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Research Report

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Bruegel Policy Brief, No. 29/2024

Provided in Cooperation with:

Bruegel, Brussels

Suggested Citation: Mejino-López, Juan; Wolff, Guntram B. (2024) : A European defence industrial strategy in a hostile world, Bruegel Policy Brief, No. 29/2024, Bruegel, Brussels

This Version is available at:

<https://hdl.handle.net/10419/322554>

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A European defence industrial strategy in a hostile world

Juan Mejino-Lopez and Guntram Wolff

Executive summary

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RUSSIA'S ILLEGAL INVASION of Ukraine has brought war back to Europe. Failing to stop Russia's aggression would leave Europe at a critical disadvantage for decades, with a long-term threat to peace in the European Union. The EU can no longer rely on United States leadership in NATO and European countries therefore need to rapidly build-up their military capabilities.

EUROPEAN COUNTRIES HAVE INCREASED the amounts spent on defence considerably in recent years but the underinvestment of previous decades means that gaps still exist. While the EU as a whole fulfils the 2% NATO target, 7 EU NATO countries still fall short of reaching it.

THE EUROPEAN DEFENCE market remains fragmented. The lack of joint procurement and national preferences for defence spending translate into small markets with low production numbers. We provide evidence of the cost of no EU single market for selected defence products: Low production numbers are a major reason for relatively high costs per unit of production.

EUROPEAN COUNTRIES SHOULD WORK with the incoming EU defence commissioner to develop a cost-effective rearmament strategy. Countries pursuing goals individually would be ineffective. While EU defence industrial policy is constrained by institutional, political and practical problems, there are significant opportunities. A more integrated market for defence products would lead to greater economies of scale, resulting in lower prices and more defence readiness. Europe should aim at greater market integration for defence rather than at protecting smaller national markets.

ADDRESSING THE CURRENT SECURITY concerns will require both EU and national large funding, easily €500 billion in the next five years, for which budget prioritisation as well as European and national debt will be needed.

THE EUROPEAN DEFENCE STRATEGY should account for comparative advantages and disadvantages, which means that purchases of weapons from outside the EU are warranted and rational, especially when the security of supply and interoperability are guaranteed. Yet local purchases, i.e. some European preference, to boost industrial capabilities and innovation are critical to reinforce strategic autonomy and avoid falling behind on military technology.

Recommended citation

Mejino-Lopez, J. and G. Wolff (2024) 'A European defence industrial strategy in a hostile world', *Policy Brief* 29/2024, Bruegel

Even in a scenario of a settlement with Ukraine, Russia's military build-up will accelerate as the loss of weapon systems on the battlefield declines

1 Introduction

War has returned to Europe. As there is no clear end in sight to the war in Ukraine, the question of armaments has become of central importance. Failing to deter Russia, or to support Ukraine adequately, would leave Europe at a major strategic disadvantage for decades to come. The challenge is multi-dimensional. Any strategy will need to take account of evolving Russian capacities, evolving political willingness and evolving defence industrial capacities.

Wolff *et al* (2024) showed that Russian military industrial capacities have increased significantly in the last two years. Production of key weapon systems now exceeds the levels of Russian material losses in Ukraine. The United States's top general in Europe has estimated that Russian military production outpaces that of the combined West (Cavoli, 2024). For example, he estimated that Russia now produces and refurbishes more than 1000 tanks per year, a number far larger than Western production. Wolff *et al* (2024) even found production numbers of up to 1500 tanks per year in Russia. Cavoli also estimated that Russia now has substantially more capacity than at the beginning of the war in 2022, despite the substantial Russian losses.

To achieve this massive production increase, Russia has systematically increased its spending on armaments. Russia now spends 30 percent of its budget on defence, rising to 40 percent if domestic security costs are factored in. Spending is now estimated to be above \$120 billion per year. In purchasing power parity terms, this spending is substantially larger (see below). Some macroeconomic pressure is building on the Russian economy, with inflation and the real interest rate rising but, at the time of writing, it appears unlikely that Russia will not be able to continue to fund its war efforts.

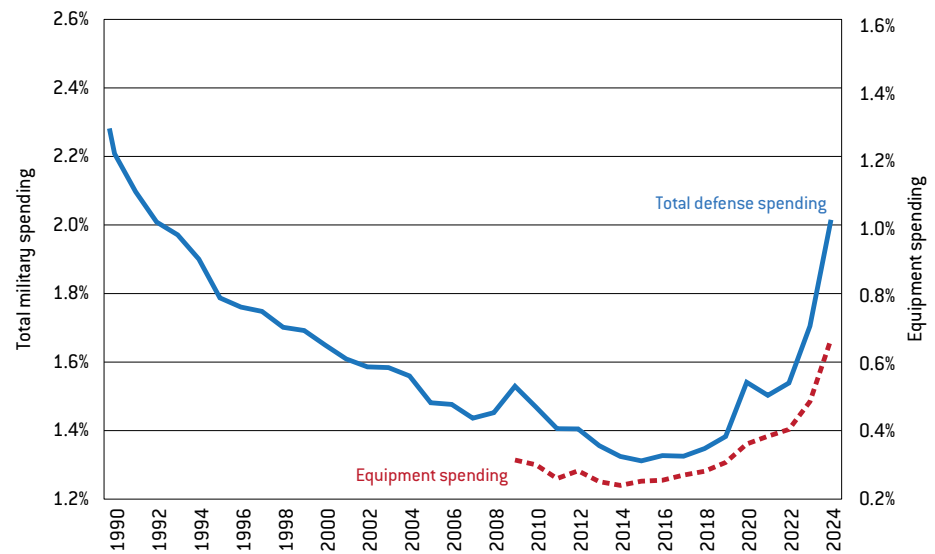
Importantly, even in a scenario of a settlement between Russia and Ukraine, assuming Russian industry continues to churn out materiel at current rates, the military build-up will accelerate massively as the loss of weapon systems on the battlefield declines. Wolff *et al* (2024) estimated that current production rates in Russia are high enough to build-up a full army the size of the German Bundeswehr in six to twelve months. In many ways, an arms race similar to or worse than that of the Cold War appears a possibility.

Europe is thus in a sort of race with Russia. Four factors will be decisive: the available resources, the political determination to produce weapons and ammunition quickly and in sufficient quantities, the costs and, finally, the necessary modernisation of weapons systems and military doctrine.

While Europe and the combined West in principle have the resources to outperform Russia because of their larger GDP, the mobilisation of fiscal resources and the commitment to do so on a longer-term basis still lag. European defence spending has increased substantially in the last few years but after years of under-investment it will take time for production capacities to be brought online and for stocks to increase again.

