



## Sources of strength: mapping the defence sector in Europe

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# Sources of strength: mapping the defence sector in Europe

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## ABSTRACT

The European Union defence sector is not only crucial for the EU's security, but it is also a major industrial asset for EU member states, as it may foster innovation and greater integration among member states, as well as facilitate technology transfer. The understanding of and inferences about the sector, however, are laborious since data on the defence industry in Europe is often contradictory and confused and it is mostly compared at the national not at the European level. As a contribution to address such shortcomings and as opening piece for this Special Issue, this article focuses on the finding, collecting, cleaning, and organizing data on the *geographical* concentration/location of EU defence industries. This is a fully original descriptive analysis of the current situation, and it provides a reliable basis on the concentration/location of defence companies. This paper represents a firm basis from which to explore (in future research) how defence companies contribute to the technological integration of the EU and it should help the reader to better understand the following articles in this Special Issue.

## ARTICLE HISTORY

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## KEYWORDS

Defence industry; European defence; defence technologies; mapping innovation; European integration

## 1. Introduction

The idea of pooling together the defence resources has always accompanied the process of European integration since the launch and demise of the European Defence Community (EDC) in the 1950s. During the Cold War some progresses were made but the road remained long. After 1989, the European public became convinced that armed conflict were unfortunate events for other geographical areas. Despite several serious terrorist attacks on European soil, the War on Terror also reverberated with Europeans as a distant undertaking. In the last decade, however, a few pivotal events, such as Brexit (which removed Great Britain and its economy from the integration process), COVID-19 (which remarked the importance of having technologically advanced armed services to respond to mass emergencies) and, above all, the Russian invasion of Ukraine have made Europeans rethink that they have to spend more on security and defence. Obviously, one of the main beneficiaries of this change of mind will be the European defence industry. It is also clear to everyone, from EU institutions down to member-states; however, that greater efficiency and coordination are probably necessary in the defence industrial

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sector so as not to waste (too much) of European taxpayers' money. This Special Issue of *Defence Studies* tackles such strategic challenge for the Europeans from multiple viewpoints. This article provides a fully original descriptive analysis on the current situation of the *geographical* concentration/location of EU defence industries as well as a guide for the reader for the articles that follow.

With a turnover of 119 billion euros, 463 000 people directly employed and more than 2 500 small and medium companies in 2020,<sup>1</sup> the European defence industry represents a major economic sector characterized by a high concentration of not only capital and employees, but also of technologies and know-how. In this context, technological innovation represents the single most important factor for obtaining and maintaining a superior edge in defence and national security production. Achieving technological superiority is, therefore, a key driver of success in this sector. European defence and the rationalization of this industrial sector have long been debated among experts in relation to technology transfer and cross-industry cooperation for technological innovation and how such practices are now crucial for companies to remain competitive in the advanced technologies of the 21<sup>st</sup> century (e.g. Giacomello, Moro, and Valigi 2021).

Among multiple factors that contribute to greater integration in the defence sector, the proximity to other defence and civil companies, together with the ownership link between defence companies, may have a significant impact. The role of the location and geographical proximity of defence companies in fostering integration of European defence is an important issue which (if not from a theoretical perspective) has not been fully addressed. Similarly, it is worth considering whether and how market concentration, both in geographical and capital terms, can foster collaboration among companies and, ultimately, facilitate innovation of products and processes through shared experiences and best practices. Furthermore, the role that spill-over effects can play within such context deserves further exploration (e.g. Sempere, 2008).

Despite a long-running and multifaceted debate, the literature on the geographical concentration of the European defence sector is limited, and analysis of geographical data is rare. Except from a theoretical perspective, the relevant publication record on such topic is still rather scarce. This article (and those that follow) aims also to correct this shortcoming of the current literature on European defence industry.

A comprehensive analysis of the geographical distribution and of market concentration is fundamental to better understand: (1) the integration dynamics of the defence sector in Europe. There are obviously several distinctive parts, contributing to different extents, to the sector integration, but having a clear view of the geolocation of defence companies and their ownership link at the European level could shed light on one of the foresee factors that has a major impact on the integration of the sector; moreover, (2) while there are multiple factors that contribute to innovation, geographical proximity, and location of defence companies is probably one of the most understudied. Likewise, the degree of sector concentration is crucial in identifying which are the research and development (R&D) resources as well as technology networks that companies rely on to strengthen their own technological innovation (one of the key topics of this Special Issue), which takes advantage of technology transfer and cross-industry cooperation, and while such solutions are common and pervasive in the private sector, they are less frequent or typical in the defence and national security sphere; finally, (3) the spill-over effect for technology ideas is a smoother process among companies (in our case,

defence companies) within geographical proximity as informal communication and problem solving of common issues may be speedier.

This article aims at filling this gap by adopting an empirical approach. The main goal of this paper is to provide a descriptive analysis of how the European defence industry is distributed among countries by outlining how the defence sector is concentrated across the European Union. The second goal is to examine the ownership characteristics of the major European defence players, with a focus on the degree of integration of the same on the European scale. Our objective here is thus achieved by mapping the European defence companies based on primary data, whereas the exploration of defence market concentration is carried out relying on secondary data on the ownership structure of major players. Overall, the article is a preliminary inquiry, a “probe” one may say. The findings presented here are not exhaustive because they will be further examined in the other contributions to the Special Issue.

While this work cannot provide the definitive answer to the question of whether geographical proximity and market concentration favour the integration of the defence sector, it serves as preliminary exploration of this topic, aimed at providing a robust starting point for further inquiry.

### **1.1. A (brief) literature review**

The European defence industry has been the subject of a rich literature, examining a wide range of issues. Research has been conducted on the relationship between national states, companies, and Europe (Fiott 2019; Gummett and Stein 1997) or on the thorny problem of duplication of military production and technology (Briani 2013).

Moreover, extensive research has focused on the traditional dilemma of balancing the preservation of national assets and the need for integration within the European defence industry. Howorth, for example, explored the relationship between European defence autonomy and dependence on the American guarantee (Howorth, 2017a, 2017b); he focused on a possible prevalence of the subsidiarity principle over national logic also on military procurement (Howorth 2019) and, finally, on the need for a “Europeanization” of the defence budget (Howorth 2017c). Daniel Keohane, instead, dealt with how, after Brexit, France, and Germany could cooperate in the military field (Keoane 2017).

Calcara’s approach, on the other hand, is more focused on industrial relations. He examined how EU member states tended to establish relations in which cooperation and competition coexisted and how forms of protectionism, oligopoly, and promotion of the interests of national companies stood in the way of the construction of a European defence industry complex (Calcara 2018, 2020). On the contrary, a limited number of works focused on the relationship between innovation approaches (e.g. Castellacci and Fevolden 2015; Fiott 2017a, 2017b).

Surprisingly enough, however, studies that attempt to map the European defence industry are missing. Adopting mostly a theoretical approach, numerous studies focus on identifying the factors that either facilitate or hinder integration and cooperation in Europe, or on identifying the optimal market structures that foster innovation and competitiveness (Kulve and Smit, 2003). As regards the geographical perspective, instead, the rare available analyses examine the defence sector at the country level, or at the best compare two countries.

As a result, there is a lack of comprehensive of the European defence sector, leaving a gap in our understanding of its broader scope and scale. Most probably, this is, at least in part, due to limited accurate data availability. Indeed, one of the few studies specifically addressing the problem of data on R&D defence technology (Hartley 2006) highlights significant gaps in knowledge, concluding that his “review of the data suggests that there is much that is not known in this field with considerable opportunities and areas for further research.”

This work takes a different approach by assessing the ground truth situation in terms of industry’s geographical distribution and market concentration at the European level. By taking a step back from existing theoretical frameworks, we aim to provide an empirical analysis that detects the salient characteristics of the industry’s concentration/location in Europe. Hence, a comprehensive mapping of the defence sector is useful to shed light on several research and political ongoing debates in the defence sector, which can be summarized as (i) integration in the European defence sector, (ii) degree of transfer between military and civil sector of dual-use technology and prevalent direction of it, and (iii) the relationship between integration and innovation in the defence sector. However, since tackling each of these research topics requires formidable, multiple research agendas, this study contributes to the first debate regarding the integration of the European defence sector. As mentioned above, our aim is to act as a starting point for generating new theoretical reflections on the subject.

## **1.2. Data gathering & methodology**

This section provides a detailed description of the technical process of data collection, including the main software tools used for this purpose. As noted, the defence sector poses a challenge when it comes to data collection. Secondary data are often hard to find or missing at all, and, even when available, they are partial and not coherent among European countries. Considering the limited availability of secondary data, the process of primary data collection became a crucial step in this research.

The data collection process involved a combination of web scraping and some “manual” labour. Web scraping refers to the process of automatically extracting data from web pages by leveraging software specifically designed for this purpose. For this study, we used the “Requests” library in Python to retrieve data from the web and a library called Beautiful Soup to process scraped data with the goal of extracting and transforming information contained within raw HTML code into clean, useable data. Manual work, instead, involved mainly copy-pasting data from the companies’ official web pages.

At the European level, the defence sector is represented by the Aerospace and Defence Industries Association of Europe (ASD), an association that advocates for the interests of aeronautics, space, defence, and security industries in Europe. At the national level, ASD comprises 23 national associations across 18 countries. Moreover, 18 of the largest defence companies are direct members of ASD, without going through the national associations.

For our data collection process, we referred to the official website of ASD to identify the webpage addresses of the national associations affiliated with (not to) the ASD. Next, the html source code of each national association’s websites was explored to understand

the underlying structure. HTML is the standard markup language used to create Web pages. This step was needed to determine whether each website was suitable for scraping data of associations' members. This would enable us to collect companies' data way more efficiently than by using manual methods. To have a view of how much time-consuming the manual process is, just consider the amount of time needed to copy-paste one by one the names and other information of around 1600 companies only in the United Kingdom (U.K.), let alone completing the task for all countries covered in this study. Unfortunately, not all websites of national associations had a regular structure that could be easily scraped. This applied specifically to Norway, Spain, Greece, and Denmark. For each of these countries, the list of the association members was collected through a manual process of copy-pasting. Data was collected starting from October 2019 until March 2020. Over this period, the dataset was updated regularly as new sources and data became available.

An online survey was also conducted and distributed to defence companies to further enrich information about defence companies. The survey had the goal to better understand the conditions, both tangible and intangible, under which innovation is more likely to occur, and defence companies were invited completed it online. It was designed to capture not only investments in R&D and other objective information regarding efforts on innovation, but also intangible factors that may impact innovation, such as companies' collaboration and experimental culture, female presence, etc., which does not lend themselves for easy measurements. Despite these efforts in collecting primary data, this attempt failed due to low number of questionnaires filled in by companies, demonstrating a clear lack of willingness to disclose relevant information for their success, broadly speaking.

