DEFENSE EXPENDITURE IN EU COUNTRIES

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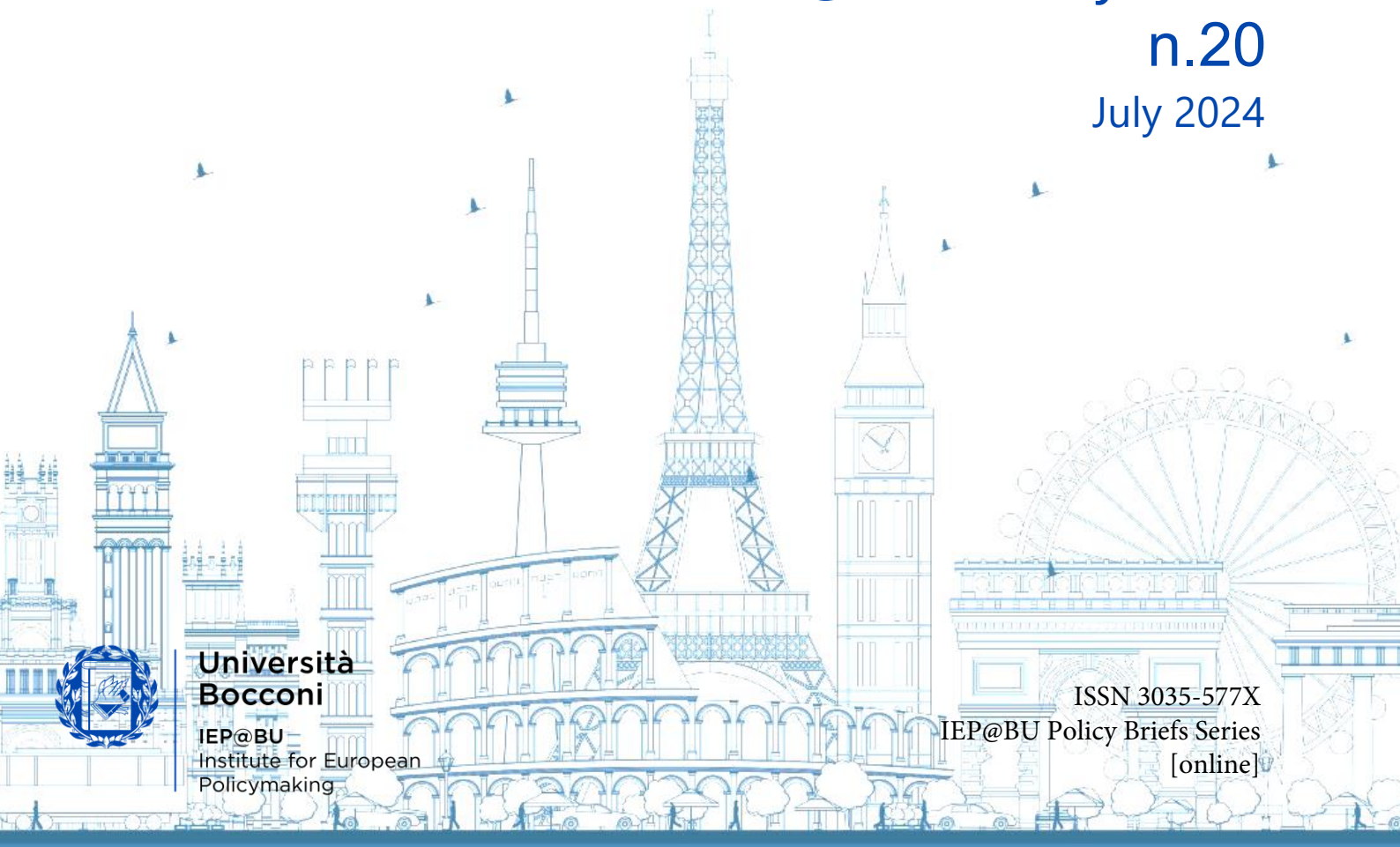

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Introduction[1]

Geopolitical developments have led to an increased interest in defense expenditure among European Union members. This paper reviews:

- the data on defense expenditure in EU members (individually and for the whole area; section 2)
- the composition of expenditure in its three main components (personnel, equipment, and operations; section 3);
- the production of military equipment in EU members and the trade of such equipment with the rest of the world (Section 4);
- the fragmentation of EU defense expenditure and production (section 5)
- the initiatives undertaken to improve the coordination of EU level defense expenditure and production, with very limited success (section 6)
- the potential gains from a unified approach to defense and the obstacles to further integration (section 7)

Section 8 concludes by adding some considerations on the sources of financing additional defense expenditure.

Trends in defense expenditure in the EU [2]

Aggregate defense expenditure in EU members (EU-14) declined rapidly in the aftermath of the fall of the Berlin Wall from 2.6 % of GDP in 1989 to 1.8 % of GDP in 1998 (Figure 1).[3] Thereafter, while broadly stabilizing in billions of euros, expenditure continued to decline as a percentage of GDP.

Things started changing after 2014 reflecting the decisions taken at the Wales NATO Summit of 4-5 September 2014. At that meeting, NATO members formally pledged to meet the defense expenditure target of at least 2% of GDP, confirming an informal and less firm commitment already undertaken in 2006.[4] At the same meeting, members agreed to spend at least 20% of defense

[1] Paper prepared for the Institute for European Policymaking of the Bocconi University (IEP@BU) Conference on *EU Security and Defence* held in Milan on July 3, 2024.
[2] In this paper we focus on NATO definitions and data on defense expenditure (see Data Appendix for details).
[3] These figures refer to the ratio between the aggregate expenditure and the aggregate product of the considered countries. The countries considered in this item are the members of the EU in 1995 without the UK (EU-14) and therefore does not include the eastern end central European states that entered the EU at a later date.
[4] For the Wales NATO meeting see (paragraph 14) of the page NATO - Official text: Wales Summit Declaration issued by NATO Heads of State and Government (2014), 05-Sep.-2014, www.nato.int. In 2006 NATO members had agreed just to "endeavor" to raise defense expenditure to 2% of GDP. On that occasion, the

expenditure on major military equipment (including R&D). The key factor behind the decision to reverse the decline in defense expenditure taken in September 2014 was the Russian invasion of Crimea, as recognized also by observers that definitely cannot be accused of a pro-NATO bias.[5]

Defense expenditure in EU members rose by 50% (net of inflation) between 2015 and 2023, with an increase in the expenditure-to-GDP ratio (Figure 2, referring to the current EU members). The increase involved all EU members, including not NATO members during the period under consideration.

The increase, in general, was slightly larger for the EU members that had a lower level of spending initially (Figure 3, reporting the slightly negative trend line of the spending increase plotted against the initial level of spending as a ratio to GDP).

While sizable in absolute terms, the discussed growth was fairly modest as a ratio to GDP: the aggregate expenditure-to-GDP ratio in the EU-14 rose from less than 1.3 % of GDP in 2015 to an estimated 1.6 % of the EU-14 GDP in 2023 (Fig. 1), thus remaining well below the 2.6 % level at the end of the 1980s. For the EU-27 group the ratio was 1.7%. The unweighted average ratio for EU members was only slightly larger: 1.8% against expenditure ratios of 3.2 % in the United States, 5.9% in Russia and 36.7 % in Ukraine.[6] Definitely, EU member countries have not yet moved towards anything that could remotely be regarded as "war economy", despite the recent resurfacing of this term in the public debate.[7] Indeed, of the 27 EU members only in 8 of them defense expenditures in 2023 reached or exceeded the 2% NATO target, although almost all of them have achieved the (not very ambitious) target of a share of expenditure for military equipment of 20 %, set at the Wales NATO Summit (see Figure 4).

NATO projects a further increase in defense expenditure for 2024: the number of EU members with military expenditure at 2% or above would rise from 8 to 15 (Fig. 5). It is remarkable, although not surprising, that military expenditure ratios are inversely proportional to the distance of a country's border from Russia (Fig. 6).

In 2024, the aggregate military expenditure-to-GDP ratio for EU members would rise from 1.7% in 2023 to 1.9%, with an unweighted average of 2%.[8] Defense expenditure, net of inflation, would rise

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NATO spokesperson underscored the following: "Let me be clear, this is not a hard commitment that they will do it. But it is a commitment to work towards it." (see the press briefing NATO Speech: Briefing by NATO Spokesman - MOD - 8 June 2006,www.nato.int).

[5] See, for example, the contribution by Raul Caruso "*Una difesa comune per l'UE*" (Greenpeace, 2024). In this contribution, Caruso argues (translation is mine): "From a strategic standpoint, [the decision to raise defense expenditure] was more specifically the result of the first moments of the Russian aggression against Ukraine, that is the invasion of Crimea in 2014. Indeed, in the following months the Wales NATO Summit approved a readiness Action Plan together with the so called 2% of GDP NATO rule for defense expenditure." (Greenpeace, 2024, p. 76)

[6] Russia and Ukraine expenditures are SIPRI estimates.

[7] See, for example, Can Europe put itself on the right footing for a war economy? | euronews.com; and EU aims to shift European arms industry to 'war economy mode' | reuters.com.