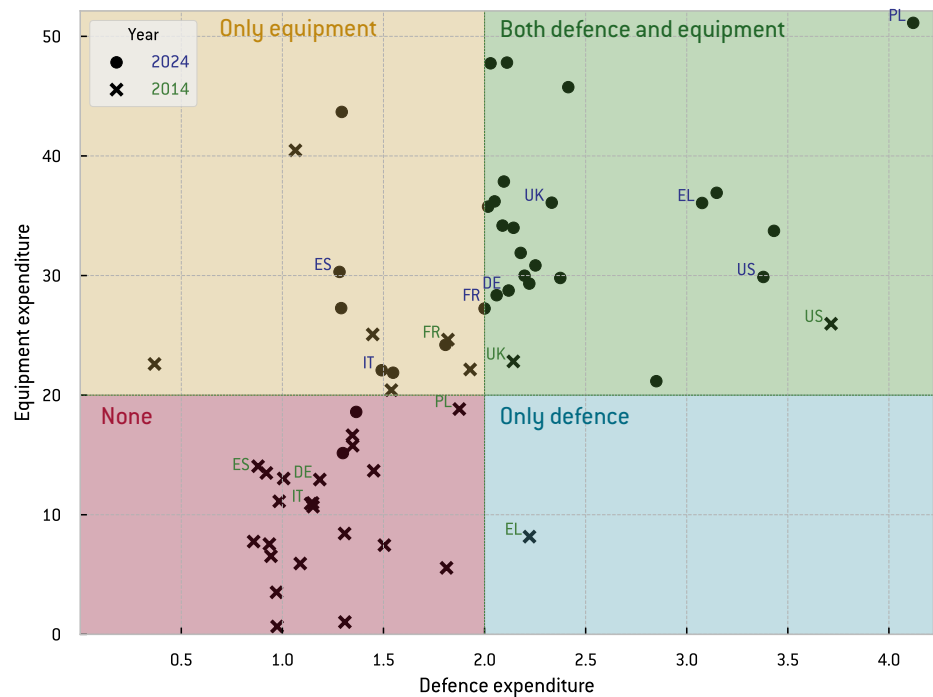
Figure 1 shows European Union defence spending (including personnel, operational and military equipment spending) and spending on military equipment. With falling defence spending, budgets for equipment spending became extremely small, with on average only 0.3 percent of GDP dedicated to it. For many years, Germany in particular invested only a very small proportion of its defence spending on military equipment. According to NATO figures, the share was only around 13 percent until 2019, compared to 25 percent in France. It was not until 2022 and 2023 that the share of investment in defence equipment increased significantly. However, Germany remains behind the United Kingdom and the US (Figure 2). In Poland, spending on equipment now even exceeds 50 percent of total defence spending. In 2024, eight NATO countries (seven EU countries and Canada) still do not reach the minimum overall defence spending target of two percent of GDP. This includes Italy and Spain, the third and fourth largest EU economies.

Figure 1: Defence spending in the EU (left scale) and spending on military equipment (right scale), % of GDP



Source: Wolff *et al* (2024). Note: 'Defence spending' refers to total EU27 defence expenditure from 1989-2023 and defence spending by EU NATO members in 2024. 'Equipment spending' refers to spending by EU NATO members. Czech Republic, Sweden and Finland are not included for 2009-2013 because of unavailability of data. EU members Austria, Cyprus, Ireland and Malta are not NATO members.

Figure 2: NATO members' defence and equipment spending, 2014 vs 2024, % of national GDP and of total defence expenditure, grouped by NATO commitments met



Source: Bruegel based on NATO. Note: figures for 2024 are NATO estimates. Members are grouped (coloured squares) by NATO commitments satisfied (eg 'Only equipment' means the country spends at least 20 percent of its defence expenditure on equipment, but less than 2 percent of its national GDP on defence).

Fiscal data thus shows that governments have been able to adjust defence budgets in response to the war and these increased budgets have also translated into larger budgets for equipment purchases. Wolff *et al* (2024) documented a substantial increase in military procurement in Germany, in particular during the last year. Yet, ordered quantities remain small, in particular when compared to Russian output or when compared to lost capabilities in the last few decades (Wolff *et al*, 2024). Ordered quantities are also relatively low in France and other key European countries.

At EU level, the new defence and space commissioner starting in late 2024 will have to face squarely the main challenges to push for the cost-effective and rapid rearmament of Europe, ideally based on a shared strategic analysis. Together with the EU's top foreign policy official, the High Representative of the Union for Foreign Affairs and Security Policy, the new defence commissioner must deliver a white paper on the future of European defence identifying financing and capability needs in defence. This has been promised within the first 100 days of the 2024-2029 European Commission's term in office (Lazarou, 2024). Presumably, continued Russian military production of current magnitude also after hostilities end in Ukraine should make it clear that Europe's overarching military risk once again lies in the Kremlin. This should ideally lead to a strategic convergence across European capitals that so far has been only partially achieved.

In section 2, we discuss the potential cost savings from a European armament strategy, a necessary element to convince EU countries of the benefits of a joint European strategy. We also provide an overview in section 3 of the current European defence industrial policy, and address the trade-offs linked to short-term equipment needs versus long-term strategic interests.

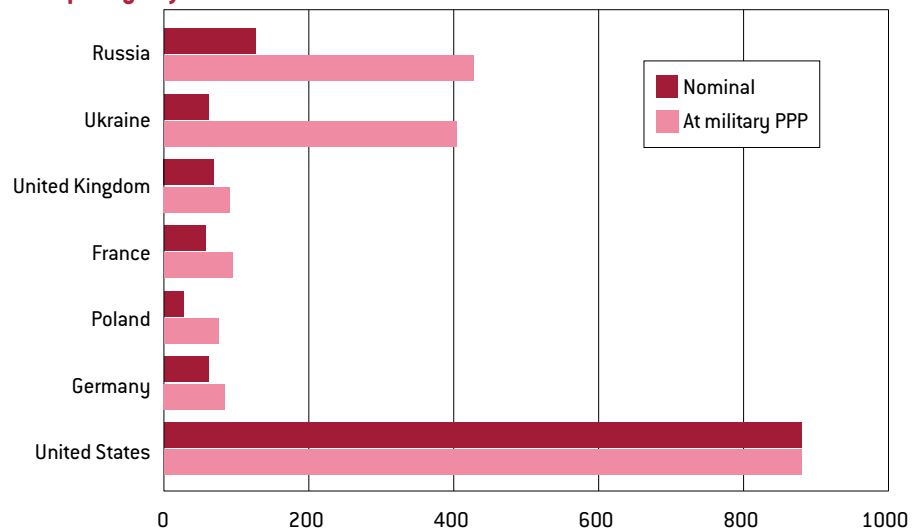
In section 4, we focus on European defence companies and how they compare with international competitors. In section 5, we set out two approaches to increase defence spending and military equipment in Europe. We conclude with policy recommendations.