### **1.3. Data**

The final dataset of the European Defence sector built and used in this study consists of over three thousand companies operating across the continent. In terms of the geographical location, the dataset covers the U.K. and almost all EU countries, for a total of 20 countries. However, data are missing for countries that are not affiliated with ASD, including Switzerland, Ireland, Croatia, Malta as well as the three Baltic Countries.

The dataset contains company data such as name, country of origin and the exact address where the company is located. In some cases, company contact information such as either phone or email address is also available. Although detailed information on main defence sectors in which companies operate was also collected, homogenous information is not available across all countries. For instance, while data for Germany and the Netherlands is complete, information for Portugal, Slovakia, Hungary, Greece, and Romania is limited to company names only.

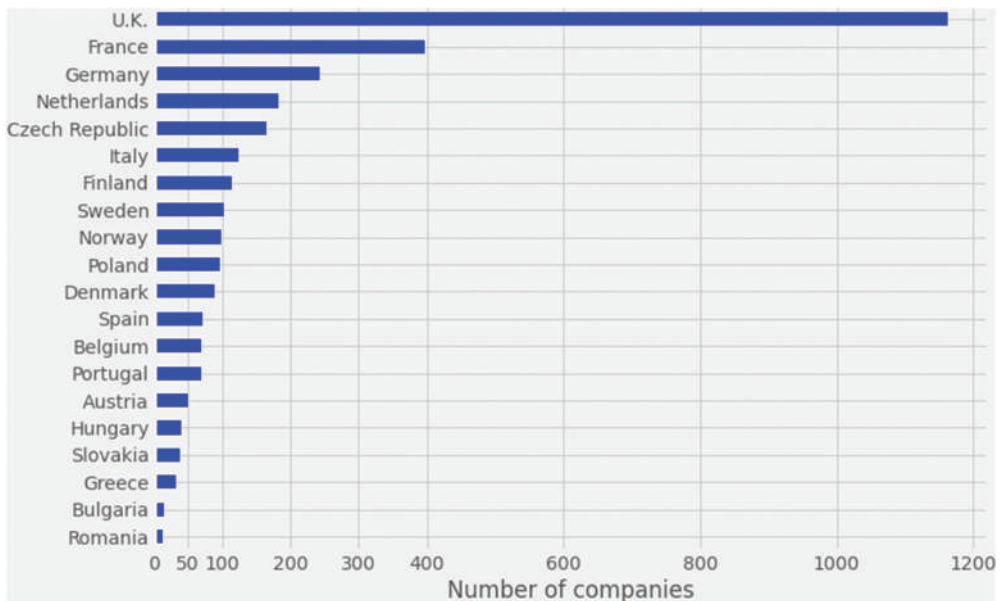
We are aware that a comprehensive dataset of the European defence sector should ideally include accurate information regarding the specific segment of the defence sector in which each company operates. Unfortunately, obtaining such data proved challenging due to a couple of reasons. First, there is a common tendency among companies to describe their economic activity in expansive terms rather than focusing on their core product(s) or service(s), making it difficult to accurately identify their sub-sector. In their official websites, companies generally show a wide range of products and services, most

of which are either complementary or an extension to companies' core business. Second, the large number of companies (several thousands) made it extremely time-consuming for authors to collect additional data about other firms' characteristics such as the number of employees, the annual turnover, and the like. As a result, our dataset mainly includes company names, countries of origin, and physical addresses, with limited information on sub-sectors of activity.

It is nonetheless important to be cautious when interpreting results throughout the analysis carried out below, which are based on these data. The geo-localization refers to the companies' headquarter (HQ) address, without regard for production plants. While for small and medium enterprises (SMEs) the HQ usually corresponds to the production plant, this may not be the case for larger companies. There is a tendency for larger players to establish their HQ in the capital of the country they operate in, or in any other big city in the region where they work, for reasons related to a company's reputation and/or proximity to where institutional power is concentrated. This can lead to discrepancies between a company's HQ and where production effectively takes place.

## 2. Results

This section provides an overview of the European defence sector. From a general perspective, the landscape of the companies operating in the defence sector in Europe varies widely, as demonstrated by the distribution of defence companies across European countries shown in [Figure 1](#). However, a visual map can provide a more comprehensive view of the defence sector in Europe. The map shown in [Figure 2](#) depicts the geographical distribution of companies across European countries. It does not include the U.K. due to



**Figure 1.** Cross-distribution of defence companies in Europe.

Source: Our elaborations based on data from National Defence Associations.



**Figure 2.** Geographical distribution of defence companies across European countries. Source: Our elaboration based on primary data.

its substantial lead in the number of defence companies, which renders comparison with other countries impractical.

At first glance, the mapping of European defence companies highlights that the distribution of the defence industry corresponds with the general economic development of regions and countries. A closer examination of the companies' country of origin reveals that the defence industry in Europe is dominated by British companies. The U.K. alone counts about 1200 defence companies, almost the same number as the total of the next 6 countries combined at around 1213 companies. In terms of company numbers, France has the second largest defence sector with almost 400 defence companies. With its 243 companies, Germany is in the third position, followed by the Netherlands with 182 companies, and Czech Republic with 165 companies. Italy ranks sixth in this classification given it has around 120 defence companies. Finland, Sweden, Norway, and Denmark form in order a block of Scandinavian countries immediately after Italy: these countries share approximately the same number of companies, with Finland having the highest number of companies at 115 and Denmark the lowest with 90. Actually, with its 97 companies, Poland overtakes Denmark getting into the so-called Scandinavian block. The ranking



continues with Spain, Belgium, and Portugal, which have roughly the same number of companies, precisely 70. Austria follows 50 companies, while the remaining countries have fewer than 40 defence companies each, in descending order: Hungary, Slovakia, Greece, Bulgaria, and Romania.

The high ranking in this classification of the Netherlands and, especially, of the Czech Republic is somewhat surprising, given that these countries do not have a significant defence industry. Several factors may explain such phenomenon. The large number of defence companies in the Netherlands can be partly attributed to the country's favourable corporate tax rates combined with a simplified regulatory environment. As witnessed with any economic sector, the fiscal advantages compared to other European countries have most likely attracted European defence companies to establish their headquarters (HQ) in Dutch cities.

As it happens in other economic sectors, this has most likely attracted European defence companies to establish their headquarters (HQ) in Dutch cities. For example, the originally French-German KNDS, a leader defence contractor, is headquartered in Amsterdam. Similarly, the number of companies located around Prague, seems to be excessive for a country of relatively modest economic size, especially when compared to much larger eastern country such as Poland, which has fewer companies.

Our supposition is that having a presence in Prague is viewed by Western European companies as an opportunity to access the resources, experience and defence industry long tradition that Eastern countries have built up over decades of the Cold War.

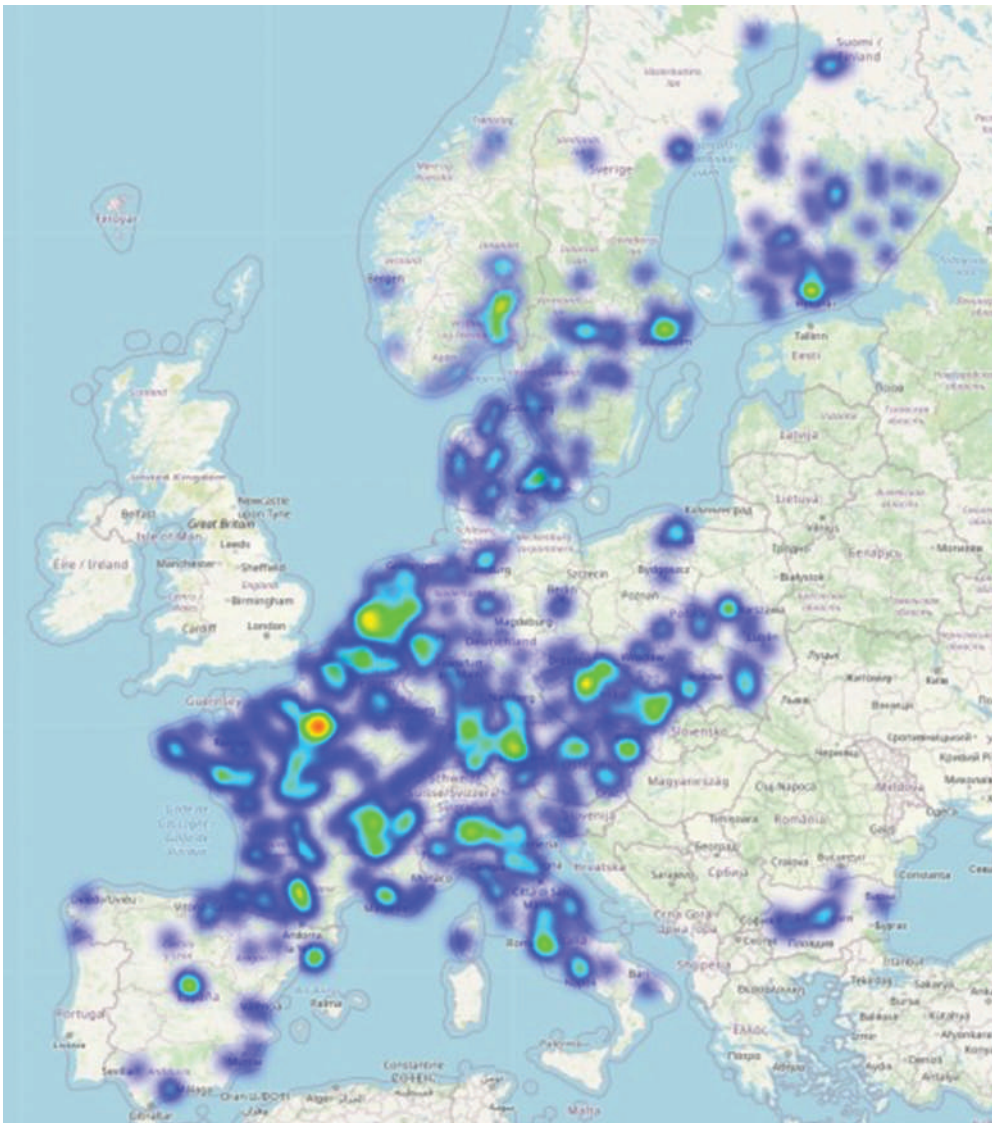
## **2.1. Geo-localization**

One of the primary contributions of this paper is the analysis of the geo-localization of the defence industry across Europe. To accomplish this, geolocation data relative to European defence companies has been collected for each country whenever available. The map displayed in [Figure 3](#) depicts the geo-localization of defence companies across Europe, with the exception of the U.K. and several smaller countries (Portugal, Hungary, Greece, Slovenia) for which data is unavailable.

