A New Era for the Defense Industry?

Security Policy and Defense Capability after the Russian Invasion of Ukraine

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Abstract

The Russian attack on Ukraine has brought the question of the German Armed Forces' operational capability back into focus. National defense, which seemed to play only a minor role with the end of the Cold War and the dissolution of the Warsaw Pact and the Soviet Union in 1991, now has gained a higher political priority again. In his government declaration of 27 February 2022, German Chancellor Olaf Scholz spoke of a turning point in time due to this war and announced a special fund of 100 billion euros to strengthen the country's defense capabilities. However, these extensive funds can only have a sustainable effect on security policy if the possibilities of the defense industry to supply new weapons systems and the possibilities of the Bundeswehr to use and maintain these weapons are brought into line. In 2020, the approximately 55,500 employees in the defense industrial sector in Germany produced weapons, combat aircraft, warships and military vehicles for approximately 11.3 billion euros; both figures were lower than in 2015 despite Russia's occupation of Crimea in 2014.

This policy paper therefore presents the status of plans to strengthen the Bundeswehr and classifies them in terms of security policy. In addition, the German defense industry with its sectors of aircraft and spacecraft, naval shipbuilding, combat vehicles as well as weapons and ammunition is portrayed and the increasingly important area of cyber defense is discussed. The policy paper concludes with defense policy and defense industry recommendations derived from the previous chapters. Recommendations include a long-term plan for strengthening the Bundeswehr and the German defense industry, stronger cooperation with European partner countries on defense projects to reduce dependency on the U.S. and including the defense industry in the European taxonomy for the financial sector, as its current status of non-sustainability threatens especially smaller and medium defense companies that are important for European security.

1 Introduction

With the Russian invasion of Ukraine, the question of the operational capability and equipment of the German Armed Forces' has once again moved into the focus of politics and the public. National defense, which seemed to be of little importance since the end of the Cold War and the dissolution of the Warsaw Pact and the Soviet Union in 1991, now has a higher priority for the German armed forces again. The low numbers of heavy weapon systems, their obsolescence and low operational readiness have been recognized by politicians and the public as a serious shortcoming. After Russia's invasion of Ukraine in late February 2022, Army Inspector Alfons Mais conceded that the Bundeswehr "more or less stands bare" (Rieke, 2022). This finding seems all the more astonishing given that a turnaround toward strengthening defense capabilities had already been announced by policymakers in 2014 following the Russian occupation of Crimea and the Russia-initiated conflict in Ukraine's Donbass region (Krause, 2018). However, defense spending as a share of GDP increased slightly only after 2018. In response to the Russian invasion of Ukraine, Chancellor Olaf Scholz announced a turning point – "Zeitenwende" – on February 27, 2022. From now on, he said, NATO's two percent target for the level of defense spending as share of GDP should be achieved. Though in the meantime, this aim has been called into question again (Bardt/Röhl, 2022). This policy paper examines the security policy implications of the largest war in Europe since the Second World War and analyzes the highly relevant defense policy with regard to the capabilities of the German defense industry.

The second chapter examines German defense policy before and after the Russian invasion of Ukraine in February 2022. The development of defense spending, measured as a share of GDP, declined sharply in the 1990s; in 2014 to 2016, the share reached a low of only 1.1 percent of GDP. A 100 billion euros special fund is now to be used to sustainably strengthen national defense capabilities (Schäfers, 2022). The optimal use of this fund will depend heavily on the capabilities of the German defense industry, which sold weapons and equipment worth approximately 11.3 billion euros in 2020 to Bundeswehr and abroad. In this context, the special fund of 100 billion euros should be seen as necessary to maintain Germany's defense industrial capabilities, not only as an "armament program". The sales and employment figures of the German defense industry are examined in chapter 3 for the aircraft, naval, land vehicles and weapons and ammunition sectors. Regional clusters of the German defense industry are also discussed. Chapter 4 deals with defense cooperation projects, which play a major role in strengthening European defense capabilities. Chapter 5 looks at cyber defense. Chapter 6 provides a conclusion and recommendations for defense policy.

2 German Defense Policy in Light of the Russian Invasion of Ukraine

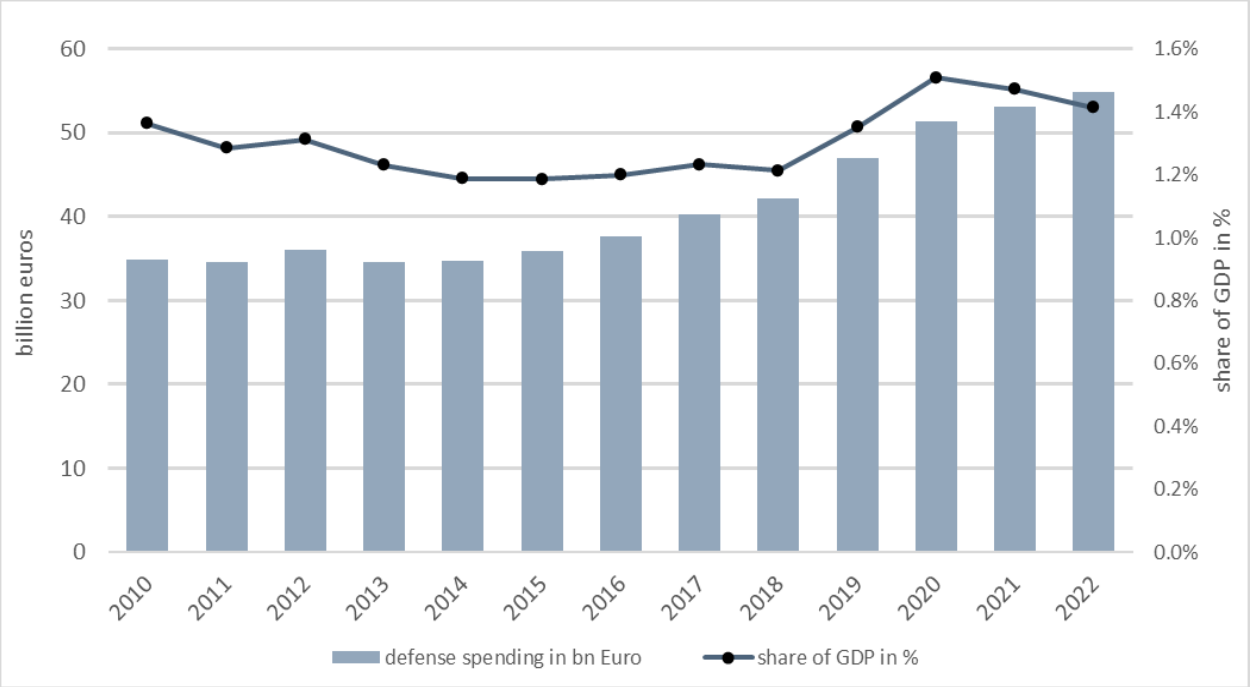
2.1 Development of German Defense Spending since 1990

With the end of the Cold War, Germany's security environment changed considerably. A man- and material-intensive defense against an attack by the Warsaw Pact was not a realistic scenario after reunification; rather, individual, smaller-scale foreign missions and the associated capabilities became important. Accordingly, the capabilities and equipment of the Bundeswehr, into which the National People's Army of the German Democratic Republic had been integrated in the meantime, had to be adapted. This meant a considerable reduction in personnel, a reduction in the number of weapons systems and, finally, the suspension and thus de facto abolition of compulsory military service. At the same time, German defense spending has been cut back

sharply since 1990. Whereas in 1989, 2.7 percent of GDP was spent on defense, the minimum figure was just 1.2 percent for 2014.[1] This corresponded to 34.7 billion euros (see Figure 2-1). Despite the joint target in the NATO framework of spending 2 percent of GDP on defense, Germany remained permanently below this level. A noticeable upturn has only been evident in the data since 2019.

