



Policy Brief

Technological Sovereignty and Europe's Competitiveness

Perspectives from Baden-Württemberg

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Executive Summary

Europe is undergoing profound geopolitical, economic, and technological transformations. The ability to safeguard prosperity, security, and democratic agency increasingly depends on strengthening technological sovereignty, maintaining competitiveness, and enhancing economic resilience.

This policy brief summarizes key insights from the panel discussion “New Realities: Technological Sovereignty and Security for Europe” at the BW–EU Economic Summit 2025 in Brussels and incorporates additional strategic impulses from the Ministry of Economic Affairs, Skilled Crafts and Tourism Baden-Württemberg. The focus lies on how Europe can maintain its competitiveness under changing global conditions and how innovation-driven regions such as Baden-Württemberg can contribute to this effort.

The analysis shows that Europe's industrial base, its strong research and development capabilities, and its value-based orientation provide a solid foundation. At the same time, fragmented implementation structures, complex regulatory procedures, and deficits in scaling technological innovations threaten this position. A paradigm shift is therefore required toward an innovation-friendly, pragmatic, sovereign, and security-aware European economic policy.

Baden-Württemberg can serve as a catalyst for technological sovereignty. Its competencies in key and future technologies such as artificial intelligence, applied robotics, chip design, microelectronics and photonics, quantum technologies, biotechnology, batteries, and green technologies illustrate how regional excellence can strengthen European sovereignty. Based on this, the policy brief derives concrete recommendations: accelerating innovation-friendly regulation; strategically bundling investments; mobilizing private capital in key technologies; opening and harmonizing European capital markets; strengthening cross-border and cross-sector innovation networks; embedding technological sovereignty holistically through closer alignment of research, industrial, security, digital, and foreign policy; and intelligently linking existing competencies with creative approaches to rethink innovation.

Europe faces the challenge of translating strategic knowledge consistently into operational action. Against the backdrop of global technological, geopolitical, and economic transformations, this phase of technological renewal requires determination, speed,

willingness to invest, and entrepreneurial dynamism as part of diversified, regionally anchored innovation and value creation structures.

1 New Realities in Global Competition

Europe stands at a turning point. The rules-based international order that ensured stability and prosperity for decades is increasingly under pressure. Trade conflicts, geopolitical tensions, and protectionist tendencies are changing the rules of global competition. At the same time, pressure on European industries—particularly in export-oriented regions such as Baden-Württemberg—is increasing as they must reposition themselves in a world where speed, technological leadership, and strategic autonomy are becoming decisive location factors.

European economic and industrial policy has largely focused on integration and regulatory harmonization. However, in a period of global power shifts, regulatory compliance alone is no longer sufficient. The loss of influence and agency among many companies and political actors points to a structural imbalance: Europe's regulatory strength in setting standards is not yet matched by a comparable capacity to rapidly translate knowledge into scalable value creation. In areas such as artificial intelligence or semiconductors, Europe is often strong in research and regulation, while industrial scaling and value creation in other regions—particularly the United States and Asia—progress faster and more seamlessly. At the Economic Summit, Minister Dr. Hoffmeister-Kraut summarized this succinctly: reforms, the courage to pursue new approaches, and the willingness to make confident decisions are prerequisites for the future viability of the European economic model.

At the same time, challenges within Europe are intensifying. Diverging national interpretations of European legal acts, fragmented markets, and complex regulatory systems hinder the development of a truly unified single market. Small and medium-sized enterprises in particular suffer from this structural complexity. They rely on rapid procedures, reliable standards, and predictable framework conditions—not additional regulatory requirements and administrative burdens.

Against this backdrop, Baden-Württemberg serves as an example of an innovation-driven region providing orientation at the European level. With its strong industrial base, excellent research clusters, and high innovation density, the region reflects both the challenges and opportunities Europe faces in global competition. It becomes clear that technological capability, economic openness, and the ability to act strategically and autonomously in key technologies are closely interconnected.

Europe must learn to think in strategic—not solely regulatory—terms. This includes recognizing global risks, diversifying dependencies, and developing confidence in its own capacity to shape the future. The transformation is not only economic but also cultural: it requires a paradigm shift from reacting to actively shaping developments. Discussions at the Economic Summit made clear that the window of opportunity for this transformation is rapidly

narrowing. Europe's competitiveness will not be decided in the next decade, but within the current political cycle.

