procurement (including R&D/R&T): 20% of total defence spending
2.- European collaborative equipment procurement: 35% of total equipment spending
3.- Defence Research & Technology: 2% of total defence spending
4.- European collaborative defence R&T: 20% of total defence R&T spending

These benchmarks are collective: they apply to the total sum spent by all EDA Member States together. They are voluntary: turning them into national targets is optional. There are no timelines for realising these benchmarks.

[13] https://eda.europa.eu/publications-and-data/defence-data

Composite and weighted indicators of defence spending

We now turn to composite indicators and one form of these: weighted indicators.

A simple indicator is based on a single ratio and is easy to interpret, so it is useful when a clear and specific metric is needed. For example, a simple indicator is an indicator of a nation's GDP growth or its unemployment rate, where both variables are related to the time factor. So is the economy indicator that relates military expenditure to GDP, as well as the other economy indicators and the efficiency and effectiveness indicators that compare two variables in a single relationship.

A composite indicator, on the other hand, combines two or more relationships, which allows for a more complete analysis and more meaningful comparisons, but makes it more difficult to calculate. For example, a simple indicator is the percentage of students passed in a subject (here, the only ratio is: students passed / total number of students examined), while a composite indicator is the percentage of students passed in a subject (first ratio) with respect to the percentage of male and female students (second ratio).

In other words, if the percentage of successful students were 80%, and the percentage of male and female students were (40 / 60) %, the figure for the composite indicator would be: 0.8 x 0.67 = 0.53. This means that 80% of the total number of students passed, but only 53% of them were male[14].

Thus, this composite indicator provides three pieces of information: gender distribution, total pass rate and male pass rate. Consequently, from the two pieces of information provided by two simple indicators, three pieces of information are obtained with a composite indicator. This is a fundamental advantage of composite indicators over simple indicators.

[14] Intervención General de la Administración del Estado, “Indicadores de gestión en el ámbito del Sector Público”, pp. 28-29.
https://www.igae.pap.hacienda.gob.es/sitios/igae/es-ES/Contabilidad/ContabilidadPublica/ContabilidadPublicaLocal/Documents/IndicadoresGestion.pdf.

Composite indicators of defence spending

Composite indicators have a number of pros and cons, according to the methodology established by the OECD (Organisation for Economic Co-operation and Development) in 2008[15].

- Pros:
  - Can summarise complex, multi-dimensional realities with a view to supporting decisionmakers.
  - Are easier to interpret than a battery of many separate indicators.
  - Can assess progress of countries over time.
  - Reduce the visible size of a set of indicators without dropping the underlying information base.
  - Thus make it possible to include more information within the existing size limit.
  - Place issues of country performance and progress at the centre of the policy arena.
  - Facilitate communication with general public (i.e. citizens, media, etc.) and promote accountability.
  - Help to construct/underpin narratives for lay and literate audiences.
  - Enable users to compare complex dimensions effectively.
- Cons:
  - May send misleading policy messages if poorly constructed or misinterpreted.
  - May invite simplistic policy conclusions.
  - May be misused, e.g. to support a desired policy, if the construction process is not transparent and/or lacks sound statistical or conceptual principles.
  - The selection of indicators and weights could be the subject of political dispute.

[15] OECD, "Handbook on Constructing Composite Indicators, Methodology and User Guide", 2008, pp. 13 and 15. https://www.oecd.org/en/publications/handbook-on-constructing-composite-indicators-methodology-and-user-guide_9789264043466-en.html

- May disguise serious failings in some dimensions and increase the difficulty of identifying proper remedial action, if the construction process is not transparent.
- May lead to inappropriate policies if dimensions of performance that are difficult to measure are ignored.

The method developed by the In the case of NATO and the European Union, therefore, the teams dealing with the elaboration of the composite indicators will be multidisciplinary, comprising defence and above-mentioned experts. These teams will present their findings to the relevant senior management for possible approval by the nations' political representatives.

This paper seeks to emphasise the prevalence of composite indicators over simple ones, as the OECD already does. Thus, in the aforementioned example on passing students, this superiority was shown by the conclusion that from two pieces of information provided by two simple indicators, three pieces of information are obtained with a composite indicator. In a second and third example below, the same conclusion will be reached.

OECD takes into account the following aspects:

- Selection of variables or partial indicators. This should take into account the theoretical framework, suggestions from experts and stakeholders.
- Normalisation. The units and range in which the indicators are measured should be comparable.
- Choice of weights. The importance of each variable in the indicator is studied taking into account the theoretical framework, and depending on previous studies or expert judgement the weight of each variable can be determined.
- Aggregation method. The indicators should be aggregated taking into account the theoretical framework.