Figure 2-1: The development of German defense spending

Expenditure in billions of euros and share of GDP in percent



Source: own calculations based on Federal Ministry of Finance, Destatis, SIPRI

Even with declining security following Russia's occupation of Crimea and the Russia-fueled Donbass conflict in 2014, real defense spending did not grow thereafter at first,[2] only beginning to rise slightly to 1.5 percent of GDP by 2020. In 2023, the budget of the Ministry of Defense sums up to 50,1 billion euros, which together with some smaller defense related expenditures in other ministries leads to a total spending of just above 1.4 percent of GDP. However, this sum is only partially available for procurement: With over 41 percent of the Ministry of Defense budget, a high proportion is spent on personnel, while less than 37 percent is spent on new weapons, vehicles and other equipment. The 2023 defense budget excluding the special fund is slightly smaller than the previous one, even in nominal terms. A renewed firm commitment to meeting the 2 percent target was made in Chancellor Scholz's speech after the Russian invasion of Ukraine, together with the announcement of a special fund of 100 billion euros to improve the equipment of the Bundeswehr (see chapter 2.2). But up to now, a substantial rise in real defense spending is still pending.

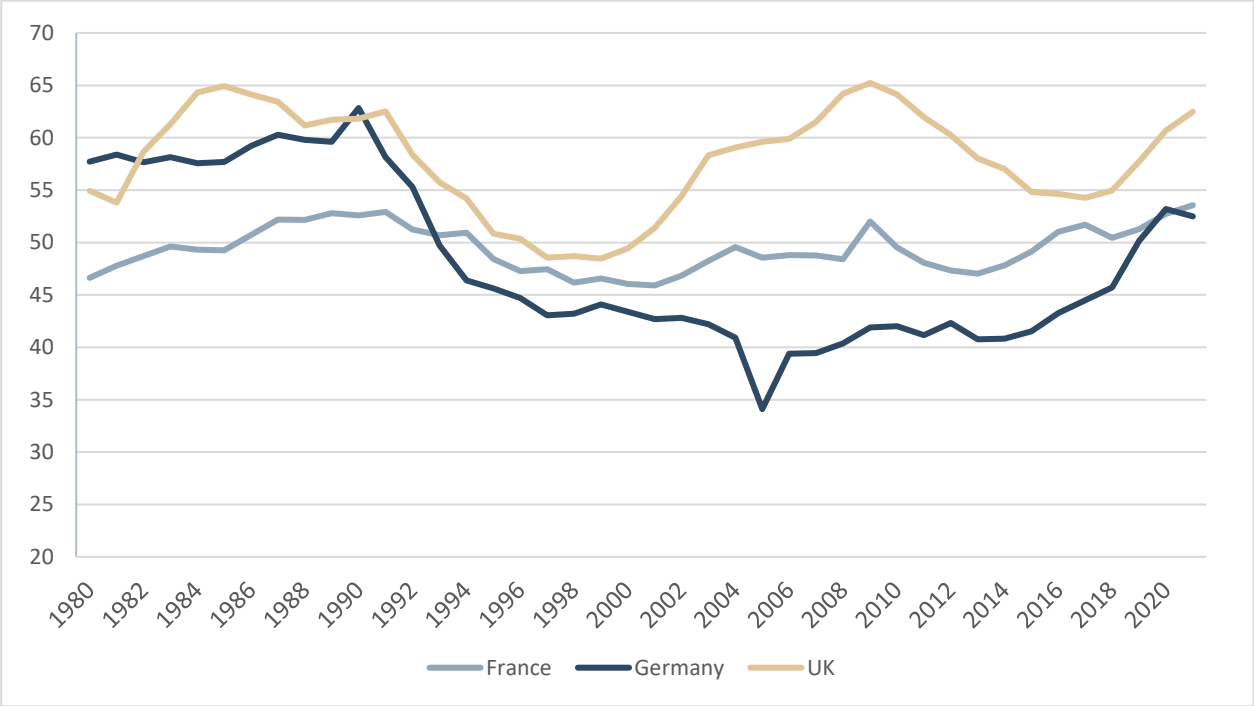
[1] As part of the cost-cutting measures, however, capabilities that are still needed in principle, such as the Army's air defense, have been eliminated. As a result, the land forces currently have no effective drone defense, although smaller armies now also have powerful combat drones.

[2] At the 2014 NATO summit, the two percent defense spending target was reaffirmed immediately after Russia's occupation of Crimea by member countries, but "those who would have expected the German government's endorsement of the two percent target in Wales to be used as an argument for reducing the Bundeswehr's financial woes found themselves disappointed. " (Krause, 2018).

Compared with other major European countries, Germany has followed its own path regarding defense expenditures. In the closing stages of the Cold War in the 1980s, Germany's absolute spending (in 2020 U.S. dollars) was at a similar level to that of the United Kingdom and well above that of France (Figure 2-2). As the security situation changed, there were large cutbacks, particularly in the United Kingdom and Germany. Since 1993, Germany has had the lowest defense spending of the three countries in absolute terms. While France and especially Great Britain stopped the trend at the beginning of the millennium and increased their budgets, in some cases substantially, Germany continued its policy of decreasing defense spending. In some years, the French budget has been a quarter higher than in Germany, and the United Kingdom had even more than 60 percent higher spending than Germany, though both countries have fewer inhabitants than the unified Germany. This only changed with the increase in defense spending in Germany from 2015. In 2019 Germany reached the French expenditure level.

Figure 2-2: Defense spending in European comparison

Expenditure in billions of US dollars, 2020

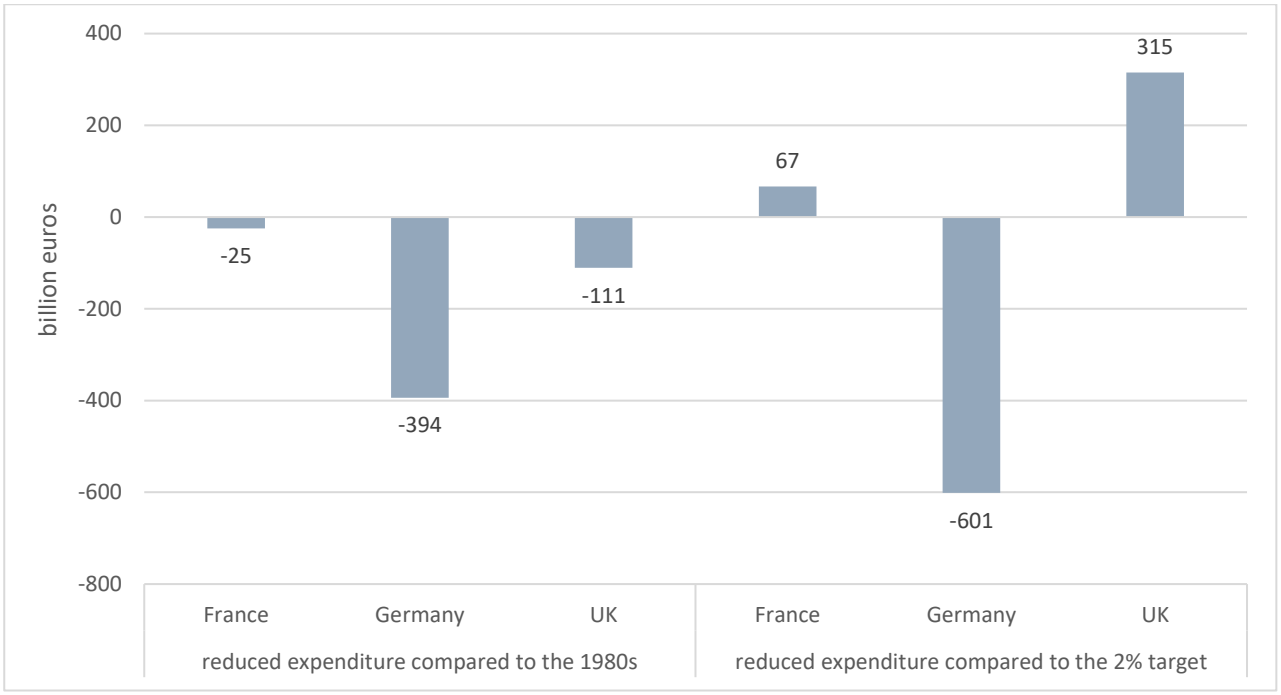


Quelle: SIPRI

The phase since the end of the Cold War has involved considerable savings for Germany. This fiscal peace dividend, measured in terms of reduced defense spending compared with the average level of the 1980s, amounts to 394 billion euros for Germany. Great Britain has saved only 111 billion euros since 1990, and France only 25 billion. Measured against the two percent target, Germany's savings are 600 billion, while France and the U.K. have exceeded this mark by 67 billion and 315 billion, respectively (Figure 2-3). In contrast to the other European countries, Germany has reaped a particularly large peace dividend and has withdrawn from financing defense burdens and built up a corresponding backlog (IW, 2021).

