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THE INFLUENCE OF THE STATE ON THE STRATEGIC CHOICES OF DEFENCE COMPANIES: THE CASES OF GERMANY, FRANCE AND THE UK AFTER THE COLD WAR

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The end of the Cold War[1] in the early 1990s led to a deep restructuring of defence companies in Europe and the United States. In this period, defence players were confronted with multifaceted developments related to the changing geopolitical context, the development of digital networks and the financialisation of the economy. National States redefined their defence policies by significantly reducing their military spending, thus producing a directly negative impact on their industrial suppliers. For defence companies, this shift posed several challenges: they had to adapt their production to the new operational and capacity requirements; furthermore, they were forced to learn how to incorporate the new technical and technological innovations while coping with new budget restrictions in public procurement policies.

1. We define the end of the Cold War as the dismantling of the Warsaw Pact and the demise of the Soviet Union leading to a new geo-political configuration of global forces. Military and defence policies have been radically redesigned as a result of this process in the early 1990s, particularly in the United States, heavily impacting structures, strategies and performances of defiance companies (Sandler, Hartley, 2003).

These trends encouraged US companies to seek mergers and acquisitions opportunities supervised by the government (Depeyre, Dumez, 2010). They increased in size while their numbers decreased. They concentrated their activities mostly in the military field (except perhaps Boeing) thus positioning themselves as essential actors in the national defence eco-system. Such concentration had the effect of increasing the density of the military industrial complex: a small handful of companies now detained highly sensitive technologies and know-how, incrementing their bargaining power with the authorities (See the "*Iron Triangle*" concept in Markusen, 2000). Companies that had had a dual position as military and civilian suppliers mostly abandoned military activities (Gentilucci, 2013).

In Europe, the situation was more complex. Governments were determined to build an "European Defence System" and to establish a single European market in order to support the necessary restructuring / concentration of these companies, while preserving their capacity for innovation and competition (Dupuy, 2013). In spite of this willingness to regionalize, industrial structures as well as the financing of defence technology have remained mostly national. While it is now widely accepted that the state is a fundamental player in national innovation systems (Mowery, Rosenberg, 1990; Edquist, 2004), such involvement was often criticized based on the idea that the state misunderstands and consequently mismanages its industrial interests. This criticism does not seem to be supported by the experience of governments around the world. Several nations have successfully implemented policies that proved essential to their industrial development and specialization. Paradoxically, however, the role of public procurement and its impacts on the defence industry have been little studied (Edler, Georghuiou, 2007; Rolfstam, 2012). This is particularly surprising when we consider how well known is the influence of customer demand in innovation development (Von Hippel, 1976; Barbaroux, Dos Santos, 2013).

While the role of public procurement in the American Defence Industry has drawn some attention in recent literature (Depeyre, Dumez, 2010; Mowery, 2010), few studies evoke the situation of European countries. In order to fill that gap, this article aims to analyse the influence of the state – main customer of defence companies – on the strategic changes in the European defence industry. Contrary to their American counterparts, European defence companies have had to face a constant reduction of military spending over the last 25 years[2].

2. This trend, however, seems to be reverting since the end of 2015, when more than 20 European countries committed to increase their military budget. This new attitude towards defence stems from the growing awareness of terrorism threats and increased insecurity among European States, which may lead to a repositioning of their defence procurement policies in the years to come.

In this context, we study three European countries: Germany, France and the UK. In the first part of this article we define the basic concepts involved, explain the methodology used and the choice of these three countries as a focus of this study. The literature review that follows in the second part emphasizes the assumption that the state plays a major role on the strategic choices of their domestic defence companies and identifies possible channels of influence. Finally, in the third part, we present the three country case studies to better define how the role of the state varied according to national circumstances, industry structures and innovation trajectories since the early 1990s.

DEFINITIONS AND METHODOLOGICAL EXPLANATIONS

Dunne (1995) defines a Defence Technological and Industrial Base (DTIB) as the group of companies that supply the military with a range of products needed for their operations. This includes not just weapons but any other type of goods or services necessary for the maintenance of these armies. Defence companies are very heterogeneous. They may range from primary contractors specialized in the production of defence equipment to small businesses that occasionally supply other defence agents, states or companies (Blom *et al.*, 2014).

The study of DTIBs poses a certain difficulty concerning the scope of the field and the quantification of observed effects. Indeed, it is hard to identify all the possible avenues of influence between public procurement and the strategic decisions of defence companies. Similarly, it is difficult to isolate the effects of other public policies on the evolution of a DTIB and its corporate structures, particularly in a dynamic context of geopolitical change. In order to minimize these hurdles, rather than trying to quantify all possible relationships in the field, we chose to adopt the case studies methodological approach. Case studies are an adequate exploration tool to discuss preliminary evidence, albeit an imperfect one (Yin, 2014). Indeed, the influence of public policy on strategic decisions of defence companies will vary depending on the size of the company, its portfolio of civil and military products, its place within the DTIB, etc. In this article, we focus on world-class German, British and French companies ranked by the Stockholm International Peace Research Institute.[3] This choice of sample has its limitations: we do not take into account, for instance, small and

3. The 100 largest arms-producing companies, *SIPRI Yearbooks*.

medium defence businesses in our analysis. It does however allow us to work with harmonized data for comparisons among companies from three countries in the studied period. Moreover, as all these large companies rely heavily on public procurement, the potential role of the state as a major customer is hardly questionable.

The choice of the three countries, Germany, France and the United Kingdom is justified for at least two reasons: firstly, the importance of their Defence Industrial and Technological Base (DTIB) in Europe; secondly, the different positioning of these States in relation to their defence industries in the aftermath of the Cold War. Before the end of the Soviet threat, these three countries had very similar positions and similarly structured DTIBs. Indeed, European states have traditionally been very involved in the organization of the defence sector as a client who strictly defined how major research programs were conducted and financed (Dupuy, 2013). After the end of the Cold War, despite initial attempts to cooperate at the European level as a response to the geopolitical changes, each of these three states ended up assuming different positions: the UK chose to lead (at least initially), a liberal policy of competition and openness; Germany chose to partially disengage from its military industry, revealing a lack of medium-term strategy for the sector; France sought to preserve its strategic military autonomy despite budget restrictions.