[Figure 3](#) shows that the defence industry in Europe is scattered across all European countries following a country-centric distribution model. Regarding the geographical distribution of defence companies at the country level, countries share a number of common patterns. In almost every country, defence contractors tend to cluster around the countries' capitals, which often represents the economic heart of the country. Moreover, in some counties, defence companies also tend to concentrate in regions characterized by high levels of development in other economic sectors. A more detailed analysis of the geo-location of defence companies by country is presented as follows:

### **2.1.1. France**

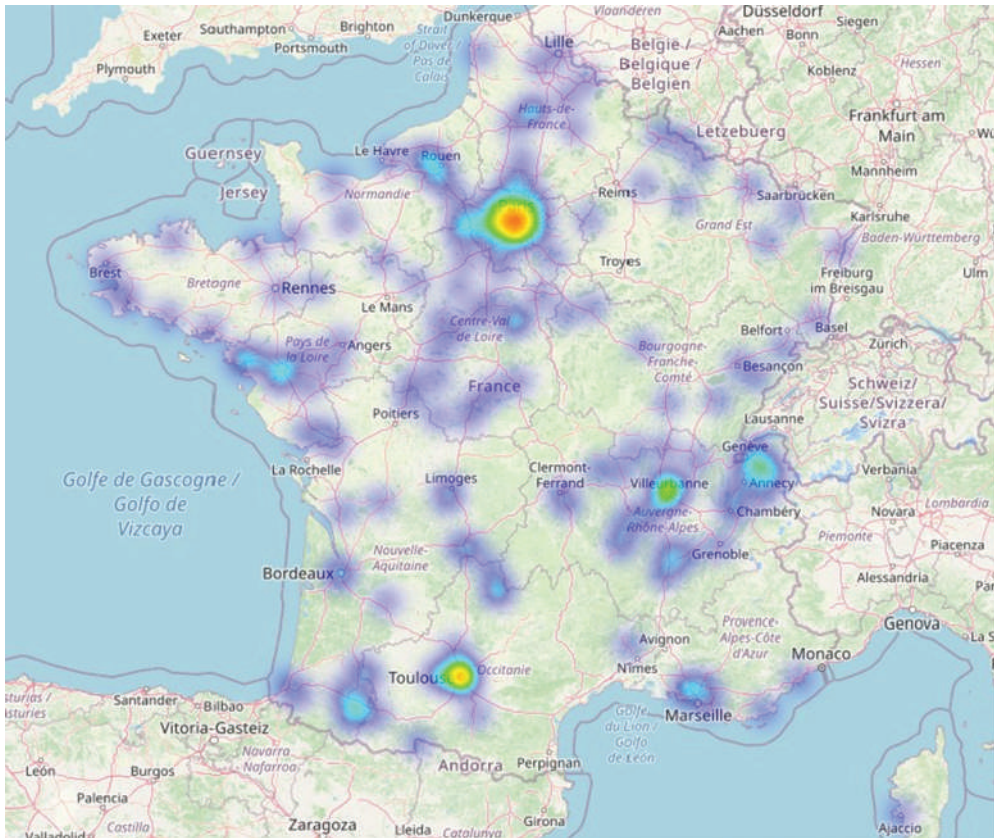
Defence companies in France are scattered all over the country as shown in [Figure 4](#). However, three main clusters stand out. Specifically, the first cluster is centred around Paris, while the other two are located around the industrial hubs in Toulouse and Lyon. Notably, the Toulouse cluster hosts the world's largest production facility of Airbus, one of the largest defence companies, while the cluster of Lyon is smaller in size.



**Figure 3.** Clustering of the defence companies across Europe.  
Source: Our elaborations based on primary data.

### 2.1.2. *Germany*

Unlike most countries, Germany shows a distinct pattern in its defence industry, with companies distributed throughout the entire territory of the country, rather than concentrated around the capital. [Figure 5](#) provides a visual representation of this scattered distribution. Although defence companies are scattered across Germany, several clusters can be identified, with most located in the Western part of the country. Hamburg relevant port and industrial area in the extreme north of the country, represents the first cluster. Although relatively small, the only defence cluster in the east can be identified around Berlin. Moreover, the largest cluster is located in extreme south around Munich in Bavaria, one of the most developed industrial areas in Germany. Defence companies are also located around a large



**Figure 4.** Clustering of defence companies in France.

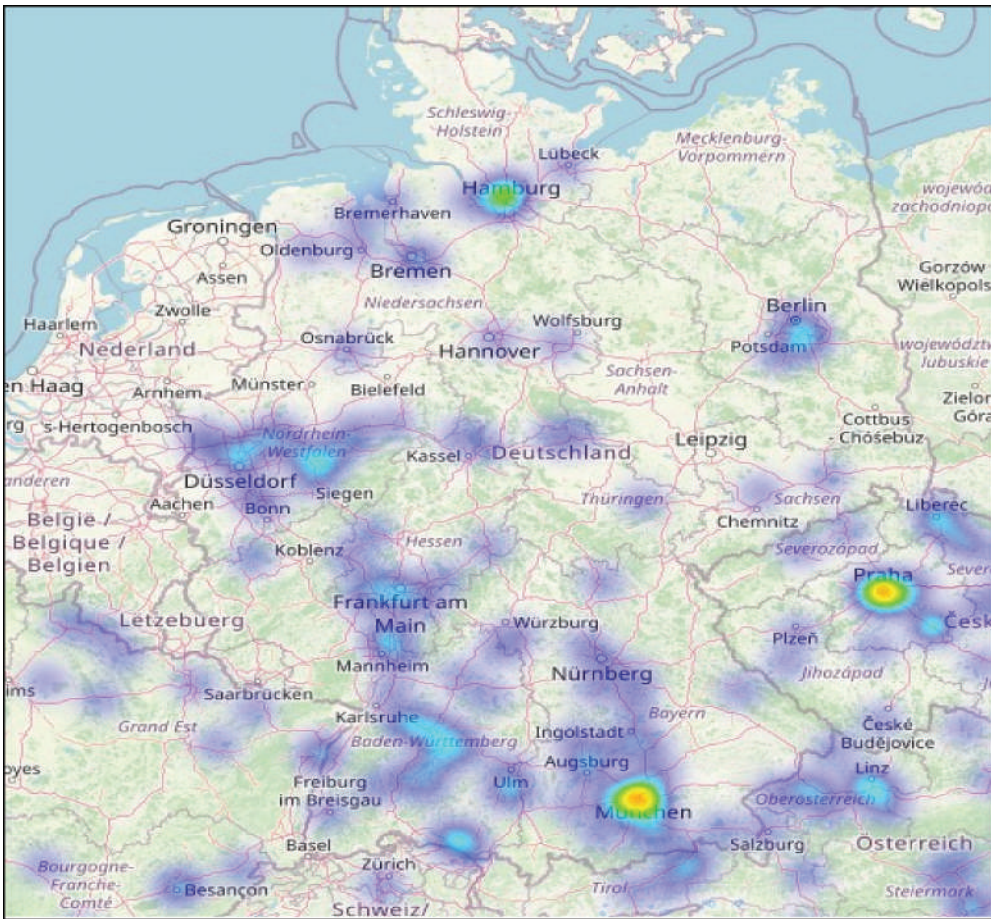
geographical area along a northwest to southeast axis, starting in Dusseldorf-Essen, continues to Frankfurt, and further, as it extends towards the other extreme of the axis, widening into two directions: Stuttgart-Augsburg in the south, and Nuremberg in the north. This axis eventually leads to it closes towards the Munich cluster in a rhombus shape. It is worth noting that the distribution of defence companies across Germany reflects the general economic development of the country. One last observation regards the potential of the last cluster to expand further in the Czech Republic by integrating the Prague cluster, which is well-positioned in geographical terms.

### **2.1.3. The Netherlands**

As seen in [Figure 6](#), the Netherlands' defence industry is distributed throughout the country, even in the geographical extremities. However, there is a concentration of companies within a roughly square-shaped area that is delimited by Amsterdam, Den Haag, Eindhoven in the south, and Arnhem to the east.

### **2.1.4. Czech Republic**

The Czech Republic shows a geographical distribution of defence companies like that of other countries: a large cluster of defence companies around the capital Prague, as



**Figure 5.** Clustering of defence companies in Germany.

already mentioned (Figure 7). However, other defence companies are also located across the country, with a denser distribution on the northeast, where two more smaller clusters can be recognized around Brno and Kunovice.

### **2.1.5. Italy**

Reflecting the well-known economic disparity between North and South, Italy's defence companies are predominantly located in the more economically developed North, particularly around the areas of Milan, Varese, and Turin, as shown in Figure 8. While there are several defence companies around Rome, their number diminishes significantly as one moves South.

### **2.1.6. Scandinavian countries**

As regards the Scandinavian countries (except for Island), they share a similar geographical distribution pattern in their defence industry: the predominant part of companies clusters around the Southern part in each country, particularly, the capital (Figure 9). This is to be expected as most of the population resides in these areas. Note that an



**Figure 6.** Clustering of defence companies in the Netherlands.

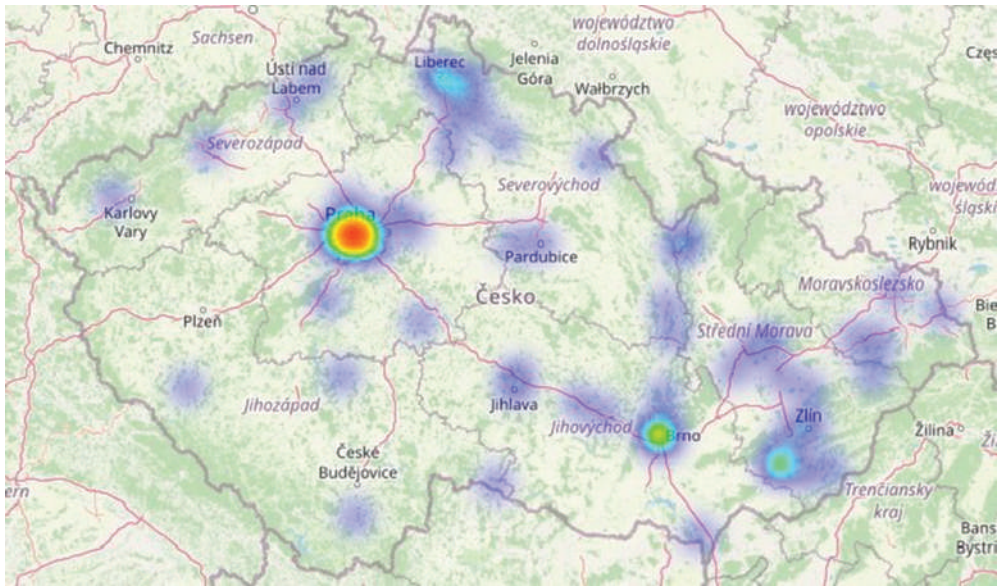
interesting triangle formed by clusters around Oslo, Stockholm, and Copenhagen emerges when looking at the map.

### **2.1.7. Poland**

In Poland, the majority of defence companies are located south of Warsaw, which, in turn, represents the main cluster of defence companies in the country (Figure 10). In addition, another group of companies is present in the extreme north of the country developed around the port city of Gdansk.

