ERT

Europe Can’t Wait:

Building Flagship Innovation Clusters to Restore Competitiveness

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ABSTRACT

CONTEXT

Europe's industrial competitiveness and investment attractiveness has been in steady decline. A set of *structural weaknesses* – including fragmented markets, insufficient scale in key technologies, weak commercialisation of research, shortages of growth capital, underinvestment in public procurement for innovative products and services, complex regulation, high energy costs, and vulnerable supply chains – compound each other. As a result, Europe is losing out to the United States, China and other key markets on many next generation technologies and risks falling behind further.

This ERT study – conducted via numerous expert interviews with senior executives across sectors and an expansive literature review – makes the case that **a focus on building out and strengthening Europe's innovation clusters may prove to be a key factor in reversing Europe's declining economic competitiveness.**

Innovation clusters continue to be a key driver of economic growth, technological leadership, and industrial transformation. Today, cluster competitiveness and global impact are determined by localised, cluster-specific factors—such as world-class poles of science and tech excellence and a dense business network of clients, suppliers, and start-ups—interacting with broader economic factors, such as strong market demand and an existing production footprint anchored within a resilient national economy.

European industrial firms – who play a decisive role in shaping clusters through R&D and production investments – **are severely exposed to structural forces that are actively pulling R&D activity away from Europe.** Large integrated markets in the US and China, faster regulatory processes, expanding scientific excellence in Asia, and major public investments are creating strong pull factors outside Europe – especially in areas at the forefront of significant technological change, such as AI, quantum technologies, biotechnology, and semiconductors.

Maintaining competitiveness requires coordinated action across industrial policy, innovation policy, education, capital markets, infrastructure, and regulation. Without sustained investment, Europe cannot reverse its economic decline. Europe's competitiveness depends on creating a more integrated, scalable, and innovation-friendly ecosystem that can compete with the US, China, and other major global markets.

SUMMARY RECOMMENDATIONS FOR POLICYMAKERS

I. CREATE INTEGRATED MARKETS AND COHERENT REGULATORY & IP ENVIRONMENTS THAT INCENTIVISE INNOVATION

Europe must eliminate national fragmentation by establishing a genuine **"Fifth Freedom"** for the seamless cross-border movement of research, knowledge, and talent. To do this, the EU should collaborate with the UK, Switzerland and other European partners, recognising pan-European value chains. Governments must strengthen demand-side conditions and supply-side enablers for industrial innovation. This includes implementing "approve once, sell everywhere" centralised regulatory approaches, ensuring robust academic IP frameworks to foster viable spin-offs, and transforming public procurement into a strategic, value-based driver of innovation.

II. ENABLE DEEP ACCESS TO CAPITAL MARKETS AND FUNDING TO BACK FLAGSHIP CLUSTERS AT EUROPEAN SCALE

Governments and public institutions must create strong scalable demand for innovation including where the state is core customer. To bridge the critical funding gap facing growth-stage scale-ups, Europe must accelerate the deployment of the **Savings & Investment Union**. Reforming institutional investment rules is essential to unlock pension fund capital for venture investment, alongside expanding targeted public-private co-investment structures and strategic instruments like the European Innovation Council (EIC).

III. ATTRACT & ENABLE FREE FLOW OF TOP TALENT AND DO MORE TO PROMOTE KEY EUROPEAN CLUSTERS

To win the global competition for highly skilled professionals, Europe must remove internal and external mobility barriers. Key interventions include introducing a fast-tracked, unified **EU Talent Visa**, implementing a digital European social security account for the seamless portability of benefits, and concentrating global talent within high-density industrial clusters that catalyse powerful network effects.

IV. STRENGTHEN PUBLIC-PRIVATE ALIGNMENT TO ANCHOR INNOVATION IN EUROPE & SCALE FOR IMPACT

Europe must move away from a fragmented funding model by concentrating resources on a limited number of internationally competitive **"flagship clusters"** to build critical mass. Policymakers must provide these hubs with long-term secured funding, facilitate campus-based public-private partnerships (PPPs), and deploy targeted subsidies and regulatory sandboxes to incentivise investor co-location. Concurrently, industry leaders must take ownership by committing financial co-investment, integrating their supply chains locally, and utilising professional cluster-based one-stop shops to accelerate commercialisation.