THE ROLE OF PUBLIC PROCUREMENT IN THE FIELD OF DEFENCE

Because governments are at the same time the main customers, regulators and financers of the defence industry, they are in a position to directly influence its structure, activity and performance (Belin, Guille, 2008). We assume as a premise, therefore, that States play a crucial role in the strategic choices of defence companies confronted with budgetary restrictions and technological changes (Bellais, 2005; Avadikyan, Cohendet, 2009). These strategic choices have revolved around four main areas: a) the nature of their activities (military, civilian or dual, Depeyre, Dumez, 2010); b) their openness to new partners (national or international, horizontal or vertical cooperation, Hoeffler, 2008); c) their market extension strategies (exports, diversification into civilian products or other defence activities) and d) their financial needs. These decisions have a strong influence on the overall industry structure and innovation dynamics.

The importance of public procurement

National defence is a matter of sovereignty. States have the responsibility to ensure the defence and security of their country. As such, governments are very sensitive to the innovative capacity of this strategic industry, as this has a considerable impact in their ability to remain militarily superior to potential enemies (Dupuy, 2013).

DTIBs are complex systems, which are both costly and risky. As such, they are inherently capital intensive. Public procurement therefore plays a significant role in reducing risk and attracting private investment in a given area or program (Uyarra *et al.*, 2014). Defence systems are all the more complex because they usually imply longer development projects, thus exposing companies to strategic government changes or budgetary restrictions (Belin, Guille, 2008). This creates a double dependency between the governments and defence businesses (Bellais, Oudot, 2008). Indeed, the demand for military technology and equipment is highly dependent on the level of government involvement in armed operations. Therefore, in order to overcome the opportunity costs associated with military equipment production, businesses need to be reassured by public support (Borras, 2004). In other words, unless a continuous public defence policy is in place, there is an increased risk of losing national technological knowledge and capabilities (Carlsson, 2003).

Domestic public demand thus represents an essential component in the business model of defence companies. A close cooperation exists between the military and their national suppliers in most defence systems, which is essential to the development of major weapons programs. This interdependence tends to greatly reduce learning costs because the practical experience of military officers on the battlefield becomes a direct input for product development (Mérindol, Versailles, 2010). Serfati (2008) also notes that program abortions are rare in this area, despite the fact that costs and deadlines are often underestimated. He argues that interrupting such programs would have indirect costs associated with decreased national security and sovereignty. Thus, the defence industry has its own mode of operation, which is quite distinct from traditional markets.

Public procurement can be defined as programs designed to streamline the acquisition of goods or services by a public institution (Edquist *et al.*, 2012). These "innovation inducing" acquisitions have to deal with at least three forces: international pressure, the socio-economic environment and the political context (Lember, 2014; see Table 1). In the case of defence, these programs aim at maintaining military supremacy (Serfati, 2008) by creating incentives to technological development. This is especially true in the event of external threats such as international instability or the risk

of war. Such risks lead national states to maintain a continuous demand for weapons and equipment to their armies according to their economic strength and the perceived level of insecurity.

Table 1 – Context of public procurement policies for innovation following the typology of Lember (2014): complementary factors in the case of defence policy

Level of analysis	**Institutional factors (Lember, 2014)**	**Complementary factors in the case of defence policy**
International pressure	Norms (administrative and economic standards and innovation policy) Regulations (trade) Economic pressures linked to globalization	Evolution of perceived threats and the nature of conflicts Evolution of international power relations
Socioeconomic Environment	Economic climate and development (market capacity) National Innovation System	Military budget and structure of the DTIB Financialisation of the economy and privatisation
Political context	State structure and governance, Public procurement systems and values, Innovation support policies	Ties between government and defence industries Political propensity for war or peace Defence policy and national strategic choices

The influence of the state, however, is not limited to military procurement (Stowsky, 2004; Dombrowski *et al.*, 2002). The state also plays an important role as industry regulator, establishing rules, authorizing or prohibiting exports, granting access to foreign capital, determining the degree of market openness to foreign competition.

Moreover, the involvement of the state also depends on its position *vs.* military technology producers, as well as the overall priority of defence industries in the national innovation system (Moura, 2011). The state is therefore an essential part of any innovation network. As the primary customer of defence companies, governments exert enormous influence on the decisions to pursue dual military / civilian product lines (spin-off or spin-in effects). Their support is also a decisive factor for developing new innovative projects and stimulating companies to seek cooperation opportunities in R&D.

In this context, the direct involvement of the state may create incentives and disincentives of various kinds (Borras, 2004). In the US for example, until the mid 2000s, companies were relatively little incentivized to export, as the domestic market guaranteed them enough revenues (Depeyre, Dumez,

2010). This was not the case in Europe, where national markets are much smaller and where state actors have different motivations than those of the United States at least for two reasons: European states have much stronger budget constraints and are positioned as "followers" in military innovations (Jordan, Williams, 2011).

Financial factors have also influenced European defence industries. The European Maastricht Treaty of 1992 imposed convergence criteria in public spending. As the defence budget has so often been an adjustment variable of public spending (Hébert, 2010), most states chose to limit their military expenditures. According to Hartley and Sandler (2003), this can be considered as a major disruption: seeking more efficiency in public procurement, governments prioritized "off-the-shelf" solutions and outsourced certain government functions, using public / private partnerships in some cases (e.g. UK). In this context, states were less reluctant to privatise certain industries or open their capital to private investors (Dupuy, 2013). Furthermore, according to Serfati (2008), the so-called "long war" that evolved since 9/11 inflated global military budgets, creating interesting opportunities for investors, leading to the financialisation of the defence industry in the 1990s (Gentilucci, 2013).