### **2.1.8. Belgium**

Unlike its neighbour, the Netherlands, Belgium has an interesting distribution of its defence sector. Surprisingly, Figure 11 shows that there are no defence companies located in the south. An imaginary line from Charleroi to Liege marks the Southern extreme border of the defence industry in the country. Companies can be found throughout the centre-North, although they are predominantly located around Brussels, followed by another cluster in Liege.



**Figure 7.** Clustering of defence companies in the Czech Republic.

### **2.1.9. Austria**

Austria shows a similar distribution pattern of defence companies to that observed in most countries. The capital, Vienna, represents by far the largest and the main defence cluster in the country, followed by the small clusters of Graz and Linz in descending order of size. However, as shown in [Figure 12](#), defence companies cover almost the entire territory.

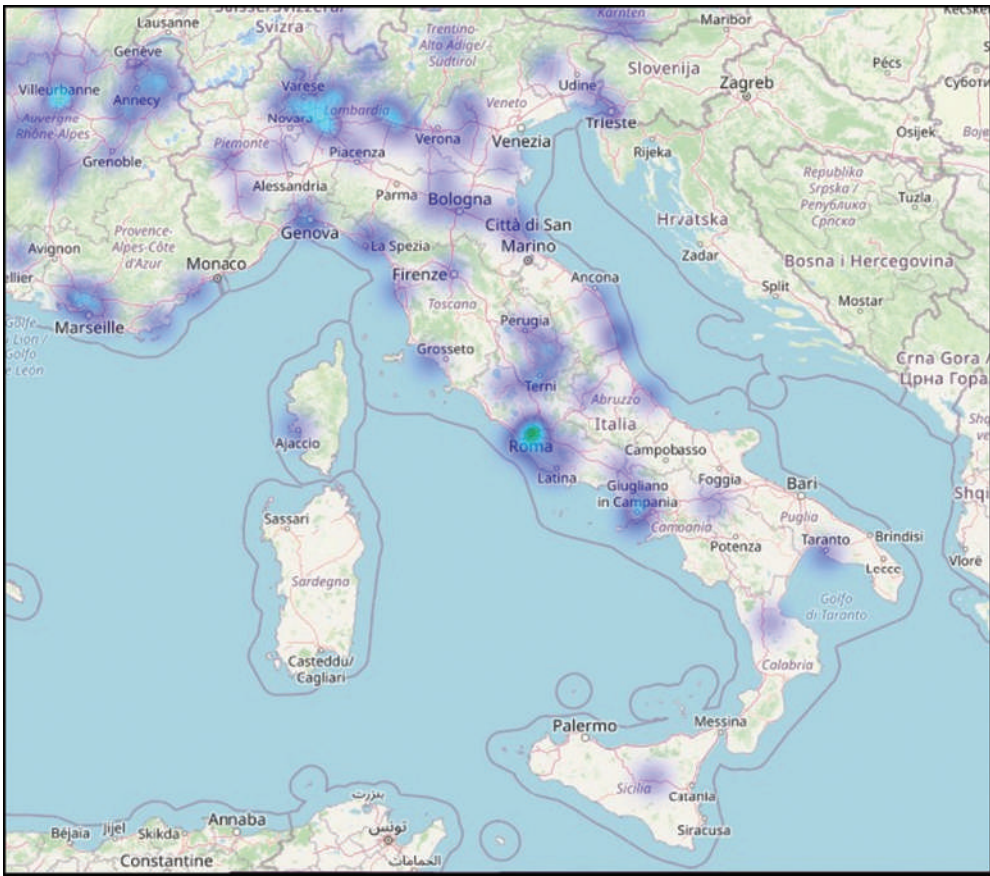
### **2.1.10. Spain**

For the country geographical extension, Spain geographical distribution of defence companies displays a similar pattern to that of Italy. Specifically, most companies are clustered around the capital, Madrid, with another group of companies located along the coastal areas, in both in the north and south, as shown in [Figure 13](#).

### **2.1.11. Bulgaria**

The few defence companies existing in Bulgaria are distributed along an axis that goes from the capital Sofia in the west to the port city of Burgas in the east ([Figure 14](#)).

Overall, patterns of geolocation distribution of defence companies at the country level suggest a spatial proximity between the defence and the civilian industry, as observed in most countries. This finding is of relevance to the goal of this study as it may serve as a starting point for further exploration into whether geographical proximity facilitates technology integration within the defence sector.



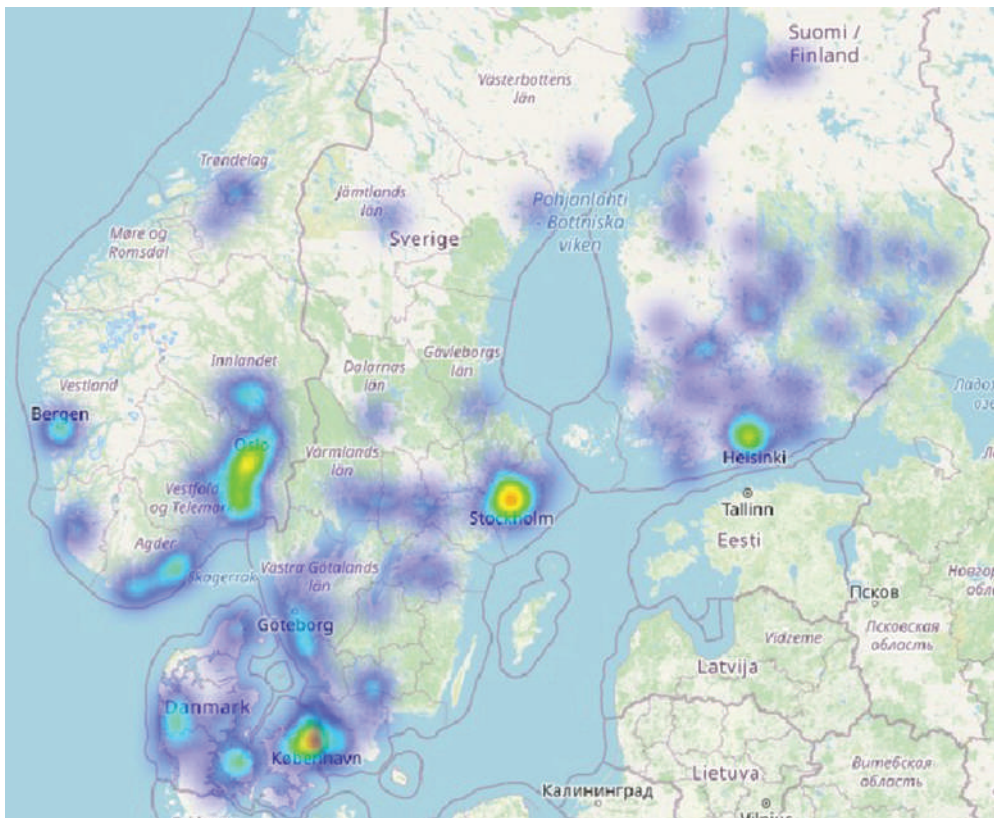
**Figure 8.** Clustering of defence companies in Italy.

### 3. Discussion

#### 3.1. Major players

As noted above, the size of European defence companies can vary widely, as it includes an ample range of company types, from SMEs to large corporations to financial holdings in some cases. However, the defence sector is dominated by major defence contractors. Because of the fundamental importance that the largest companies play within the sector, a more in-depth analysis has been carried out for a limited number of companies for which more granular data is available. Throughout this study, these companies are referred to as big players, major or leading companies interchangeably.

The first issue to tackle is the identification of the leading companies, meaning what kind of companies are considered big players. Two criteria have been adopted to identify the leading companies in the European defence industry. The fundamental criterion has been whether the company is part of the world top 100 defence companies in terms of the annual turnover, according to the data provided by the Web site *Defence News*], which specializes in the defence sector. To design this classification, *Defence News* and the



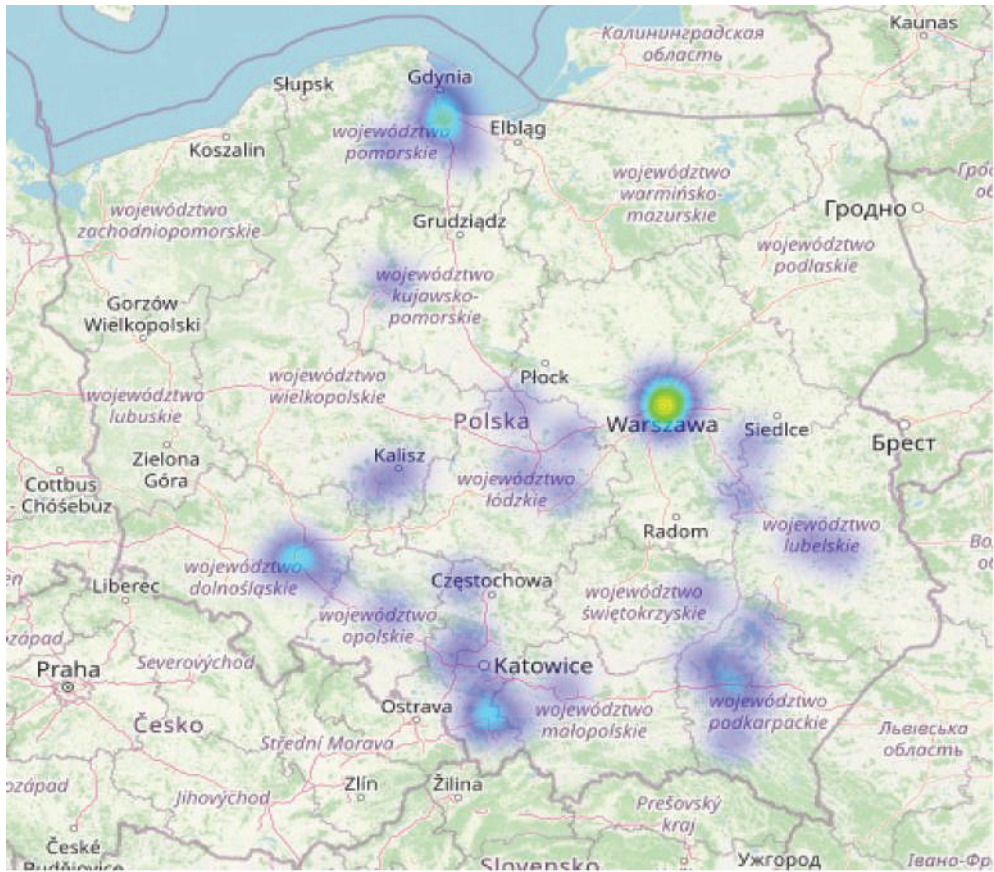
**Figure 9.** Clustering of defence companies in the Scandinavian countries.

International Institute for Strategic Studies (IISS) relies on several primary data sources including annual reports, information solicited from companies and data from sector analysts, among others.