1. INNOVATION CLUSTERS AS AN ECONOMIC PHENOMENON TO GUARANTEE EUROPEAN COMPETITIVENESS

Innovation clusters have long been recognised as engines of economic growth and technological advancement. Today, the most dynamic clusters are no longer confined to single cities or regions – they increasingly span multiple countries, reflecting a deepening integration of global polycentric corporate R&D networks rather than isolated local systems (Turkina/van Assche 2018; Koschatzky/Stahlecker 2012). This spatial expansion since at least the 2000s signals a structural shift: geographic innovation clusters are becoming nodes within a globally distributed innovation architecture, and their competitiveness depends on how effectively they are connected both to their local environment and to global technological networks.

In general terms, the effects of cluster participation on firm performance are well-documented, including benefits from a shared pool of qualified labour, the closeness to scientific excellence, the embeddedness in localised value chain and the energising effects of co-located competitors (Frenken et al. 2015). At the same time, they are nuanced: while co-location generally enhances innovation output and competitiveness, the magnitude of these benefits varies considerably depending on firm size, sector, technology maturity, regional infrastructure, and the quality of the surrounding regulatory and funding environment (Chen et al. 2022; Lehmann/Menter 2018; Zizka/Stichhauerova 2023). This underscores that clusters are not self-sustaining structures – their performance is highly sensitive to the broader policy context in which they operate.

A critical analytical lens for understanding cluster dynamics is the concept of the cluster life cycle (Fornahl/Hassink 2017, Aydemir 2024). Clusters can emerge around new technological fields – often science-based around important universities or research institutes (see for instance the “new spaces” in some regions of the south-west in the US) – or as a result of technological renewal of existing

industries, pass through phases of innovation-led growth, and can enter stages of industrial decline that carry significant consequences for the regions in national economies which they are embedded.

The emergence of new clusters is closely tied to breakthroughs in key enabling technologies which makes the cluster concept highly relevant for policymakers – both on the regional, national and supranational level (de Noni/Belussi 2021). In times of rapid technological change, the question of whether firms corporate decision makers and policymakers choose to reinvest in established sites instead of or redirecting capital toward newly emerging clusters is therefore not merely a corporate decision but a matter of regional and national economic resilience and therefore a central question for Europe's overall economic destiny (Kiese et al. 2024; Aydemir 2024; Grashof et al. 2019).

In more concrete terms, the emergence of new clusters is closely tied to breakthroughs in fields such as artificial intelligence, quantum computing, and biomedicine. Particularly in those fields, new geographic centres of gravity for innovation are currently formed. The presence of world-class research institutions and scientific excellence is a decisive factor in determining where these clusters take root – and which regions are left behind (Bobek et al. 2024; Thakur et al. 2024).

While corporate decisions are the fundamental driver of this process, the eventual cluster performance and dynamic of clusters and national competitiveness are at the same time inseparably connected to the national and European level policy mix that the cluster is embedded in (Elola/Wilson 2025). No single policy instrument suffices. Sustained cluster vitality requires not only local and regional policies but also the coordinated deployment of innovation and technology policy, industrial policy, education reform, and labour market policy at national and European level. When aligned, these complementary levers create reinforcing conditions for excellence (Brenner et al. 2025; OECD 2025; Kiese 2018).

In addition to national and European level technology-policy, labour market and industrial policy, both demand-side and supply-side factors shape the market conditions under which firms innovate, invest, and grow. In the context of cluster dynamics, strong and sophisticated demand can accelerate cluster emergence and expansion by creating incentives for firms to develop new products, attract skilled labour, and invest in specialised capabilities. At the same time, in capital-intensive and infrastructure-driven sectors, innovation and investment decisions are equally influenced by access to competitive energy and feedstock, industrial infrastructure, scale-up capabilities, and permitting efficiency. Demand conditions therefore influence not only the competitiveness of individual firms but also interact with structural supply-side conditions that determine the evolution, upgrading, and long-term resilience of regional clusters and innovation ecosystems.