Therefore, the end of the Cold War changes the position of the State and their role in defence procurement (Versailles, 2005). In a context of economic openness and liberalization, the general philosophy of its evolution was rather liberal. Motivated by the urge to lower costs, States have often incited competition among supplying companies, to the detriment of a long-term perspective of fostering innovation and creating new knowledge (Avadikyan *et al.*, 2009). They also exploited the concept of dual military / civilian product lines to justify reduced military spending (Bellais, 2005). In this context, defence companies found themselves more directly subject to competitive pressures (Sachwald, 1999) and needed to diversify their activities to find new markets.

Consequences of the role of the State in industrial restructuring

According to Hartley and Sandler (2003), the environment of defence companies is composed of three factors: political (nature of conflict and positioning of the States in relation to war and peace), economic (defence budget and overall importance of the DTIB) and technological (pace of innovation and product development). Pressured by these three forces, companies tend to seek to reduce transaction costs when they decide whether to invest in innovation and market expansion.

In the early 1990s, both technological and political forces conspired to change the structure of the defence industry. On the one hand, technical complexity increased the cost of military equipment and barriers to entry in this market. As a result, the bargaining power of systems manufacturers in the United States improved significantly (Depeyre, Dumez, 2007). On the other hand, the shift from defence to security policies with the rise of terrorism and the changing nature of conflicts, particularly noticeable from the late 1990s, also tended to favour certain sectors such as defence electronics (Serfati, 2008).

Thus, the positioning of the state as a defence client has had several impacts on the activities of defense companies such as:

- A sharp contraction in the DTIB, leading companies either to abandon the production of military equipment and refocus on civil products, or to specialize in defence operations or to pursue a dual strategy to take advantage of potential synergies between the two types of product;
- Significant structural changes, with mergers and acquisitions leading in some cases to an oligopolistic structure and the growing influence of financial actors.
- Increased competition among companies pushed them to pursue external markets and to develop cooperation agreements for complex weapons programs. In some cases, defence companies coped with competition by scaling up to the national, European, transatlantic and international levels, horizontally or vertically. Some chose to also open their capital to domestic and foreign private investors. In Europe, this trend also led to the privatization of defence companies.

Blom *et al.* (2014) link the increased willingness of defence companies to export and cooperate domestically or regionally to two public procurement criteria: increased quality requirements and the demand for specialized (or diversified) expertise. Thus, as states require their suppliers to be able to produce a wide variety of equipment with increasingly specialized skills, companies tend to seek cooperation opportunities in order to benefit from resource complementarity and shared technological spillovers. This cooperation results, in a second stage, in an increased capacity to export and to develop a greater variety of products. As far as internationalization is concerned, however, defence companies have had a more heterogeneous reaction on how to adapt to the changing environment (Melitz, 2003; Helpman *et al.*, 2004).

In a globalized world of increased competition and major technological change, strategic changes also affected the way defence companies invest

in research and innovation. For governments and businesses facing limited financial resources, the concept of technological duality seemed appropriate. Military products could benefit from civilian technology and, conversely, companies could also monetize their military research by exploiting these technologies for civilian purposes. However, the benefits of technological duality have been often overestimated. A weapons system is built with specific military requirements that give it superiority over competing systems; when civilian technologies are used, they often need to be adjusted (Uzunidis, Bailly, 2005). Indeed, military requirements are very specific and so are the related technologies (Quenzer, 2001). According to Mérindol (2005), armament programs require tacit and explicit knowledge which is oriented towards solving a specific military problem. Therefore, even if the duality may be possible on the domain of basic research, very rarely is it the case when it comes to developing dual-use equipment. Caught between the constraints of an imperfect duality strategy and increased competition fostered by public procurement policies, companies had to review their R&D priorities.

The role of the state as customer since the 1990s: the cases of Germany, France and the UK

The evolution of military spending among these three countries followed different trajectories since the early 1990s (Annex 1). Budget reduction was much more massive in the German case. The French DTIB benefited from constant support from the government, with military equipment expenditures suffering less cuts over the period, stabilizing around 1998. The UK maintained its overall equipment expenditure levels throughout the period. After 2001, Germany kept its budget constraint policy, while France and the UK boosted their military spending until 2001. Despite reductions after the 2008 crisis, expenditure levels remained quite high for these two countries, with the UK spending more in 2014 than it did in the early 1990s. The decision by France and the UK to sustain the levels of expenditure over the last two decades despite strong financial constraints, in contrast with Germany's low budget policy, reflects the different positions of these states, as described in Appendix 2.

The positioning of the state in Germany, France and the UK in their defence industry since 1990

In the UK, the liberal policy of the British government from the early 1980s led to the gradual privatization of enterprises, including defence companies.

Moreover, a policy known as "best value for money" for acquisitions, initiated by Peter Levene (director of defence procurement) in 1988 aimed to overcome the double shock of limited public resources and the explosion of development costs (Masson, 2008). He believed that offering greater autonomy to defence companies would give them new opportunities to restructure. Large companies had indeed a global scale, which enabled them to participate in contracts in the United States or Europe. Yet the British military engagement in the Balkans and in Afghanistan in 2001 and Iraq in 2003 highlighted the risks in terms of military capabilities related to excessive autonomy of defence companies. Without abandoning its policy of "best value for money", the Ministry of Defence (MoD) developed their so-called Defence Industrial Strategy[4] (DIS) and Defence Technology Strategy[5] (DIS) based on the concept of *Smart Procurement*. These two initiatives aimed to identify strategic partnership opportunities between the state and the defence industry in order to develop critical skills and technologies. In this context, public-private partnerships multiplied.

The strategic development of the British industry over the last two decades can thus be divided in two phases (see appendixes). In the first phase, during the 1990s, European or US investors managed to acquire UK defence companies while the British themselves invested heavily in the United States. Foreign investment funds thus increased their presence in the British DTIB during this restructuration phase. During the second phase, however, as the UK was involved in the aforementioned conflicts in the early 2000s, the government was determined to play a more influential role in public procurement. In 2007, for instance, the MoD refused to contract with naval manufacturers until they accepted to update their innovation programs (Masson, 2008). Due to this repositioning of the British state, larger companies sought to develop advanced skills in the fields of national defence and sovereignty. This is the case of BAe systems which, through acquisitions of specialized subsidiaries in the British territory over the last 10 years, have gained an increasing share of funding from the MoD (Matelly, Maulny, 2013). In spite of these efforts to liberalize and open up the British DTIB, apart from a few cases such as Rolls Royce, the majority of British defence firms remain very specialized – perhaps due to the overall national trend to divest from industrial activities in favour of the financial marketplace.

