About the Article

How does Europe's defence-industrial base compare to Russia's war economy, and what must Europe change to sustain high-intensity war and credibly support Ukraine as US backing wanes? Industrial capacity, mobilised at scale and able to adapt legacy systems, matters more than cutting-edge tech in attritional war; Russia currently does this better than Europe. Europe should rebuild mass production, cut its dependence on China, and unify procurement to deter Russia.

About the Author

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1. Introduction

Since Russia invaded Ukraine in 2022, European leaders have begun to recognise that Europe needs to defend itself as US protection is no longer a guarantee and may become conditional. Increasing industrial capacity is essential for defending European values and maintaining peace, as industrial warfare has returned to Europe. At the centre of this effort lies the dormant European industrial complex. How does it compare to Russia's war economy, and what can Europe's defence industry do to enhance Europe as a credible defence actor? To provide an idea, this essay will assess the importance of the defence industry, characterise Russia's defence industry and highlight key differences with Europe's defence industry.

2. Defence Industry in Industrial Warfare

It is helpful to briefly examine the war in Ukraine and its industrial requirements for maintaining the war effort. Contrary to what Putin anticipated, the invasion swiftly evolved into a war of attrition, where both sides are equipped with military equipment of similar sophistication. In wars of attrition, the victor typically emerges due to a stronger industrial base, either by possessing the capacity to produce more ammunition or by rapidly converting existing civilian facilities for military purposes, rather than by having superior specialised technology (Vershinin, 2022). It is unlikely that Russia can deliver a decisive strike to European nations; however, further research is required to evaluate different scenarios. Regardless of whether Russia directly attacks Europe or maintains its war effort in Ukraine, assessing the European defence industry is useful to understand how Ukraine can be supported in a future where US support diminishes further. In any case, Europe will need to rely on US CI4SR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) capabilities, as Europe remains decades behind.

3. Russia's Defence Industry

3.1 Design, Ethos and Innovation

Russia's lack of world-leading high-tech innovation can be partly attributed to its political system and the specific cultural implications it entails. In the Soviet Union, there was a distinct focus on aerospace, the military, and nuclear innovation, which weakened civilian sectors. This period also saw the Soviet Union attempt to compete with Silicon Valley by leveraging its STEM-educated population in a satellite district of Moscow, Zelenograd. (Usdin, 2005). The goal was to build a worthy rival to the semiconductor and computing industry in California, which has clearly failed, as I am writing this essay on a MacBook and not a Bitblaze Titan BM15. Russia's inward focus after Vladimir Putin's 2012 reelection limited its ability to attract businesses and individuals who drive innovation at the technological frontier, leaving it without technologies as advanced as those in the West. Little market incentives, direct political control, low venture capital, and fear of failure in the top-down legacy are among the reasons why the Soviet Union failed to attract the most creative and ambitious people (Center & Bates, 2019). Several Soviet-era design demands and system-based limitations are shaping the Russian defence industry as it exists today. While there have been profound changes in requirements and constraints, such as the 1990 economic collapse, NATO expansion, and hybrid warfare in Georgia and Crimea, some crucial design tenets endure. Soviet military doctrine and its specific demands on weapons systems mean that mass production is inherent in the design of Russian military equipment today. The anticipation was that battles would be intense and prolonged, as they are in Ukraine today (Richard Ward, 1989). A particular understanding of military economic efficiency that accounts for the damage inflicted on enemy objects at an approved cost in material resources is crucial to understanding Soviet military design (Danylyuk, 2022). This was, and still is, partly influenced by the limitations of engineering and manufacturing capabilities in the Soviet Union and