1.1 WHAT MAKES CLUSTERS ATTRACTIVE?

Innovation clusters become attractive when they combine critical mass with meaningful connectivity. So, the first central takeaway from cluster theory is that the geographic concentration of thematic resources matters (Maskell 2001). Without a certain localised critical mass of competences and capacities, companies will not be able to make a profit of agglomeration effects. At the same time, it is not enough to have many firms or strong universities in one place; what matters is how effectively these actors interact.

Hence, the first central characteristic of a successful innovation cluster is a concentration of dynamic innovation agents, including both private and public actors. High-performing clusters bring together research institutions, start-ups, established companies, investors, and public actors in ways that enable rapid knowledge exchange, collaboration, and trust-building (Autio et al. 2026). Typically, they emerge around one or several anchor firms or, in some cases, research organisations. In their proximity, this density of relationships lowers transaction costs, accelerates learning cycles, and increases the likelihood that ideas are translated into viable products and services (Grashof 2021). At the same time, successful innovation clusters are characterised by frictionless access to capital – ranging from early-stage venture funding to scale-up financing – which is crucial for enabling growth beyond the prototype stage.

A second key factor is the presence of a strong talent base. Clusters that attract and retain highly skilled workers – entrepreneurs, scientists, engineers, and product and solution designers, interdisciplinary professionals – create a self-reinforcing ecosystem (Autio 2026). Talent is drawn not only by career opportunities but often also by quality of life, openness, and opportunities for continuous learning. Closely linked to this is access to start-up and scale-up capital (for aspiring entrepreneurs) excellent infrastructure, including research facilities (for scientists), digital platforms, pilot & testing environments (for engineers and developers), and "living labs" where innovations can be developed and validated under real-world conditions (for product and solution designers).

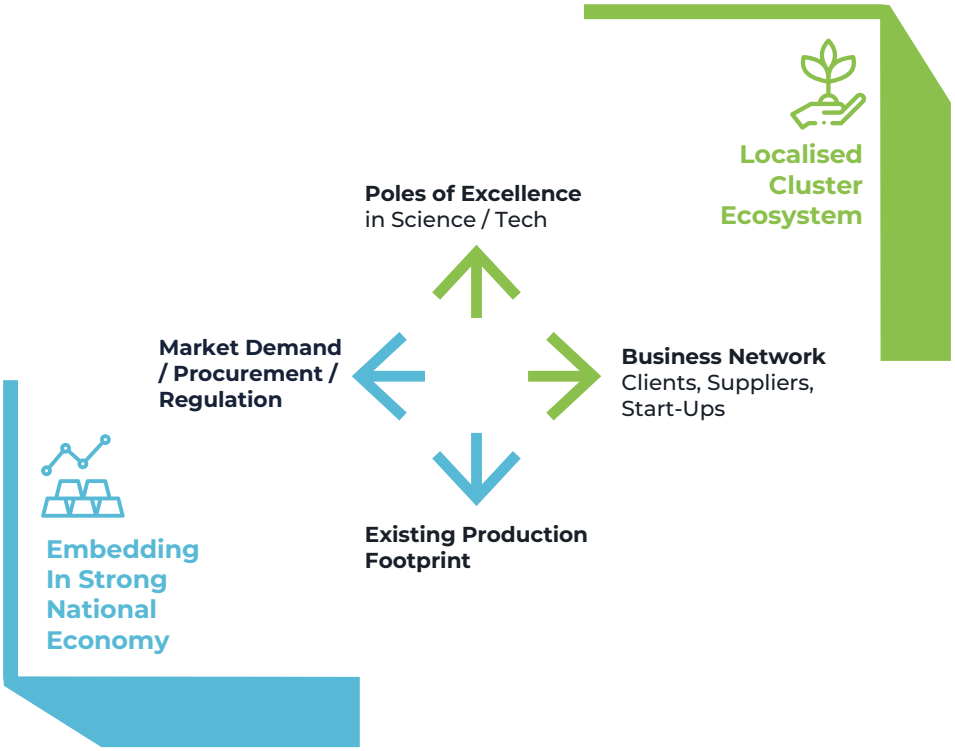
In addition, effective governance and supportive policy frameworks also play a decisive role. Attractive clusters typically feature platforms and 'one-stop-shops' that offer and enable streamlined, transparent processes for stakeholder engagement, coordinated access to funding along the innovation lifecycle, and clear incentives for collaboration and knowledge transfer (Bobek et al.2024). In general, such publicly funded 'cluster institutions' act less as regulators or providers of funding, but more as enablers, fostering both local and interregional partnerships and reducing bureaucratic friction. At the same time, access to capital – ranging from early-stage venture funding to scale-up financing – is crucial for enabling growth beyond the prototype stage.