In view of the above-mentioned aspects, it follows that the compilation of composite indicators is a laborious matter that requires the collaboration of experts in economics, statistics, mathematics, auditing, etc., as well as in the specific subject areas to which the indicators refer. These specialisations appear, for example, in the development of

composite indicators for good university management[16].

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Let us continue, then, with the method used above to present the second example. We will first take two simple economic indicators and formulate an indicator composed of two ratios. The first indicator we will use is the one that currently prevails in NATO, i.e. the aforementioned indicator relating defense expenditures (resource) to GDP (resource). The second indicator is the ratio between the cost of peace operations (resource) and defense financial resources (resource).

Therefore, the composite indicator would be: *"Percentage of defense expenditure / GDP", in relation to the "Percentage of peace operations cost / defense financial resources"*.

If we assume that a nation spends 3% of GDP on defense and the cost of its peace operations represents 6% of its defense budget, the resulting figure for this composite indicator would be: 3% / 6% = 0.50. If the entire defense budget were applied to peace operations, the figure would be: 3% / 100% = 0.03. Therefore, a nation that spends 3% of its GDP on peace operations would have a composite indicator of 0.03.

Another nation spending 1% of GDP on defense and 6% of its defense budget on peace operations, the resulting figure would be: 1% / 6% = 0.17. If the entire defense budget were applied to peace operations, the figure would be: 1% / 100% = 0.01. Therefore, a

[16] BAS CERDÁ, María del Carmen, PhD Thesis: "Estrategias metodológicas para la construcción de indicadores compuestos en la gestión universitaria" ("Methodological strategies for the construction of composite indicators in university management"), Editorial Universitat Politecnica de Valencia, Valencia, enero 2014.

nation spending 1% of its GDP on peace operations would have a composite indicator of 0.01.

As can be seen, regardless of what percentage of GDP is spent on defense, the composite indicator figure with peace operations tends to zero as investment in peace operations increases.

Next, let's compare the defense and peace operations expenditures of the two nations. As we have just seen, a nation spending 3% of GDP on defense and 6% of that spending on peace operations would have a composite indicator of 0.5. Whereas for the nation spending 1% of GDP on defense, the percentage of peace operations spending equivalent to the nation spending 3% of GDP would be: 1% / x% = 0.5. That is, 2%.

This means that the 1% of GDP nation would have to spend 2% of its defense expenditures on peace operations. But, as we have mentioned, this nation spends 6% on peace operations, which is proportionally three times what the 3% GDP nation spends on them. Therefore, if the key indicator is spending on peace operations, it follows that the 1% of GDP defense spending nation spends proportionally three times as much as the 3% of GDP spending nation.

If the target composite indicator were 6% of defense spending, both nations would meet the target. What happens is that the nation that spends 1% of GDP on defense obviously has to spend three times as much in percentage of peace operations spending as the nation that spends 3% of GDP on defense spending.

Consequently, this second composite indicator leads to the conclusion that from the two information provided by the simple indicators *“Percentage of defense expenditure / GDP” and “Percentage of peace operations cost / defense financial resources”* we obtain three pieces of information: the two provided by the two simple indicators plus a third one, the one provided by the composite indicator when combining the two simple indicators.

Finally, just as we have used this composite indicator, this procedure can be applied to obtain many others. Combinatorics, as a branch of mathematics, determines the number of possible ways of grouping simple indicators into composite indicators, starting from the fact that the universe of the sample of those indicators is immense. All this in order to find one or more composite indicators that serve as a benchmark for nations and

that best reflect their contribution in defense spending to the military alliance.

Weighted indicators of defense spending

In the OECD methodology described above, weighting is one of the key aspects to be considered. In this paper, we consider the weighted indicator as a particularly useful type of composite indicator, which will be the third example presented here.

If we continue with the second example about the two nations spending 1% and 3% of GDP on defense, respectively, as well as both spending 6% on peace operations, we could make the following weighting. On the one hand, we set the weighting to 40% for defense spending relative to GDP. On the other hand, we set the weighting at 60% for spending on peace operations. In other words, we consider that the expenditure for the participation of nations in peace operations is more relevant than the expenditure they may apply in general to defense, in the proportion 60/40. The indicators and their results would be expressed as follows:

In the first nation, the weighted indicator would be: (40 % x 1%) + (60 % x 6%) = 0.004 + 0.036 = 0.04.

In the second nation, the weighted indicator would be: (40% x 3%) + (60% x 6%) = 0.012 + 0.036 = 0.048.

In this example, the target indicator that could be set is for the nations to reach the figure 0.045. As can be seen, the second nation exceeds it by three thousandths, while the first nation should, for example, increase 0.05% of GDP in defense spending and 1% of defense spending on peace operations, so that: (40% x 1.05%) + (60% x 7%) = 0.0042 + 0.042 = 0.0462. Thus, the first nation would also exceed the 0.045 target.