Figure 2-3: Savings in defense spending since 1990

Defense spending compared with the average of the 1980s and with the two-percent target; in 2020s euro prices



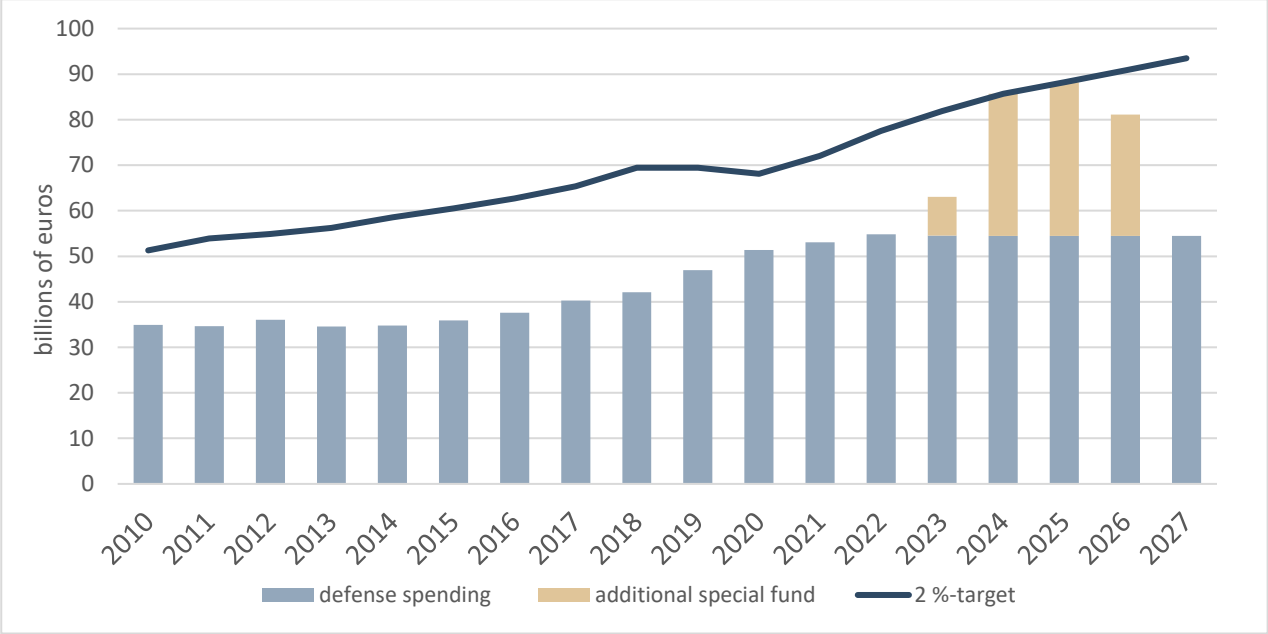
Quellen: eigene Berechnungen; SIPRI; EZB

2.2 The 100-billion-Euro Special Fund

A few days after the Russian invasion of Ukraine on February 24, 2022, German Chancellor Olaf Scholz announced that a special fund of 100 billion euros would be created to strengthen defense capabilities. The special fund was realized by authorizing additional borrowing outside the limits of the debt brake, although the time frame for spending is open (Schäfers, 2022). However, if one takes literally Chancellor Scholz's statement that from now on the NATO target of 2 percent of GDP for defense is to be exceeded, and compares this with the budget planning of the Federal Minister of Finance, which does not envisage any increase in the current defense spending, the 100 billion euros would be just enough to raise defense spending to the two percent limit in 2024 and 2025 as the rising inflation is pushing up nominal GDP (see Figure 2-4).

Figure 2-4: German defense spending and special assets

Expenditure in billions of euros and hypothetical expenditure for the two-percent target

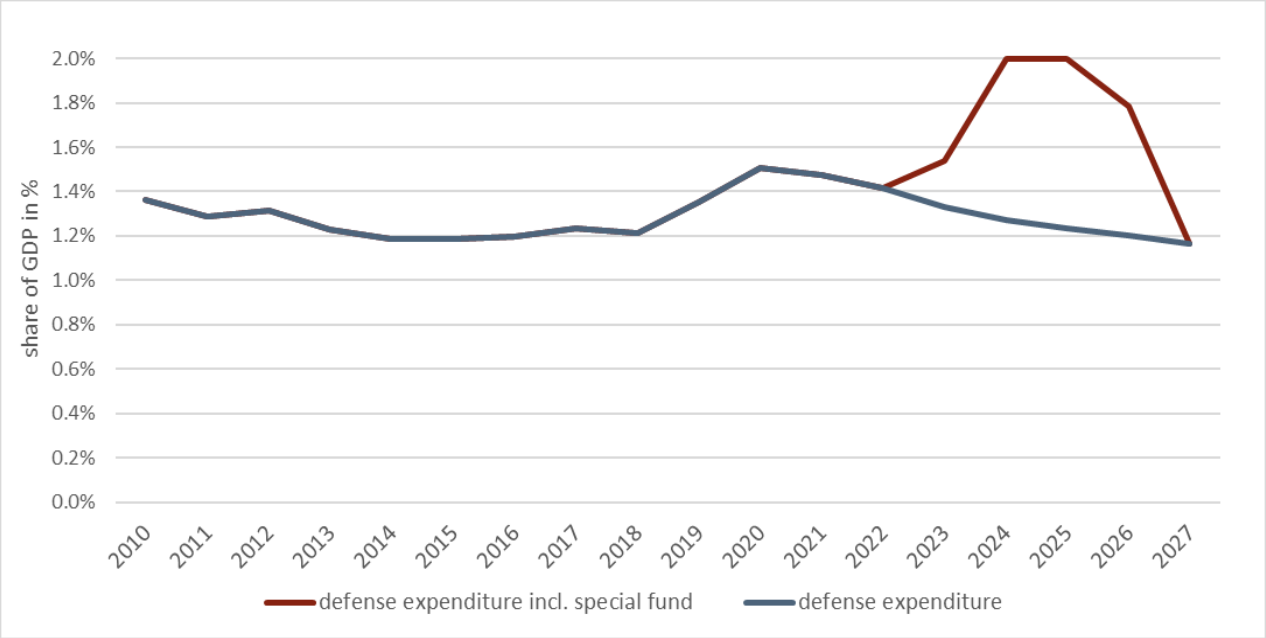


Source: own calculation based on NATO, BMF, Joint Economic Forecast

From 2026 onwards, however, funding to meet the two percent target is still unclear. The budget plans so far provide for constant budget appropriations in nominal terms, which translates to real term reductions because of inflation. If the special fund is used to reach the target for two years, there will already be a remaining gap of almost 10 billion euros in 2026 and 39 billion in 2027. If this is not closed, the share of GDP would fall back to 1.2 percent (Figure 2-5). If funds from the special fund are to be used later – which is likely given long procurement processes –, the gaps will arise earlier and the committed target cannot be achieved. A Clarification and corresponding medium-term financial planning is not only significant for defensive capabilities in the next legislative period, but must be undertaken early on in order to achieve long-term planning security beyond 2025 (Mölling/Schütz, 2022). Without this stabilization of adequate financing, the defense industry will also not be able to adapt to future requirements.

Figure 2-5: German defense expenditure with special assets as a percentage of economic output

Expenditures as a percentage of GDP, from 2022 to 2026



Source: IW calculation based on NATO, BMF, Joint Economic Forecast

The special fund is explicitly placed outside the provisions of the Basic Law on the debt ceiling. To this end, this case had to be anchored independently in the German constitution, which necessitated an agreement with the CDU/CSU opposition (Lohse/Wehner, 2022). The advantage of a solution beyond the annual budgets is the certainty associated with the new regulation that the budget will actually be available over the next few years and cannot be cut. Nevertheless, the regulation also shows that the existing political restrictions – no tax increases, no cuts, debt ceiling in its current form – might be too tight for necessary additional spending. By 2026 at the latest, a regular defense budget increase by about 60 percent must be decided on to meet the two percent target.