4. H&M Government, Defence Industrial Strategy, Defence White Paper, December 2005 – http://www.mod.uk/NR/rdonlyres/F530ED6C-F80C-4F24-8438-0B587CC4BF4D/0/def_industrial_strategy_wp_cm6697.pdf.

5. MoD, Defence Technology Strategy, 2006 – http://www.mod.uk/NR/rdonlyres/27787990-42BD-4883-95C0-B48BB72BC982/0/dts_complete.pdf

The German model is different from the aforementioned case. The end of the cold war brought two contradictory goals that are still visible in the country's defence policies: on the one hand, a willingness to legitimize an autonomous national defence in the context of German reunification and European integration; on the other hand, a desire to downplay the cold war legacy by massively reducing military spending while trivializing arms production. Thus, military spending decreased by 31.4% between 1990 and 1997; in comparison, military spending in France fell by 9.7% over the same period, while in the United Kingdom it fell by 20.8%. The drop in equipment expenditures in Germany in the same period was even steeper, at 58%. These policies emphasize the belief that the defence industry is dynamic and efficient enough to evolve with little direct support from the state.

This position is not new. The German Federal State had never, until recently, held shares of defence companies (Masson, 2010). This detachment explains a certain decline of the German defence industry, with many companies choosing to discontinue production for the Ministry of Defence. Recognizing these difficulties, the federal authorities have started to prioritize domestic suppliers in their arms acquisitions programs. Procurement bids were now offered mostly without competition, with domestic companies enjoying systematic preference as suppliers of land and naval military equipment (Uterwedde, 2009). Since 2009, the Defence Ministry established a policy of focusing their investments in large companies, hence limiting the ambition of SME subcontractors. Likewise, the 11th Amendment Act on foreign trade of July 2004 imposes strict and systematic control over foreign acquisitions of defence companies, limiting its participation to 25%.

Under these conditions, German defence companies who have chosen to continue producing arms became ultraspecialized and heavily dependent on public orders (as in the case of Diehl). Their perimeter of activities evolved little (Krauss-Maffei Wegman, for example). Investments remained private, and capital remained in the hands of existing investors, mostly traditional German families. More recently, however, the quality reputation of the industry has facilitated their access to emerging markets. German investors have thus started a process of acquiring interests in foreign companies (in the case of Atlas Electronik Group, for instance, 55% of their 2013 turnover was realized in Greece, South Africa and Malaysia – see annexes).

The involvement of local German Federal States (the so-called *Länder*) is also very important for defence companies. This is the case of OHB, a

major industrial player in the European Galileo program. Their growth of almost 600% in turnover since 2004 is due to the massive support from the Bremen region. This policy resulted in the formation of important regional clusters around large companies, creating opportunities to develop a dense and diversified network of small and medium enterprises. Such clusters facilitate the multiplication of cooperation agreements with the civil sector, boosting regional growth (see, for example, the case of Rheinmetall and the involvement of the automotive industry in the development of a light armoured vehicle). However, as a result of this regional focus, German companies have little interest in European cooperation. The recent partnership between KMW and Nexter seems to be an exception to this rule (Masson, 2012).

France's trajectory constitutes a third model. Public policy has prioritized national independence and strategic autonomy (Fontanel, Hébert, 1997). The end of the Cold War has definitely had an impact on this model, without however altering its core principles and general structure (Hébert, 1993). Based on a framework of deterrence, France's DTIB has played an important role in the national innovation system, even if it is sometimes seen as an inertial factor leading to national specialization (Miotti, Sachwald, 2004). Underlying French public procurement policies is the notion that the market alone cannot ensure the adequate development of technologies and equipment necessary for national defence.

Even though the public procurement program was reviewed in the 1990s with budget cuts in mind, the government agency known as General Delegation for Armaments (*Délégation Générale de l'Armement* or DGA) remained a strong influencer of technological defence capabilities through its direct involvement in major weapons programs. In spite of a wave of privatizations, the State retained a significant stake in these companies while seeking industrial partners rather than institutional investors (Hébert, 2006). The French state proposed the concept of "competitive autonomy" without actually opening the domestic market to foreign competition. The policy was clearly mercantilist in nature, relying on a strong support to the export of arms and the systematic use of national preference as a criterion for arms acquisitions. As a result of this state policy, key players in the meso-system of defence chose to merge in order to create large defence groups in their domains. Armoury specialists like DCNS and Nexter chose to remain focused on arms and equipment production, while less traditional companies in electronics and aerospace companies (like Airbus, Safran and Thales) chose a dual strategy of serving both military and civilian markets.

Industrial restructuring in Germany, France and the United Kingdom since 1990 and the role of public procurement

The tables and graphs presented in the appendices are intended to portray the strategic evolution of defence companies in the three countries studied since the early 1990s. The state, main customer of these companies, played a key role in those strategic changes on at least three aspects: by influencing the nature of their activities (Appendix 4), by opening up their capital to foreign investors (Appendixes 3, 5 and 7) and by being a leading provider of funds (Appendix 6).