[8] We have assumed that for the 4 EU countries for which NATO projections are not available the increase in spending would be in line with that of NATO members excluding countries whose increase is particularly high (Czechia and Romania). The average expenditure-to-GDP ratio would not change much assuming instead that non-NATO members of the EU increase their expenditure just as much as needed to keep constant their expenditure-to-GDP ratio.

for all countries except Slovenia. It would be particularly sizable for some countries, such as Germany, where NATO projects an increase of 30% (Figure 5). However, for the moment these are just projections, and, in any case, spending would remain low compared to Cold War levels.

Before proceeding, a clarification is needed. The sizable resources that EU members have allocated to support the defense of Ukraine are not included in the above statistics.[9] According to the Kiel Institute (Trebesch, et al., 2023), the total support provided to Ukraine, in terms of financial, humanitarian, and military aid amounts, so far, to 206.05 billion USD of which military aid represents 52% of the total.[10] Of the total military aid provided 38% comes from EU member states and 50% from the United States. To put these figures in perspective, military aid to Ukraine from the EU and the US has, so far, represented 23% and 30% of the Ukrainian GDP in 2023.[11]

Furthermore, the military aid of EU member states was not only bilateral but also accomplished through the European Peace Facility (EPF) that, according to the European Council, contributed some 11.9 billion USD to the Ukraine war effort.[12]

Composition of defense expenditure

Defense expenditure can be usefully classified into three main components: military equipment and infrastructure (including related R&D), personnel expenditure, and other expenditure, which is mostly operations and maintenance.[13] The logic of this tripartition is obvious: to fight a war you need weapons and people who must be adequately trained and ready to use their weapons. Therefore, an appropriate balance between the three components of defense expenditure is necessary. The distribution of defense expenditure among these three components varies widely across EU members.

In 2023, expenditure for “equipment and infrastructure” ranged from a minimum of 15% for Denmark to a maximum of over 70 % for Luxembourg (Figure 4). This compares to 30.2 % for the United States. As noted, for almost all countries just for equipment expenditure (also shown in Figure 4)

[9] The military expenditure reported in the text includes only countries’ expenditures for their defense and the NATO or EU budget. Support for Ukraine may enter such a statistic only indirectly. For instance, through the substitution of equipment sent as in-kind aid to Ukraine. To date, no estimates of such indirect effects have been released for the public.
[10] The figures are updated to April 2024.
[11] Ukraine GDP was 177 billion USD in 2023, IMF estimates. IMF, World Economic Outlook 2023 (See Appendix I on data for the link).
[12] The facility is an instrument, separated from the EU budget to which member states contribute on the basis of their GNP, see European Peace Facility - Consilium (europa.eu). Note that, according to the Kiel Institute, a large share of the contribution of the EPF is already accounted for as support to Ukraine by the contributing states, and thus the figures of the EPF are not counted separately by the Institute to avoid duplication. See footnote 8, page 18 of the methodology document released by Kiel Institute, (Trebesch, et al., 2023)
[13] Spending for personnel includes also the compensation of civil personnel working in the military sector.

exceeded the NATO 20 % target. However, only in eight EU countries the share of equipment exceeded the share of this item in the United States.[14]

The share of personnel expenditure varies even more broadly across EU members, ranging from a minimum below 20 % in Sweden to over 60 % in Italy and Portugal (Figure 8). Differences in this area depend on the size of the armed forces (including civilian personnel) and on the generosity of salaries and pensions.

The size of the armed forces, scaled by the population of each country, is less dispersed than the share of military expenditure (Figure 9), suggesting that the different levels of compensation also matter. Personnel expenses are typically more subject to internal political pressure than other types of military expenditure.

One can conjecture that in those countries where fiscal discipline is not regarded highly in the scale of social values, and where public employment acts as a social protection tool, may have a larger share of personnel expenditures relative to other forms of defense expenditure.

This is confirmed in Figure 10, where the personnel share is plotted against the public debt-to-GDP ratio: the relation is strongly positive (with a correlation coefficient of 0.60).[15] In the United States, the share of personnel expenditure is 27%: in the EU, the share is below this benchmark just in five countries.

Expenditure for operations and maintenance in EU members is also lower than in The United States in all but four EU members (Figure 11). This is relevant because this item includes the cost of using military equipment, including expenses for training purposes. The gap with the US is particularly strong in this area: some EU countries may have weapons, but these are not used for training.

Altogether, not only defense expenditure in the EU is much lower than in the United States, as a ratio to GDP, but it is also biased towards personnel expenditure, possibly because the latter was used to accommodate social needs to increase spending for public employment (both in terms of numbers and of remuneration) rather than because of actual defense needs. In a world in which technology reigns, having many soldiers who are more poorly armed and trained does not seem ideal.

In this respect, while the number of military personnel as a ratio to the total population is high in the United States compared to Europe (Fig. 9), the real difference lies in the equipment, infrastructure, and operational expenditure level per personnel unit. Such an expenditure is over four times as large as the expenditure of the median EU member (Figure 12).[16] Indeed, it is well above that of any EU member, except Luxembourg, whose army only includes 900 units.

Of course, the higher level of equipment, infrastructure, and operational spending per unit of military personnel is partly explained by the higher per capita income of the United States, but even

[14] The share for the US is 28.7 percent.
[15] The correlation between the share of personnel expenditure and debt-to-GDP ratio persists in a slightly more complicated context where we add a further variable: the distance from the Russian border. For more details see Appendix 2.
[16] The figures reported on the military personnel does not include the number of civil employees, whose compensation is instead included in the expenses for personnel.

correcting for this the expenditure level of the US remains well above that of EU countries except Hungary and Poland (Figure 13). This said, the imbalance related to personnel expenditure is diminishing: 46.2% of the increase in defense expenditure since 2015 is due to expenditure on equipment and infrastructure.

Military equipment: trends in production, imports and exports

On the side of the production of military equipment, the EU defense industry is relatively small if compared to the rest of the economy and, especially, the United States, albeit it rose rapidly during the most recent years. Data provided by the Aerospace and Defense Industries Association of Europe (ASD), covering the 27 EU members plus the UK, Turkey, and Norway, show that employment in the defense sector in 2022 amounted to 516.000 people (0.3% of EU employment), with an over one-third rise with respect to 2014. The turnover was 135 billion euro (of which 41% was for aeronautics, 24% for naval defense 35% for land defense), corresponding to 0.8% of EU GDP.[17]

In addition to some 2,500 SMEs engaged in the defense sector, 17 of the first 100 defense firms are located in the EU, according to the SIPRI database (see Table 1 for the list of the ten largest ones). In 2021, the arms sales for these industries averaged USD 4,491 million, a much smaller size than the US firms included in the same list USD 7,200 million. The largest of these is the Italian Leonardo with sales that amounted to USD 15 billion. This is dwarfed by the size of the largest US arms firm, Lockheed Martin, with sales of USD 65.9 billion.

The limited size of the EU arms industry compared to the United States is also reflected by the relative import and export balance of the EU countries and their share of the global arms industry.[18] In 2021-23 US exports amounted to 38 billion TIV (the unit of measurement used by SIPRI), against 23.6 billion of EU member countries (after netting out intra-EU trade) (Table 2). Yet, with 8.9 billion TIV of imports, the EU is a net exporter of arms, as a result of sizable exports to emerging, developing, and low-income countries. Regarding trade with the United States, EU imports from the US are large and have been rising over the last decade: the share in EU imports from the US increased from about half in 2015 to almost two-thirds in 2023 (Figure 14).

Incidentally, out of some 100 billion of additional military spending introduced or announced since the Ukraine invasion through June 2023, only 22% remained in the European Union (Maulny, 2023).

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[17] See the page Defence (asd-europe.org). It is estimated that ASD members cover 97% of the European aerospace and defense industries.

[18] The following analysis of the imports and exports is based on the data of the "SIPRI Arms Transfers Database" which is the most complete and up-to-date database on arms imports and exports (see SIPRI Arms Transfers Database | SIPRI). One drawback of this source is that data are expressed by "Trend-Indicator Value" (TIV), an ad-hoc index constructed by SIPRI to represent a comparable measure of the volume of arms transfer. Thus, the data cannot be interpreted as expressed in current monetary terms and the difference between exports and imports cannot be interpreted as a standard balance of trade. Nonetheless, it should allow a comparison of the volumes of imports and exports between countries and over, therefore it should be indicative of the sign of the balance of trade and the relative size of imports and exports across countries.

As a reference, the share of imports from the EU out of total US imports was 47% in 2023 but the total US imports were five times smaller than those of the EU.

Fragmentation of defense expenditure and military production

As we have seen, the defense sector in the EU is relatively small compared to the United States, in terms of both spending and production. However, in absolute terms, its size is certainly not trivial. In 2023 the combined military personnel was 1.34 million units, more or less the size of the Russian armed forces (1.32 million units). Spending for defense was some 304 billion, much more than Russia (109 billion US dollars), although it is estimated that the gap in terms of spending reflects to a large extent the different price and salary levels in Russia and the EU: correcting for this spending levels may also be more or less those of Russia.[19]

The real problem is the fragmentation of the defense sector across the 27 EU members. There are at least three dimensions in this fragmentation. The first relates to the complication of coordinating from a combat standpoint 27 different armies. This problem is probably the most important one but discussing it goes beyond the scope of this paper (and the expertise of its authors).