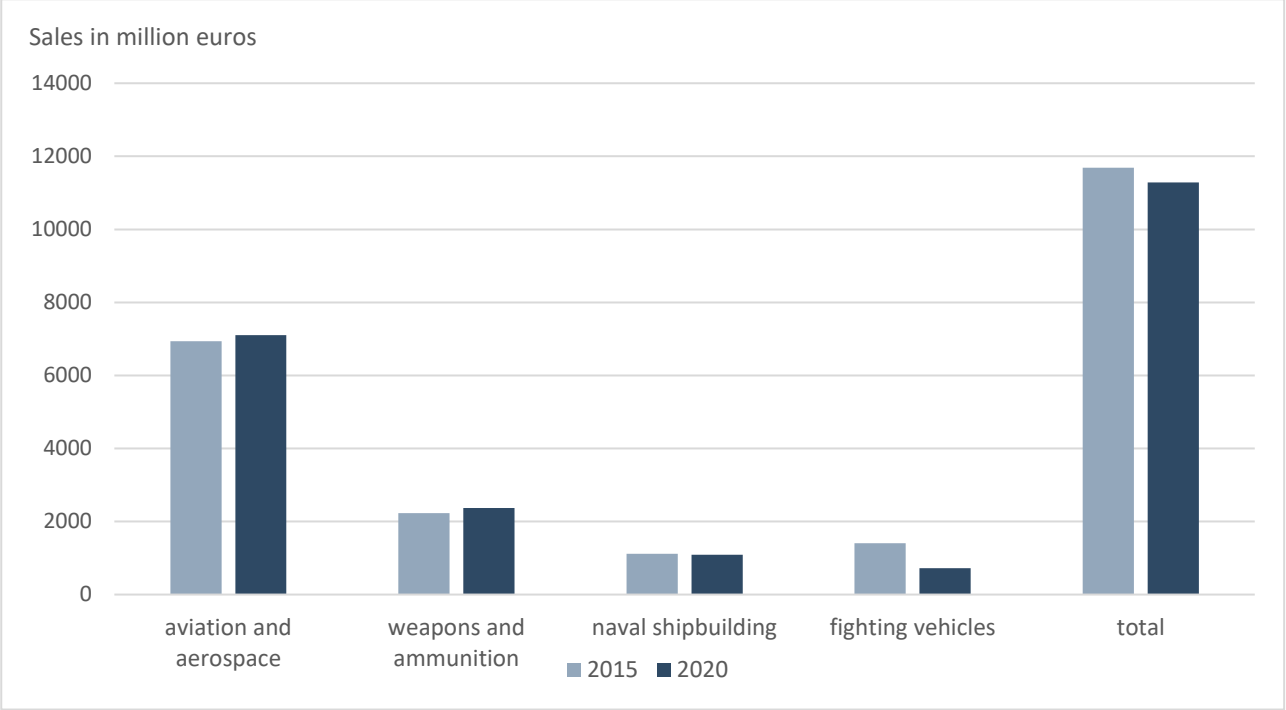
3 The German Defense Industry

Germany's industrial strength is also reflected in a broad-based defense industry capable of producing a wide variety of military vehicles, weapons and ammunition. Since the end of the Cold War more than 30 years ago, however, the number of units produced and thus also the production capacities of the industry have been drastically reduced. Weapons and ammunition account for only a small part of the defense industry. The war in Ukraine, however, makes it clear that the stockpile of ammunition and the ability to produce ammunition in large quantities are of considerable importance in case a major war.[3] Aircraft account for the largest share of the sector by value, while naval ships and tracked or wheeled land vehicles account for a smaller share of sales, as shown below (Figure 3-1).

[3] Despite stockpiling large quantities of Soviet-era ammunition and having its own arms industry, Ukraine became increasingly dependent on Western ammunition supplies after two months of intensive warfare.

Figure 3-1: Sales of the German defense industry

Sales in million euros by sector, without supplying industries, 2015 and 2020



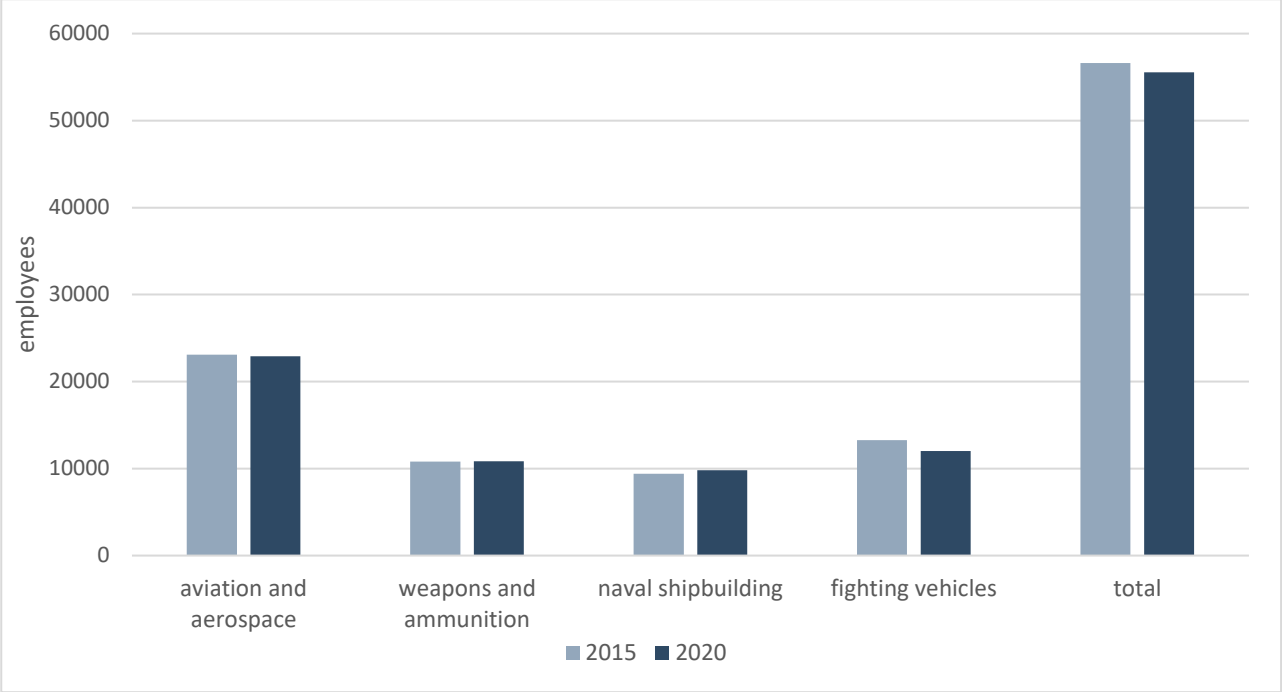
Sources: Data from shipyards; German Aerospace Industries Association; Statista; German Federal Statistical Office; German Shipbuilding and Ocean Industries Association; own calculations.

In many cases, sales and employment figures for the German defense industry can only be estimated on the basis of company data, as they are not reported by the Federal Statistical Office for data protection reasons due to the small number of companies in the individual sectors (IW, 2022). Sales in military aerospace, naval shipbuilding, weapons and ammunition, and military combat vehicles were about 11.3 billion euros in 2020 (Figure 3-1), down 3.5 percent from 2015, the year after Ukraine invaded Crimea and the Donbass. The decline was mainly caused by a decrease in combat vehicle construction.

Figure 3-2 shows the number of employees in the defense industry, which can also only be estimated. In 2020, approximately 55,500 mostly highly skilled workers are estimated to have worked in defense-related companies, this represents a slight decrease of approximately 1,000 employees compared to 2015. Similarly large employment effects can be assumed in companies supplying the defense industry. The total number of employees in defense and security related branches including suppliers and related services is far higher and could reach 300,000 according to an unpublished survey.

Figure 3-2: Employees in the German defense industry

Employees 2015 and 2020



Employees in naval shipbuilding, military combat vehicles: data for 2014 instead of 2015; employees in the military combat vehicles category 2020: IW estimate.
Sources: Data from shipyards; German Aerospace Industries Association; Statista; German Federal Statistical Office; German Shipbuilding and Ocean Industries Association; own calculations.