Russia. At the edge of what was technically feasible, the Soviets nearly always attempted to replicate what the West was doing. However, even before World War II, the complexity of weapons systems increased exponentially, requiring absorptive capacities to compete in producing the most advanced weapon systems (Gilli & Gilli, 2019). Since the systems integration skills, tacit knowledge, and the industrial and scientific base were firmly established in the West, the USSR could never quite catch up, even when detailed blueprints for Western projects were stolen, as demonstrated by the Tu-144 and the Buran Programme (Redacted Author, 1984). Despite its obsolescence, the military legacy left by the USSR, comprising vast stockpiles of comparatively simple tanks, bombers, fighter jets, munitions, and unguided bombs, as well as the industrial capacity to produce and maintain them, has been repurposed to support the war effort in Ukraine. Armoured vehicle deliveries to the military are high to sustain attrition; however, of the roughly 1500 tanks delivered in 2023, only a fraction were new, while the rest were modernised older models taken out of storage (Evans, Gasparyan, Wolkov, Gibson, & Kagan, 2025). Other legacy systems, such as unguided bombs, are updated to deliver some degree of precision, offset by a heavier payload, making roughly hitting the target "good enough" (Danylyuk, 2022). Updating legacy equipment to meet modern requirements is, in part, enabled by the heritage present in many Russian systems, such as the many variants that followed the original Su-27. Low-cost, mass-produced Geran-2 loitering munitions, based on the Iranian Shahed system, have also been firmly integrated into the Russian military doctrine (Clark, 2025).

3.2 War Economy and Supply Chain Management

The Russian war economy is sustainable for now, but it is doubtful whether it can sustain itself much longer (Snegovaya, M. 2025). The invasion of Ukraine in 2022 lowered Russia's arms exports significantly. Sales began to dwindle during the pandemic in 2020 and have remained low since (George et al., n.d.) The high demand from the Russian military, which offset slowing external demand, led to growth, with 520'000 new jobs created since the start of the war, bringing the total to roughly 4.5 million. (Danylyuk, 2022). A new middle class has emerged, with defence wages multiple times higher than the average pay that members of disadvantaged communities previously received, reducing their interest in ending the war significantly (bne IntelliNews, 2025). Contracts with manufacturers are long-term, and companies have made significant investments in increased production by opening new facilities and modernising and extending existing ones (Danylyuk, 2022). Stockpiles do not last indefinitely, and Russia is not a fully autarchic economy in its wartime efforts, which is why China has become its most significant ally. Disrupting supply chains for basic raw materials in defence manufacturing would have a greater impact than disrupting those for specialised hardware like microchips. Up to 70 per cent of Ukrainian combat casualties have been attributed to artillery shelling (Epstein et al., 2023). Producing artillery munitions requires cotton pulp and cellulose nitrate, raw materials mainly imported from China, as well as machinery for processing cotton (Luzin, 2025). Efforts to produce cellulose nitrate from linen or hemp have so far been unsuccessful; thus, disrupting cotton imports to Russia presents a significant opportunity to weaken the Russian war economy. Europe's limited influence on the global cotton market makes this a largely theoretical possibility.

Imports of Cotton Cellulose (HS Code: 470610) To Russia – January 2020-March 2024)