The second problem relates to the fragmentation of procurement activities: purchases are usually made by individual countries rather than in common, which reduces the economies of scale, thus unnecessarily raising costs (or reducing the availability of equipment for the same spending level). The third relates to the fragmentation of production and related activities such as R&D. We focus on the latter two aspects.

Defense spending directly by the European Union is a small fraction (2%) of an already small EU budget (the budget of the Union represents just 1% of EU GDP) and it is for two/thirds allocated to the main four EU member states (Greenpeace, 2024, p. 67). Economies of scale can therefore be achieved through cooperation across member states. Such cooperation is limited.

Procurement is still mostly conducted at the national level, although less so for joint development/production/purchase activities, in the aerospace sector.

The European Defense Agency (EDA; see below) has indicated a non-binding guideline of achieving at least a 35% level for joint “collaborative procurement projects”, but it estimated that in 2020 joint initiatives represented just 11% of total procurement activities, the lowest percentage since 2005, although the share recovered in 2021 (Figure 15) (EDA, 2021, p. 10-11).

The result is a high degree of fragmentation in the equipment of EU members. A 2017 paper by Federica Mogherini (at that time Vice-President and High Representative of the Union for Foreign Affairs and Security Policy) and Jyrki Katainen (then Vice-President for Jobs, Growth, Investment, and Competitiveness) estimated that in the EU (which then included also the United Kingdom) there 178 different types of military equipment, against just 30 in the United States, of which 17 different

[19] See The Economist (2024), p. 16.

types of main battle tanks, against 1 in the US, 29 types of destroyers/frigates, against 4 in the US, 20 types of fighter planes, against 6 in the US (European Commission, 2017, p. 9).

There are of course exceptions to this fragmentation. For example, in January 2024 Germany, the Netherlands, Romania, and Spain ordered together 1,000 of the missiles used in the Patriot air defense system, at lower prices (The Economist, 2024). But these remain, indeed, exceptions, which, anyway, involve only a handful of countries.

On the production side, the size of EU military firms is hampered by two factors with respect to the US. First, the US spends for equipment more than three times the amount spent by European countries (in 2023 USD 252 billion against USD 71 billion). Thus, the US "national champions" (in the area of military equipment all countries of a certain size prefer to rely on national champions for geopolitical reasons) are fueled by a much larger buyer. Second, expenditure in the EU is fragmented across its 27 members, the largest of which (Germany and France) spend less than 20 billion a year in equipment: thus, their national champions are fueled by much lower purchases than what they would be if the EU countries moved jointly in making purchases. The Commission is responsible for creating a common market also in this area, i.e. a European defense equipment market, or EDEM, but exemptions are routinely allowed for the protection of the nation's essential security interest) (Hartley, 2023, pp. 3-4). As a result, as noted in section 4 above, the size of EU national champions is much smaller than that of US military equipment firms.

Collaboration in aerospace (where costs and potential economies of scale are usually higher) has helped to achieve economies in R&D and production. However, even in this area, little progress has been made recently and there have been some steps back.[20]

In general, cooperation mostly involves a selected group of countries, usually three or four and coordination problems tend to increase with the rise of the number of countries involved (see Table 3).[21] Altogether, the excessive reliance on national champions, benefitting from a "captive market approach" with limited participation to tenders of foreign firms, reduces competitiveness and efficiency.[22]

[20] For example, the new fighter that will replace the Eurofighter Typhoon, which had been realized by cooperation among Germany, Italy, the United Kingdom, and Spain, will no longer involve this group of countries. France, Germany and Spain are working together in the context of the Future Combat Air System, but Italy has not joined the group. The United Kingdom is instead working with Sweden, Italy, and Japan on the Global Combat Air Program for the Tempest fighter (Greenpeace, 2024, p. 105-106).
[21] The last update on the topic is the Italian purchase of the new Rheinmetall MBT platform with a memorandum of understanding setting the participation of the Italian Leonardo (and thus of Italy) in the MGCS program. See Leonardo-Rheinmetall, firmata l'intesa sui carri armati - Il Sole 24 ORE.
[22] (Letta, 2024, p. 70).

The current institutional arrangements to strengthen cooperation in the EU in the defense sector

Currently, three main EU institutions are responsible for common defense and for enhancing the *European Union Defence Technological and Industrial Base* (EDTIB) policy, which, broadly speaking, aims at reducing the fragmentation of procurement and production activities in EU member states. These institutions are:

- The *European Union External Action Service* (EEAS) which formulates *Common Security and Defence Policy* and, in this framework, it coordinates 13 EU structures for EU-relevant civilian and military security matters. The institution is directed by the High Representative of the EU for Foreign Affairs and Security Policy/ Vice President of the European Commission (Josep Borrell during the 2019-24 Von der Leyen European Commission) who adopts the acts drafted by EEAS. Among other things, the EEAS is responsible for the Strategic Compass, a set of objectives to enhance EU defense by 2030.
- The *European Defence Agency* (EDA) is one of the structures coordinated by the EEAS to support the development of defense capabilities and military cooperation between member states. The agency is headed by the High Representative of the Union. EDA acts as a facilitator, in particular in relation to research and technology development, equipment procurement, and training. From 2017 it identifies the potential space of improvement for EU defense to strengthen intergovernmental planning and priority definition. It does so by producing a set of reports such as the *Long Term Review*, the *Coordinated Annual Review of Defense*, and the *Capability Development Plan*.
- The *Directorate General for Defence Industry and Space* (DG-EDIS) is a European Commission directorate responsible for the industrial aspects of common defense policy, thus being responsible for industrial strategy and its funding.

A fourth Institution that operates to improve EU member states R&D development in defense is the Permanent Structured Cooperation (PESCO). This institution is based on a treaty among participating EU members, and thus, technically, is not an EU institution, although it strictly cooperates with them since its Secretariat is composed of the EEAS and EDA. PESCO currently coordinates 68 projects.

In principle, these bodies are responsible for several initiatives. The most relevant ones are the *Strategic Compass for Security and Defence Policy*, the *EU Defence Industrial Strategy* (EDIS), and the *European Defence Fund* (EDF). These initiatives aim at compensating for the defense gap identified over time by the EDA reports, by the *European Defence Action Plan* (European Commission, 2016) and more recently by the Strategic Compass. Objectives recently defined in the EDIS include achieving a value of intra-EU defense trade of 35% of the value of the defense market, 50% of defense procurement to be produced internally to the EU (60% by 2035), and 40 % of the defense investment to be procured collaboratively by member states.

In practice, while the objectives and the period, of 2030, are well defined, what is missing is a clear implementation program supported by enough resources. For instance, the EDF set up to support R&D in defense (which has often operated in financing PESCO projects) amounts to just 8 billion euros in the EU 2021-27 budgetary cycle. To gather further funding the European Investment Bank

is being involved in the backing of the defense sector, while at the same time, new initiatives are underway to gather resources from the private sector.[23]

In general, the size of the above-mentioned institutions in terms of resources (personnel and funding) is quite small (Table 4). All in all, in the assessment of Hartley the initiatives undertaken so far to strengthen common defense in the European Union amount to "lots of fine words … with little operational significance The European Defense Action Plan offers a blueprint for future action but promises need to be converted to real action…" (Hartley, 2023).

Estimates of potential savings and obstacles to further integration

Given the fragmentation of defense expenditure and production in the EU, initiatives to aggregate demand and supply may lead to sizable savings, or to a more effective defense for the same amount of spending. In principle, this can occur through different channels:

(i) The most ambitious would imply the formation of joint European armed forces to replace existing national ones in full or at least to some extent. This would require assuming that war among current EU members is no longer possible, which, indeed, was the assumption at the basis of the failed attempt in the early 1950s to create a *European Defence Community* (based on the so-called Pleven Plan) with multinational divisions, the same uniform, the same weapons, and budget.[24] This approach would also allow the economies of scale listed below, but, in addition, would also allow a reduction in the needed military personnel and infrastructures because the borders that need to be defended would be the EU borders and not the intra-EU ones. More specifically, smaller armed forces would be needed to face what is now perceived as the main threat to EU security, namely Russia. The size of the armed forces needed would likely be smaller than the sum of the national defense forces of EU members, which, at least in principle, should be ready to face threats from everywhere, including other EU members.

(ii) Savings from a single army would arise from the elimination of duplications of command, coordination, and control activities arising in the presence of 27 different armies.

(iii) A third source of savings would come from joint procurement activities (simply because of lower prices arising from larger purchases, to bring these to a level comparable with that of the United States) and from the related reduction of different models of weapons (e.g. the 17 different types of tanks mentioned above, each one requiring specific maintenance and training programs).

[23] One of these new initiatives is for instance the Defense Equity Facility of the European Investment Fund. See Defence Equity Facility (europa.eu).
[24] See SHAPE History | that a 1952 treaty created a European Army within NATO

(iv) Finally, savings and efficiency gains would arise in the production size through the merger of EU firms producing military equipment or, at least, for the more regular use of consortium projects for R&D activities.