2 The cost of no EU single market

European governments order relatively small quantities of weapons and ammunition. As a result, it is difficult to benefit from economies of scale, which would in principle lead to faster and cheaper production and higher production numbers. This is also a result of a fragmented market for defence products, in which each EU country orders separately. For example, if the procurement of artillery shells is not bundled and standards differ slightly, or if militaries tailor systems to unique national criteria that do not substantially reflect mission requirements, then national industries will remain the main producers for the needs of national armies and will produce in relatively small quantities at relatively high cost. Scale economies result from industrial production processes that require large-scale purchasing. Moreover, governments need to commit over the long term to buy certain quantities, in order for industry to invest in industrial production capacities.

Cost effectiveness is a key issue to consider in military comparisons. Research shows that a comparison of military budgets based on nominal US dollars yields a highly distorted picture of countries' defence capabilities. Figure 3 shows military spending in nominal terms and adjusted for military purchasing power parity (PPP, ie accounting for price differences), based on a methodology pioneered by Robertson (2021). The figure shows that real Russian military spending is substantially higher when accounting for the different prices in Russia (eg lower wages for personnel).

Figure 3: Military spending, 2023, \$ billions, nominal and military purchasing power parity adjusted



Source: Bruegel based on Robertson (2021) and SIPRI.

Since Robertson's (2021) measure does not capture well the prices of military equipment, we have attempted to show price differences for specific military equipment. We have compiled the costs of battle tanks in different countries in euros at market exchange rates (Table 1). There are substantial differences between prices paid by China and Russia, and by the US and Germany. The Germany-US price difference is also substantial. While the price for a US Abrams tank is higher than the price of German Leopard 2A6s sent to Ukraine, the modern versions of the latter, the Leopard 2A8, is estimated to cost closer to €30 million per unit. Even though US labour costs are higher, the US costs per tank are thus substantially lower – possibly an indication that low production numbers for the Leopard drive up prices. Still, even US production numbers are quite low, with an estimated monthly output of five to ten¹. Production of self-propelled howitzers follows similar patterns (Table 2).

Table 1: Estimated costs for third-generation main battle tanks in four countries

Country	Model	Cost (€)
China	Type 99A	2,309,896
Russia	T-90	4,157,812
Germany	Leopard 2A6	9,239,582
US	M1A2 Abrams	17,555,207
Germany	Leopard 2A8	29,000,000

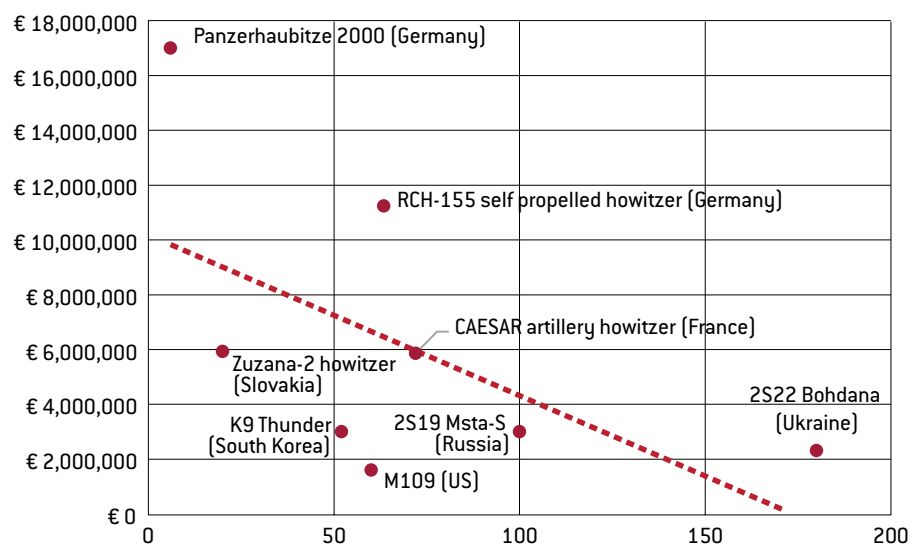
Source: Bruegel based on Kiel Institute and media reports (contact the authors for details).

¹ The main plant in Lima, Ohio, currently receives additional US federal investments to increase automation in production. Precious Grundy, 'Major improvements coming to Lima's tank plant', *The Lima News*, 20 May 2024, <https://www.limaohio.com/top-stories/2024/05/20/major-improvements-coming-to-limas-tank-plant/>.

Table 2: Estimated costs for 155mm self-propelled howitzers, selected countries

Country	Model	Manufacturer	Cost (€)
Slovakia	Zuzana-2 howitzer	Konstrukta	5,932,705
France	CAESAR artillery howitzer	Nexter	5,863,133
Germany	RCH-155 self-propelled howitzer	KNDS	11,087,499
Germany	Panzerhaubitze 2000	KNDS and Rheinmetall	17,000,000
China	PLZ-05	Norinco	2,309,896
US	M109 ²	BAE Systems	1,602,871
Russia	2S19 Msta-S	Uraltransmash	1,478,333
South Korea	K9 Thunder	Hanwha Land Systems	3,000,000
Ukraine	2S22 Bohdana	Kramatorsk Plant	2,309,896

Source: Bruegel based on Kiel Institute and media reports [contact the authors for details].

Figure 4: Self-propelled howitzer cost per unit and production annual capacity

Source: Bruegel based on information released by companies and specialised press in terms of purchase agreements and delivery dates.
Note: Production capacity per year should be considered a lower bound estimate.

While these numbers are not hard evidence of the benefits of scale economies, the production numbers per type of tank/artillery system tend to be lower in Europe than in the US, Russia or South Korea (Figure 4). Moreover, reported prices per unit tend to be relatively high in Germany in particular, while for those manufacturers with higher production numbers per year, unit prices are lower. The European Commission (2022) estimated that the lack of cooperation results in high costs, estimated to be between €25 billion and €100 billion each year.

² The US M109 uses a shorter, cheaper barrel than all other howitzers listed here. Should it use the same type of barrel, its unit price would be in line with the South Korean K9 Thunder and Russian 2S19 Msta-S.