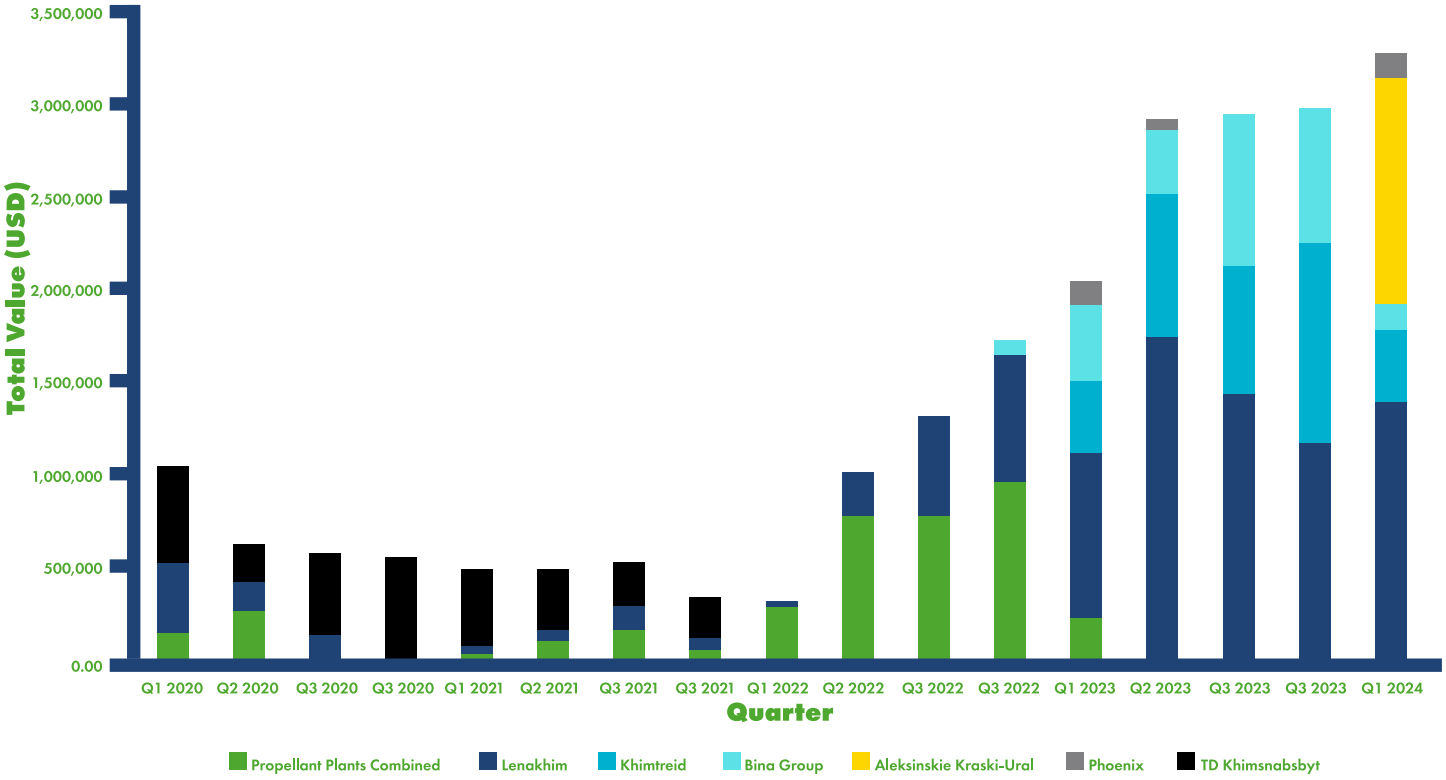

Figure 1: Russain Imports of Cotton Cellulose and Recipient Entities, Source: https://www.rusi.org/explore-our-research/publications/external-publications/ore-ordnance-disrupting-russias-artillery-supply-chains

Europe has more leverage over the companies that are the sole suppliers of high-precision machine tools used in rocket manufacturing. The lack of a firm commitment to strictly enforce export regulations allows Russian rocket production, which is central to its military doctrine, to survive (Galeev, K., et al., n.d.). A similar dependency on European machine tools exists in the Russian artillery supply chain (Borovikov et al., 2024).

3.3 *Europe*

Posen argued in 2006 that the newly formed European Union was "preparing itself to manage autonomously security problems on Europe's periphery and to have a voice in the settlement of more distant security issues, should they prove of interest." (p. 150) The final part is especially important because there was little recognition of Russian interests and their gravity after Crimea was annexed in 2014. When Russia began its invasion of Ukraine in 2022, Germany pledged to rapidly establish itself as the main pillar of conventional defence in Europe" (Danylyuk, 2022).

3.4 De-industrialisation and Rescaling

The innovation-driven European defence industry excels at high-end research and development. Still, it is currently unable to sustain a prolonged high-intensity conflict along a drawn-out front. Several factors have led to a decline in European industrial defence capabilities over the past 35 years. The peace dividend meant that European economies thrived while militaries were underfunded, and the industrial defence sectors shrank. Military missions were mainly carried out away from European borders and had different requirements compared to a war of attrition; the available funds were used for high-end manufacturing, though in small quantities. Most importantly, the culture and skilled workforce, along with their tacit knowledge for mass defence manufacturing, were lost — a problem that cannot be simply fixed by throwing money at it. Rheinmetall cannot simply approach Volkswagen and buy an entire production line, including personnel, to manufacture tanks or ammunition. Employees require specialised training and security clearances to handle explosives; warehouses must be certified and adapted to store

explosives; and robots that assembled the ID.3 this week cannot assemble a Leopard next week, to name just a few issues. New production lines are costly and take time to reach full capacity. Still, they are a necessary step, one that Rheinmetall has taken with their new plant in Unterlüss, Germany, which is planned to be fully operational in 2027 (Deutsche Welle, 2025). This challenge is not limited to Europe but also extends to the US, where artillery systems have received less attention in recent history due to the focus on precision-strike weapons (Hacker, 2023).