Different estimates exist on the savings arising from some of these channels. Unfortunately, they all face significant problems, including being based on "heroic assumptions" and not distinguishing between savings related to general efficiency gains and savings truly arising from joint initiatives.

A good example of these two problems is the estimate of savings reported by Briani (Briani, 2013), which seems to be the basis for frequent later claims that savings from better integration could exceed 100 billion euros.

This study is, in turn, based on a 2005 paper by the US company Unisys, which starts from earlier estimates made by the Belgian think tank "*Institut royal superior de defense*". This think tank concluded that the operational capacity of EU member countries 'armed forces is just 10% of the capacity of the United States, which is blamed fully on the fragmentation of the European armies. Thus, the result that was then achieved in Europe by a total cost of 173 billion dollars could be achieved by spending just 10% of the US defense expenditure, which at that time was 382 billion dollars, i.e. 38 billion.

The savings would therefore be 135 billion dollars. Despite the obvious shortcomings in this approach, the results have been widely quoted as upper estimates of the savings from replacing the national EU armies with a single European army (Ballester, 2013).[25]

Several papers, reporting estimates of savings from European joint defense initiatives, have been published over time by the Value Added Unit of the European Parliament Research Service (EPRS). Two relatively recent reports are worth quoting.

A 2019 EPRS paper (Del Monte, et al., 2019), coordinated by Anthony Teasdale concluded that annual savings would amount to about 22.1 billion euros (0.2 of EU GDP). It is based on three main estimates. First, an estimate of savings of 6,5 billion euros in the cost of personnel coming from a 2013 study of the German think tank Bertelsmann Stiftung, also quoted in a previous EPRS paper (Ballester, 2013, p. 22). This paper concluded that through better coordination of EU land forces (not further specified) it would be possible to save some 300.000 units.[26] Second, an estimate of saving of 7.4 billion in equipment expenditure, which, however, does not seem to be clearly justified.[27] Third,

[25] Later papers also refer generally to estimates of savings exceeding 100 billion a year (Letta, 2024, p. 73), referring to a report released by the European Parliament) and a recent European Commission discussion paper (Cepparulo & Pasimeni, 2024, p. 5) (without any indication of a specific source). We could not find any estimate as high as 100 billion or more other than the Briani and Ballister papers. Late papers seem to bounce back this same number, in spite of the obvious shortcomings.

[26] The 6.5 billion were at 2011 prices. Nevertheless (Del Monte, et al., 2019) still reports the same figure, which should therefore be regarded as an underestimation. The Bertelsmann Stiftung paper can be found at the link The European Added Value of EU Spending. This includes various estimates, including the 6.5 reported in the text.

[27] (Del Monte, et al., 2019, p. 219-22) argues that the EU budget includes spending 2.5 billion for the European Defense Fund. This corresponds to about 5% of the 50 billion spent on investment and infrastructure by member states. The paper argues that this percentage can be raised to 15% leading to cost reductions in the long run of 7.4 billion. This reasoning is faulty in two respects. First, the expenditure in the EU budget (2.5

an estimate of saving of 8.5 billion euros from better procurement practices for non-equipment material (which includes operational and maintenance, i.e. purchases of fuel, ammunition, civilian vehicles, etc.). This estimate is based on a 2017 McKinsey paper (McKinsey, 2017), which, however, has little to do with joint defense activities in the EU: it simply reports how much, in McKinsey's view, can be saved by national states through better procurement practices.[28]

Finally, a 2020 EPRS paper (Saulnier , et al., 2020) reports estimates based on the Data Envelopment Analysis (DEA) technique in which efficiency gains in public spending of various spending units (e.g. different countries) are estimated by drawing an efficiency frontier that is based on the relationship between input and output of the best performers. The efficiency gains are then estimated as the cost reduction that could be achieved by moving all units to the efficiency frontier.[29]

Applying this methodology to the defense sector faces huge problems, including because the output of the defense sector is almost impossible to measure.[30] Eventually, the authors use as input total defense expenditure and as output the number of readily deployable troops. In this way, they conclude that the annual savings arising from the introduction of common EU defense spending would amount to some 32 billion euro (0.2% of EU GDP) and that almost all countries would experience economies of scale.[31]

This approach is highly unsatisfactory for several reasons. First, the "output" indicator (the number of deployable troops) does not say much about the fighting capability of an army, especially in today's world in which technology is of paramount importance: Paradoxically the indicator implies that an increase in spending to provide better equipment to the deployable troops would reduce efficiency.

Second, the study finds that large countries do not show economies of scale (France even has a diseconomy of scale). This implies that smaller EU members would benefit from pooling their resources only as long as their pooled resources do not exceed those of, say, Italy, beyond which diseconomies of scale would arise: not a very convincing argument in favor of a single EU army. Third, the authors attribute all efficiency savings to economies of scale but without justification for such a conclusion.

In sum, the available estimate of the savings arising from joint defense initiatives, better coordination of defense expenditure, or the creation of European armed forces that replace at least in part national armed forces are problematic in various respects and definitely more work in this area would be

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billion to be raised to 7.4 billion) is not a net saving for the EU but simply a transfer from defense spending by member states to centralized spending. Second, if anything, the additional "saving" with respect to the initial situation would be just 4.9 billion (the difference between 7.4 and the initial 2.5 billion).

[28] Indeed, they quote Israel as a relevant case study. An earlier McKinsey paper (Dowdy, Scherf, & van Sintern, 2013) estimates that spending for equipment can be reduced by some 31% (13 billion at that time) by increasing the size of defense orders by 570%, to bring them to the average size in the United States. However, this estimate is simply based on McKinsey's "analysis and experience", without further specification.

[29] See, for example (Bowlin, 1998).

[30] See (Hartley & Solomon, 2015), (Smith, 2024) and the UK government article on the blog page: Measuring Defence productivity: a first step| blog.gov.uk

[31] The authors also run a second exercise in which the input is the expenditure for procurement of defense equipment and the output is R&D expenditure, with an estimated saving of 13 billion. The critique here presented for the first exercise also applies to this second one,

needed. There are also clear differences in potential savings depending on the extent of integration that EU member states want to achieve and, especially, on whether such integration would lead to a reduction in the number of military personnel, once it is accepted that war among EU member states is no longer a concrete possibility. Nevertheless, the amount of savings would rise with the degree of integration through the four channels listed at the beginning of this section. Incidentally, none of the above estimates focuses explicitly on the savings arising in the production size if EU firms producing defense equipment reached a size comparable with that of the United States.

Nonetheless, several obstacles to further integration remain, and these are beyond the still limited initiatives listed in this section. As noted by (Hartley, 2023, p. 8) even joint initiatives are marred by the dominance of national interests: work is shared based on politics rather than economic efficiency; each partner will want its share of high technology work; each will demand, for example, a national flight testing center and a national final assembly line; and each will require a role in procurement.

The larger the number of EU nations involved in joint projects, the more these issues come at the expense of economic efficiency and savings. There are also problems from different languages, tactics, funding, training, as well as free riding, each country benefitting from defense spending from other EU members (Hartley, 2023, p. 10). Another obstacle is the existence of differences in defense strategies and priorities: “France wants carrier-capable jets and lighter armored vehicles; Germany prefers longer-range aircrafts and heavier tanks” (The Economist (2024)).

The bottom line, however, is political. Again, in Hartley’s words:

“Europe remains a collection of sovereign nation states, each valuing its independence. European collective military action solutions need to address the independence issue. The EU will never achieve its economic potential in defense if it continues to ignore the absence of a European level political federation structure.” (Hartley, 2023, p. 10).

On the positive side, one can hope that the changed geopolitical landscape will provide the stimulus for a paradigmatic change.[32] Perhaps, the progress will be faster on the production side sector: mergers of European defense firms have increased in recent years, under the competitive pressure of US firms (Hartley, 2023, p. 9).

Conclusions and some remarks on the sources of financing of additional defense expenditures in Europe

This paper has highlighted several key problems that hamper the effectiveness of defense expenditure in EU member states and cast serious doubts on their ability to respond to external threats without the intervention of the United States. In particular:

- The level of spending, while rising as a ratio to GDP since 2015, is still well below the levels at the end of the Cold War, not to mention the comparison with the level of spending in the United

[32] See A guide for action (europa.eu).

States. Expenses are also very different across EU members, higher for those close to Russia, for obvious reasons.

- Overall spending is not small compared with that of Russia alone. However, there are severe problems in terms of the composition of spending and its fragmentation, which imply lower effectiveness for the same amount devoted.
- The composition of spending is largely biased toward personnel compensation rather than equipment, infrastructure, operations, and maintenance. Indeed, the expense level for these items per unit of personnel is much lower than in the United States. European armed forces not only are much smaller, in terms of soldiers, than the US armed forces, but are also less well equipped. Per capita expenditure is particularly low for operations and maintenance, including training. In other words, even when equipment is available, soldiers may not be trained to use it.
- On the production side, the EU defense sector is small compared to the size of the whole economy and when compared to the US. This is true also at the level of individual military equipment firms, consequently reducing economies of scale on the production side.
- Europe is also much more dependent on imports from the US than the US is dependent on imports from the EU. Such a dependence has been rising since 2014.
- On the demand side, procurement is fragmented, leading to higher costs, and an excessive number of types of equipment. This fragmentation and excessive reliance on national champions also reduces competition and efficiency.