3 Conceptualising European defence industrial policy

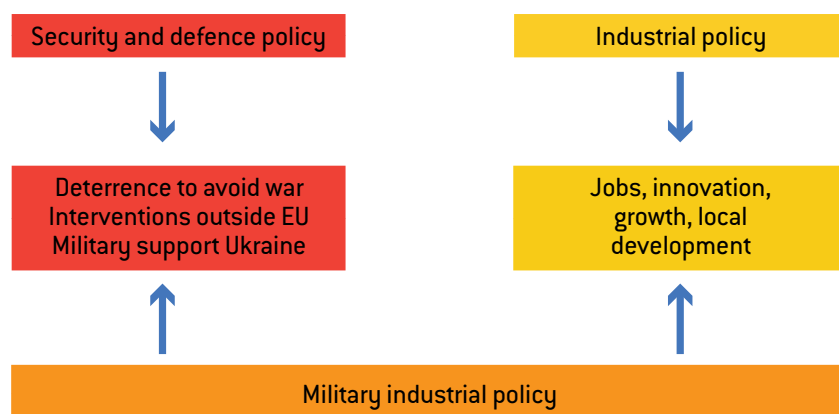
3.1 An overview of the EU's conceptual approach to defence industrial policy

The EU institutions deserve some credit for highlighting the urgency of addressing the shortcomings in European military equipment production and proposing some initial ideas for improvements. The European defence industrial strategy (EDIS), proposed by the European Commission on 5 March 2024³, indeed aims to achieve “*EU readiness through a responsive and resilient European defence industry*”.

According to the EDIS proposal, the European defence technological and industrial base (EDTIB) – the EU defence industry broadly defined including SMEs working in the sector – had a turnover of about €70 billion and exported more than €28 billion worth in 2021, employing about 500,000 people. The EDIS plan aims to reduce fragmentation in the European defence industry and reduce weapons imports. Goals include increasing the value of intra-EU defence trade to 35 percent of the value of the EU defence market by 2030, and ensuring that by 2030 at least 50 percent of EU countries’ defence procurement comes from the EDTIB. Finally, it seeks to ensure that EU countries procure at least 40 percent of defence equipment in a collaborative manner. However, the strategy’s goal of reducing import dependency is problematic in that it may create new security risks and increase costs (Wolff, 2024). Moreover, the available data does not corroborate the Commission’s claims about excessive import dependence (Mejino-Lopez and Wolff, 2024).

The defence commissioner will have to build on this plan and develop a feasible strategy. For this, a realistic and conceptual understanding of the specific characteristics of defence industrial policy is necessary. Advancing military industrial policy is a complex endeavour in any country. Figure 5 conceptualises the dual goals of defence industrial policy. It aims to create the material means needed to deter opponents, enable military operations abroad and support allies such as Ukraine. These goals are defined by a country’s security and defence policy. But industrial policy goals, and in particular electoral preferences, also determine objectives such as job creation, local development and broader innovation aims. Marrying these two separate types of objective is already difficult at national level, where local development goals might not be aligned with economic efficiency or security targets.

Figure 5: Conceptualising defence/military industrial policy



Source: Bruegel.

³ In EU terms, a joint communication from the European Commission and the EU High Representative for Foreign Affairs and Security Policy (European Commission and High Representative, 2024).

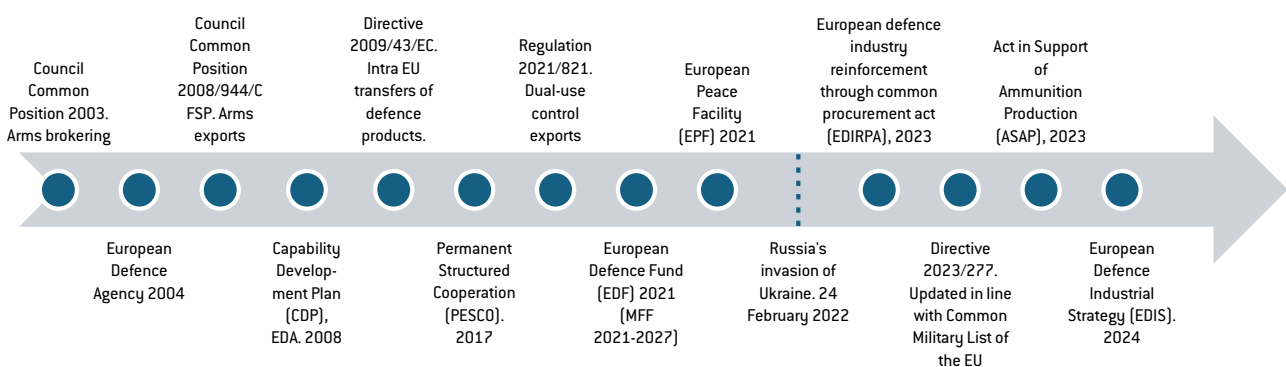
Designing a defence industrial policy at EU level is complicated even more by the institutional separation between industrial policies and security and defence policies. EU decision-makers are responsible for many aspects of industrial policy rulemaking (state aid, competition, cohesion), often with a significant and leading role for the European Commission. However, security and defence policy is largely a national competence (Leonard *et al*, 2019) and the most relevant cooperation framework is and remains NATO.

When it comes to defining strategic interests in security and defence, the EU is far from reaching a clear shared understanding. At EU level, there is some coordination and a so-called ‘strategic compass’ – an action plan to strengthen EU security and defence policy – has been approved⁴. Yet, the security interests of EU member states are, and remain, different. The main military threat of Russia, while it is growing, is still perceived as much less worrying in some parts of the EU than others. This lack of shared strategic interest will obviously affect the work of the new defence commissioner and of the High Representative of the Union for Foreign Affairs and Security Policy.

The EU treaties make clear that national governments largely retain the competence for industrial policies and market-design questions in the defence/security field. For example, Article 346 (2) of the Treaty on the Functioning of the EU (TFEU) stipulates that “*any Member State may take such measures as it considers necessary for the protection of the essential interests of its security which are connected with the production of or trade in arms, munitions and war material; such measures shall not adversely affect the conditions of competition in the internal market regarding products which are not intended for specifically military purposes*”⁵.

Nevertheless, in practice, the EU is already involved at many levels in defence markets and defence cooperation and has been able to overcome political and legal obstacles (Figure 6). The change of direction in US defence policy under President Trump’s first administration, followed by Russia’s illegal invasion of Ukraine pushed the EU to think about its weaknesses and develop a European defence strategy. Legal aspects such as the prohibition on funding defence purchases from the EU budget have been constraints, but the reformed European Peace Facility (Box 1) and the EU’s ability to find a way to provide ongoing funding to Ukraine based on the proceeds from frozen Russian assets show that measures can be implemented, even if not all member states are fully supportive (Véron, 2024). Different programmes have also been established to contribute to different parts of the defence industry, from research and planning to production and delivery to third countries (Box 1).

Figure 6: Timeline of EU defence initiatives



Source: Bruegel.