Apart from *Defence News*, a well-known research institute, the Stockholm International Peace Research Institute (SIPRI) that focuses on military expenditure, also designs a classification of the top 100 defence companies worldwide every year (SIPRI 2015-2019). However, the SIPRI classification has limitations given that its focus is on the arms industry, and that the data provided by SIPRI considers predominantly arms-producing and military services (it does not examine, for example, manufacturing or maintenance units of armed services), whereas *Defence News* also considers revenues derived from broader defence activities.

When comparing the two listings together, there is not a great difference between them. Nevertheless, the ranking designed by *Defence News* varies from that of SIPRI only on the bottom of the classification: the number of Spanish companies has gone from 2 to 1; Norwegian firms have increased from 1 to 2; a company with origins in Finland has been included; PGZ, a Polish-owned company, does not appear anymore. After analysing both data sources, we reached the conclusion that, compared to SIPRI, *Defence News* provides not only more recent but also more accurate data.





**Figure 10.** Clustering of defence companies in Poland.

The ranking of the world's top 100 defence companies, as reported by both DN and SIPRI, fluctuates annually due to various factors. A single defence contract can lead to a company being included or excluded from the ranking, and mergers and acquisitions are not uncommon even among major players. Based on such sector dynamics, companies that have been listed in the world's top 100 defence companies at least once during the five-year period 2015–2019, in terms of the annual turnover, are considered as major players.

In 2019, the ranking was dominated by U.S. companies accounting for more than 50% of the sector's total revenues worldwide. European defence contractors accounted for about 24% of the sector's revenues (\$110,000 million), according to *Defence News*. It is worth noting the rapid expansion of Chinese defence contractors increasing their representation from zero to eight in just 5 years. In 2019, these companies generated \$94,998.85 million in revenues, accounting for 18% of the sector's revenues (see Figure 15 and Figure 16).

### **3.2. Size of defence companies**

This section examines the size of European companies in terms of defence revenues. Revenue levels of each company are displayed in Figure 17. Based on revenue levels,

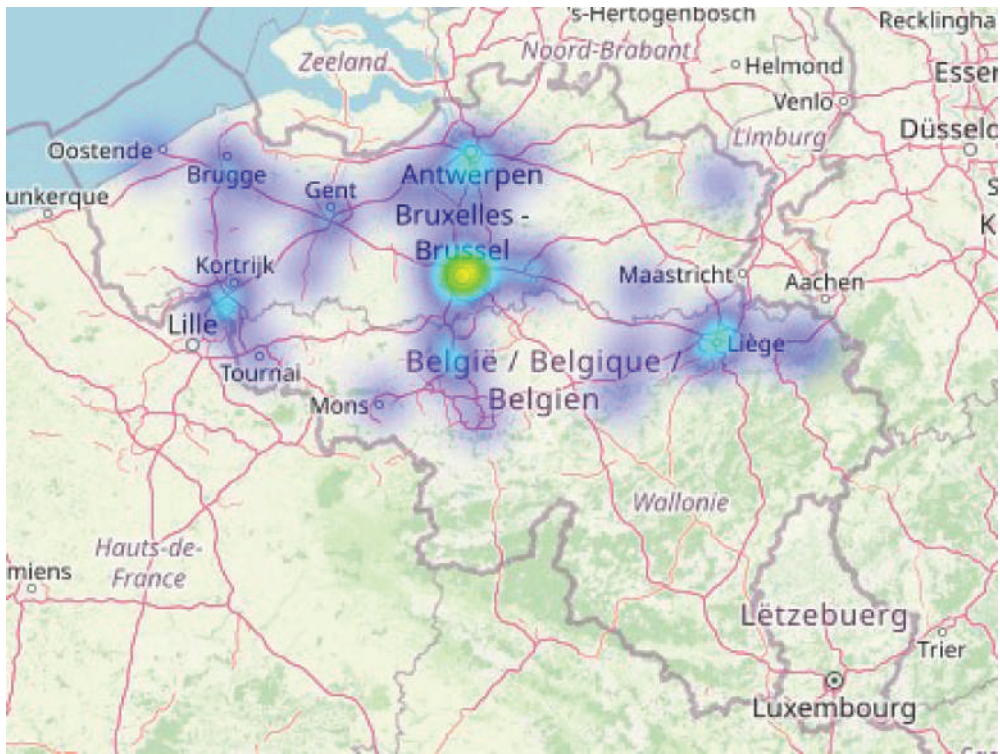


Figure 11. Clustering of defence companies in Belgium.

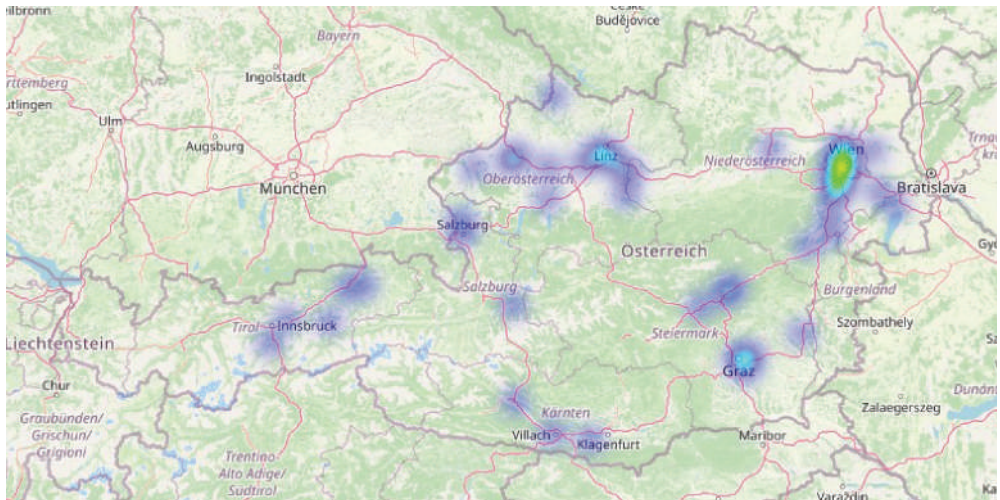
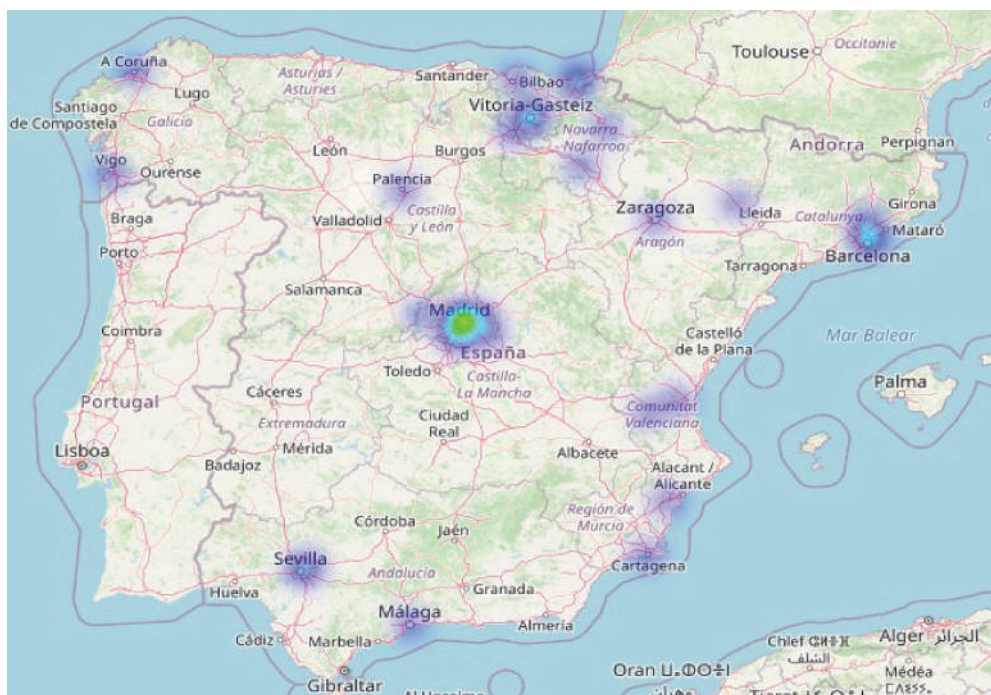
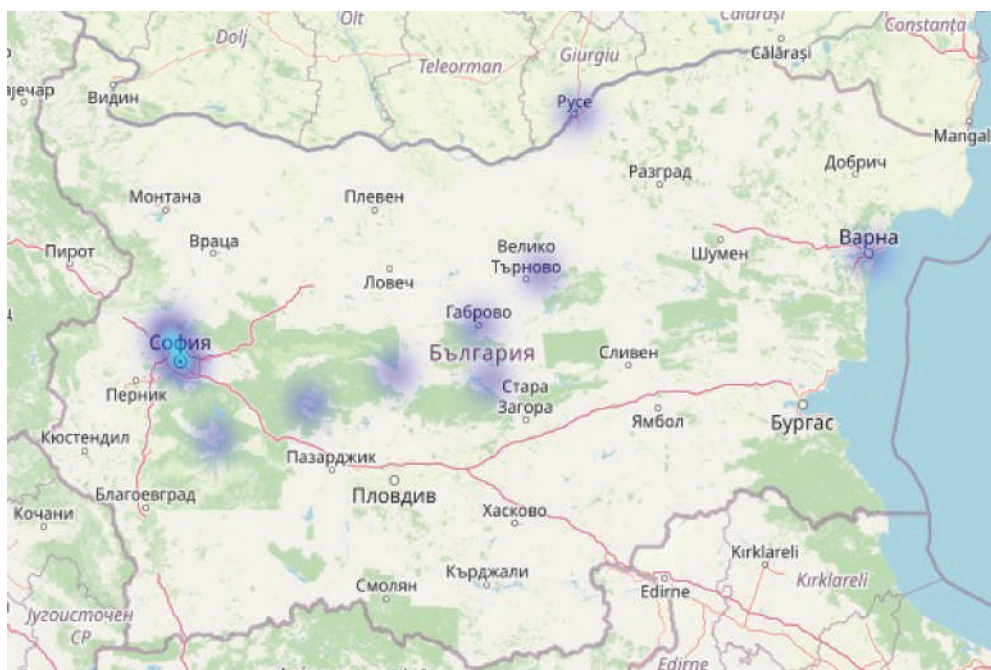


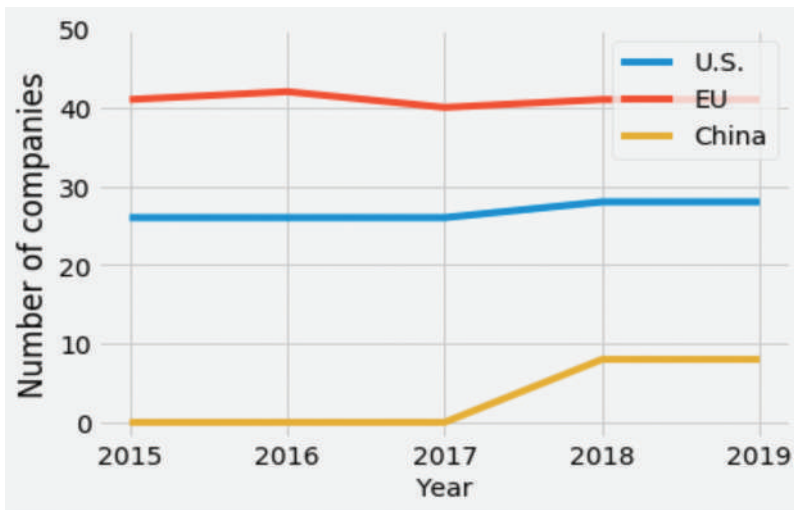
Figure 12. Clustering of defence companies in Austria.