German companies show a significant drop in their defence sales. Some of them, like Siemens, even dropped out of the SIPRI ranking. Those that remained had to concentrate (Krauss-Maffei, Wegman, for instance) and specialize in defence (44% of total revenues in 2013 as compared with only 28% in 1990). The decline in defence-related employment has been much more massive in Germany than in France or the UK. There are more British companies in the ranking in 2013 than in 1990, suggesting a high concentration in niche expertise areas (for example, Cobham, Meggit) that were prioritized by the Ministry of Defence. The central player in the British DTIB is BAe Systems, whose turnover in the defence area has increased exponentially thanks to a strategy of mergers and acquisitions. Ultraspecialized on military equipment production, the company is present in all areas of defence, thus becoming an essential partner to the MoD. The French DTIB is positioned as an intermediate model. The number of French companies in the SIPRI ranking has, as in the German case, sharply decreased. This was due rather to the process of mergers than to French companies leaving the defence sector, as was the case in Germany. The numbers concerning defence activities and defence-related jobs have also remained fairly stable in France between 1990 and 2013. The defence turnover of these companies has, like the UK, increased significantly (see, for example, the case of Dassault).

The choice to open up the capital of defence companies to foreign investment was also influenced by public policy in some of the cases. Like the model described by Blom *et al.* (2014), liberalization and competition have pushed British companies either to export or invest in foreign markets, particularly the US. Cobham, for instance, acquired 60 US companies between 2000 and 2010 (Masson 2010). On the other hand, foreign companies also invested in the British domestic market. The German government favoured a twofold strategy: to protect specific sectors where dual product lines proved complicated (such as land and naval industries) while inciting

companies in aerospace to diversify and find European partners. The birth of EADS / Airbus is an illustration. It was initially the product of an ongoing cooperation between the German company DASA and British BAe systems.

Another aspect about the role of the state concerns the decisive importance of the traditional relationship between companies and their country of origin. After opening up their capital, British companies invested primarily in the US, a very familiar, Anglo-Saxon culture with a heavy presence of the state in defence. German companies, but also to a lesser extent the French, took longer to open up but they eventually succeeded in exporting or investing in more diversified markets in Europe, Asia and the Middle East, among others.

In the area of corporate finance, again the three models differ in large part due to the role and position of their states. In the post-World War II era, only the French and British states had ever taken part in the capital of defence companies. The change of context in the 1980s and 1990s has led to the privatization of these companies. In the case of the UK, the government has chosen to widely open up the capital of these companies while establishing a Golden Share which limited the weight of each investor. Company shares were held by many investors, often institutional. These private investors held each a small part of the capital (a 13% limit for Invesco Asset Management in the case of BAe Systems, for instance). In France, the government preferred to favor industrial investors and maintain a state presence in the capital. Their IPOs came a later stage (Belin and Guille, 2008) and their capital structure is less diverse. The shares that are not owned by the state are held by other defence companies. The German case is less dynamic; the German State did not wish to hold shares in their defence companies but at the same time chose to limit the presence of foreign investors. These companies continued to produce military equipment, usually remaining in the hands of large industrial families. In a few cases they were briefly owned by foreign interests, as was the example of ThyssenKrupp Marine Systems (25% of its shares were acquired by US investor One Equity Partner in 2006 and then sold back to ThyssenKrupp in 2009).

CONCLUSION

In spite of all the evidence presented here, there remain several incongruences among the three countries and the trajectories of their defence companies, which suggest that public policies have a less systematic impact than

would portray the literature on the subject or our own initial observations. Clearly, other factors do interfere with strategic business choices. Company strategies and structures are a result mostly of their adaptation to the nature of their productive activities. In the aerospace sector, for instance, among engine manufacturers, or in the field of communication and electronics, defence companies have seized opportunities that led to a very different position than the one they held in the early 1990s. Apart from BAe Systems, which displays an original path, other companies have diversified into civilian activities in order to take advantage of opportunities in new markets. They boosted their exports and foreign investment, and increased cooperation. That is not the case in the sectors of land and naval equipment, where companies have failed to restructure and open up their capital. This is largely due to the specific nature of their products and activities, which over rely on specifications of a state customer. Such dependence limits the opportunities of opening their capital, cooperating with partners or investing in foreign companies. These incongruences are also affected by the changing nature of global or regional conflicts (Serfati, 2008), which is a major influence on public procurement policies.

As is also observed in the United States, vertical and horizontal cooperation often takes place among primary contractors and systems integrators. In Europe, horizontal cooperation usually happens at a regional, sometimes international level (mostly transatlantic cooperation). This is quite logical since system integrators have merged and restructured since the early 1990s, mainly on a national basis, sometimes at the European level. The size of domestic markets in the three countries renders the coexistence of several global defence companies unlikely, considering the complexity of the systems involved. States have thus incentivized the restructuring of defence platform contractors in order to maintain their competences at a national level by seeking to forge cooperative partnerships or by networking with "national champions". That was the case of Airbus. In the cases of the mergers between BAe and DASA or BAe and EADS, even though the partnership failed, the state motivations and objectives were the same: to create a national champion. So it happened with BAe in the UK, Dassault, Nexter and DCNS in France, Rheinmetall and TKMS in Germany.

The situation is more complex in the case of system integrators or equipment manufacturers. Not as much at the centre of attention of policy makers, they were given more latitude to diversify their operations and enter new markets. In the cases in which they did choose to preserve their defence production, they often created partnerships with platform developers within major weapons programs. They were thus involved in various

types of vertical cooperation. The engine manufacturers appear to be a special case (which might deserve a separate article). Indeed, they play on a more global market scale, both civilian and military. Due to the vast resources required to innovate on that scale, they have sought to cooperate horizontally with most of their competitors. They are present on many different weapons programs around the world regardless of the country or sector in question.

Therefore, the role of the state as customer varies not only in terms of national defence policy differences but also according to the industrial sector and company size. In future studies, it could be interesting to deepen this analysis by including a wider range of companies classified by sector. It could also be useful to look into the relationship between large defence companies and their influence on public procurement policies.

To conclude, we can observe that the strong financial constraints in Europe over the last 20 years, coupled with new technological developments, has led European states to position themselves differently than their US counterparts *vs.* their defence industry (Depeyre, Dumez, 2010; Dupuy, 2013). The widespread increase in military spending announced by a number of European states may change this scenario and lead to new industrial restructuring but also to a new form of militarization of economies. This rearrangement will again be strongly influenced by the position of the state.