3.5 Fragmentation and Duplication

In addition to the fragmented ideas regarding Europe's posture, there is also fragmentation in defence systems. On the one hand, economies of scale cannot be realised, and path dependency hinders countries' ability to adapt swiftly. On the other hand, a broader range of systems may pose greater difficulties for Russia to adapt to. The inefficiencies start with Research and Development, where distrust hinders collaboration among EU members and results in small-scale production, preventing the take-up of economies of scale (European Parliament, Directorate General for Parliamentary Research Services, 2024). Resources are wasted through duplicated research and processes; some products even end up competing in foreign procurement programmes.

3.6 Supply Chain Management

Europe is also dependent on imports for defence manufacturing. These dependencies include, but are not limited to, rare earths, tungsten, and guncotton. The most relevant issue is the same one Russia faces: cellulose nitrate, a vital component of artillery-shell propellants (Hackett et al., n.d.). China, which is also Europe's main supplier, has in recent years "developed, tested, and deployed a new set of second-generation economic weapons [...] used more often and for a wider set of policy goals [...]"(Medeiros & Polk, 2025). Some of these dependencies that China can leverage today have existed for over 15 years, and control over rare earths and their processing—up to 98% in some cases—does not happen overnight; many opportunities have been missed.

China Has Leverage Over Seven Rare Earth Metals Amid Trade Tensions

The US has zero refined production of these elements

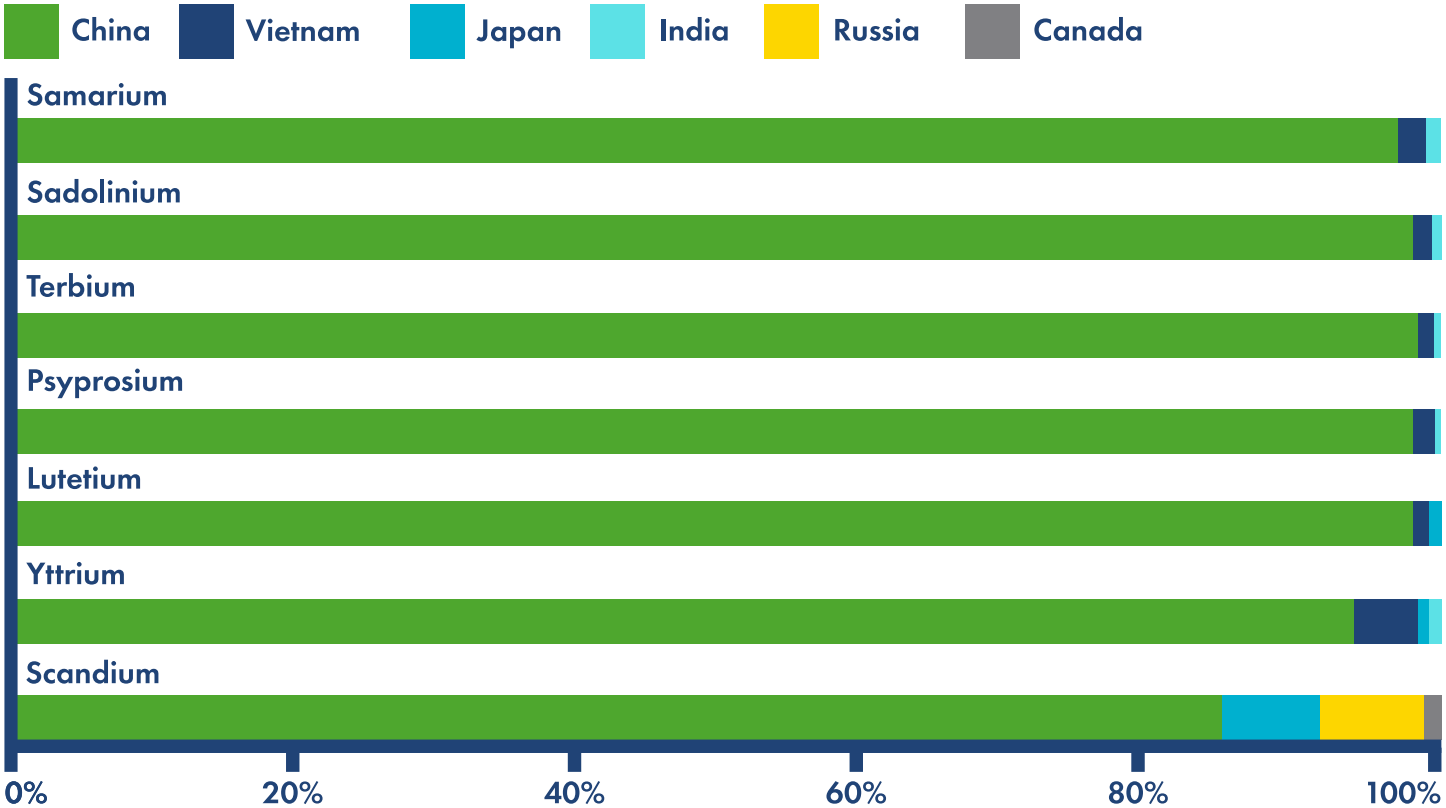

Figure 2: Country breakdown of global refined output, Source: https://www.msn.com/en-us/news/world/why-rare-earths-are-china-s-trump-card-in-trade-war-with-us/ar-AA1GzrBX

Besides its crushing monopoly over the refining of these seven rare earth elements, China accounts for over 90% of global refining (International Energy Agency, 2025). Without refinement, raw materials cannot be used in their final application. This means that although China has an abundance of rare earth elements, controlling one step in the value chain allows it to dominate the entire market. Institutionalisation of Procurement and Funding. The urgency of the matter might prompt changes in how troop and resource contributions within the EU have been planned for a long time. The main reason EU states have previously cooperated in security missions is through networked collaboration, where key states utilise dense institutional and social networks to negotiate, pressure, bargain, and persuade other states to participate (Henke, 2019). These security missions vary significantly in length, scale, and urgency, from a potential hot war with Russia, requiring