2 Technological Strength as an Expression of Sovereignty

Technological sovereignty has long evolved beyond an industrial policy buzzword—it has become a central lever for strengthening Europe's economic, political, and security-related capacity to act. In a world where geopolitical power is increasingly exercised through technological capabilities, control over key technologies determines economic stability, political agency, and societal resilience. Europe faces a dual imperative: on the one hand, it must systematically expand its own technological capabilities—particularly in key areas such as semiconductors, artificial intelligence, robotics, quantum technologies, cybersecurity, and automation. On the other hand, political and regulatory frameworks must be designed to enable innovation to emerge more quickly, scale effectively, and be translated into market-ready products and services. This includes digital infrastructures, innovation-friendly regulation, targeted technology transfer, and the development of skills and key qualifications along the entire value chain.

This relationship was clearly emphasized in the panel discussion. Representatives from politics, industry, and academia highlighted that technological strength is an expression of a sovereign Europe—not only in terms of independence, but as the ability to actively shape the future. While the United States and China are pooling billions in strategic technology sectors such as artificial intelligence, semiconductors, and cloud infrastructures, Europe risks failing due to its fragmentation. Capital and sales markets remain constrained, risk financing is scarce, and a culture of risk aversion often replaces entrepreneurial courage.

Business representatives stressed that regulation alone does not create an innovation-friendly environment. What is needed instead is trust, pragmatism, and a culture that understands failure as part of progress. Innovation emerges where freedom and responsibility are balanced. Baden-Württemberg, with its strong research, development, and application ecosystems, demonstrates how regional excellence can become a European competitive advantage—from quantum research to microelectronics and AI applications in production and services.

At the same time, it became evident that Europe's structural weakness lies less in research than in implementation and, in particular, in transferring knowledge from research to small and medium-sized enterprises. Without translating research findings into market-ready applications, dependencies increase and Europe's sovereignty is undermined. The European Union possesses an excellent scientific base as well as demand-oriented funding and cooperation instruments – for example within European research programmes and joint technology initiatives. Nevertheless, the so-called “valley of death” frequently persists between scientific discovery and economic scaling. Especially in this transition from research to market, suitable financing, deregulation, and growth instruments are often lacking. Overcoming this deficit requires new approaches: more flexible funding instruments, stronger

entrepreneurial incentives, and European financing mechanisms that mobilize private capital and support technology-oriented companies in scaling their innovations.

For technological sovereignty, this means rethinking the interaction between politics, business, and academia. It requires innovation-friendly regulation that creates room for experimentation rather than imposing limits. It needs a start-up and scale-up culture that views entrepreneurship as a European future project, not as an administrative risk. And it demands the political will to understand strategic technologies as part of an overall architecture of security, competitiveness, and prosperity.

Europe can only assert its sovereignty if, building on its strong competencies, it has the courage to assume technological leadership—with clear priorities, accelerated procedures, and a culture that does not fear progress but enables it.

3 Strategies and Framework Conditions for a Sovereign Europe

Safeguarding technological sovereignty is not possible without coherent political, economic, and regulatory framework conditions. Europe needs a strategic architecture that not only enables innovation but accelerates it and creates space for scaling. This includes a harmonized single market, open capital markets, diversified, competitive, and resilient energy infrastructures, and a modern industrial policy that is pragmatic, capable of action, and future-oriented.

The discussion highlighted that the European single market remains a foundation of economic strength, yet suffers from structural fragmentation. Diverging national regulations, complex approval procedures, and inconsistent standards make it difficult for companies to scale innovations across Europe. Against this backdrop, the call for a “second generation of the single market” is more than an economic policy slogan: it describes the necessary transition from overregulation toward a single market of opportunities. The single market strategy presented by the European Commission in May 2025 addresses these challenges and sets important impulses for deeper integration. However, the decisive factor will be whether strategic guidelines can be translated into concrete implementation steps. Harmonized procedures, interoperable digital administrative processes, and accelerated recognition of qualifications and approvals are key levers for reducing barriers to innovation and strengthening the scalability of European companies in a sustainable way.

In parallel, Europe must align its economic relations with its strategic needs. Building new partnerships—for example with India, Indonesia, and other emerging economies—is becoming a geopolitical necessity. The discussions emphasized that Europe’s foreign and economic policy should become more pragmatic, more sector-oriented, and more consistently focused on implementation and results. Instead of comprehensive packages that take years to negotiate, “mini-deals” are needed to increase speed while securing access to raw materials, markets, and production chains. Managing relations with China and the United States also requires a new balance between cooperation and self-assertion: Europe must continue to

strive for openness and resist tendencies toward isolation. At the same time, Europe must learn from past experience and strengthen its own capabilities to avoid significant dependencies.