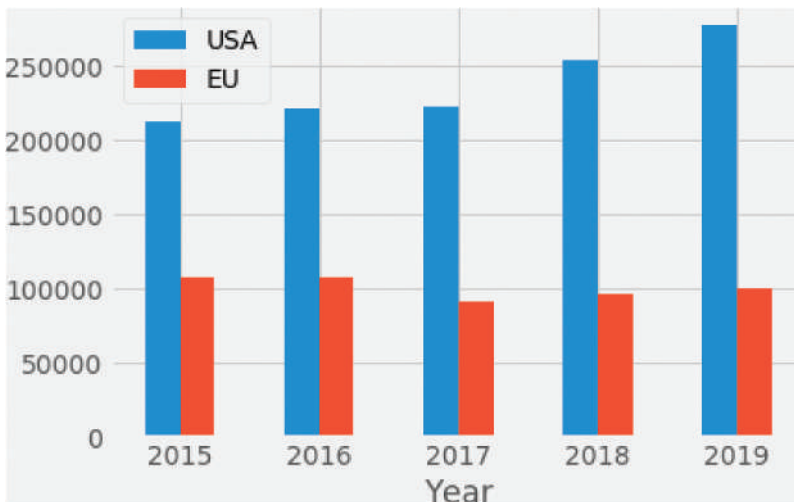
**Figure 13.** Clustering of defence companies in Spain.



**Figure 14.** Geographical distribution of defence companies in Bulgaria.



**Figure 15.** Number of U.S., European and Chinese companies listed in the world top 100 (2015–2019)  
Source: Our analysis of data provided by *Defence News*, 2015–2019..



**Figure 16.** Defence revenue relative to U.S. and European companies in the world top 100 (2015–2019).  
Source: Our analysis based on *Defence News*, 2015–2019.

companies can be classified into three main groups. The first group comprises the four largest companies in Europe. This group of companies is led by BAE Systems, based in the U.K., with revenues exceeding \$20'000 million in 2019. The following three companies have revenues of about \$10,000 million per year: Airbus (\$11,266.57 million), Leonardo (\$11,109.27 million) and Thales (\$9,251.68 million). This group accounts for around 52% of the total revenues of European defence companies in the top 100 worldwide.

The second group consists of companies with revenues ranging from a minimum of \$250 million to a maximum of \$650 million. This group includes eight companies:

Dassault, Rolls-Royce, Safran, Naval Group, Rheinmetall AG, Babcock International, Saab AB, KNDS. The remaining companies fall into the third group, with 2019 annual revenues below \$2,500 million, ranging from a maximum of \$1,787.40 million (Cobham) to a minimum of \$385.17 million (Chemring), which is the last company in the list. [Figures 18 and Figure 19](#) display the share of revenues derived from defence activities over total revenues for each company (the first in absolute terms, whereas the second in relative terms as a percentage of total revenues). Both figures reveal several interesting aspects of the defence sector. First, the largest defence contractors are not necessarily the largest companies in terms of revenues deriving from all sectors, including non-defence sectors. When total revenues are considered, the ranking of the companies changes significantly as shown in [Figure 20](#).

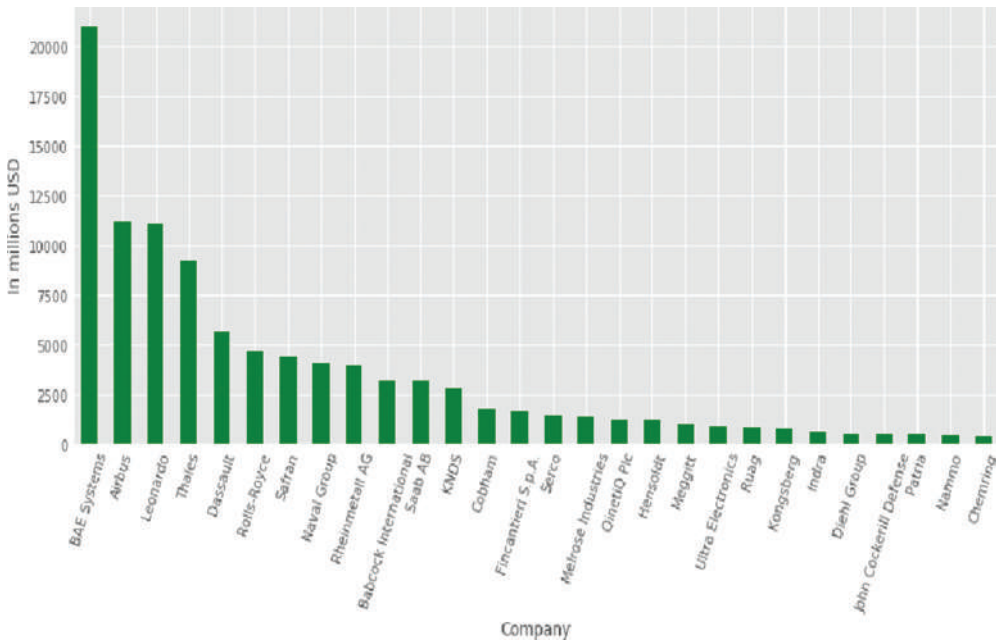
Overall, the data supports that the size of a company's military division is not necessarily related to the overall size of the company, as measured by the total revenue from both military and defence activities. The share of defence revenues varies widely among companies regardless of their positioning in the European defence sector, ranging from as low as 10% (Melrose Industries) to as high as 100% (Naval Group, Hensoldt, KNDS, John Cockerill Defence). Even the largest companies do not follow a consistent pattern in terms of defence revenues or instance, Airbus and Thales, are among the major four largest defence companies, even though their defence revenues account for only around 15% and 45% of their total revenues, respectively. The same applies to other companies in the list, with the defence divisions of Rolls-Royce and Safran accounting for only 22% and 17% of their total revenues, respectively.

### **3.3. Ownership structure**

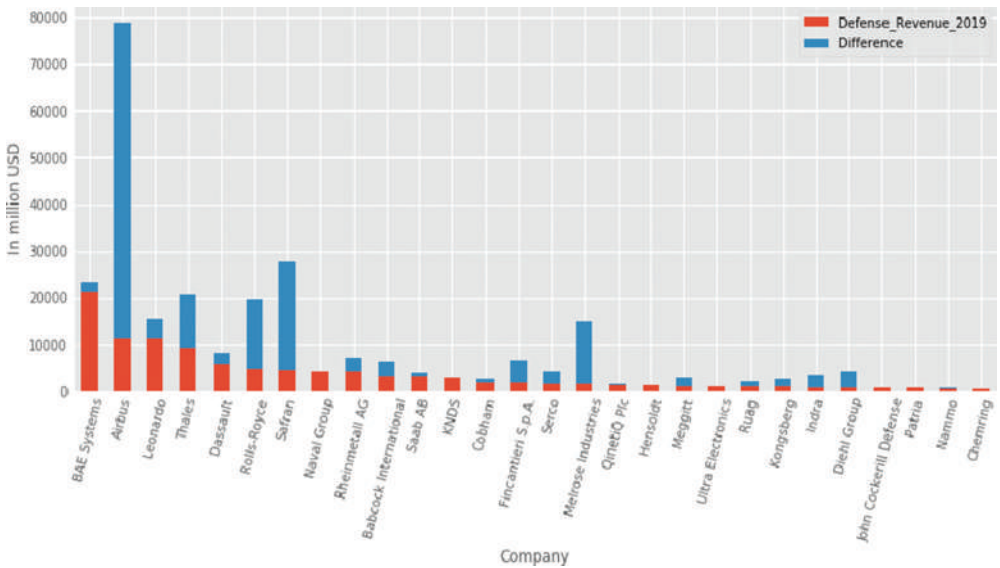
Another important aspect analysed by this paper is the ownership structure of the major players, with a particular emphasis on the shares owned by public institutions. Before examining each major defence contractor, it is worth noting that the ownership profile in this sector undergoes frequent changes and is highly dynamic. This is due not only to changes in ownership of small amounts of shares, but also to frequent changes in controlling ownership of large companies. A recent example is represented by the acquisition of GKN Aerospace by British Melrose Industries in 2018.

Furthermore, another relevant aspect that emerged during the data collection process is the frequent ownership transfer of innovative SMEs. Larger companies show a particular preference of acquiring SMEs operating in nanotechnology, cybersecurity, big data analytics, and artificial intelligence (AI) fields. This enables major players to quickly access cutting-edge technologies and outstanding human resources.

When analysing the ownership structure of the major players, several clear patterns emerge. First, it can be observed that, unlike other countries, the U.K. companies have a fragmented ownership structure, with a significant proportion of shares being publicly traded. [Figure 21](#) shows the largest shareholder of leading companies in the U.K., except for the floating shares that are listed in the stock-market. The largest shareholder of each company holds from a minimum of slightly above 4% to a maximum of 12% of the total number of shares. It is worth pointing out that BAE Systems, the European leader by far, shows the most fragmented ownership structure compared to the other U.K. companies.