3.1 Air Combat Systems

In 2020, military aerospace accounted with 63 percent of the total for the largest share of defense-related sales at 7.1 billion euros; 22,900 employees were counted in this most important segment of the defense industry in 2020. Complex systems such as the Eurofighter, the Tiger combat helicopter and the A400M transport aircraft form the backbone of aerospace defense industry. However, there have been reports for years of insufficient operational readiness of the Bundeswehr's aircraft systems. These problems are likely to be mainly due to inadequate spare parts procurement and maintenance, but also in part to the high complexity of the systems. Part of the new funding will therefore have to be spent on improving the usability of existing combat aircraft and helicopters through greater spare parts stockpiling and better maintenance.

In mid 2021, a Bundeswehr Space Command was formed (BMVg, 2021a), with Germany following the example of other countries such as the USA, Russia, the United Kingdom and France (since 2020). In addition to observing the space activities of other countries, six satellites are available for reconnaissance and communication purposes.

A future European air combat system consisting of radar-invisible fighters and drones is to be developed jointly with France and Spain in order to be able to keep up with the capabilities of the militarily leading powers after 2040. However, since this is hardly the case at present, a contingent of the U.S. F-35 jet is to be procured as an interim step - a decision necessitated by the Ukraine war (FAZ, 2022). Many NATO partners

use this fifth-generation fighter aircraft,[4] so that a high level of interoperability with partner armies is ensured. The future NATO member Finland alone has ordered 64 of these “stealth” aircraft with low radar signature.[5]

An electronic warfare version of the Eurofighter, of which some 150 are already in service with the Bundeswehr, is to be procured in small numbers alongside the F-35 as a replacement for the obsolete Tornado ECR (Electronic Combat and Reconnaissance) aircraft. This is a decision where industrial policy and defense policy mix, since similar capabilities are already available on capable American aircraft, the procurement of which would probably be more cost-effective than developing a specialized Eurofighter version. However, the supply of already ordered Eurofighters for the Luftwaffe is almost complete and the new European air combat system is still a long way from starting production: without an order to bridge the manufacturing gap, there is therefore a risk of losing knowledge and skilled workers for production in the meantime.

3.2 Naval Shipbuilding

The German naval industry offers a wide range of vessels from submarines to minesweepers and patrol boats to ocean-going frigates (VSM, 2021). German shipyards generated around 1.1 billion euros in sales from the construction of naval vessels in 2020. In 2015, sales were similarly high; on average in recent years, however, naval-related sales were slightly higher at 1.5 billion euros. In recent years, however, the good reputation of "Made in Germany" in this field has suffered somewhat due to quality problems and warships for the German Navy being completed only after long delays. For this reason, the Bundesmarine's new F126 frigate series – which, with a displacement of nearly 10,000 tons, will be almost as large as a 1930s’ cruiser – is now being built under the leadership of the Dutch Damen Group with the participation of German shipyards after the Dutch group won the tender (Riedel, 2020).

The F126 frigate also experienced years of delays due to legal disputes over the award of contracts and tight budgets (Riedel, 2020). As with previous frigate classes, the number of units will initially be reduced from the identified requirement: Only four units will be built instead of the required six, with the option of ordering more ships at a later date – although this never happened in case of previous reductions in the number of frigates ordered from a series (BMVg, 2021b, 114; Wiemann, 2021).

While other European countries have mainly merged their naval shipyards into national consortia, Germany has so far relied on competition. Now, however, there are signs of progressive consolidation in this country as well, with two shipyard alliances initially being formed around ThyssenKrupp Marine Systems (TKMS) and German Naval Yards, which has been associated with the Lürssen Group since 2020 (Frank, 2020). An even more far-reaching consolidation of shipyards is currently being discussed (Handelsblatt, 2022).

[4] Developed since the 1980s, the Eurofighter is considered a fourth-generation fighter aircraft.

[5] There is also an urgent need to procure a new heavy transport helicopter to replace the CH-53s that have been in service since the early 1970s. In the absence of a European offer, only American helicopters can be considered for this purpose. Because it is less expensive, Germany in the meantime decided to buy the twin rotor CH-47 (BMVg, 2022).

3.3 Vehicles, Weapons, and Ammunition

The backbone of the German ground forces' defense capability is still the Leopard 2 main battle tank, which has been in service since the 1980s. In the meantime, the Leopard 2 A7 version is used, which can "keep up" with tanks developed later by other countries. After the Bundeswehr's inventory had temporarily dropped to around 230 tanks, the number is to grow to 320 units at the end of 2023 (Lobitz, 2020).[6] In addition, a successor model for the period after 2035, the Main Ground Combat System (MGCS), is to be developed jointly with France (BMVg, 2020). For this purpose, the companies KMW (Germany) and Nexter (France) have joined forces to form the KNDS Group.

Tanks such as the Leopard 2 – which continues to be exported as well – and other tracked or wheeled military vehicles accounted for sales of just over 700 million euros in 2020, but this was a negative outlier. In 2019, combat vehicles worth 2.3 billion euros were sold. With the end of the delivery of the first batch of the Puma infantry fighting vehicle to the German armed forces and a lack of export deliveries, very low sales are also to be realized in 2021 and 2022.[7] This highlights the high volatility in the defense industry, which is entirely dependent on government procurement projects. In February 2022, manufacturers KMW/KNDS and Rheinmetall submitted an offer to the German government for a second batch of 200 Puma infantry fighting vehicles (Hoffmann, 2022), but a split in procurement between Puma tracked vehicles and the Boxer wheeled fighting vehicles is currently being considered (Geiger, 2022). Supplier companies with a high share of sales in tracked vehicle components are threatened in their existence by the delay, which in turn calls into question the overall ability to build complex combat vehicles in the future (Prem, 2022). Employment in vehicle manufacturing is likely to have fallen compared to 2015 due to consolidation in the industry as a result of mergers, but the figure for 2020 can only be roughly estimated at around 12,000 employees.

Weapons and ammunition were manufactured for 2.4 billion euros in 2020, with 10,800 employees in this sector. Compared to 2019, these were declines in each case, although the Covid19 pandemic, which affected production in virtually all industrial sectors through lockdowns and supply chain disruptions, probably also contributed to this.

Many defense companies in the vehicle and weapons and ammunition sectors are small, unlisted companies, or the civilian and military sectors of production are not clearly separated, making it difficult to identify defense production data.

3.4 Regional Distribution of the German Defense Industry

The companies in the German defense industry are not evenly distributed across the country but have spatial centers in the south and north of Germany. The north is primarily represented by shipyards for naval shipbuilding and regional suppliers, while Bavaria is a center for the high-revenue construction of combat aircraft. In Baden-Württemberg, on the other hand, in addition to the military-relevant vehicle industry, there are also weapons and ammunition manufacturers, most of which are medium-sized (Friese et al., 2022).

[6] In the 1980s, the Bundeswehr had up to 4,000 main battle tanks, including older types.

[7] However, the reactivation of stored end-of-life vehicles such as the Gepard anti-aircraft tank and the Marder infantry fighting vehicle for Ukraine or the armed forces of Eastern European NATO partners could increase sales in the short term depending on the residual value attributed to them.

The high importance of the defense industry for southern Germany is primarily due to the defense division of the European aerospace group Airbus. Airbus Defence and Space, headquartered in Munich, employs around 34,000 people across Europe, with the main German locations being Munich and neighboring Manching. As Munich is also the headquarters of the combat vehicle manufacturer KMW and nearby Taufkirchen is home to the defense electronics manufacturer Hensoldt, the Bavarian capital has the largest defense industry cluster in Germany (Friese et al., 2022).

Northern Germany is represented in the defense industry primarily by naval shipbuilding, although Bremen, as a location of the space industry with Airbus and OHB, also produces reconnaissance and communications satellites that can be used for military purposes. The naval shipyard industry is spread across Hamburg (Blohm+Voss, part of NVL), Bremen (Naval Vessels Lürssen [NVL]) and Kiel (ThyssenKrupp Marine Systems [TKMS] and German Naval Yards), with smaller shipyards and other companies as suppliers in the coastal region. The number of employees at the shipyards is lower than at the southern German locations, but their regional importance is even greater due to the industrial weakness of the coastal region and – except for Hamburg – the existing structural problems. In northern Germany, the KMW site in Kassel is also involved in tank production (Puma, Leopard 2, Boxer).