EU targets to overcome these problems do exist but have not been backed up by concrete decisions and money. If these problems could be overcome, there are likely to be sizable savings or, alternatively, much stronger effectiveness given the current level of spending. This is particularly true for more intense forms of cooperation, up to the possibility of having, at least incrementally in the future, joint armed forces. This said, much more work would be needed to quantify the potential savings from joint defense initiatives. The available estimates quoted by several papers, ranging from 25 to 100 billion, are not at all reliable.

Unfortunately, there remain huge problems in strengthening coordination in defense, including different languages, tactics, funding, training, free riding, and the existence of differences in defense strategies and priorities across EU members. However, by far, the main problem remains the dominance of national interests, as Europe remains a collection of sovereign nation states, with limited trust for each other.

One should hope that, at least in incremental terms, joint initiatives will now prevail, given the need to enhance the effectiveness of defense capabilities, although the strengthening of nationalistic parties throughout Europe does not bode well in this respect.

In any case, there seems to be broad agreement that, notwithstanding the desirable improvement of joint initiatives, enhancing defense capabilities in Europe will also require additional spending, which leaves one last topic to be discussed, namely how such additional spending should be financed.

Many have called for the use of common sources of borrowing including Eurobonds, as argued, for example, by Kaja Kallas, backed up by Macron, possibly through the intermediation of the European Stability Mechanism (as suggested by Enrico Letta). There are definitely advantages to common borrowing, including making it more likely that this common borrowing will fuel joint spending initiatives. However, one should always keep in mind that borrowing resources for defense spending

does not imply that that spending comes at no costs, i.e. without implying that there is a need to choose between “butter or guns”.

Indeed, unless military equipment is provided from abroad (which is something that would further increase the dependence of Europe on the United States) real resources, in terms of workers, will have to be moved from the production of non-military equipment to military equipment one. This is true unless we assume that: (i) there is unemployment that can be reduced only by raising military spending so that total output can be raised, which is unlikely to be the case in the long run; or (ii) financing spending through debt has a positive effect on the long term growth rate of the economy, which is at least debatable, unless the level of public debt is quite low.

Financing the additional spending needs through borrowing (either jointly or at the national level) may be easier from a political perspective, at least in countries that are not too concerned about the level of public debt but, from an economic standpoint, it is not a panacea.

Lastly, military spending is by large composed of current spending, making the case for financing it through borrowing definitely weaker. Even the rationale to finance standard investment spending by borrowing, namely the fact that investment spending increases potential income, does not really apply to most military equipment and infrastructure spending, except for its R&D component.

Appendix 1 - Data

The data used in this paper come from the NATO database and follow NATO definitions unless otherwise indicated.[33] The advantage of using this database is that the data reflect harmonized definitions that more closely approximate the expenditure that impacts the defense capabilities of EU members. National definitions reporting allocations to the Ministry of Defense sometimes include items that have little to do with the defense of national borders and exclude items that, instead, do relate to defense capabilities. In particular, NATO: (i) excludes from its definitions of military spending most of the cost of militarized police (as in the case of Carabinieri for Italy, Gendarmerie Nationale for France, and Guardia Civil for Spain) and (ii) includes expenditure for military equipment and R&D often included in the budget of ministries different from the defense ministry. Unfortunately, NATO definitions also include the cost of pensions for military personnel, which does not impact a country's defense capabilities.[34]

This said the NATO data are not fully consistent over time. More specifically: data for Bulgaria and the United States include pension expenditure only, respectively from 2013 and 2006; data for Greece, Hungary, and Portugal exclude expenditure for militarized police only from 2002, Italy from 2007, Luxemburg from 2008, and France from 2009.

NATO relies on the provision of data from EU members that, in turn, follow in the recording of the data on defense expenditure following the ESA 2010 manual. In this respect, regarding the timing of the recording of equipment expenditure, ESA 2010 (point 20.191) prescribes the following:
"The time of recording of asset acquisition is the time of the transfer of the ownership of the asset. In the case of long-term contracts involving complex systems, the time of recording of the transfer of assets should be upon actual delivery of the assets, not the time of cash payments. If some long-term contracts cover in addition the provision of services, government expenditure should be recorded at the time of the provision of services, recorded separately from the provision of assets."

This means that increases in equipment expenditure in a certain year may be affected by the bunching of certain deliveries (e.g. the delivery of expensive F35s, each costing some $110 million) based on past decisions rather than on taken budgetary decisions related to that year.[35]

SIPRI data are used for the countries that are not part of NATO or were not members for a part of the considered period. SIPRI is also the source for data on global arms transfers taken from the Arms Transfer Database and for figures on the arms industry from the Arms Industry Database.[36] The transfers are not expressed in dollars but in Trend Indicator Values (TIV) (see footnote 18). The

[33] See NATO - News: Defence Expenditure of NATO Countries (2014-2024), 17-Jun.-2024

[34] For more information on the NATO definition of defense expenditure NATO - Topic: Defence expenditures and NATO's 2% guideline

[35] See, on this issue (although referring to the ESA 1995 manual) Bureaucrat's Delight: EU Rules on Military Leases (defense-aerospace.com)

[36] SIPRI databases | SIPRI

value of European Arms export in 2023 is derived from the European External Action Service database.[37] The value of collaborative procurement in the EU is derived from the European Defence Agency database.[38] The GDP and GDP per capita data for the EU and US in dollars are extracted from the International Monetary Fund 2024 World Economic Outlook.[39] This causes minimal discrepancies in the amount of expenditure as a ratio to GDP we computed, and the ones provided by NATO data. All in all, the ratios reported are consistent and similar. Finally, the data on the EU population in 2023 and on the debt to GDP ratio in Europe are derived from the Eurostat database, corresponding in particular to “Population on 1st January” (code: tps00001) and “Government deficit/surplus, debt and associated data” (code: gov_10dd_edpt1) data series.[40]

[37] COARM Public v2.0 - Introduction | Sheet - Qlik Sense (europa.eu)
[38] Defence Data Portal (europa.eu)
[39] World Economic Outlook (WEO) Database (imf.org)
[40] Database - Eurostat (europa.eu)

Appendix 2 – The determinants of the share of personnel over total military spending (regression analysis)

We estimated with OLS of the following model:

$$milex_i = \alpha + \beta d_i + \gamma dis_i + \varepsilon_i$$

where α is a constant, $milex_i$ is the military expenditure for personnel in the country i, d_i is the corresponding public debt-to-GDP ratio, dis_i is the distance between the country i and Russia (measured by the distance between the i country border and the Russian frontier, the distance being zero for countries with a common border with Russia), and ε_i is the error term.[41] The hypothesis underlying the model is that the lower the importance given to fiscal sustainability (i.e. the higher the debt-to-GDP ratio) the higher the share of personnel expenditure: military employment is used, like other spending items, as a social safety net. However, countries that are closer to Russia cannot afford military spending to be affected by clientelism and will have a lower share of personnel spending. We would therefore expect both coefficient β and γ to be positive.

The model is estimated using 2023 cross-section data for the 23 NATO members of the EU. The estimates of the coefficients and related statistics are reported in Table A.1.

[41] The distances used in the regressions were obtained by the web app geodatos.net, "Distance between countries".

Table A.1

Dependent variable: Expenditure for Personnel (as a percentage of total defense budget)	(1)	(2)
Debt-to-GDP ratio	0.16	0,17
	(0.07) **	(0.07) **
Distance from Russia	0.007	0,009
	(0.004)	(0,04) *
Constant	25.53	23.30
	(4.83) ***	(4,38) ***
R-squared	0.42	0.53
R-squared Adj.	0.37	0.48
Observations	23	22
Standard errors in parenthesis		
*p <.1, **p<.05, *** p<.01		

The first column shows the results of an estimate that includes all 23 countries. The fit is fairly good for a cross country regression, with an R-squared of 0.43. Both β and γ are positive, as expected, and the first is significant at the 5% level, while the second one is not significant. However, this is entirely due to the inclusion in the sample of Romania, a country that, in spite of its proximity to Russia, has a very high share of spending for personnel (close to 60%). When Romania is removed (second column) the fit of the estimates and the significance of the “distance from Russia” estimated coefficient improve.