⁴ See EU External Action Service, ‘A strategic compass for security and defence’, https://www.eeas.europa.eu/eeas/strategic-compass-security-and-defence-1_en.

⁵ This does not prevent the EU however from having a security and defence policy, with the TFEU foreseeing in Article 2(4) that “*The Union shall have competence, in accordance with the provisions of the Treaty on European Union, to define and implement a common foreign and security policy, including the progressive framing of a common defence policy*”. Yet, the European defence strategy, such as the strategic compass (see footnote 4) certainly do not carry the same weight as NATO or national strategies.

Box 1: An overview on EU defence initiatives and structures

The EU's European Defence Fund (EDF), a fund of €8 billion for 2021-2027, is an instrument governed and implemented directly by the European Commission. It finances defence research (€2.7 billion) and development (€5.3 billion).

The Permanent European Structured Cooperation (PESCO) groups EU countries on a voluntary basis to cooperate in developing defence capabilities. It currently covers 26 member states except Malta, which participate jointly on projects in different military domains (such as cyber, maritime and air defence).

On military production, the Act in Support of Ammunition Production (ASAP, Regulation (EU) 2023/1525) is intended to motivate EU companies to work together to supply Ukraine with weapons and avoid supply-chain bottlenecks. Under the act, funding of €514 million has been provided to scale up production capabilities covering explosives (23 percent), powder (48 percent), shells (18 percent), missiles (10 percent) and testing (less than one percent).

On the procurement side, the European Defence Industry Reinforcement through Common Procurement Act (EDIRPA, Regulation (EU) 2023/2418) established a joint procurement instrument for acquiring weapons to meet the most urgent needs of member states (eg help for Ukraine). It has a total budget of €310 million (lower than the €500 million proposed by the European Commission). Implementation of the programme has been subject to delays.

For provision of defence support (operations and assistance measures) to third countries, the existing European Peace Facility (EPF) provides reimbursement to countries that export defence equipment to Ukraine. Since the start of the war in Ukraine, the EPF has mobilised €6.1 billion to assist Ukraine, and the facility has been increased by other €5 billion. A committee of EU country representatives oversees the EPF.

Planning military capabilities remains a national responsibility. However, common EU needs and a long-term strategy are scoped out in the European Defence Agency's Capability Development Plan (CDP). This sets out 22 different priorities grouped across five military domains (land, maritime, air, space and cyber) and wider aspects including medical support and critical infrastructure. Priorities include naval combat and maritime defence, integrated air and missile defence, and chemical, biological, radiological and nuclear defence.

On the European defence industry overall, the European Commission has proposed a European Defence Industry Programme⁶ to underpin EDIS and will try to balance the short-term urgent needs and the necessary defence industry long-term investments. Under the proposal, it would have a budget of €1.5 billion from the EU budget for the 2025-2027 period to increase the competitiveness and readiness of the EU defence industry, together with co-operation with Ukraine for the improvement of its defence industry.

Finally, EDIS will be shaped in 2025 by the forthcoming white paper on the future of European defence (Lazarou, 2024) and old instruments will need to be rediscussed before 2027 in relation to the EU budget cycle starting in 2027.

3.2 European preference?

A core practical question for European policymakers is the extent to which they want to favour European producers when procuring weapons and ammunition at national level. There is a strategic interest in building up an industry that can provide well-functioning and full-spectrum armaments to the armies of EU countries. Commission president Ursula von der Leyen has promoted the simple principle that on defence, Europe “*spends more, better*”

⁶ See European Commission, ‘The European Defence Industry Programme at a glance’, undated, https://defence-industry-space.ec.europa.eu/eu-defence-industry/edip-future-defence_en.

*and European*⁷, as well as noting that the forthcoming proposals in the white Paper on the future of European defence should respond to “*the most extreme military contingencies*”, suggesting that she endorses the paradigm shift of boosting domestic industrial capacities by directing to it military procurement and output planning, in order to address the EU’s under-investment and production gaps.

The basic idea is that increasing the demand for weapons developed and produced in the EU will strengthen EDTIB, leading to greater strategic autonomy. Such a move is even more important at a time when the US military industrial base is facing difficulties in sufficiently ramping up production. Jones (2024) argued that the war in Ukraine has shown the deficiencies of the US defence industrial base and that the US would not be prepared for a conflict in Taiwan. Moreover, a preference for European suppliers will be even more needed if NATO come under strain under the second Trump administration. Finally, an argument for a European preference is that the military industry can have some positive innovation effects on the wider economy (Box 3).

However, there are three important counterarguments against a Europe-first strategy. First, a European preference in arms purchases might lead to slower than necessary arrival of some critical weapon systems. Second, European preference could also lead to the purchase of weapon systems that are inferior to the best available on the world market, especially if there is no additional growth of the industry. Third, European preference could result in paying higher prices for weapon systems that could be produced more cheaply elsewhere.

At the political level, an important counterargument against a European preference in arms purchases is the possible political reaction in the US. For decades, the US has provided a security guarantee via NATO but it has also benefited from major European purchases of US weapons. Should the European side decide to rapidly reduce purchases of US weapons, the US Congress would certainly notice.

4 The European defence sector

4.1 Comparing market values of European defence companies

To increase military production, Europe will need its defence companies to scale up and new firms to emerge. In this section, we show that European defence companies are smaller than the top companies in the US, Russia and China. Only one European company, BAE Systems, ranked among the world’s top 10 defence companies in 2022 (Table 3). The situation for the EU specifically is even more worrying, with only three companies in the top 20. To be competitive in the global market Europe needs scale.

7 European Commission, ‘Andrius Kubilius - Mission letter’, 17 September 2024, https://commission.europa.eu/document/1f8ec030-d018-41a2-9759-c694d4d56d6c_en.