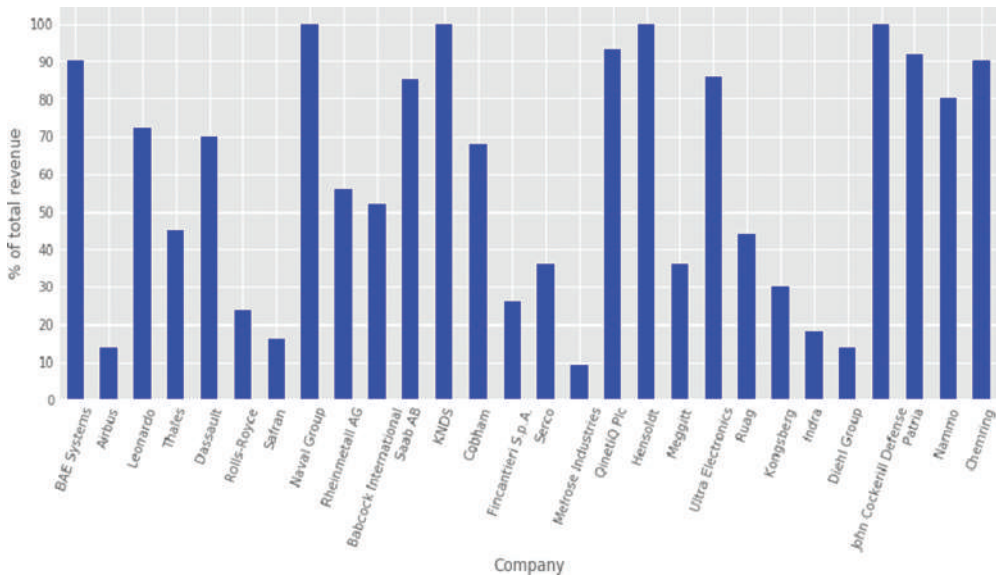


**Figure 17.** Defence revenues of European defence leading companies (2019). Source: *Defence News*, 2019.

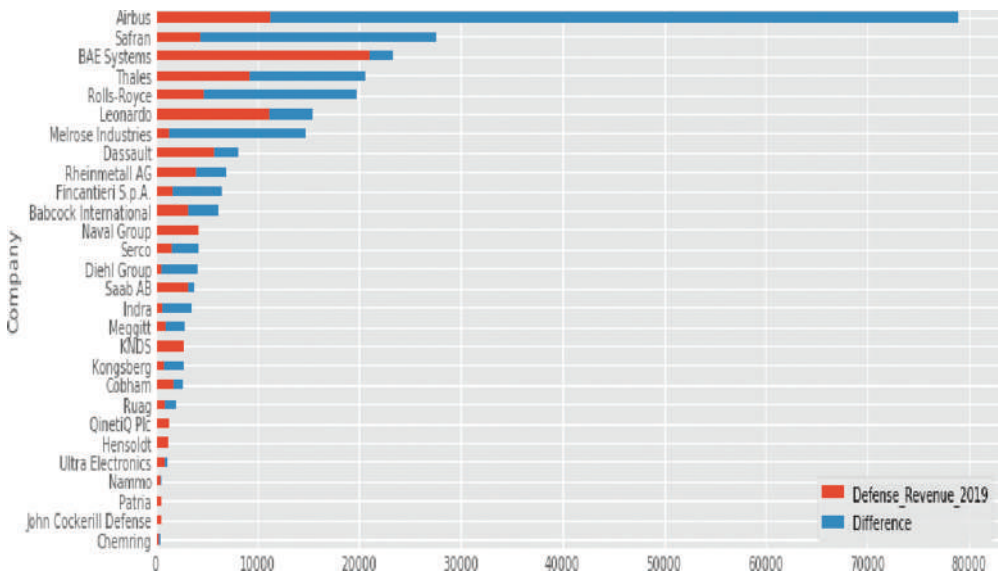


**Figure 18.** Defence and total revenues of leading European companies in 2019 (US\$, millions). Source: *Defence News*, 2019.

Conversely, other countries show a similar pattern among them: the main shareholder usually holds a predominant part of the total shares, which is usually larger than 20%. In some cases, a unique investor, mostly a family investor, controls the entire company. In France, for example, the main shareholder holds more than 60% of stocks of Dassault



**Figure 19.** The proportion of defence over total revenues for European big players (2019). Source: *Defence News*, 2019.



**Figure 20.** Ranking of defence companies in terms of total revenue (2019). Source: *Defence News*, 2019.

aviation and Naval Group, while the principal investor of Thales Group has nearly 25% of company shares. Instead, the ownership structure of Safran is as diffused as that of companies in the U.K., with the largest investor holding only 12% of total shares (Figure 22).

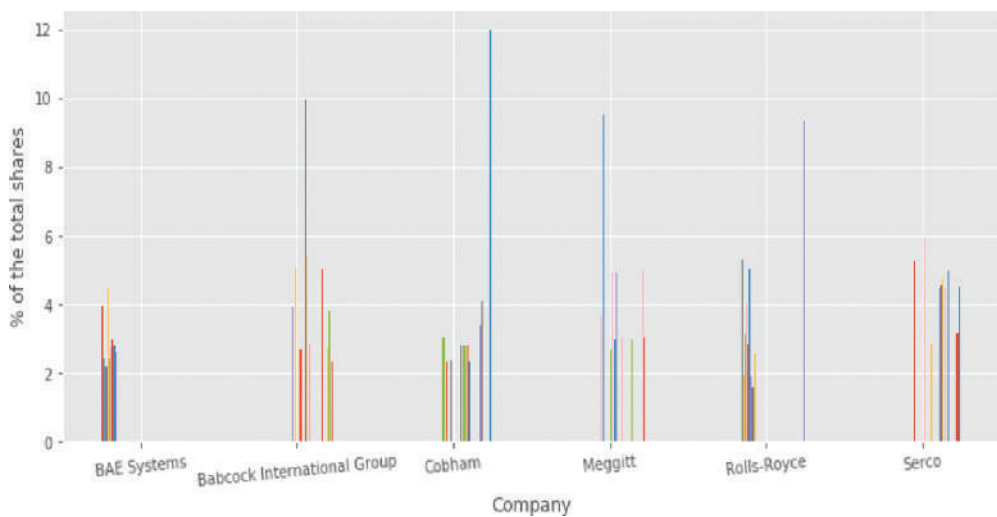
The same pattern can be observed in Germany. Specifically, Liebherr has been historically owned by the same family, while Thyssenkrupp is controlled by a 20% stake of the main stakeholder. However, Rheinmetall has a relatively fragmented capital structure, with the largest shareholder accounting for about 10% of the entire capital (Figure 23).

In Italy, the two companies listed in the world top 100 are strongly concentrated. The largest one, Leonardo, is controlled by a 30% stockholder, while Fincantieri is firmly controlled by a single investor with 70% of shares (Figure 24).

### 3.4. Ownership link

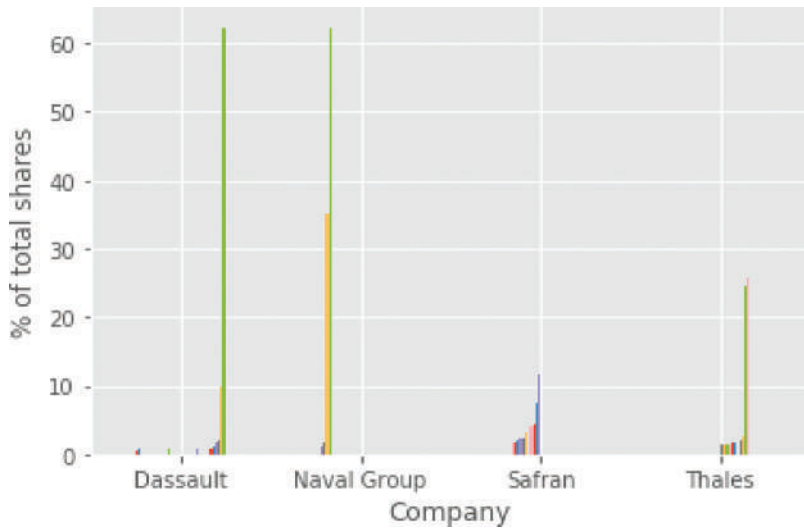
In addition to the ownership structure, we also explored the existing links across major companies in terms of shareholdings or other type of collaborations configured in various forms. Several observations can be made by analysing the ownership link of the major players. The most important finding is that the integration of the defence sector at the European level can be considered weak. Among the companies analysed in the study, only three – Airbus Group, KNDS Group, and MBDA – can be considered as trans-European, with cross-participation between them.

All three of the above-mentioned companies have different legal structures, with Airbus being an operating company, KNDS being a holding between the German KMW and the French Nexter, with 50% of shares each, and MBDA being a consortium focusing on building missile systems. Consortium is an instrument through which companies can collaborate among them in an associated form with purpose of conducting a common activity. Likewise, Joint venture is another legal instrument that allows two or more companies to bring together their resources and expertise to pursue a specific objective while sharing opportunities and risks. Once the shared objective is achieved, the mission of the consortium must be considered completed. This is the case of Telespazio, a joint venture between Leonardo (67%) and Thales (33%), which is

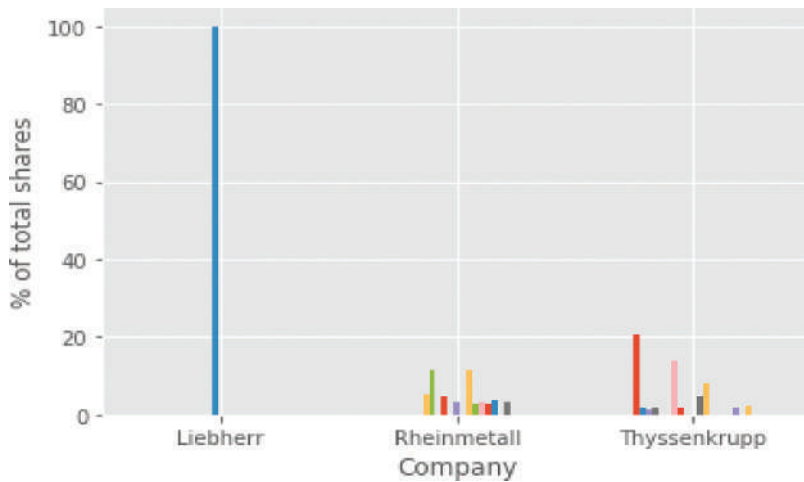


**Figure 21.** Main shareholders of the leading defence companies in the U.K. (2019).  
Source: *Defence News*, 2019.





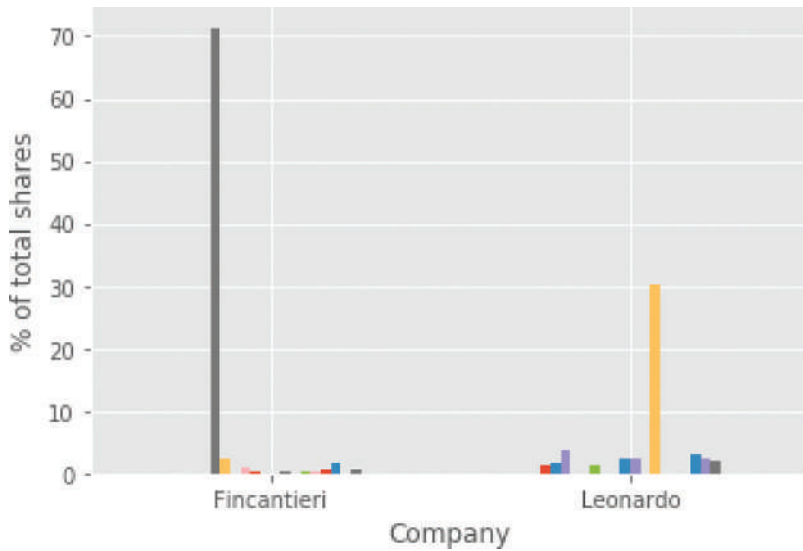
**Figure 22.** Ownership structure of major defence companies in France (2019). Source: Market Screener, 2019.