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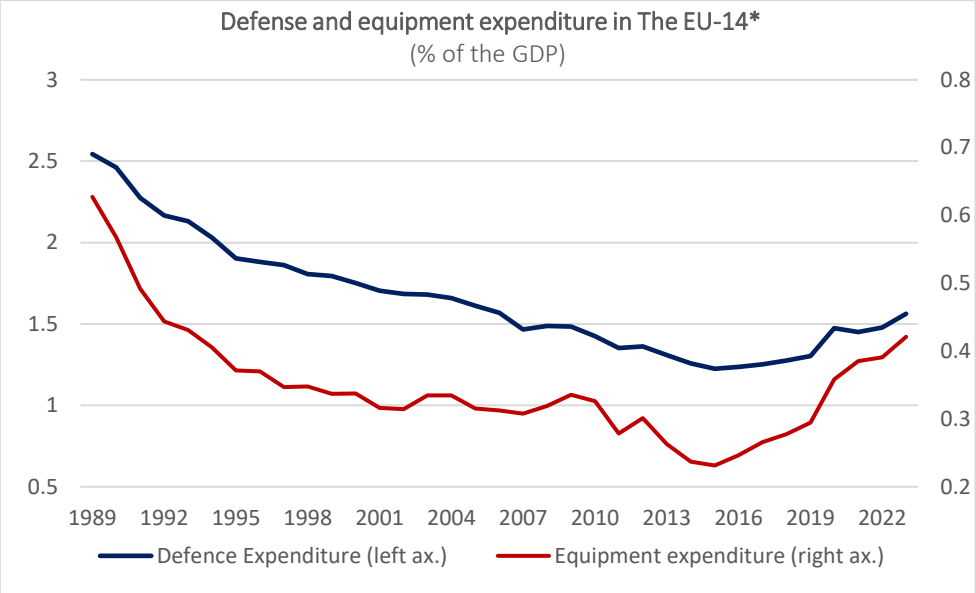
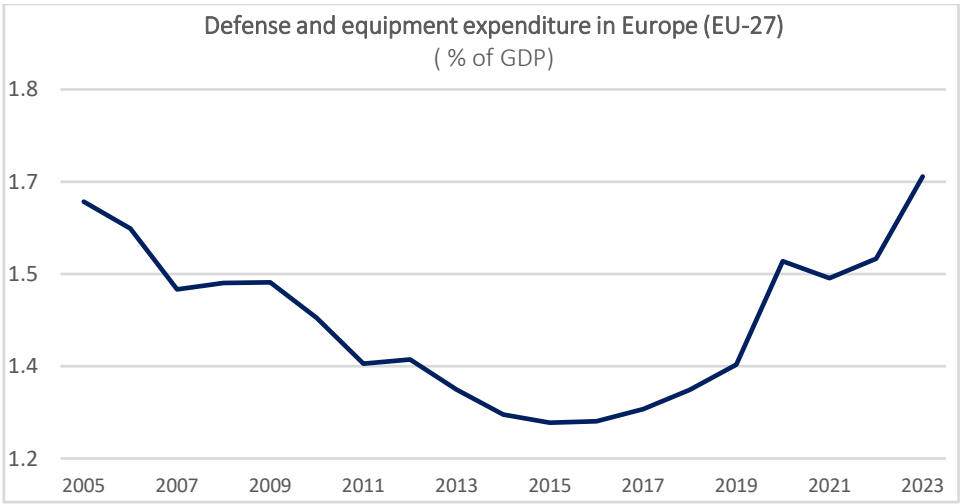
Figure 1



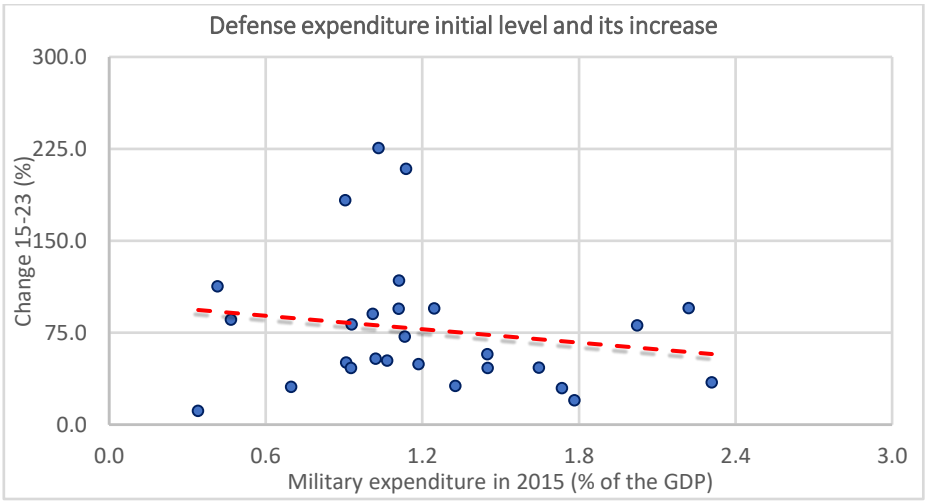
Ratios between the sum of defense expenditures for the EU-14 countries and the sum of EU-14 countries' GDP.
(*) The EU-14 corresponds to the EU members after the 1995 enlargement, without the UK.
(**) Equipment includes infrastructure expenditure; this line does not include Austria, Finland, Ireland, and Sweden in the computations.
Source: NATO, SIPRI, authors calculations

Figure 2



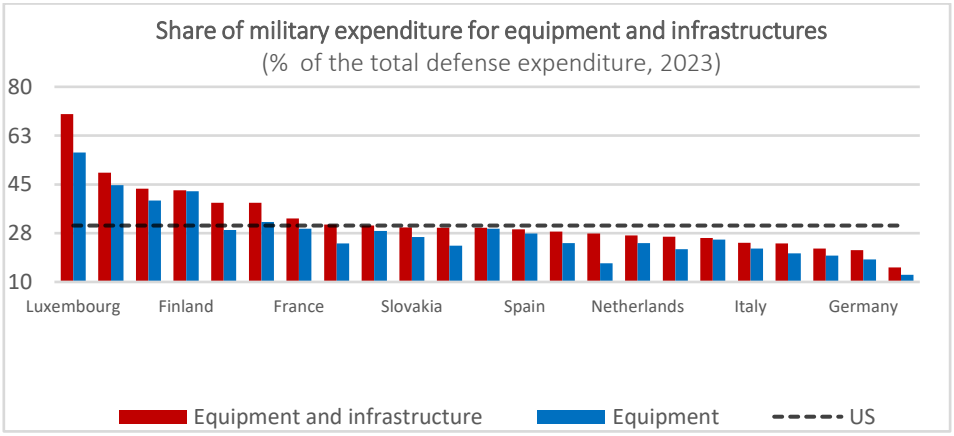
Ratios between the sum of defense expenditures for the EU-27 countries and the sum of EU-27 countries' GDP.
Source: NATO, SIPRI, authors calculations.

Figure 3



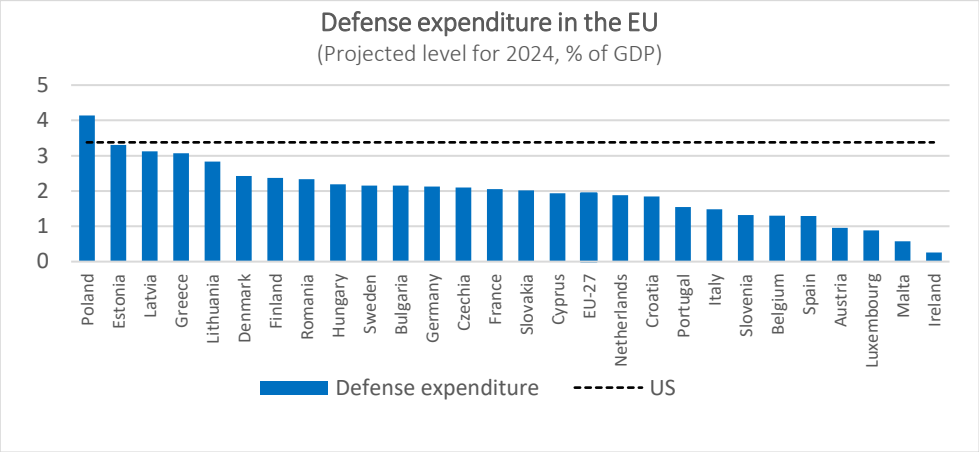
Source: NATO, authors calculations.

Figure 4



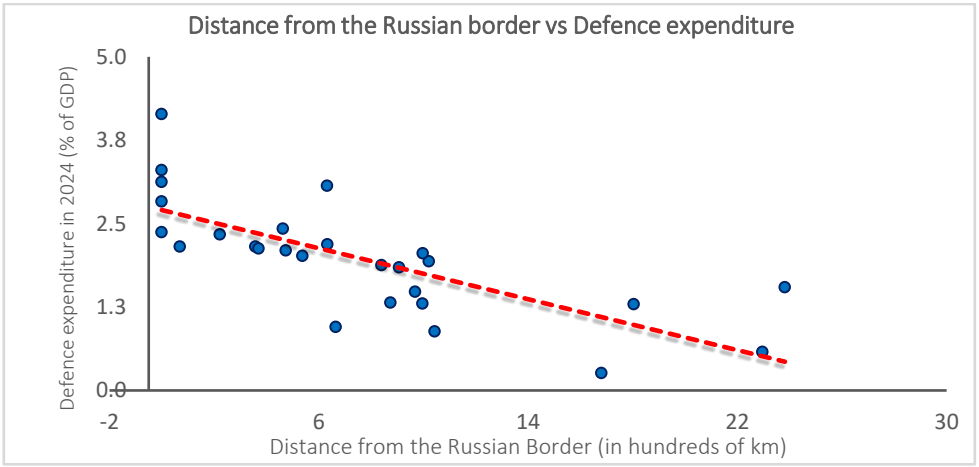
Source: NATO.