In addition to the role of policies in shaping clusters, demand-side conditions are a critical determinant of a cluster's competitiveness and attractiveness because they directly influence the incentives for innovation, investment, and firm growth. Clusters tend to be more attractive locations for firms, entrepreneurs, and investors when innovators can anticipate strong and sophisticated demand, rapid market uptake of new products and technologies, premium prices for high-value solutions, and clear pathways to commercialisation. At the same time, supply-side enablers such as access to industrial infrastructure, efficient permitting, and the integration of production, R&D, and logistics are equally critical, particularly in process industries and advanced materials. These combined conditions stimulate local innovation activity, attract external firms, talent, and capital, and reinforce agglomeration economies, strengthening the cluster's long-term competitive position.

Finally, successful clusters are outward-looking and adaptable. They are well connected to global markets and value chains, open to cross-sector collaboration, and capable of identifying and shaping emerging fields. Neither is there ever just one successful cluster per thematic field or sector, nor does one cluster typically cover just one thematic field or sector. Their strategic flexibility allows successful innovation clusters to continuously renew their focus, integrate new technologies, and remain competitive over time.

FIGURE 1:

Key factors that drive performance, growth and global impact of innovation clusters



In sum, the attractiveness of innovation clusters lies in their ability to align people, resources, and institutions at scale around a shared capacity to generate, scale, and sustain innovation. The following figure shows the different factors that drive performance, growth and global impact of innovation clusters. The two main pull factors for global companies safeguarding their competitiveness and determine their investment decisions are localised cluster ecosystems on the one hand and their embeddedness in a strong national economy on the other hand.

1.2 HOW DO FIRMS SHAPE CLUSTERS?

While policy frameworks set the conditions for cluster development, it is ultimately the investment and operational decisions of large firms that give clusters their character and trajectory. Major commitments to R&D and production facilities generate a local cascade of structural effects that reach far beyond the individual company.

The most direct impact is felt in labour markets and academic institutions: demand for highly skilled graduates and specialised scientists influences university curricula, teaching priorities, and the strategic direction of scientific programmes. Simultaneously, firms' access to and co-investment in leading-edge research infrastructures shapes the scope and intensity of academic research agendas in the surrounding academic institutions.

At the market level, the local concentration of technologically sophisticated firms creates dense demand-and-supply dynamics. These market interactions drive the specialisation patterns of adjacent firms – suppliers, service providers, and competitors alike – and thereby influence the broader innovation activities within the cluster through value-chain-driven transactions.

Large firms also reshape the institutional architecture of the cluster itself. Their engagement determines the scope and priorities of public and semi-public intermediary organisations – technology transfer offices, industry associations, and innovation agencies – that support cluster dynamics and individual company needs. This institutional shaping is compounded by the expansion of highly specialised financial actors and related services, including technology scouting, market intelligence, venture building, and deep-tech investment vehicles.

Taken together, these mechanisms give rise to self-reinforcing feedback loops: an initial strategic corporate investment triggers a chain of responses – in talent attraction, supplier specialisation, institutional development, and capital formation – that can drive a cluster far from its prior equilibrium, either toward rapid growth and technological leadership, or, in the absence of sustained commitment, toward stagnation and decline. This is the precise process that creates the core of new agglomeration at the outset of a novel technological area.