solutions that focus more on the long term than on networked cooperation. A crucial step in this direction is the establishment of the ReArm Europe Plan/Readiness 2030, which aims to mobilise €800 billion in defence spending over four years through a combination of national fiscal flexibility, EU-backed loans, and redirected cohesion funds. This includes the €150 billion Security Action for Europe (SAFE) instrument, adopted by the EU Council in May 2025, which facilitates joint procurement in priority areas such as air and missile defence, drones, and cyber security, while ensuring at least 65% of production occurs within the EU, Norway, or Ukraine (European Commission, 2025). While there is significant innovation potential in European startups, economies of scale, cohesion, and availability require well-funded European solutions, such as those mentioned above, to enhance incentives for greater coherence in the Defence industry.

4. Conclusion

The war in Ukraine has highlighted the importance of industrial capacity, rather than technological sophistication alone, in high-intensity conflicts. Russia's ability to mobilise legacy systems, increase production, and maintain a war economy despite structural weaknesses starkly contrasts with Europe's fragmented and downsized defence industry. Years of underinvestment, deindustrialisation, and the loss of tacit manufacturing knowledge have left Europe poorly prepared for prolonged warfare or for supporting Ukraine without considerable external aid. At the same time, Europe must ensure that its engineering excellence is not used to produce Russian weapons further. To become a credible security actor, with or without US support, Europe must move beyond ad hoc or short-term mechanisms such as networked cooperation and instead establish long-term procurement, funding, and supply-chain strategies, as volatile markets are not the right environment for consistent defence industry funding. Rebuilding industrial capacity and securing critical inputs are essential steps towards restoring Europe's ability to deter aggression and sustain high-intensity operations. Ultimately, Europe's strategic credibility depends not only on advanced technology but also on managing supply chains and bottlenecks to enable large-scale and rapid production of defence materiel, as "the war in Ukraine has proven that the age of industrial warfare is still here" (Vershinin, n.d., p. 1).

Tacit Knowledge:
specialised, unwritten expertise and organisational experience gained through long-term practice and trial-and-error, which cannot be captured in blueprints or manuals. It is a critical component of absorptive capacity, acting as a „complexity barrier" that prevents adversaries from successfully replicating advanced technologies through espionage or reverse engineering alone.

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