Western Germany features the main location of Rheinmetall Landsysteme, Germany's largest manufacturer of tanks and combat vehicles, headquartered in Düsseldorf, but is otherwise hardly characterized by the defense industry apart from supplier companies: The days when the heavily industrialized Ruhr region was also a center of weapons production are a thing of the past.

There are no relevant defense industry locations in eastern Germany, as the GDR's defense companies were wound up after the fall of the Berlin Wall or had to develop other product fields, but due to the reduction in defense spending there was also no need for additional locations for western German manufacturers or a relocation of production. Interestingly, the Kiel shipyard Thyssenkrupp Marine Systems is currently looking for expansion opportunities and could possibly take over the insolvent MV shipyards, so that an East German defense industry site could be created (NDR, 2022).

4 European Defense Policy and Defense Industry

4.1 The Common European Defense Policy

The European Defense Union is founded in the Common Foreign and Security Policy (CFSP), which was adopted with the Maastricht Treaty in 1992. Against the backdrop of the Balkan war in the 1990s, it became clear that this must also include the possibility of military action. In 1999, therefore, the European Security and Defense Policy (ESDP) was agreed in the Treaty of Amsterdam (BMVg, n.d.). In 2009, the EU defense policy was once again significantly strengthened by the Treaty of Lisbon (Art. 42 to 46). Since a common defense policy depends on a common foreign policy, the European External Action Service, headed by a High Representative of the Union for Foreign Affairs and Security Policy, was established. In addition, the Treaty of Lisbon contains a mutual assistance clause in Article 42.7 – similar to Article 5 of the North Atlantic Treaty of 1949, the founding document of NATO (BMVg, n. d.).

Within certain limits, EU countries can decide for themselves whether to participate in the common European defense policy and its projects. The only country that has not participated at all so far is NATO member Denmark. This is due to the rejection of the Maastricht Treaty by the Danes in 1991, which is why the Scandinavian country does not have to introduce the euros or participate in the common security and defense policy (Steuer, 2022). Only recently, under the impact of the Ukraine war, has Denmark decided to join the European Defense Union.

Within the framework of the European Defense Union, there is the so-called Permanent Structured Cooperation (PESCO) of the EU members for improved European capability to act through joint equipment procurement and training; there are a total of 46 cooperation projects in PESCO so far (BMVg, n.d.). To strengthen cooperation, an annual review on European defense (CARD) was also introduced and the European Defense Fund (EDF) was established. Since 2017, the EU has also received the capability to conduct military planning and training missions, for example in African countries.

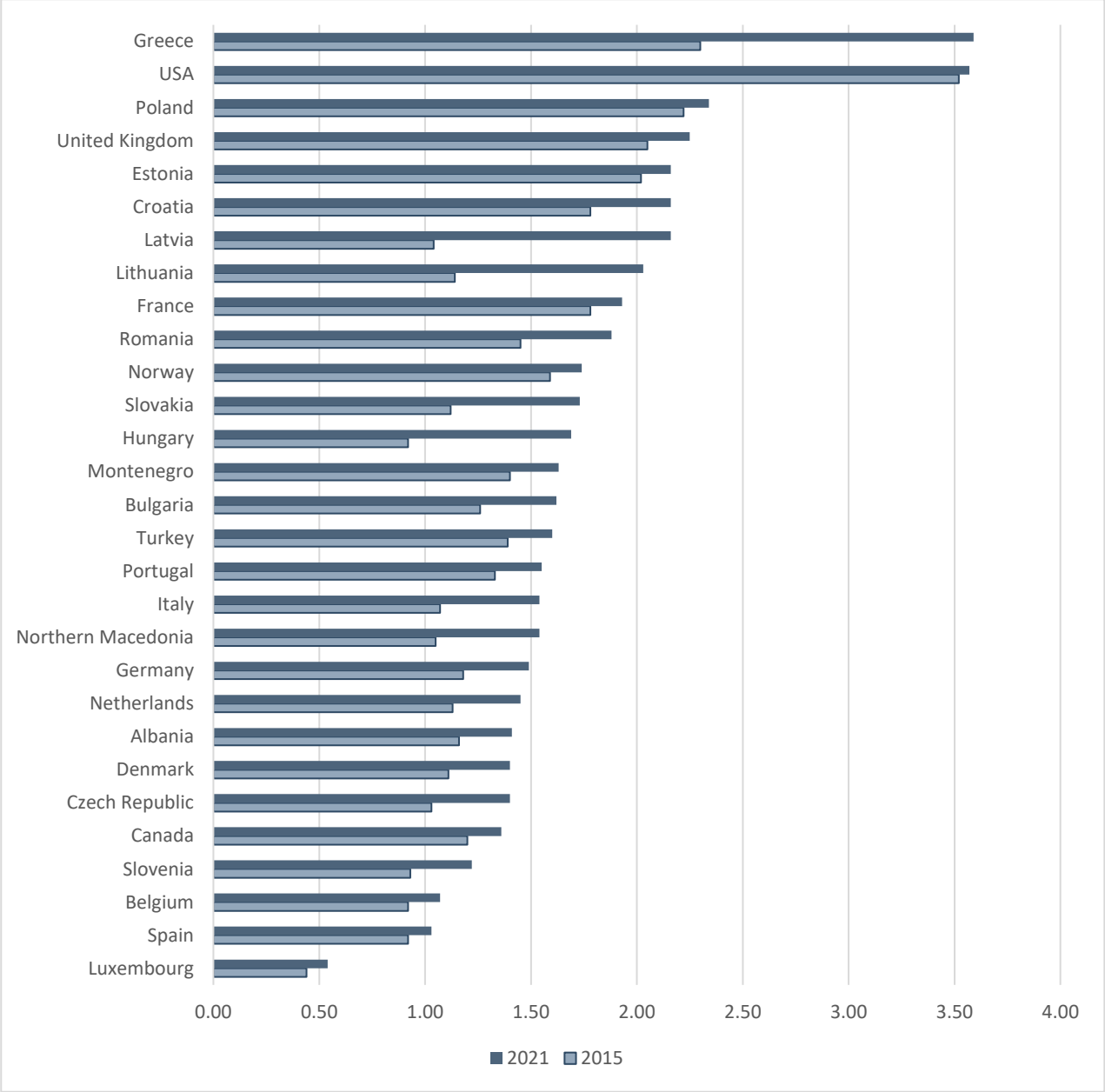
In September 2017, the French president advocated a stronger European defense pillar in his “Initiative for Europe” (République Française, 2017). On the one hand, strengthening the EU's defense pillar seems imperative, as it is an essential part of greater European political integration. On the other hand, it also poses dangers, since a departure of the participating EU members from NATO within the framework of an independent European defense strategy could rather lead to a weakening of European security – at least as long as the EU does not really have the military means for self-defense. This is all the more true since Brexit, as the United Kingdom, together with France, forms the European mainstay of nuclear deterrence and has probably the most combat-capable European forces – especially in the navy and air force.

The Ukraine war and the reaction of Western countries to Russian aggression have once again shown clearly that Europe cannot act independently in the event of a conflict but remains dependent on the political and military power of the United States. This is also due to Europe's low defense spending, with only a few countries – the United Kingdom, Poland and the Baltic states – reaching NATO's two percent target in 2021. Only Greece has a GDP contribution to defense similar to that of the United States, at 3.6 percent (see Figure 4-1). Compared to 2015, however, all NATO countries have increased their defense spending.

No European country - not even Germany with its broad-based defense industry – has on its own a comprehensive portfolio of defense production technology capabilities in aerospace systems, land warfare, naval vessels, and cyber defense. At the European level, the full spectrum of capabilities is available, but countries pursue industry-related particular interests, which hinders interoperability and the deepening of independent European defense capabilities. The solution can therefore only lie in better European coordination and cooperation if dependence on the USA is not to grow further. This must include a strengthening of joint European defense research, but also increased defense spending to meet the two-percent target across Europe following the Ukraine invasion. To this end, the procurement system must be set up in a targeted manner not only in Germany, but preferably throughout Europe.