From a larger-scale perspective, innovation ecosystems are often initiated by singular events, such as breakthrough technologies or entrepreneurial activity, creating initial momentum. In some cases, these developments are observed and strategically scaled by the state – as seen in China – through targeted policy direction.

Corporate investments can serve as important trigger points for innovation ecosystems; however, sustained and strategic public investment truly catalyses ecosystem formation and cluster development. In many cases, companies follow and scale these dynamics rather than initiate them. As ecosystems mature, they generate self-reinforcing reinvestment cycles, resulting in a cascading growth effect that can also be actively initiated at the regional or national level. Achieving speed and scale can benefit from combining market- and technology-driven models (US/EU) with state-driven approaches (China).

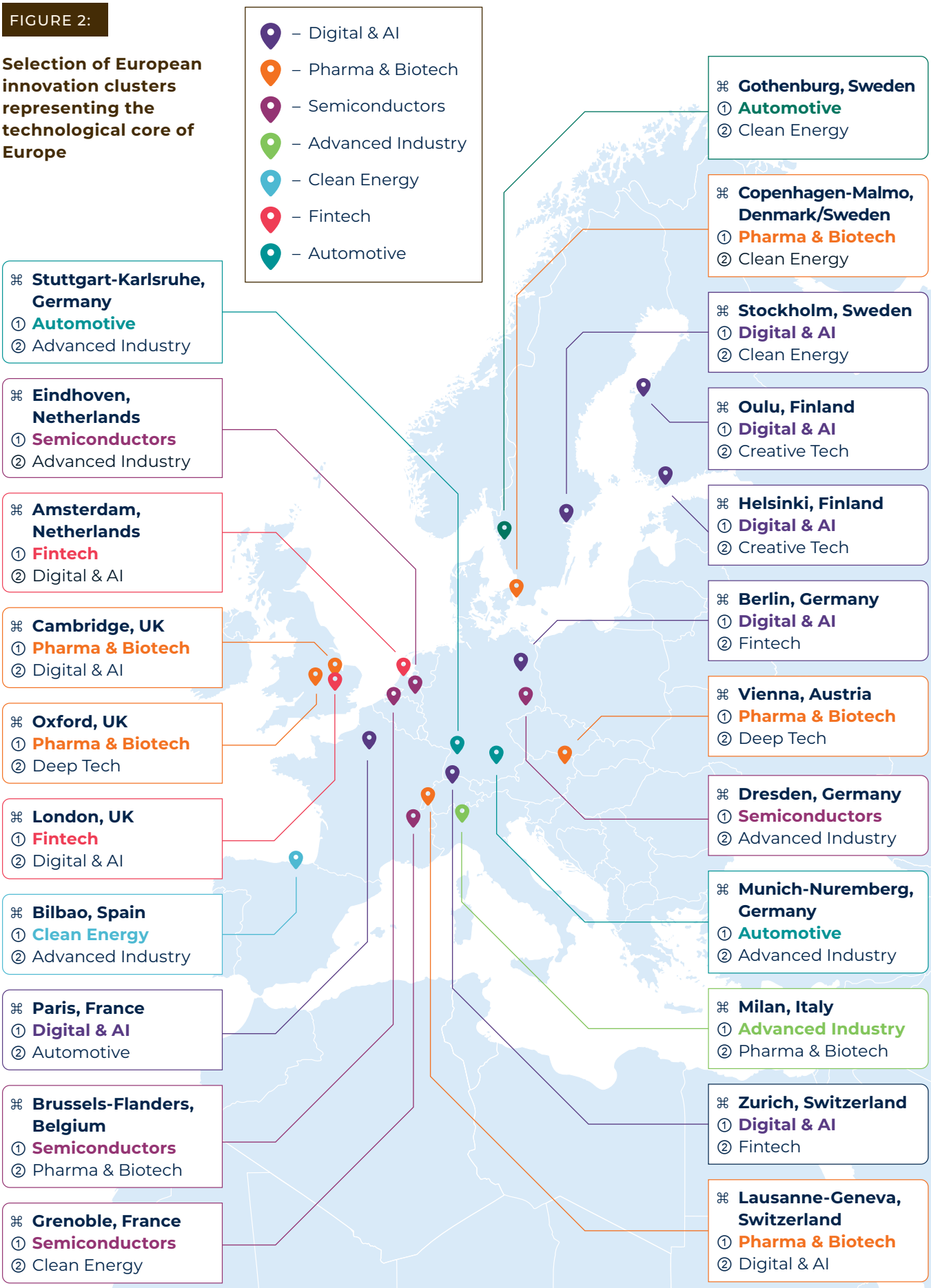
As the centre of global investment in leading technologies has historically shifted from Manchester to the Ruhr Area, to the East Coast to Silicon Valley, the currently unfolding next technological cycle has prompted and may easily further prompt a gradual increase of such investments and cluster dynamics outside of Europe. In this situation, it is crucial to understand how Europe can continue to attract corporate R&D investment that helps sustain existing cluster dynamics or even give rise to new ones.