Access to capital is also of central importance. Start-ups and technology-oriented SMEs in Europe still face insufficient risk capital to bridge the gap from founding to scaling. European financial instruments must therefore be strengthened and aligned strategically—for example through initiatives such as the planned “Scale-up Europe Fund,” a strengthened European Competitiveness Fund, and national and regional partnership plans within the new EU financial framework, ensuring that grants, equity financing, and guarantees are systematically linked. A stronger connection between research funding and market deployment is essential to transform knowledge into growth. The Capital Markets Union can become a strategic key instrument—provided it does not drift into new centralization debates but preserves regional expertise and responsibility.

Finally, the panel emphasized that technological sovereignty requires innovation-friendly regulation. Instead of increasing reporting obligations and overregulation, Europe needs a regulatory framework that trusts companies to handle new technologies responsibly. Regulatory sandboxes, experimentation clauses, and functional regulation are not risks but prerequisites for dynamism.

Europe therefore faces the task of transforming its economic policy from a principle of mistrust to a principle of enablement. A sovereign Europe is one that creates freedom, rewards innovation, and confidently represents its strategic interests—within Europe and globally.

4 The Security Dimension of Key Technologies

At a time when geopolitical tensions, cyberattacks, and hybrid threats are increasing, it becomes clear that technological independence also means security resilience. The discussion at the Economic Summit demonstrated that Europe’s future viability in the 21st century depends on whether it can not only develop key technologies but also protect them strategically and anchor them within a security-related framework.

Security policy today extends far beyond defence in the traditional sense. Artificial intelligence, quantum technologies, semiconductors, sensors, and robotics are no longer purely economic issues—they determine the capacity of states to act. Dual-use technologies, meaning applications with both civilian and military benefits, are moving to the centre of European security strategies. The focus is less on militarization than on strategic autonomy: Europe must develop its own capabilities to avoid long-term dependence on external supply chains or political alliances in critical areas.

During the discussion, Member of the European Parliament Strack-Zimmermann emphasized that Europe still lacks a genuine single market for defence. Divergent national structures, the principle of unanimity, and lengthy decision-making processes hinder joint projects and prevent innovation from reaching where it is needed. A functioning European single market for

defence technologies would be a decisive step toward increasing efficiency, reducing costs, and shortening innovation cycles.

Baden-Württemberg plays a special role in this debate. As an industrial heart of Europe, the region combines high-tech competencies that are central for security applications—from sensors and AI-based control systems to quantum-based communication solutions. Companies in mechanical engineering, photonics, and robotics possess key technologies that are strategically relevant not only economically but also from a security perspective. The Minister therefore rightly emphasized the importance of European procurement policy as part of a comprehensive toolbox that promotes dual-use innovations and creates optimal framework conditions for European providers.

A shift in thinking is also evident at the European level. The European Commission increasingly views defence and security technologies as drivers of technological innovation and industrial performance. Instruments such as joint procurement, mission-oriented research funding, and strategic public procurement can help open new markets and create scaling opportunities for start-ups and scale-ups. Young, technology-oriented companies in particular contribute significantly to Europe's security and resilience architecture with solutions in areas such as cybersecurity, drone technologies, aerospace technologies, and data-driven analytics. However, reliable market access is essential. Public actors can assume a new role here—not as substitutes for the market, but as strategic anchor customers who create early demand, reduce innovation risks, and mobilize private capital.

The linkage between technological and security sovereignty is therefore not an option but a necessity. Europe's strength will increasingly be measured by how consistently it succeeds in translating technological excellence into economic, security-related, and geopolitical room for manoeuvre. Security does not arise from isolation, but from cooperation, resilience, and the ability to retain control over critical technologies.

Europe must take the security dimension of innovation seriously—and view it as an opportunity. Building a European security ecosystem that more closely connects research, industry, and policy could not only strengthen defence capabilities but also significantly accelerate innovation in areas such as robotics, quantum technologies, and artificial intelligence. Technological sovereignty thus becomes a dual lever: strengthening both competitiveness and resilience.

5 Baden-Württemberg as an Innovation Space for Technological Sovereignty

Baden-Württemberg exemplifies how technological sovereignty can be systematically strengthened at the regional level through targeted innovation, research, and technology transfer policies. The region benefits from a strong economy, excellent research institutions, and a well-established culture of collaboration between industry, academia, and policymakers,

supported by diverse cooperation, dialogue, and transfer formats. This combination provides a solid foundation for developing new technologies and translating them into market-ready applications.