Figure 4-1: Share of defense spending in gross domestic product of NATO member states

2015 and 2021, in percent



Source: NATO (North Atlantic Treaty Organization)

4.2 European Defense Industry

While the global defense industry has seen strong growth since Russia's occupation of Crimea in 2014, the development at the European level has been more subdued. Sales of the 100 largest companies in the defense sector worldwide increased by 36 percent from 2014 to 2019 (Strategy&, 2022). In 2014, European defense industry sales stood at 97.3 billion euros, and the number of jobs was about half a million, with another 1.2 million employed by suppliers and service providers (European Parliament, n.d.). BAE Systems, based in Farnborough, UK, is by far the largest European defense company, with sales of 23.5 billion euros in 2020. The second and third-placed companies, Airbus Defence with 12 billion euros and Leonardo (Italy) with

11.2 billion euros, together only just reach this turnover. France's Thales follows in fourth place with 9.2 billion euros, while Germany's Rheinmetall AG is only seventh in Europe with sales of 4.25 billion euros (2020). Part of the critique of an independent European security structure provided by the EU is that building parallel structures to NATO requires scarce resources that could be better used to strengthen military capabilities (Strategy&, 2022). By 2020, European defense industry revenues had changed little. Although European NATO countries committed to increasing defense spending and capabilities to meet the two percent target at the 2014 Wales Summit, European defense company sales have stagnated since then, and the region's largest companies have lost global market share to U.S. and Chinese competitors.

One of the reasons for the restrained growth of the European defense industry is the non-implementation of the two percent target not only by Germany, but by all European NATO countries except Greece, Poland, Croatia, the Baltic States, and the United Kingdom (see Figure 4-1). Lack of planning capability due to uncertain funding also makes it difficult to build the necessary competencies required for modern defense technologies.

Another important reason for the slow development of the European defense industry is that decisions on defense and security spending are made at the national political level, with each bigger country having its own national industry champions, resulting in a wide range of products and platforms developed at great expense by a large number of manufacturers. This reduces technological capabilities and limits the ability to share expertise across borders. In important areas such as the development of fifth-generation radar-invisible fighters, Europe has fallen behind the United States as a result, forcing European countries to rely on U.S. products like the F-35.[8] Capability development is also hampered by the fact that various universities are very restrictive in their cooperation with the defense industry through so-called civilian clauses. The alliances of production and development-related research that are so important for innovation can be developed only inadequately in this sector. However, reduced innovative strength ultimately weakens the ability to succeed in armed conflicts, to protect the lives of soldiers and to ensure external security.

4.3 Cooperation in Defense Projects

As the cost of developing new high-technology weapons systems continues to rise, warships, aircraft and tanks are becoming increasingly expensive. The only way to counteract this in terms of unit costs is through larger unit numbers, which can be achieved through exports or cooperation projects. For example, the last two generations of combat aircraft acquired for the German armed forces, the Eurofighter and the Tornado, were both European cooperation projects.[9] However, experience with cost reductions from cooperative projects has been mixed: While the increase in unit numbers was generally achieved, the development costs also increased usually due to different requirements of the partner countries. For example, the Eurofighter Typhoon, jointly developed by Germany, the United Kingdom and Italy, became significantly more expensive to develop than originally planned. European cooperation is made more difficult when export opportunities

[8] This is currently exemplified in the German decision to procure F-35s instead of waiting 20 years for a comparable European system developed together with France.

[9] Eurofighter Typhoon: Germany, United Kingdom, Italy, Spain. Panavia Tornado: Germany, United Kingdom, Italy. For both fighter projects, France decided against participating in the project due to divergent requirements – such as the ability of the aircraft to be deployable from French aircraft carriers.

are not available due to a German veto because of restrictions on weapons sales, but are essential for other suppliers.

In 2020, defense exports of 5.8 billion euros were approved in Germany, rising to 9.4 billion euros in 2021 (BMWK, 2022). Export orders thus continue to play a significant role for the German defense industry. However, highly restrictive handling of arms exports to countries outside NATO has repeatedly thwarted arms deals with countries such as Saudi Arabia, while European partners such as France are less reticent on this point. Since Germany departed five years ago from the practice it had followed since the 1970s (Leber, 2019) and also made supplies from partner countries in cooperation projects subject to German export controls, it has become a rather unloved partner in joint defense projects.[10]

In 2019, under pressure from France, the former practice was re-established in an agreement for the planned Franco-German air combat system, as France doesn't want to bind itself to German export restrictions (Sauer, 2019), and in 2022, Germany and France signed an agreement effectively returning to the status quo ante, allowing French export decisions. However, without a general arrangement of national freedom of decision in defense partnerships, a politically desired closer defense cooperation in Europe seems difficult to imagine, since predictably no other country wants to make itself dependent on German export control in its decisions and Germany cannot go back on the treaty concluded with France in the case of agreements with other EU countries. In order to strengthen European defense capabilities – whether as the long-term goal of an independent EU defense doctrine or as a European pillar of NATO – a common European defense policy appears necessary, which would also have to include the development of common export regulations to replace the different national regulations in this area.

5 Cyber Defense and Cyber Warfare

An increasingly important area of defense is cyber warfare, including cyber defense and security. Cyber warfare takes place in the so-called cyberspace, which includes all computers, systems and other devices that can be connected to the Internet (Herpig, 2016). Specifically, cyber warfare involves using digital technologies to disrupt or disable IT systems to directly attack defense structures or to achieve downstream effects such as cutting off electricity. Disinformation campaigns are also part of cyber warfare. Digital attacks can also be used in combination with traditional types of attacks.

Digital security risks arise from intentional or unintentional threats in cyberspace that are transnational, exploit vulnerabilities, and result in the availability, integrity, and confidentiality of data, hardware, software, and networks being compromised (OECD, 2019). These risks are particularly high because many so-called critical activities depend on this very availability, integrity, and confidentiality of data, hardware, software, and networks.[11]

[10] On the development of the German attitude toward export controls from cooperative projects, see Leber (2019). Germany's more liberal stance on partner country exports from cooperative projects from the late 1970s to 2017 stemmed from an agreement between Chancellor Helmut Schmidt and French President Valéry Giscard d'Estaing.

[11] Critical activities are economic and social activities whose interruption or disruption would have serious consequences for the health, safety, and security of citizens; the functioning of services essential to the economy, society, and government; and broader economic and social prosperity (ibid.).

Russia's attack on Ukraine also shows that cyber warfare is playing an increasing role. In addition to land, air, and sea attacks, Ukraine has seen a high number of distributed denial-of-service and ransomware attacks against government institutions, banks, and critical infrastructure operators. These attacks aim to cripple the communications infrastructure, disrupting critical activities and further destabilizing the situation. Since almost all areas of public and private life are digitally networked, all of these areas can also be attacked digitally. This can be done regardless of location and does not necessarily require extensive human resources, making these attacks particularly attractive. The political activism of non-state hackers ("hacktivism") in Russia, Ukraine and other parts of the world can neither be comprehensively monitored nor controlled, but has the potential to further endanger the global security situation.

The impact of digital attacks extends beyond Ukraine (UK Government, 2022). The infrastructure of NATO countries may also be a target of attack below the threshold of a military strike by Russia due to Western support for Ukraine (Sanger/Conger, 2022).[12] Thus, there have also been additional IT security incidents in Germany since the start of the war, but they have only had an isolated impact (BSI, 2022). Nevertheless, the responsible Federal Office for Information Security (BSI) speaks of an increased threat situation for Germany.

The private sector is particularly at risk. There are often numerous security gaps in companies, which were also widely exploited before the Ukraine war. The increased home office during the pandemic has also led to a tightening of the cyber security situation (Engels, 2021). Cyber attacks caused damage to 86 percent of companies in Germany in 2021 or 2020, according to Bitkom (2021). Damage from ransomware attacks, associated with the failure of systems or disruption of operations, has increased by 358 percent since 2019 (ibid.). In order for companies to be more defensible against cyberattacks, they also rely on rapid support from government agencies.