The following figure 2 shows a non-exhaustive selection of European innovation clusters across different countries and technology fields or technologies.[1] Against this background, the geographic core of Europe's technological capability is in the south-eastern part of England, Belgium/Netherlands/Ile-de-France, the southern and eastern part of Germany (Baden-Wuerttemberg, Bavaria, Saxony), Switzerland, Grenoble and Lombardia as well as selected metropolitan regions in Denmark, Finland and Sweden (Copenhagen, Stockholm, and Helsinki). Industrial priorities are pharma, medtech and biotech, automotive and mobility, microelectronics and semiconductors, but also digital technologies and AI. In addition, highly specialised regional clusters – for example in Spain – play an important role in specific industrial value chains, including energy and clean technologies.

1. This is a non-exhaustive list of clusters as well as a non-exhaustive list of sectors represented in the cluster.

FIGURE 2:

Selection of European innovation clusters representing the technological core of Europe



2. EUROPEAN COMPANIES AND THEIR ROLE IN THE GLOBAL CLUSTER LANDSCAPE

European firms – including ERT member companies - are active participants in, investors in, and drivers of both European and global innovation clusters. Their engagement outside Europe is not uniform but reflects each company's individual global R&D strategy and takes several organisational functional forms:

R&D embedded in production facilities

leveraging operational proximity to manufacturing assets

Dedicated foreign R&D centres

established to access specific talent pools, markets, or technologies

Bilateral agreements with foreign universities or RTOs

enabling structured research collaboration

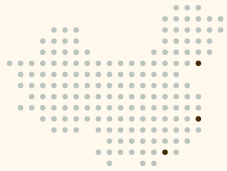
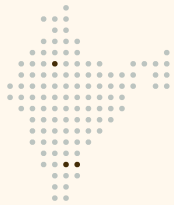
Lightweight listening posts

Small units embedded in foreign clusters to monitor emerging technologies and trends through informal networks

A guiding principle for all of these types of engagements across these models, confirmed in multiple board level interviews, is that corporate R&D follows markets and global centres of excellence. In the light of the large unitary US and Chinese markets as well as the by now high levels of excellence in either competing nations, this creates a dynamically increasing pull effect towards non-European clusters of excellence.

Yet despite the increasing internationalisation of R&D, the organically grown benefits from a location in fully integrated home-base clusters in Europe remain strategically difficult to replicate elsewhere and are rarely abandoned outright. European companies have, over decades, actively shaped their home-clusters environment – and those clusters, in turn, have shaped the companies. In other markets, domestic firms have played that role and European firms are entering an established, oftentimes tight fabric of relations, claims and established loyalties as outsiders.