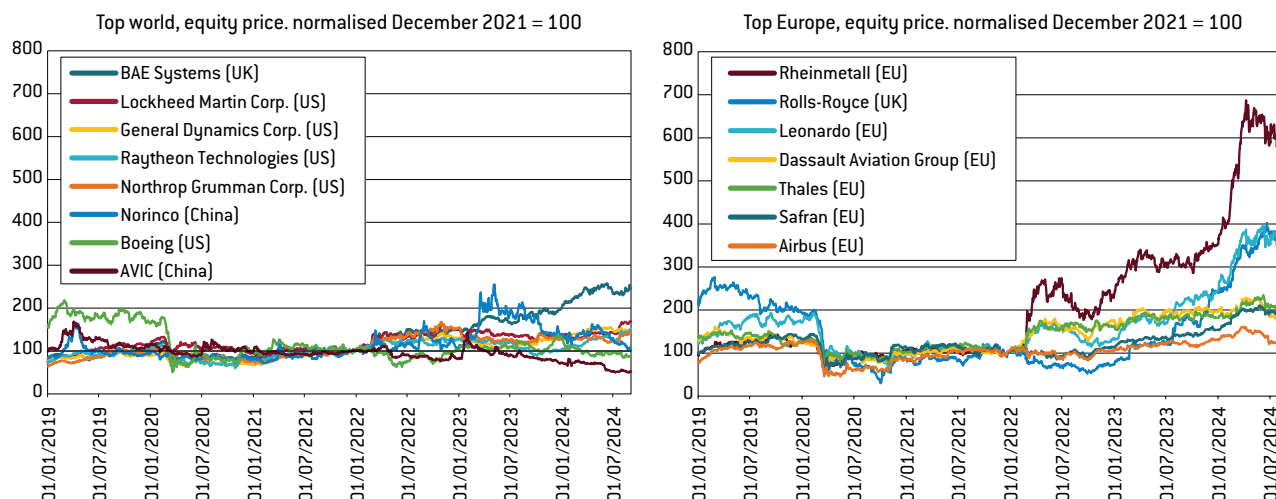
Table 3: Global top 10 and European top 10 defence companies by turnover, 2022

Global rank	Company	Country	Armaments revenues, \$ billions	Total revenues, \$ billions	Armaments revenue as % of total revenues
1	Lockheed Martin Corp.	United States	59390	65984	90%
2	Raytheon Technologies	United States	39570	67074	59%
3	Northrop Grumman Corp.	United States	32300	36602	88%
4	Boeing	United States	29300	66608	44%
5	General Dynamics Corp.	United States	28320	39407	72%
6	BAE Systems	UK	26900	27712	97%
7	NORINCO	China	22060	82537	27%
8	AVIC	China	20620	82499	25%
9	CASC	China	19560	44458	44%
10	Rostec	Russia	16810	30295	55%
13	Leonardo	Italy	12470	15025	83%
14	Airbus	Trans-European	12090	61805	20%
17	Thales	France	9420	18479	51%
23	Dassault Aviation Group	France	5070	7288	70%
25	Rolls-Royce	UK	4930	15647	32%
28	Rheinmetall	Germany	4550	6742	67%
29	Naval Group	France	4530	4578	99%
32	MBDA	Trans-European	4380	4428	99%
34	Safran	France	4200	20021	21%

Source: Bruegel based on SIPRI. Note: Blue rows indicate the European top 10 firms.

Since the Russian invasion of Ukraine, the market values of European defence companies have increased substantially, with most more than doubling their share price. This has been mirrored worldwide (Figure 7) but the rising share prices of Germany's Rheinmetall, Italy's Leonardo and the UK's Rolls-Royce stand out in particular compared to international peers, and indicate the extent of Europe's pent-up demand for defence products after 30 years of low defence spending and peace dividend.

Figure 7: Stock price evolution of major global and European defence companies



Source: Bruegel based on Bloomberg.

On the whole, the European defence industry has benefitted economically since the start of Russia's war against Ukraine. Yet, companies' revenues remain relatively small, suggesting that their capacity to scale up is limited by the scale of their national markets and by export restrictions.

4.2 Pan-European projects as a way of scaling up?

Box 2 lists some examples of European defence joint ventures on missiles, fighter jets and tanks. These cases show that cooperation is possible and can facilitate greater scale and more specialisation, though questions emerge in terms of the governance of these projects, especially those with many countries participating, and whether governments should be directly involved or not. Too great involvement of governments, particularly several governments, may well lead to sub-optimal decision-making and excessively long and inefficient production times. These concerns could be addressed through a European model of budget, coordination and cooperation for the development of joint projects of common European defence interest.

Box 2: Examples of defence joint ventures

In missile manufacturing, MBDA is the main European joint venture. MBDA is owned by BAE Systems (UK), Airbus (pan-European) – each holding 37.5 percent of the company – and Leonardo (Italy) with the remaining share. The executive board reflects the pan-European aspect with seats apportioned by nationality according to ownership shares. Governments are not directly involved in MBDA⁸.

The Eurofighter is the flagship combat aircraft venture at European level. It is produced by a consortium of BAE Systems, Leonardo and Airbus, with ownership shares distributed across four participating countries: United Kingdom (33 percent), Germany (33 percent), Italy (21 percent) and Spain (13 percent). Differently to MBDA, a NATO agency oversees the venture and governments are directly involved. The Future Combat Air System (FCAS) is another project to develop combat aircraft in which the governments of France, Germany and Spain participate.

To produce tanks, MGCS is an ongoing Franco-German project to deliver new battle

⁸ Sylvia Pfeifer and Leila Abboud, 'How the Storm Shadow missile maker launched a new model of defence co-operation', *Financial Times*, 8 April 2024, <https://www.ft.com/content/3914c6b7-3f3f-4be8-8342-52f5fefa62f3>.

tanks and other systems for both countries between 2040 and 2045⁹. The French and German national authorities participate directly with Germany in the leading role. KNDS is another example of tank production, also based on Franco-German collaboration.

The European defence industry needs modernisation in preparation for wars of attrition, as in Ukraine. In addition to meeting industry's short-term needs, long-term investment is required. European defence is technologically behind on some military equipment, such as aircraft or helicopters (Draghi, 2024) and investment in defence R&D is essential to close this gap. Box 3 gives an overview of European defence R&D investments and a short review of the positive spillovers linked to this type of investment.

Box 3: Industrial policy and long-term needs, European defence to foster innovation

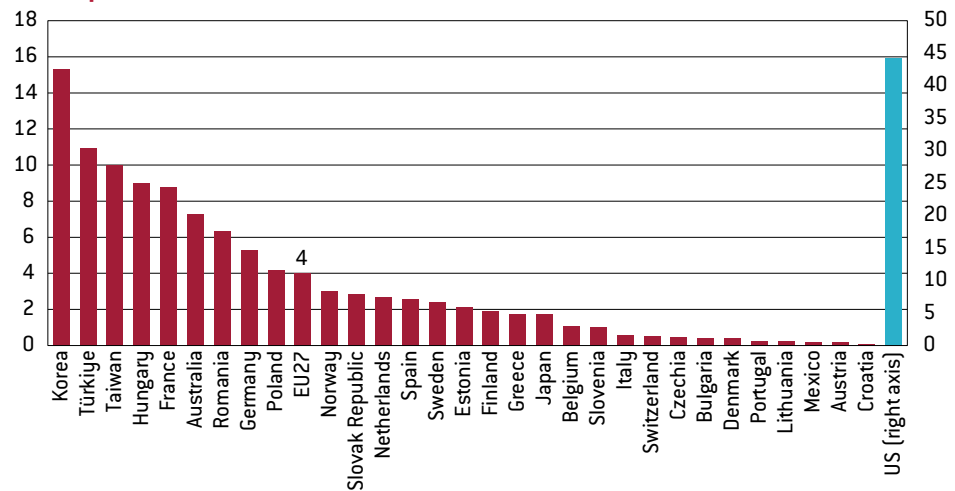
National defence takes up a substantial part of public R&D budgets in many countries (Figure 8). However, the shares in many European countries are lower than in the US. Draghi (2024) estimated the US-EU gap in total R&D investment in defence at almost €120 billion in 2023.