From the calculation conducted, the simplicity of the interpretation of the weighted indicator is noteworthy. Naturally, the formula could be complicated with a greater number of variables and with different types of weightings. Thus, if weighted averages with standardized weights are used, the formula and its interpretation become more complicated. However, we refer here to the above example, which, in any case, provides a third information in addition to that which would only be provided individually by the simple indicators of GDP and peace operations. Hence the preference for weighted

composite indicators over simple indicators.

Although composite indicators are more difficult to construct, they nevertheless provide more information and are easier to interpret than a battery of separate indicators, so their use in comparisons of defense expenditures between nations is to be recommended. However, even if they were difficult to interpret, so are the many simple and composite ratios used in the world of finance, but we trust that technicians and specialists will know how to do so and explain them to the layman.

In the military field, the guidelines for drawing up defense expenditure indicators often come from the managerial and political environment, so it is important for managers and representatives to be aware of the advantage of composite indicators over simple ones. The specification is in the hands of multidisciplinary technical teams composed of military, economists, statisticians, etc. from NATO and/or European Union countries. These teams will develop the composite indicators according to the OECD methodology or the one they deem appropriate. At the end, they will offer for approval to the corresponding managers or politicians the indicators they deem appropriate, with which to carry out the comparison of defense expenditures between nations.

Finally, and in another order of things, it is convenient to underline the importance of the control and follow-up of the fulfillment by the nations of the objectives set in the indicators. To this end, in the case of NATO and the European Union, their respective external control bodies should be considered responsible for carrying out the corresponding compliance and operational audits. In NATO, the International Board of Auditors for NATO (IBAN) is the competent body for these and similar tasks[17], while in the EU it is the European Court of Auditors (TCU).

In addition to these bodies, the respective internal control bodies of each nation should carry out a prior advisory task in the elaboration of the indicators and, subsequently, participate in the follow-up of the fulfillment of the target set by the indicators, in collaboration with the external control bodies.

[17] Cfr. CORDERO APARICIO, José María, "Evaluación de las Políticas Militares de la OTAN" ("Evaluation of NATO military policies"), Boletín IEEE nº 23, 2021, pp. 130-145.

Conclusions

The content of the Spanish proverb “every comparison is odious”[18] is intensified if we say that, in addition, the comparison may be unreal and unfair. This happens when the essential aspects that make up the reality of a situation are not contemplated. Moreover, situations are often complex, especially when we move in the field of international relations and, in particular, in the defense expenditures that each nation must allocate to achieve its objectives in the field of defense.

Management indicators are used to measure, evaluate or control a situation, process or performance. There are many types of indicators including simple and composite indicators. The simple indicator that prevails in the defense sector for international comparisons is the percentage of defense spending to GDP. While it has the virtue of simplicity and easy comparability, it has the weakness of not sufficiently reflecting reality.

Management indicators are used to measure, evaluate or control a situation, process or performance. There are many types of indicators, including simple and composite indicators. The simple indicator that prevails in the defense sector for the purposes of international comparisons is the percentage of defense expenditure to GDP. While it has the virtue of simplicity and easy comparability, it has the weakness of not sufficiently reflecting reality.

The simple indicators presented in this paper are those of economy, efficiency and effectiveness. Many examples are given as samples, which gives an idea of the enormous universe of indicators. For both NATO and the European Union, the indicators available to the public are mainly those of economy. It would be desirable for both supranational organizations to make available to the general public indicators of efficiency and effectiveness, confidentiality permitting, that would provide a clearer picture of the resources, outputs, capabilities, outcomes, impacts and objectives relating to the defense spending of member nations, considered individually and as a whole.

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[18] CERVANTES, Miguel de, “El Quijote”, II, 23: “cuente vuesa merced su historia como debe, que ya sabe que toda comparación es odiosa, y, así, no hay para qué comparar a nadie con nadie”.

guidelines for the development of defense expenditure indicators usually come from the political and managerial environment, so it is useful for their representatives to be aware of the advantage of composite indicators over simple ones.

The specification of the indicators will be the responsibility of multidisciplinary technical teams from NATO and/or EU countries. These teams will develop the composite indicators according to the OECD methodology or the one they consider appropriate. At the end, they will propose for approval by the relevant decision-makers or politicians the indicators they consider adequate, for the purpose of comparison of defense expenditures between nations.

Last but not least, the indicators should be previously and subsequently reported and audited by national and supranational internal and external control bodies. This will ensure that the defense spending indicators reflect the true picture of each nation's contribution to the Atlantic Alliance or the European Union, for the purpose of comparison between nations.

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