At the same time, Baden-Württemberg—like many industrial core regions in Europe—faces significant transformation pressures. Structural change, skills shortages, high energy prices, regulatory complexity, and a strong dependence on global trade and critical raw materials are weighing on economic dynamics. Economic developments in recent years show that technological strength alone does not automatically translate into growth. This makes it all the more important to use innovation capacity strategically as a lever for renewing economic structures.

Baden-Württemberg has a diversified innovation ecosystem that brings together global market leaders and hidden champions, start-ups and SMEs, universities, and applied research institutions within regionally anchored clusters. In areas such as artificial intelligence, cybersecurity, quantum technologies, and data-driven industry, innovation approaches are emerging that have the potential to open new value creation pathways—provided suitable conditions for spin-offs, scaling, and market access are in place.

Innovation hubs such as the Innovation Park Artificial Intelligence (IPAI), Cyber Valley, and QuantumBW, as well as innovation infrastructures like the High-Performance Computing Center Stuttgart (HLRS), illustrate the strength of this innovation landscape. They represent internationally visible ecosystems of research, transfer, and value creation where technological excellence, industrial application, and societal responsibility converge. At the same time, they reveal where Europe's structural weaknesses lie—and address them directly: in scaling, in research-based company creation, in creative interdisciplinary networking of existing competencies, and in the transition from pilot projects to sustainable business models.

Instruments such as regulatory sandboxes, open data spaces, and participatory innovation formats make an important contribution to testing new technologies under real-world conditions. However, these approaches operate within tight regulatory frameworks at the European level, which can bind significant resources—particularly for SMEs and research-based spin-offs. In innovation-intensive sectors such as medical technology, regulatory complexity increasingly leads to delays or relocation of innovation activities.

Against this backdrop, Baden-Württemberg serves as a model for potential innovation and industrial policy responses to challenging economic conditions. The region's experience highlights what is required at the European level: reducing burdens on innovation-driven companies, simplifying and digitizing approval and authorization procedures, and creating innovation-friendly framework conditions.

If Europe aims to secure technological sovereignty, it needs not only strategies but also functioning and cooperative ecosystems capable of delivering impact even under difficult

conditions—ecosystems that can transform excellent research into sustainable companies, new value creation, and long-term competitiveness.

6 Policy Recommendations

The discussions at the Economic Summit, the Minister's positions, and contributions from industry, academia, and politics make one point clear: Europe possesses the necessary resources and competencies to secure its technological sovereignty—yet it lacks speed, coherence, and courage in implementation. To move from discussion to action, five key areas of action are decisive.

First, Europe **needs demand-oriented and simplified regulation** that enables rather than hinders innovation. Many companies, particularly small and medium-sized enterprises, currently face a dense network of reporting obligations, certification procedures, and complex EU regulations. Instruments such as SME checks, experimentation clauses, and digital approval procedures must be firmly established so that new technologies can be tested more rapidly and brought to market. Regulatory sandboxes—already successfully implemented in Baden-Württemberg—can serve as a blueprint for transforming European regulation into a learning system.

Second, **investments must be bundled more strategically**. European funding and financing instruments should consistently focus on key technologies in which Europe's competitiveness will be determined—including artificial intelligence, robotics, quantum technologies, microelectronics, photonics, green technologies, and cybersecurity. This prioritization corresponds to the industrial and innovation policy priorities set out in the European Commission's current work programme and aligns with the objectives of Germany's High-Tech Agenda (2025). It should be reflected coherently in funding, regulatory, and investment decisions. Public funding alone, however, will not be sufficient. Mobilizing private capital systematically and reducing investment risks along the growth phases of technology-oriented companies is essential. This requires further development of the European financial architecture: tax incentives for research and development investments, growth-oriented funding instruments, and fund structures that support start-ups and SMEs in transitioning from market entry to scaling. European initiatives can provide important leverage—provided they are designed to address regional ecosystems broadly, create connectivity for private investors, and productively reconcile the tension between cohesion and competitiveness.

Third, **Europe must open and harmonize its capital markets**. The Capital Markets Union must not remain a technical project but must become a political objective. Common standards, the mobilization of private capital, and the removal of national barriers are prerequisites to ensure that innovation in Europe does not fail due to financing constraints. Baden-Württemberg, with its close integration of industry and financial markets, can serve as a testing ground for combining regional expertise with European integration.