Defence R&D spending is aimed at enhancing national security, but might also generate positive broader growth effects by boosting innovation. The literature on public subsidies for R&D and their effects on the rate of innovation, while not totally conclusive, suggests that there are some positive effects, especially when public funding focuses on basic R&D, which individual companies find difficult to fund because they cannot capture the overall benefits generated. Wolff and Reinthaler (2008) showed positive employment and innovation effects linked to public R&D subsidies given to firms, and Moretti *et al* (2023) found significant increases in private R&D and productivity following on from public defence R&D investments. However, Barro and Redlick (2011) and Dimos and Pugh (2016) did not find evidence for these positive spillovers onto private R&D.

An important counterargument against government subsidies is that they only substitute for companies' own private funding. Given that the number of top researchers and engineers in companies is limited, the only effect is to replace one source of funding with another. In the defence sector specifically, however, defence research occasionally leads to breakthrough innovation, which alters growth paths by creating totally new general-purpose technologies. Mowery (2012) argued that some areas of Israeli defence-related R&D and procurement generated significant innovation for civilian and company use, for instance in the IT sector, and similarly for commercial aviation (Mowery, 2015).

9 Laura Kayali and Caleb Larson, 'France and Germany give new push to joint next-generation battle tank', *Politico*, 22 September 2023, <https://www.politico.eu/article/france-germany-give-new-push-to-joint-next-generation-battle-tank/>.

Figure 8: Public R&D spending on defence, % of total public R&D expenditure, major developed economies



Source: Bruegel based on OECD.

In sum, while European defence policy contributes to the main objective of maintaining national and collective security, it is also an industrial policy tool. Public investment in defence R&D can generate positive spillovers onto private R&D and ultimately productivity growth.

5 A European approach to increase military equipment output at reasonable costs

The US and the EU have both started major initiatives to increase military production. The US Department of Defense (DoD) in September 2024 reported on its initiatives to increase production in the context of the Ukraine Defense Contact Group¹⁰. The DoD documents substantial increases in ammunition production and weapon production, but also shows the very substantial problems in increasing capacities. Production numbers for key weapon systems remain below Russian equivalents, especially when taking into account Russian access to North Korean and Iranian production¹¹. Russia continues to outpace Ukraine in terms of ammunition quantities (Wolff *et al*, 2024). It is thus important to reconsider how to boost military production in the US and in Europe. Here we focus mostly on the EU.

Conceptually, there are two broad ways to think about how to organise and increase the production of military equipment in Europe.

¹⁰ The Ukraine Defense Contact Group is a group of countries supporting Ukraine by providing weapons. See US Department of Defense, 'Fact Sheet on Efforts of Ukraine Defense Contact Group - National Armaments Directors', 6 September 2024, <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direct/>.

¹¹ For example, US production of artillery shells has increased substantially, but now exceeds by a factor of more than two the production of the necessary propelling charges. US production of usable artillery shells thus stands at merely 18,000 per month, much less than the European production effort led by Germany with up to 700,000 units per year. The numbers have to be contrasted with the daily use of more than 10,000 shells by Russian artillery.

The most important factor in successfully implementing the second approach [market integration] is thus trust among EU countries

The first approach would establish a ‘war economy’. It has been suggested that Europe should adopt an EU defence production act similar to the US Defense Production Act, which gives the US president substantial powers to direct critical material and financial flows to the production of defence goods¹². Putting aside the difficulties of creating such a scheme in a fragmented European polity and a fragmented defence market, we are sceptical about such command-type economic policy guidance¹³. Intervening in an economy and directing resources towards a specific type of production is usually an expensive and rather inefficient way of achieving a policy goal. The EU may still play its part in providing smart incentives to increase the production and competitiveness of the European defence industry. However, a full war-economy approach appears politically infeasible in the absence of war on EU soil. A strong reliance on state intervention in defence companies, possibly driving the creation of pan-European companies with strong state involvement, could be part of the war-economy approach. It would risk becoming a rather slow and bureaucratic approach to defence production.

The second approach would be to integrate segmented defence markets and increase competition in the market in the hope of driving down costs and increasing efficiency and timeliness of production. The greater competition brought about by market integration should, *a priori*, contribute to a higher level of industrial innovation. In normally structured markets, pursuing this approach would be relatively straightforward and uncontroversial – as a proven way to maximise efficiency. Defence products, however, are special in that the number of customers is limited to governments, and security priorities override economic efficiency priorities.

The most important factor in successfully implementing the second approach is thus trust among EU countries. The more integrated markets become, the more likely it will be that defence production specialises, with production sites for specific products concentrating in certain countries. Specialisation improves efficiency but those countries that still have a broad defence industry might object on the basis that they would lose direct access to some key technologies. Put differently, a stronger market-based approach would require both trust and a strategy to build trust, especially among the main countries with substantial weapon industries.

Finally, at least for some crucial weapon systems, notably drones, changes to the production approach and contracting will be necessary. Ukrainian domestic drone production highlights the cost effectiveness of directly integrating more commercially available technologies into deadly weapons. This will not apply to all weapon types, but a general revision of the traditional cost-plus financing model for arms (ie a pricing system whereby the state is ready to pay a fixed mark up over the costs that, according to firms, the development and production of a weapon would cost), where applicable appears necessary to reduce future defence costs in the EU. This change in contracting approach has been shown to be of crucial importance in increasing output and reducing costs¹⁴. Greater integration of commercial with military supply chains would raise questions about the resilience of those supply chains (eg Chinese made components) and security risks (hacking, espionage), while it certainly has major advantages in terms of speed, quantity and quality. Here, the EU could play a greater role as member-state procurement of these types of systems is in its infancy and because EU larger scale could be particularly more suitable.

12 Laurence Boone and Nicu Popescu, “Europe must build a war economy without delay”, *Le Monde*, 1 April 2024, https://www.lemonde.fr/en/opinion/article/2024/04/01/europe-must-adapt-and-build-a-war-economy-without-delay_6666993_23.html.