**Figure 23.** Ownership structure of major defence companies in Germany (2018). Source: Market Screener, 2019.

specialized in space-based solutions for defence and security applications. Considering these cases, it appears that companies from different countries prefer to establish collaborations among them based on specific projects as this allows them to preserve economic and managerial autonomy.

When considering the integration within the same country, the scenario is a more nuanced. As previously noted, the defence companies in the U.K. show a fragmented ownership structure, with large part of shares being listed in the stock market. However, a considerable presence of the same foreign shareholders among the main investors can



**Figure 24.** Main shareholders of Italian big players (2018).

Source: *Defence News*, 2019.

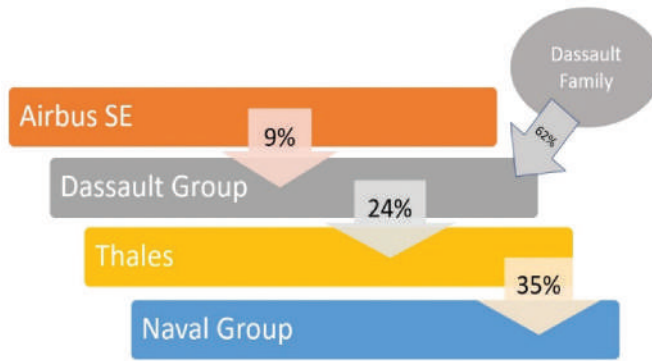
be observed, particularly American investment funds such as Blackrock and Vanguard. This is not surprising given the established tradition of U.S. investment funds managing significant financial resources in various sectors, including defence. This trend is also partly attributable to London's historical importance as European financial hub prior to Brexit.

France (Belin and Guille, 2008) shows a very clear pattern of integration through cascade shareholding. In fact, it is the most integrated country, with three out of its four largest defence companies being integrated through this ownership structure, as shown in Figure 25. Specifically, as of 2018, Dassault (Aviation) Group, which is controlled by the Dassault Family (holding 62% of shares), holds a significant stake in Thales (24% of shares). Thales, in turn, is the second largest investor in Naval Group, with a shareholding of about 35%. This pattern of shareholding suggests a high level of interdependence and collaboration among these major players in the French defence industry.

Germany also exhibits unique pattern of family-owned companies which maintain complete ownership control, as observed with Liebherr, an entirely family-owned business.

Italy and Spain, on the other hand, have only a few highly concentrated companies making it difficult to draw any conclusions about ownership link within each country.

Moreover, a reciprocal shareholding pattern has been observed between companies of Norway and Finland (Figure 26). Specifically, the largest defence company in Norway, Kongsberg, controls 49% of the Finnish company Patria, which, in turn, owns 50% of the shares of Nammo, another Norwegian company.



**Figure 25.** Cascade shareholdings of Dassault group (2018).  
Source: our analysis based on data provided by *Market Screener*, 2020.

#### 4. Summing up

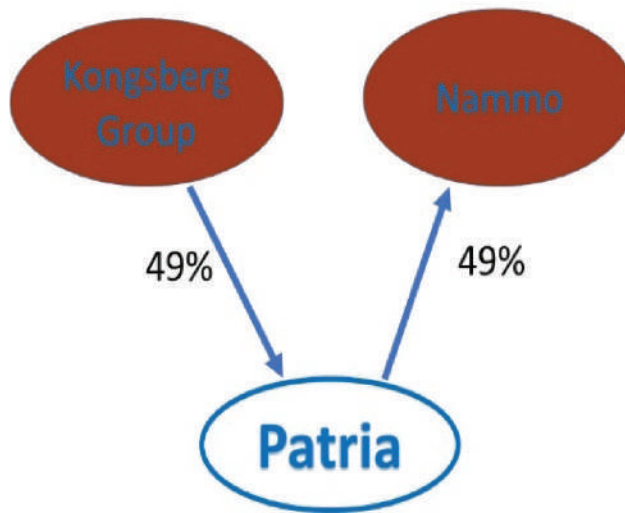
In the defence sector, the concentration of capital, employees, and technologies is at the highest level. The unavoidable challenges in such a competitive context in the 21st century require the reorganization of the defence industry in Europe, the elimination of duplications between member countries and the provision of adequate financial resources to support an ambitious R&D process.

Accurate and up-to-date data are not only crucial for advancing research debate but also for effective decision-making and informed public debate European policymakers. This is particularly important if robust interventions are to be planned in the context of the European defence industry, which is a critical sector for the continent's security and competitiveness.

The findings of this paper provide useful elements for further stimulating such debate and, ultimately, help develop informed policy recommendations. As noted above, the analysis presented in the preceding section provides valuable insights into geolocation and concentration of defence companies in Europe. This study also highlights another important aspect regarding the ownership link of the major players in the industry.

In general terms, two rather interesting aspects concern the relationship between the concentration/location of defence companies and the centres of power within EU. Defence companies tend to be geographically concentrated around the national capitals of the EU countries, such as Paris, Berlin, Rome, Amsterdam, Prague etc. These cities serve as important centres of decision-making regarding national security, making the proximity of companies to such centres a significant factor in shaping the structure of the defence sector.

A second important aspect, then, is that the military sector tends to cluster its sites in the most industrialized areas of each country. This may help such clusters act as a catalyst for the development of heavy industry, Information Technologies (IT) and telecommunications subsectors. Furthermore, each country has specific districts that emerge around major players in the defence industry. These districts are characterized by a proliferation of small and medium-size companies which often operate as suppliers, creating a vibrant



**Figure 26.** Reciprocal shares Norwegian and finish companies.  
Source: our analysis of data provided by *Defence News*, 2019.

ecosystem of collaboration and innovation. An example is the aerospace district of Toulouse in the South of France, which has been developed around Airbus. This kind of data, in particular, seems helpful to reduce duplication within and among EU countries and create real *technological districts*, in which the military and civil sectors collaborate with each other.

A second aspect that emerged as crucial in the companies observed is the relationship between profits and profits deriving from defence. This aspect, in addition to the quantitative dimension, is fundamental to understand the peculiarity of each company, that is, whether they are strictly military companies, or civil companies that are nevertheless able to operate also on defence projects. This data on the origin of the turnover could also tell us something about the direction of any technological transfers. Not only Airbus, but also Rolls Royce, though with a much lower turnover with respect to the Franco-German company, the civil sector is a driving force compared to the military branch. In the case of Airbus, unlike that of Rolls Royce, however, technology transfers could even take place from the civilian to the military sector. If this hypothesis were verified, that business model would deserve to be studied carefully because it may provide useful ideas for a reform on a European scale such as that envisaged by the EDF, or a revision of the EDF itself. Regarding the relationship between the civilian and military components of these companies, the data relating to the diffusion and concentration of their property should also be considered.

In addition to the distribution of the defence sector in Europe, this study has also identified important trends regarding the ownership structure of major defence contractors. Specifically, ownership in mainland Europe is generally concentrated in the hands of the State or a family. Key examples include Dassault, Naval Group, Liebherr, Leonardo and Fincantieri. On the one hand, the prevalence of State-owned companies inhibits forms of transactional integration, making it difficult for different actors in the industry

to collaborate and work together effectively. In fact, while there might be economic advantageous to integrating different defence companies mainly related to exploiting of the economies of scale, such integration could be strategically disadvantageous in terms of national defence and security interests. On the other hand, developing European-wide company policies could be held back by family-type corporate logic, perhaps effective on a national scale, but much less in the perspective of regional integration.

Contractual clauses such as the “golden power,” in the first case, or the veto of majority shareholders such as the Dassault family, in the second case, would intervene to curb mergers and acquisitions. The overall result is a fragmented and uncompetitive European defence sector when compared to those of other areas of the globe, in particular North America. Such fragmented structure can lead to duplication of efforts and inefficiencies, which in turn can hinder the competitiveness and effectiveness of the European defence sector. Clearly, we are aware that a substantial part of the defence industry, which is located in the U.K. does play an important part and this affect the European defence debate as well as the European strategic autonomy, but an analysis of this issue is outside the scope of this work.

The edge in technology is the most sought-after characteristic in production by the defence sector. One of the causes of that edge is obviously technological innovation, which, in turn, is influenced by several factors. Is geographical proximity one such factor? If so, is it a positive or negative trend? Problematically for the researcher, data on the defence sector tends to be quite messy, contradictory, and confused: without good data, quality research and effective policies are impossible. Hence, as we anticipated in the introduction, the mapping of the defence industry in Europe can only be considered a *probe*, an exploratory study, and thus considered in the wider context of this Special Issue.

As an early first attempt in this direction, the results we have reached are far from being exhaustive, as they need to be further refined. Nonetheless, specialized research on the concentration/location of defence industries may, in the future facilitate, a better explanation of why and how technology transfer within the defence sector and to the civilian world takes place. Pinpointing the actual concentration/location of defence companies thus could help more far-reaching research to understand whether concentration/location favours technology exchange and innovation.

The mapping of European Defence companies has clearly demonstrated that the geographical concentration of defence industries in Europe is a clear *fact* (with some significant differences in Germany), whereas the sector remains fragmented due to the prevalence of national military interests. As this was ultimately, a descriptive analytical undertaking, and we wanted to verify the location of the main hubs of the defence sector, in this respect we believe this paper has succeeded. Nevertheless, whether this is an advantage when it comes to technological spill-overs (especially compared to competitors such as the United States or Russia) cannot have a definitive answer yet. These and other questions remain open for further research, but this paper should be a valid springboard for that purpose.

From a policymaking perspective, the transformation of the defence sector's characteristics in Europe necessitates a reconfiguration of the corporate model prevailing among the large groups. The fragmentation of the defence industry is, indeed, a consequence of the proliferation of small and medium-sized enterprises, as well as of the scarcity of public companies following the Anglo-Saxon model among the major players of continental Europe. This is undoubtedly an effect of the history of those areas but which, to date, needs to be reconsidered and adapted to the current international

realities and the business context of the 21st century to ensure the competitiveness of the European defence industry in the future.

In addition to examining the ownership links, there are also other ways in which the integration among companies from different countries can be configured. Literature indicates that the German automotive industry heavily depends on components produced by Italian SMEs. It is reasonable to wonder if the same applies to the defence industry and what the implications would be if Italian SMEs were to stop supplying the German defence industry. To what extent would it be possible to replace Italian suppliers with local ones, and at what cost?

Due to data constraints, it was not possible to explore further whether major players across Europe can rely on suppliers from other countries. It is worth noting that such a lack of information could potentially hinder the development of cross-border collaboration and, consequently, hinder the further integration of the defence industry at the European level. Geographical proximity does appear to lead to greater integration among defence industries. But, this is only the initial step in a long path of empirical research on such a large and, in the light of recent events, pivotal topic for the whole of Europe.

## Note

1. The European Parliament, “Fact Sheet on the European Union: Defence Industry,” <https://www.europarl.europa.eu/factsheets/en/sheet/65/defence-industry> (accessed March 17, 2023).

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