Figure 5



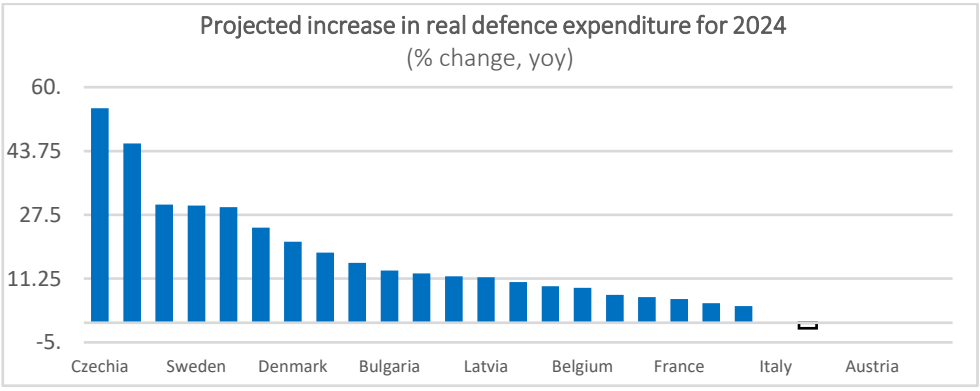
Source: NATO, SIPRI, authors calculations.

Figure 6



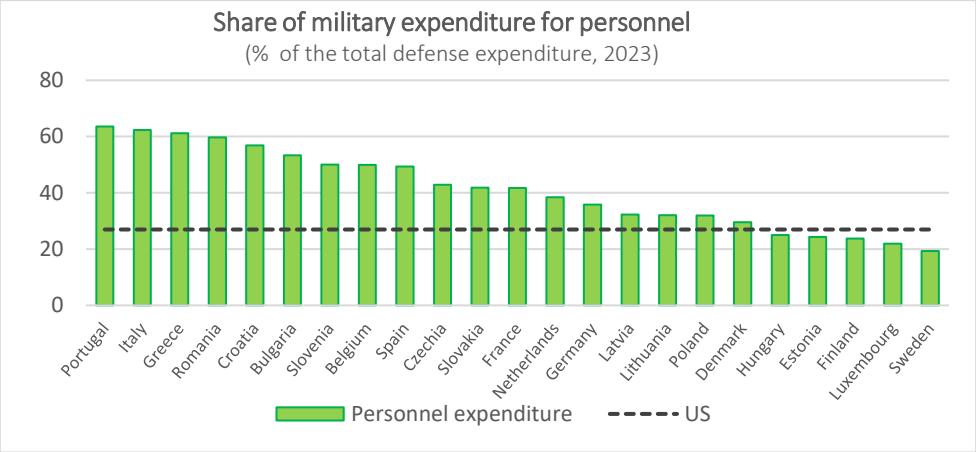
Source: NATO, SIPRI, authors calculations.

Figure 7



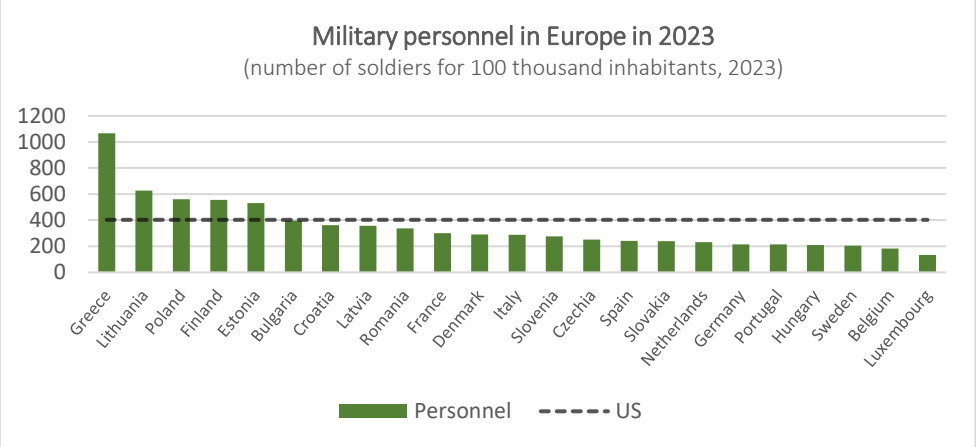
Note: Na is "Not available"
Source: NATO.

Figure 8



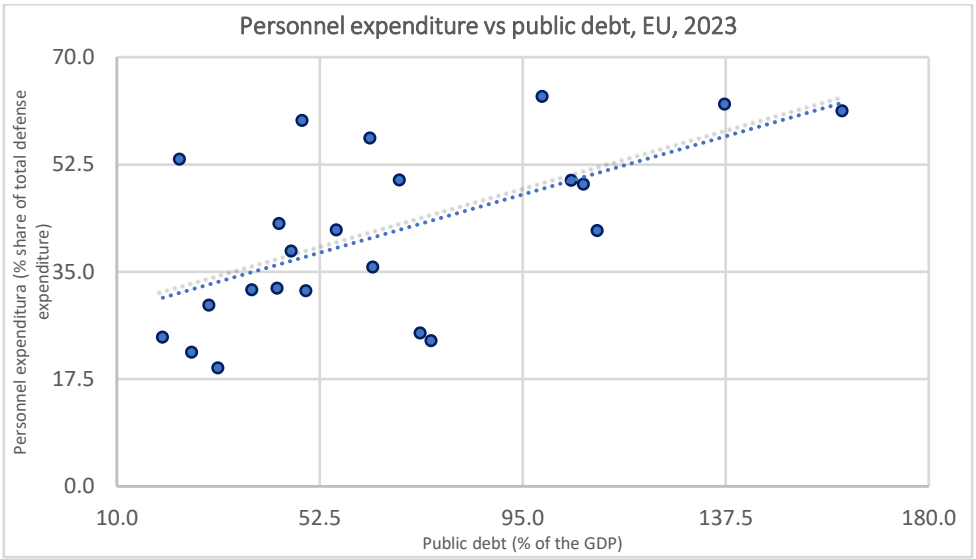
Source: NATO.

Figure 9



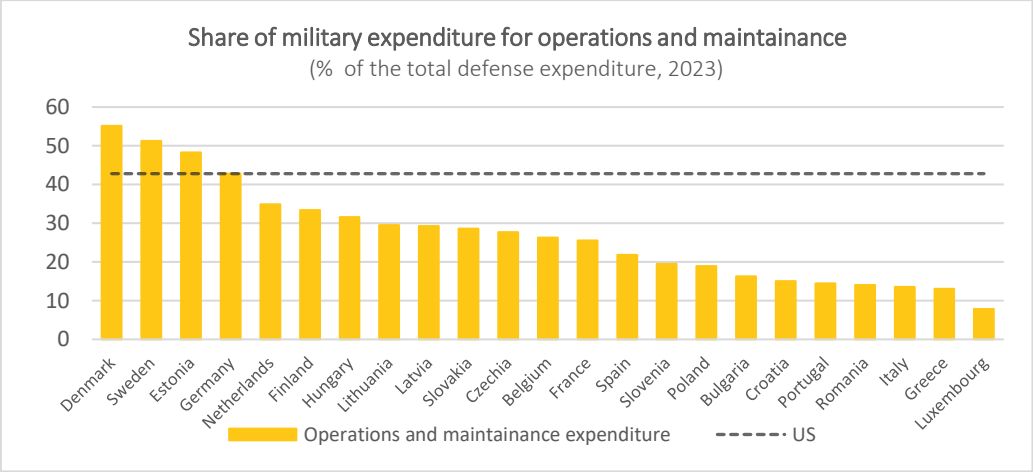
Source: NATO, authors calculations.

Figure 10



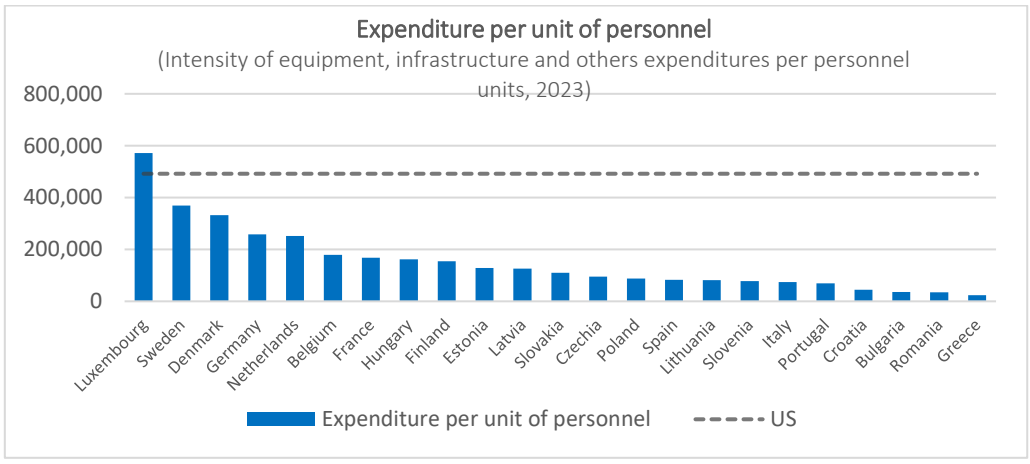
Source: NATO, Eurostat, authors calculations.