13 There may be creative solutions at EU level to fill the gaps through joint industry output plans that respond to the growing defence capacity needs, starting with EU ammunition production, which is seen as insufficient to help defend Ukraine against the Russian invasion.

14 See, for example, Streb and Streb (1998).

6 Conclusions

It has become urgent to move beyond the current piecemeal approach to European defence. The forthcoming white paper on the future of European defence (see section 1) needs to spell out how production capacity will be increased, how costs will be reduced, how Europe will strengthen its main military-technological capabilities and how the necessary fiscal resources will be mobilised. These are major factors in a war of attrition such as that in Ukraine. Wars of attrition are the norm between peer competitors, implying that the Russian threat to the EU presents the same problem set as is currently unfolding in Ukraine. The EU white paper will need to take positions on the main trade-offs and be specific to make rapid progress. The following elements will be crucially important in order to achieve these goals.

A: Focus on funding for defence

Achieving scale and cost effectiveness requires funds, both for demand and supply.

On the demand side, the fiscal constraints faced by European countries affect the credibility of governments' long-term commitments. This is the case with Germany's medium-term budgetary planning for defence (Wolff *et al*, 2024) and other EU countries without clear political majorities and with uncertain budgetary prospects (eg France and Spain). On the national funding, fiscal rules could incentivise debt issuance to pay for defence spending but this could raise debt sustainability concerns (Pench, 2024).

Exempting from fiscal limitations some spending for EU-agreed defence priorities might be a way forward. Expensive investments with EU-wide impact, such as air defence, could be financed through EU debt (Steinbach and Wolff, 2024). The debate on the next EU budget cycle (from 2028 into the mid-2030s) will be an opportunity to prioritise such investments. For the EU as a whole, increases in defence spending for the next five years will have to amount easily to €500 billion if Europe wants to shed its dependence on the US security umbrella.

On the supply side, some weapon companies and particularly SMEs still face financing constraints (European Commission, 2024). Improving access to finance for these companies should be a priority. Institutions such as the European Investment Bank should reconsider a current prohibition on providing financial support to defence-only projects. This would also give a positive signal on defence investment to the overall financial sector (Draghi, 2024). More broadly, the negative stigma that defence companies are still confronted with among investors and civil society needs to be addressed as a priority, so that funding can reach not only the big defence companies but also mid-sized companies and start-ups, which are essential for innovation and mass production of drones, counter-drone systems and electronic-warfare and intelligence-gathering solutions.

B: Push back against economic nationalism while addressing security concerns

We recommend the more-integrated markets approach rather than the war economy. Markets tend to be more efficient than governments in allocating resources, with governments having a clear role to play addressing market failures. However, achieving market integration is difficult. It is hard to limit the scope for economic nationalism in the EU because the EU treaties (Article 346(2) TFEU) explicitly allow countries to deviate from single market rules for security reasons. To enable greater market integration, legitimate security concerns thus need to be addressed, for example through security treaties among major producer countries, establishing rights and safeguards.

Fostering a political agreement among key countries to increase joint purchases, possibly with pooled funds, is necessary to reduce unwarranted national biases in military procurement. While there have been EU-level efforts on joint procurement (EDIRPA, Box 1), these are rather small. The EDIRPA budget for example was set at €310 million, which is minimal, even compared to the approximately €25 billion in equipment procurement by Germany in 2024. The March 2024 EDIS proposal looks set to face similar financial constraints (Wolff, 2024). National

Expensive investments with EU-wide impact, such as air defence, could be financed through EU debt

Despite being a global standard-setter, the EU plays no role in standards for weapons

procurement offices will issue different specifications even for the same basic product. Beyond the reform of national procurement offices, more joint EU procurement, for example through the EDA, could lead to greater market integration.

Moreover, despite being a global standard-setter, the EU plays no role in standards for weapons. As a consequence, weapons production is fragmented and more expensive than necessary and interoperability is low, complicating logistics and undermining combat effectiveness. EU countries have provided to Ukraine 10 different howitzer types and currently manufacture five different versions versus only one in the US (Draghi, 2024). While NATO has established standardisation agreements for artillery, they are thus clearly not enforced. Enforcement by the EU of NATO standardisation agreements in EU countries could thus further contribute to market integration.

Fragmented EU export rules could undermine market integration¹⁵. Current rules on arms-related exports, both within and outside the EU, would benefit from more solid legal underpinning in a directive or regulation with transposition dates and/or enforcement tools. This would ensure effective standardisation and greater alignment of national policies. To account for the risks related to weaker ethical considerations while standardising export rules, post-shipment onsite inspections (Bromley *et al*, 2022) enforced by an EU agency could guarantee a level playing field across EU countries.

C: Towards ‘intelligent European preference’ for more innovation and strategic autonomy

The EU should avoid procuring only European, but there are strategic justifications for more procurement from resident firms¹⁶. Such ‘intelligent European preference’ can increase industry capabilities and foster innovation while reinforcing strategic autonomy¹⁷, but it needs to account for comparative advantages and disadvantages. For some products, cheap and scaled-up production remains of paramount importance (eg artillery shells for Ukraine). Procuring arms from third countries remains perfectly reasonable, especially if the security of supply is high and interoperability with European systems can be reasonably guaranteed.

Ukraine and its defence industrial base are of great importance to the EU defence strategy and could be transformative for the EU’s military industrial capacity. For many products, Ukraine is the cheapest producer, and is also the most innovative and advanced (eg modern drone warfare). The UK should also be considered an integral partner for the European defence industrial base. Finally, as long as the EU remains dependent on the US security guarantee, it needs to carefully calibrate how the building its own defence industrial base will impact US political perceptions.

D: Supply chain security

The EU could play a role in securing defence supply chains by regularly monitoring and assessing risks of over-dependency. Since the start of the war in Ukraine, the European Commission has discovered significant vulnerabilities, for example in relation to the security of supply of explosives and propellants. It would be a natural role for the EU to issue alerts on limits in production capacities. The EU is aware of the importance of assessing security risks, such as those for dual-use technologies. The EU economic security strategy, for example, sets out critical technology areas and requests risk assessments from member states (European Commission, 2023, 2023a). There exist, however, challenges in addressing these issues (Chimits *et al*, 2024). Some of the competences required remain at the national level – for instance foreign policy responsibility – making a common and effective response more difficult.

¹⁵ Rules on exports to Israel or Saudi Arabia highlight how such national rules are sometimes used deliberately for political purposes and export promotion. Harmonised rules at EU level appears the only way to overcome such incentives.

¹⁶ See for example Calcara *et al* (2023) for an academic discussion.

¹⁷ See for example Caverley and Kapstein (2023).

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