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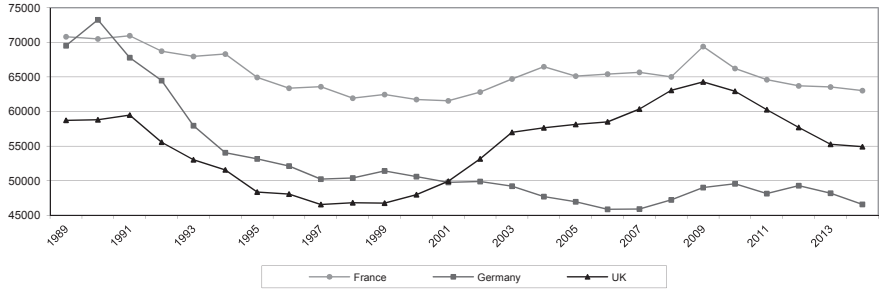
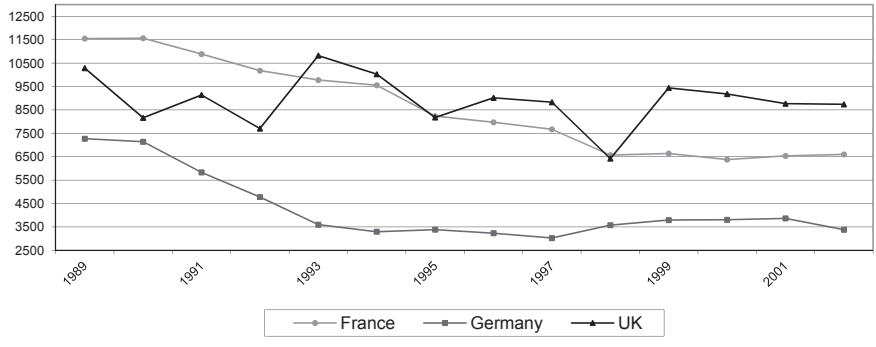
Appendix 1 – Military expenditure of the three countries since 1989

Military expenditure Germany, France, UK in US$ millions (2011 dollars)



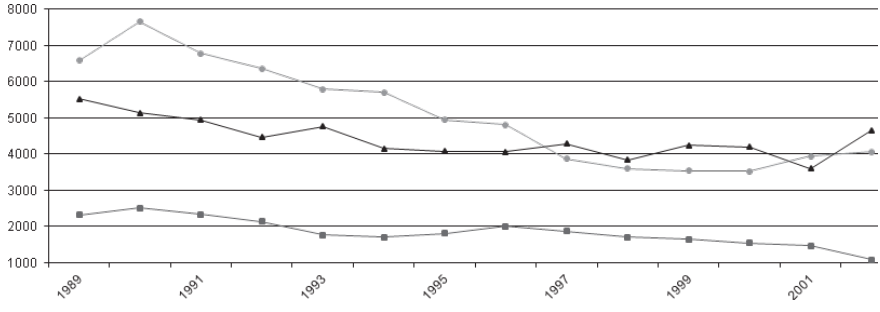
Source : SIPRI Military expenditures database.

Military equipment spending US$ millions, 1990 dollars



Source : SIPRI Yearbooks.

Military public spending on R&D in 2005 dollars adjusted for Purchasing Power Parity



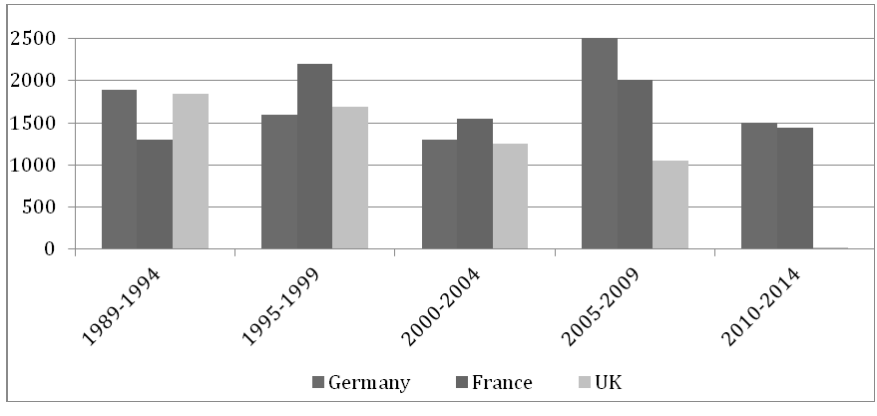
Source : OECD Main science and technology indicators.

Appendix 2 – Synthesis of Selected European State Positioning (as described by Lember, 2014)

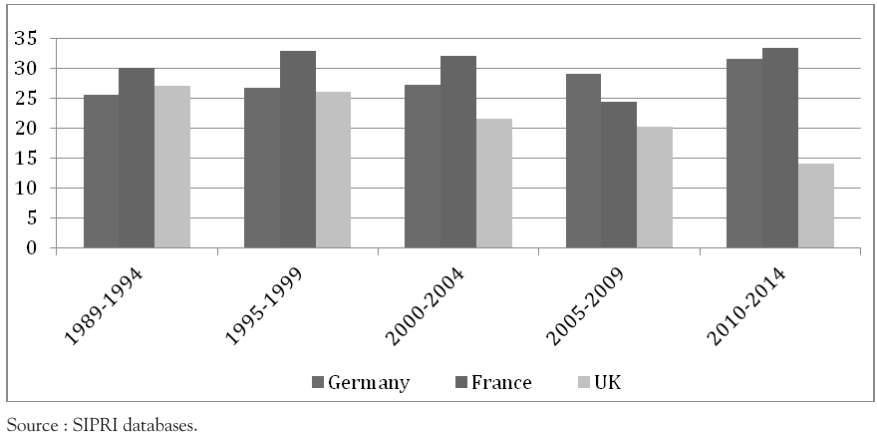
International pressure	• Liberalization, creating new opportunities but also weakening the role of the state and enshrining the supremacy of the market • Major geopolitical changes with the end of the Cold War • Information and communication technologies revolution
Germany	
Socio-economic environment	• Weight of industry in the country and relative weakness of the DTIB • Weak public funding of support to the industry
Political context	• Re-unification and Federal State
State position as customer	• Willingness to benefit from the "peace dividend" + trivialization of defence industrial activity • Procurement policy prioritizing national products (in certain cases more than in others)
Consequences for DTIB	• Closed DTIB with national, specialized companies (aerospace, land and maritime equipment), niche activities for small and medium sized businesses • Export orientation and implementation in emerging countries
France	
Socio-economic environment	• Organized industries around "national champions" • Weight of the state in the National Innovation System; DTIB held in high regard.
Political context	• Strategic autonomy and independence + Force ostentation in external operations
State position as customer	• State as shareholder • Centralization at the DGA department
Consequences for DTIB	• DTIB focused on "national champions" • Importance of these companies within the Industry and the NIS
UK	
Socio-economic environment	• Deindustrialization followed by financialisation • Liberalization and privatization
Political context	• Force ostentation in external operations • Liberalization and privatization
State position as customer	• *Best Value for Money* sought by systematic tendering + Public-private partnerships • Low involvement and outsourcing + Identification of key strategic skills
Consequences for DTIB	• Focus on transatlantic businesses with strong US presence • Core of large companies specialized in defence • High proportion of diverse institutional investors