Figure 11



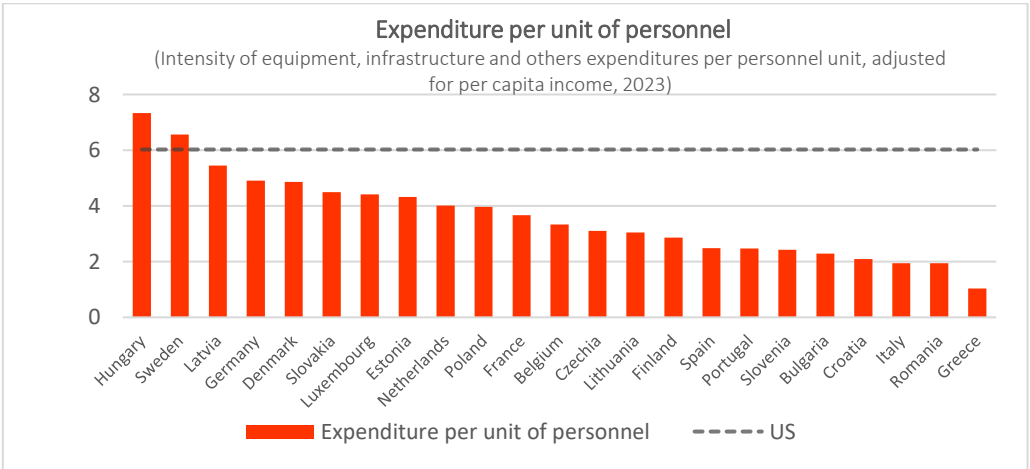
This item also includes R&D not included in the equipment and infrastructure category and other smaller items.
Source: NATO.

Figure 12



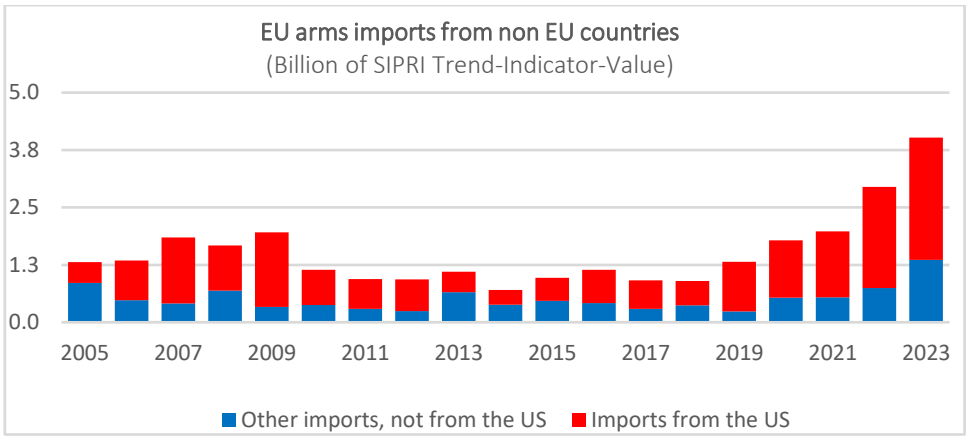
Source: NATO, authors calculations.

Figure 13



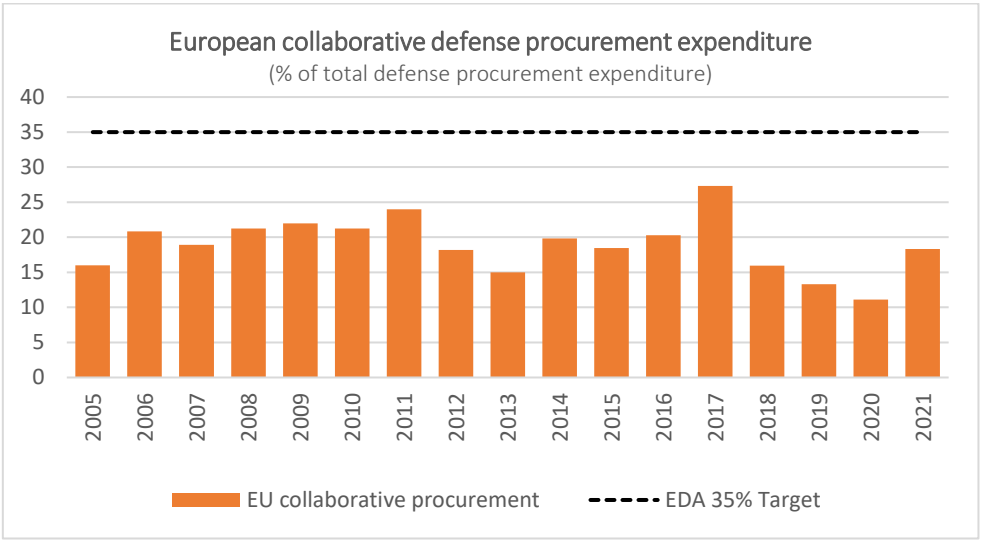
Source: NATO, authors calculations.

Figure 14



Source: SIPRI Arms Transfers Database.

Figure 15



Source: European Defence Agency

Table 1

Top ten arms company in the EU, 2022

Arms company by revenue

Rank in the global top 100	Company	Country	Arm revenue (mln USD)
13	Leonardo	Italy	12470
14	Airbus	Trans-European	12090
17	Thales	France	9420
23	Dassault Aviation Group	France	5070
28	Rheinmetall	Germany	4550
29	Naval Group	France	4530
32	MBDA	Trans-European	4380
34	Safran	France	4200
39	Saab	Sweden	3700
44	KNDS	Trans-European	3200

Source: SIPRI Arms Industry Database

Table 2

Top countries by import and export

Export				Import			
Country	**Volume** (2021-23 in TIV)	**Share of global export** (%)	**Share change** (compared to 2018-20, %)	**Country**	**Volume** (2021-23 in TIV)	**Share of global Import** (%)	**Share change** (compared to 2018-20, %)
United States	37953	11,3	11,3	**EU-27***	8946	95,5	95,5
EU-27*	23626	31,3	31,3	India	7969	-9,9	-9,9
France	9172	1,1	1,1	Qatar	7266	56,3	56,3
Russia	6187	-64,8	-64,8	Ukraine	6847	5008,2	5008,2
China	5825	40,5	40,5	Saudi Arabia	6250	-36,3	-36,3
Germany	5625	51,5	51,5	Pakistan	4630	76,3	76,3
Italy	4803	142,3	142,3	Japan	3784	23,9	23,9

(*) EU-27 data are netted out of intra EU import and export

Source: SIPRI arms Transfers Database

Table 3

European Collaborative Projects

Project	Type	Start Date	Number of Nations	Total Output
Concorde	Supersonic airliner	1962	2: France/UK	20
Euromissile	Milan; Roland; HOT	1962-64	2: France/West Germany	Milan: 360,000 Roland: 23,000 HOT: 70350
Jaguar	Strike aircraft	1965	2: France; UK	543
Anglo-French Helicopter	3 types of helicopter	1965	2: France; UK	Gazelle: 1775; Lynx: 450+; Puma: 697
Alpha Jet	Trainer/ Light attack aircraft	1969	2: France; WG	480
Tornado	Strike/ air defence aircraft	1969	3: Germany; Italy; UK	990
Merlin	Helicopter	1981	2: UK; Italy	180+
Typhon	Strike/air defence	1986	4: Germany; Italy; Spain; UK	571
NH90	Battlefield helicopter	1992	4: France; Germany; Italy; Netherlands	446
Boxer	Armoured vehicle	1993	2: Germany; Netherlands	1062+
Euro Torp	Torpedo	1993	2: France; Italy	NA
Horizon Frigate	Warship	2000	2: France; Italy	4
A400M Atlas	Military transport	2003	7: France; Germany; Spain; UK; Turkey; Belgium; Luxembourg	178
FCAS	Combat aircraft	2018	3: France; Germany; Spain	NA
Tempest	Combat aircraft	2020	4: UK; Italy; Sweden; Japan	NA
MGCS	New Generation Tank and armoured vehicles	2020	2: Germany; France; Italy*	NA

i) NA is not available

ii) Output Figures are approximations update

iii) FCAS is the Future combat air system

iv) MGCS is Main Ground combat system

Source: Hartley, 2020; French ministry of defense

Table 4

European bodies involved in the development EDTIB

EU Body	Description	Budget in 2022 *Euros Mln*	Staff members
EU External Action Service	Body for the Foreign and Security policy of the European union, coordinates 13 structures determining the priorities of EU defense.	786,9	1715
European Defence Agency	Supports the development of common defense capabilities, acting as a facilitator, in particular for joint R&T, procurement and training.	40	180
DG- European Defence Industry and Space	Department of the European Commission developing and carrying out the commission's policies on the defense industry and space.	*3500	281

* The budget for the DG-EDIS refers to an annual fraction of the total budget set for 2021-2027, also relative to the financing of EU space program

Source: European Union