Fourth, **technological sovereignty requires stronger cross-technology networking**. Clusters, competence centres, and innovation partnerships should operate across borders and thematic areas, learning from one another. The transfer of best practices—for example from regions and sectors with successful AI or quantum technology policies—can significantly accelerate Europe’s learning curve. At the same time, EU funding policy should continue to strengthen regional innovation ecosystems, as innovation emerges locally but unfolds its impact at the European level when systematically connected and scaled.

Fifth, **Europe must think sovereignty holistically**—as the interplay of economic, technological, security-related, and societal dimensions. This means that research, innovation, and industrial policy must be approached more boldly and interdisciplinarily. Security, foreign, and digital policy must also be considered together. Only a policy that looks beyond traditional boundaries can reduce Europe’s vulnerabilities while unlocking growth potential.

Baden-Württemberg has already demonstrated in many of these areas how technological sovereignty in selected key technologies can be strengthened through targeted industrial, research, and innovation policy instruments: through clear priorities, bold pilot projects, and the linkage of industrial strength with political determination. These experiences should now be leveraged at the European level. Europe’s future does not depend on a new strategy, but on the ability to consistently implement existing initiatives—with pragmatism, reliability, and confidence in its own innovative capacity.

7 Outlook – Europe’s Necessary Start-up and Innovation Boom

Europe stands at a decisive juncture. The technological and economic transformation ahead will determine whether the continent can sustainably secure its industrial strength, prosperity, and political capacity to act. The challenges are significant—yet the preconditions are stronger than public discourse often suggests. Europe benefits from excellent research and infrastructure as well as highly skilled talent. What has been lacking is not capability, but the collective determination to bundle these strengths and translate them into scalable value creation.

The coming years therefore require not a retreat into risk aversion and administration, but a targeted start-up, investment, and innovation boom that systematically translates technological excellence into entrepreneurial dynamism. Technological transformation is not a peripheral issue, but a central lever for economic competitiveness, societal stability, and security resilience. It requires a shift in mindset—from a primarily regulatory approach to a policy of active shaping. Innovation must no longer be seen as an exception or risk, but as a strategic prerequisite for Europe’s future viability.

Europe must combine its strengths in research, industry, and normative orientation into a shared vision for the future. What is needed is an innovation policy approach that does not pit technological progress, economic competitiveness, and social and ecological sustainability against one another, but interlinks them. Such an approach relies on entrepreneurial initiative,

bold investments, and framework conditions that enable experimentation, scaling, and learning.

Baden-Württemberg can assume a special role in this process. With its strong industrial base, innovation-driven SMEs, and dense European networks, the region exemplifies how technological change can be implemented in practice rather than merely discussed in theory. Successes in areas such as artificial intelligence, quantum research, and chip design demonstrate that technological sovereignty does not emerge solely at national or European level, but particularly where research, entrepreneurship, industrial application, and creativity converge.

However, accelerated entrepreneurial dynamism cannot be created through programmes and funding schemes alone. It requires a new self-understanding: confidence in one's own capacity to shape the future, openness to cooperation across institutional and sectoral boundaries, and a willingness to take calculated risks. Europe needs an innovation culture that encourages entrepreneurship, tolerates failure, and recognizes societal value as a strategic resource—not as a constraint.

If these forces can be combined—between regions and member states, between science, business, and society, and between political steering and entrepreneurial freedom—the current transformation phase can evolve into a new dynamic of European innovation and start-up activity. A dynamic focused not on short-term trends, but on long-term resilience and competitiveness.

For Baden-Württemberg as well as for Europe, the interplay of technological excellence, political determination, and cross-border and cross-sector cooperation will be decisive. From this shared understanding, a Europe can emerge that not only reacts to global developments, but confidently shapes its economic and technological future.

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Prof. Dr. Katharina Hölzle, MBA, Chief Technology Advisor of the Minister for Economic Affairs, Skilled Crafts and Tourism Baden-Württemberg

Authors:

Prof. Dr. Katharina Hölzle, MBA, Institute of Industrial Engineering and Technology Management (IAT) University of Stuttgart and Fraunhofer Institute for Industrial Engineering IAO

Dr. Sebastian Paul, Ministry of Economic Affairs, Skilled Crafts and Tourism Baden-Württemberg

Inka Woyke, Ministry of Economic Affairs, Skilled Crafts and Tourism Baden-Württemberg