This requires more financial and human resources as well as clear responsibilities. According to the chart on the state cybersecurity architecture in Germany, which is regularly updated by the think tank Stiftung Neue Verantwortung (SNV), 75 bodies – including ministries, committees and government organizations – are responsible for keeping damage away from IT systems at the federal level alone (Herpig/Rupp, 2022). These are joined by international actors, UN, EU, and NATO actors, and numerous state institutions. This fragmentation means a high coordination effort that does not match the dynamics and reach of digital attacks. Bundling competencies is urgently indicated and is also sought by the Federal Minister of the Interior Nancy Faeser (Delhaes et al., 2022). She sees the Federal Office for Information Security (BSI) as being primarily responsible (Koopmann, 2022). The BSI is also home to the National Cyber Defense Center, which was established in 2011 as a cross-agency and cross-institutional platform to improve the exchange of information between authorities and institutions and to strengthen the coordination of protection and defense measures against IT security incidents (BSI, n.d.). The Bundeswehr's Cyber and Information Space organizational unit, established in 2017, is also represented in the Cyber Defense Center.

How Germany performs as a producer of military cybersecurity products is difficult to capture statistically, as the distinction from civilian areas of electronics and cybersecurity is fluid. In addition, many of these are services, not industrial sales. In 2014, a study for the German Federal Ministry of Economics put sales for defense and security electronics at around 2.8 billion euros (Fischer et al., 2015). More recent data is not

[12] Israel and Iran have been engaged in mutual cyber attacks for years (Fassihi/Bergmann, 2021). The U.S. is also registering increasing activity by Chinese hackers against American companies and data infrastructures (Lyngaas, 2022).

available, but a strong increase can be assumed. Overall, the revenue rates in the ICT market in Germany have been clearly positive since 2010 for the areas of IT hardware, software and IT services (Bitkom, 2022). Only in the Covid19 year 2020 sales in the IT services area fell compared to 2019 (ibid.). Some of the hardware sales are likely to be electronics components, which are included as intermediate inputs in the four defense industrial sectors listed (see Chapter 3). It can be assumed that it is not so much the procurement of hardware and software that is a bottleneck for cyber defense in Germany. Rather, the shortage of IT security specialists is a bottleneck that particularly affects companies, but also the armed forces. Globally, a lack of skilled workers jeopardizes cybersecurity in 85 percent of companies (Trellix, 2022).

Despite the urgency of additional investment, cybersecurity is not included in the 100-billion-euros special fund for the Bundeswehr. The necessary funding is now to come primarily from Interior Ministry funds (Koopmann, 2022). Federal Interior Minister Nancy Faeser announced that investments in cybersecurity will continue to be significantly increased in the next federal budgets (Delhaes et al., 2022). Faeser plans to announce a new cybersecurity concept before summer 2023 (Koopmann, 2022). In addition to a well-organized, powerful cyber defense in the form of programmers who can protect IT systems and fend off hacker attacks, cyber resilience should play a stronger role. This enables IT systems to recover more quickly after an attack.

6 Conclusion and Recommendations

Russia's invasion of Ukraine is a turning point for Germany’s policy and the Bundeswehr, but also for the defense industry. The focus is mainly on improving the Bundeswehr's financial resources with the help of the special purpose fund of 100 billion euros. In view of the accumulated equipment deficits on the one hand and to the two-percent target of NATO on the other, a long-term increase in defense spending is necessary, also to maintain the still extensive defense industrial capabilities in Germany. The financial planning to date does not take these needs into account, but defines a cut-off point at the end of the legislative period. To ensure planning security and maintain a good level of equipment, it is more important in the long term to stabilize the increased spending on the defense budget that the one-off 100-billion-euros special fund allows for a few years.

The existing deficits of the Bundeswehr as a provider of external security lie in particular in equipment, spare parts and ammunition shortcomings. Low spending in the past on equipment and ammunition has resulted in a high investment backlog. In addition, it has become much more difficult for the Bundeswehr to attract the necessary skilled personnel and specialists. Military service would hardly compensate for the training of specialists who have to work with complex technological systems. The reintroduction to this “in-kind tax” on young adults therefore does not seem to be adequate to solve the current recruitment problems.

A turnaround in German defense policy is not possible without strengthening cyber defense. War always also - and increasingly - takes place in the digital sphere. German cyber defense must be strengthened in terms of funding and personnel, and responsibilities must be clarified. Nationally and internationally, cyber security must be better coordinated. In addition to cyber defense, it is also central to create cyber resilience. Cyber attacks cannot be prevented entirely. This makes it all the more important for IT systems to be able to absorb attacks well and recover from them quickly.

External security can be better ensured in a European alliance than nationally. A common European defense policy becomes all the more urgent the less the United States is prepared to bear the main burden of European security. Without the United States, Europe would hardly be able to act in the current crisis. European cooperation must be designed in such a way that it does not compete with NATO, otherwise Europe's defense capability would be weakened rather than strengthened.

More European cooperation is also needed for the defense industry. Obstacles caused by differing restrictive national export policies must be removed. But proportionality in the awarding of contracts is also not in line with a modern defense policy. Nor must the European taxonomy for the financial sector become an obstacle to the production of necessary defense equipment. It seems counterproductive that the state, which is the sole buyer of defense equipment and considers the preservation of defense capability to be essential, is at the same time – via the supranational EU level – developing a taxonomy that makes it more difficult for defense industry producers to obtain financing due to an alleged lack of sustainability criteria. Medium-sized companies in supply chains, which are often highly specialized, are particularly affected (Prem, 2022). By contrast, companies where less than 20 percent of sales are accounted for by defense equipment are exempt from the regulations, so that conglomerates benefit over smaller specialized companies, which also contradicts the European SME strategy.

German abstract

Durch den russischen Angriff auf die Ukraine ist die Frage der Einsatzfähigkeit der Bundeswehr erneut in den Fokus gerückt. Die Landesverteidigung, die mit dem Ende des Kalten Krieges und der Auflösung von Warschauer Pakt und Sowjetunion 1991 nur noch eine geringe Rolle zu spielen schien, besitzt nun wieder einen hohen politischen Stellenwert. Bundeskanzler Olaf Scholz sprach in seiner Regierungserklärung vom 27. Februar 2022 von einer Zeitenwende durch diesen Krieg und kündigte ein 100 Milliarden Euro umfassendes Sondervermögen zur Stärkung der Verteidigungsfähigkeit an. Diese umfangreichen Mittel können jedoch nur nachhaltig sicherheitspolitisch wirksam werden, wenn die Möglichkeiten der Industrie zur Lieferung neuer Waffensysteme und die Möglichkeiten der Bundeswehr zur Nutzung und Instandhaltung dieser Waffen in Einklang gebracht werden. Im Jahr 2020 stellten die etwa 55.500 Beschäftigten im verteidigungsindustriellen Bereich in Deutschland Waffen, Kampfflugzeuge, Kriegsschiffe und Militärfahrzeuge für circa 11,3 Milliarden Euro her; beide Werte lagen trotz der bereits erfolgten Besetzung der Krim durch Russland niedriger als 2015.

Dieses Policy Paper stellt deshalb den Stand der Pläne zur Stärkung der Bundeswehr vor und ordnet sie sicherheitspolitisch ein. Zudem wird die deutsche Verteidigungsindustrie mit ihren Sektoren Luft- und Raumfahrzeuge, Marineschiffbau, Kampffahrzeuge sowie Waffen und Munition portraitiert und anschließend auf den immer bedeutenderen Bereich der Cyberabwehr eingegangen. Das Policy Paper schließt mit einem Fazit und verteidigungspolitischen und verteidigungsindustriellen Empfehlungen. Zu den Empfehlungen zählt eine Verstetigung der erhöhten Verteidigungsausgaben bei zwei Prozent der Wirtschaftsleistung, um Planungssicherheit für Rüstungsprojekte über 2025 hinaus zu erreichen und die Fähigkeiten der deutschen Verteidigungsindustrie nachhaltig zu sichern, eine verstärkte Kooperation mit europäischen Partnern in der Verteidigungspolitik und in Rüstungsprojekten sowie eine Berücksichtigung des Verteidigungssektors in den Nachhaltigkeitskriterien der Taxonomie für den europäischen Finanzsektor.

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