Appendix 3 – German, British and French exports

Arms exports 1989-2014 in US$ millions (1990 dollars), annual average



Average number of country clients – on an annual basis



Source : SIPRI databases.

Appendix 4 – German, British and French companies ranked among the top 100 companies in terms of arms turnover

Source SIPRI Arms Production Database and SIPRI Yearbooks from 1990 to 2015 – in millions of dollars for total turnover and defence turnover, in dollars for turnover per employee, in percentage for the share of defence on the total turnover

In 1990						
World Rank		**Defence Turnover**	**% of Total Turnover**	**Total Turnover**	**Number of employees**	**Turnover per employee**
German companies						
17	Daimler Benz (All)	4020	8	50250	376800	133360
19	DASA	3720	48	7750	61279	126471
50	MTU	1110	50	2220	17524	126683
53	Bremer Vulkan	1050	44	2386	10922	218491
55	Siemens	990	3	33000	373000	88472
60	Diehl	860	48	1792	15108	118591
66	Rheinmetall	750	41	1829	14062	130086
67	Thyssen	710	3	23667	149644	158153
74	Telefunken System Technik	680	65	1046	9372	111625
93	Dornier	500	28	1786	10931	163362
Average		**1439**	**33.8**	**12573**	**103864**	**137529**
Total		**14390**		**125726**	**1038642**	
British companies						
3	British Aerospace	7520	40	18800	127900	146990
14	GEC	4280	25	17120	118529	144437
33	Rolls Royce	1830	28	6536	65900	99176
57	VSEL Consortium	930	100	930	15464	60140
78	Lucas Industries	630	15	4200	54942	76444
90	Westland group	510	69	739	9800	75421
Average		**2617**	**46**	**8054**	**65423**	**100435**
Total		**15700**		**48325**	**392535**	
French companies						
9	Thomson-CSF	5250	77	6818	46900	145377
18	Direction des Constructions Navales	3830	100	3830	30500	125574
21	Aérospatiale	2860	44	6500	37691	172455
25	Dassault aviation	2260	65	3477	14900	233351
40	SNECMA	1490	34	4382	27616	158689
41	GIAT Industries	1430	97	1474	15000	98282
49	Matra Groupe	1180	26	4538	24348	186400
75	Snecma	650	25	2600	14083	184620
82	Sagem Groupe	570	28	2036	16162	125957
89	Dassault électronique	530	72	736	4331	169963
Average		**2005**	**56.8**	**3639**	**23153**	**160067**
Total		**20050**		**36392**	**231531**	

In 2002						
World Rank		**Defence Turnover**	**% of Total Turnover**	**Total Turnover**	**Number of employees**	**Turnover per employee**
German companies						
20	Rheinmetall	1580	37	4270	25950	164558
38	ThyssenKrupp TK	950	3	31667	191250	165577
59	Krauss-Maffei Wegmann	570	100	570	–	
65	Diehl	510	38	1342	9830	136532
77	MTU Aero Engines (DC)	430	20	2150	8380	256563
Average		**808**	**39.6**	**8000**	**58853**	**180807**
Total		**4040**		**39999**	**235410**	
British companies						
4	BAE Systems	14070	77	18273	96300	189748
14	Rolls Royce	2850	33	8636	37300	231538
18	GKN	1800	27	6667	36050	184928
34	Smiths	1100	28	3929	33000	119048
40	QinetiQ	930	80	1163	9380	123934
62	Cobham	540	49	1102	7910	139322
63	Serco	540	27	2000	22700	88106
76	Babcock International Group	440	68	647	6910	93641
92	Alvis	340	100	340	2800	121429
Average		**2512**	**54**	**4751**	**28039**	**143521**
Total		**22610**		**42756**	**252350**	
French companies						
7	Thales	6840	65	10523	60660	173476
23	DCN	1370	100	1370	13300	103008
29	SNECMA Groupe	1160	19	6105	38990	156585
31	Dassault Aviation Groupe	1140	35	3257	12170	267637
47	GIAT Industries	730	100	730	6250	116800
54	SAGEM Groupe	620	24	2583	12100	213499
Average		**1977**	**57**	**4095**	**23912**	**171834**
Total		**11860**		**24569**	**143470**	
European companies						
9	EADS	5630	20	28150	103970	270751
19	MBDA	1690	100	1690	10000	169000
Average		**3660**	**60**	**14920**	**56985**	**219876**
Total		**7320**		**29840**	**113970**	

In 2013						
World Rank		**Defence Turnover**	**% of Total Turnover**	**Total Turnover**	**Number of employees**	**Turnover per employee**
German companies						
32	Rheinmetall	2860	47	6085	21080	288667
57	ThyssenKrupp	1770	3	59000	156860	376132
61	Diehl	1230	32	3844	14520	264721
72	Krauss-Maffei Wegmann	1010	95	1063	–	
Average		**1718**	**44.3**	**23331**	**64153**	**232380**
Total		**6870**		**69992**	**192460**	
British companies						
3	BAE Systems	26820	94	28532	84600	337257
14	Rolls Royce	5550	23	24130	55200	437146
26	Babcock International Group	3270	59	5542	10260	540192
39	Serco	2560	32	8000	120540	66368
55	Cobham	1820	65	2800	10090	277502
63	QinetiQ	1190	64	1859	6220	298935
76	Meggitt	960	38	2526	10720	235664
79	GKN	950	8	11875	49700	238934
80	Chemring Group	920	94	979	3690	265237
Average		**4893**	**53**	**9583**	**39002**	**299693**
Total		**44040**		**86244**	**351020**	
French companies						
10	Thales	10370	55	18855	65190	289225
16	Safran	5420	28	19357	66230	292272
19	DCNS	4460	100	4460	13650	326740
52	Dassault Aviation Groupe	1860	31	6000	11600	517241
74	Nexter	990	95	1042	2780	374858
Average		**4620**	**61.8**	**9943**	**31890**	**360067**
Total		**23100**		**49714**	**159450**	
European companies						
7	Airbus (ex EADS)	15740	20	78700	144060	546300
15	MBDA	3850	100	3850	10000	385000
Average		**9795**	**60**	**41275**	**77030**	**465650**
Total		**19590**		**82550**	**154060**	

Appendix 5 – Export-Orientation of the defence companies of the three countries

	Activity	% of Turnover in the Domain of Defence 2013	% of Exports / Turnover	% of Defence Exports / Total Exports
Germany				
Atlas Elektronik	Systems, naval electronic equipment		66	
Diehl BGT Defence	Systems and equipment, missiles and ammunition	32	51	80
Krauss-MaffeiWegmann	Air defence platforms, land systems integrators	95		68
Rheinmetall Defence	Land platforms, land systems integrator, aeronautical, naval defence	47	68	88
MTU Aero Engines	Engine manufacturer		88	
OHB	Space platforms, systems integrator		**72**	
TKMS	Naval platforms, systems integrator			
France				
Dassault Aviation	Air defence platforms, systems integrator	31	71	38
DCNS	Naval platforms, systems integrator	100		
Nexter	Land platforms, systems integrator	95	24	24
Saffron	Engine manufacturer (e.g. Snecma), systems integrator and electronic equipment (e.g. Sagem)	28	78	77
Thales	Land, naval and aeronautical systems and equipment integrator	**55**	**69**	**71**
UK				
Babcock International	Naval, land and aeronautical support systems	59	19	74
BAE Systems	Air defence platforms, systems integrator	94	79	87
Cobham	Aeronautical equipment, electronic systems (naval, land, aeronautical)	65	87	90
Meggit	Aeronautial equipment and defence	38	50	51
QinetiQ	R&D services provider	64	51	88
Smiths Group	Electronic systems integrator	-	96	
Rolls-Royce	Engine manufacturer	23		
Europe				
Airbus Group	Aerospace Platforms	20		39
MBDA	Missiles	100		

Appendix 6 – Capital Structure of defence companies in Germany, France and the UK

	Public	Private	Number of shareholders	Majority investor	Shares Owned
Germany					
Atlas Elektronik		100%	2	Thyssen Krupp	51%
Diehl BGT Defence		100%	1	Diehl family	100%
Krauss-Maffei Wegmann		100%	1	Wegmann & Co	100%
Rheinmetall Defence		100%	-	Harris Associates	5.52%
MTU Aero Engines		100%	-	Artisan Partner	4.56%
OHB		100%	-	Fucks family	69.72%
TKMS		100%	1	ThyssenKrupp AG	100%
France					
Dassault Aviation	3.1%	96.9%	3	Groupe Industriel Marcel Dassault	50%
DCNS	64%	36%	3	French State	64%
Nexter	100%		1	French State	100%
Saffron	22.4%	77.6%	4	French State	22.4%
Thales	26.6%	64.4%	-	French State	26.6%
UK					
Babcock International		100%	-	The Capital Group Companies	6.05%
BAE Systems		100%	-	Invesco Asset Management	13%
Cobham		100%	-	Schroders	5.22%
Meggit		100%	-	Capital Research and Management Cies	11.67%
QinetiQ		100%	-	Ruane Cunif	9.7%
Smiths Group		100%	-	Harris Associates	5.3%
Rolls-Royce		100%	-	Invesco Asset Management	4.58%
Europe					
Airbus Group	30.3%	69.7%	-	SOGEPA (French State)	11%
MBDA				Airbus and BAE Systems	37.5% each

Appendix 7 – Breakdown of sales by geographic area as % of total turnover

	Domestic	European	US	Asia	Other
Germany					
Diehl BGT Defence	49	-	-	-	51
Krauss-Maffei Wegmann	-	-	-	-	-
Rheinmetall Defence	32	28	19	8	23
Atlas Electronik	34	11	-	-	55
OHB	28	71	-	-	1
MTU Aero Engines	12	8	68	7	5
ThyssenKrup Marine Systems (TKMS)	-	-	-	-	-
Average					
France					
Dassault Aviation	29	-	-	-	71
DCNS	-	-	-	-	-
Nexter	76	-	-	-	24
Saffron	22	7	32	17	22
Thales	29 + 11[6]	20	10	14	-
Average					
UK					
Babcock International	81	-	-	-	19
BAE Systems	21	9	40	3	-
Cobham	13	15	45	7	20
Meggit	50	22	10	-	18
QinetiQ	49	42	-	-	9
Smiths group	4	20	45	7	-
Rolls-Royce	-	36	29	23	12
Average[7]					
Europe					
Airbus Group	-	36	15	33	16

Source : Notebook DGA 2014.

6. In the case of Thales, the French and British markets are considered domestic and represent 29% of sales for France and 11% for the UK.
7. Non-pondered arithmetic average on the turnover or size of companies.