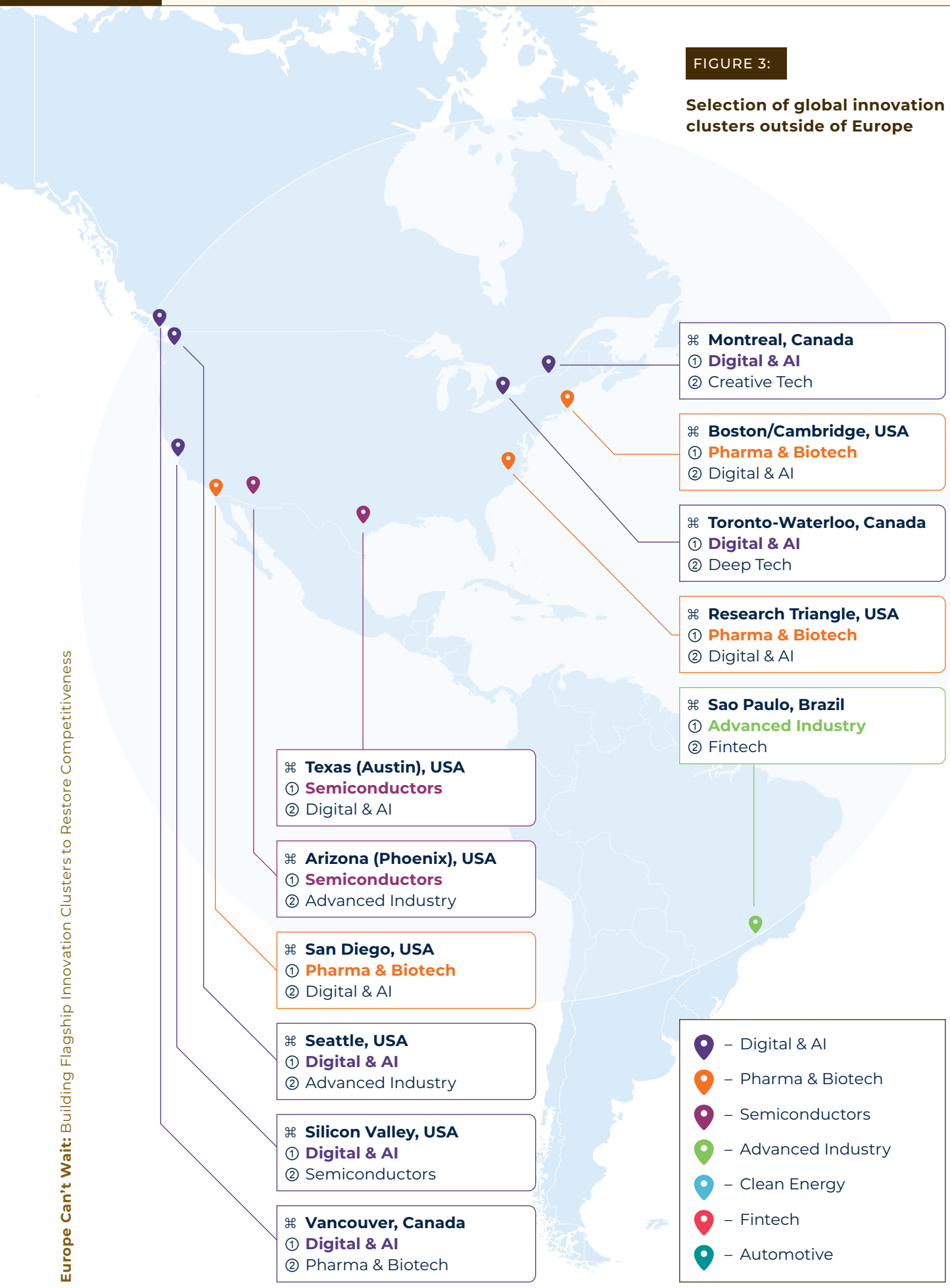
The global cluster landscape presents a set of distinct competitive environments:

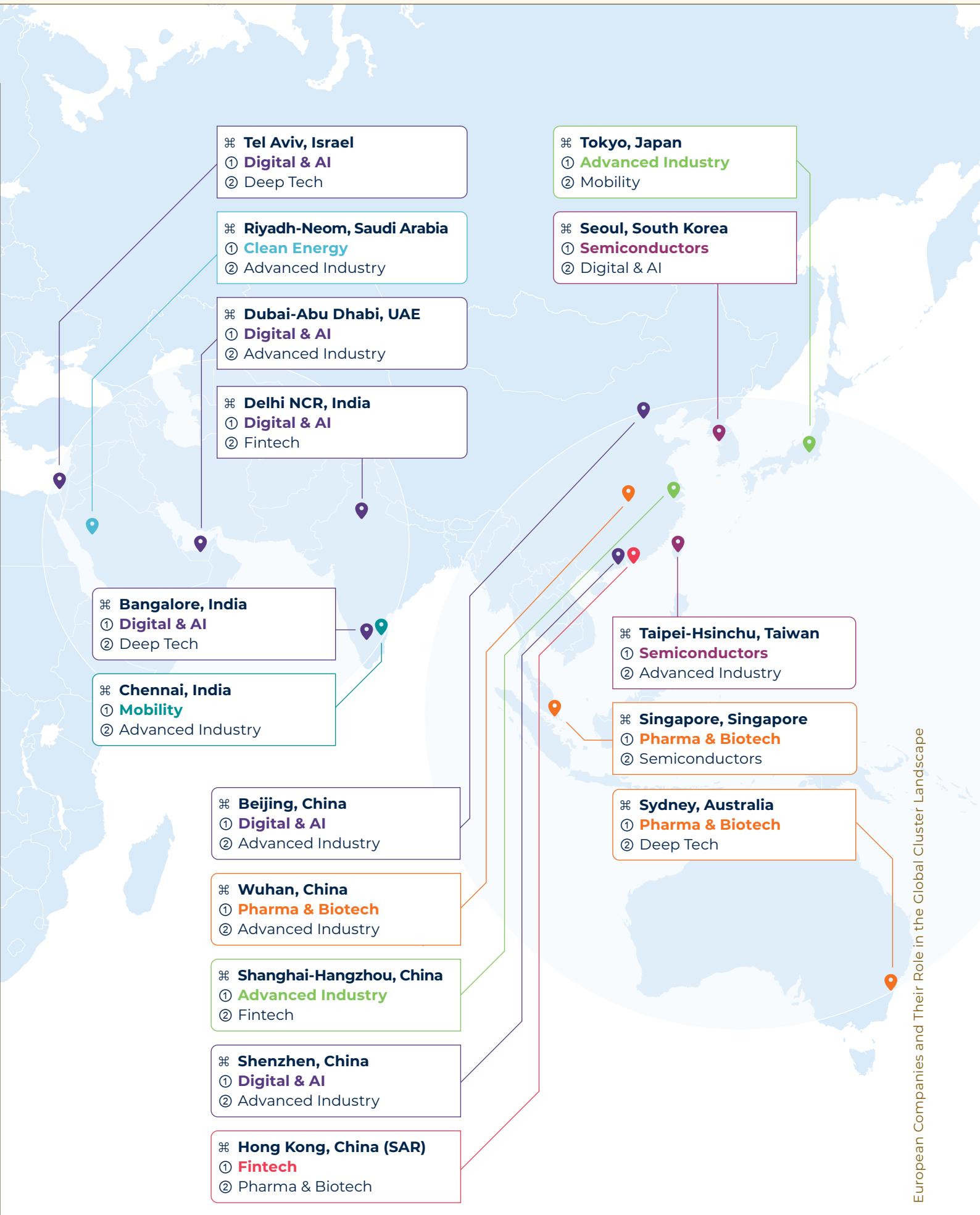
Region	Key Clusters	Distinguishing Features
 **United States**	Silicon Valley, Boston, Research Triangle	Large homogeneous market; High willingness to pay; Well-resourced private insurance systems
 **China**	Shanghai, Shenzhen, Beijing	Scientific capacity matching or exceeding the west; "China speed"; Minimal regulatory delays; High-quality infrastructure
 **Gulf Economies**	UAE, Saudi Arabia	Substantial public funding for science and innovation; High political determination to build innovation capacity
 **India**	Bangalore, Chennai, Delhi	Rapidly expanding domestic market; Rising local competence across technology disciplines

In addition to the key clusters mentioned in the table above, the following map complements the list by indicating the cluster location and the main technological fields. On a global scale, China and the US are leading when it comes to emerging fields like digital and AI technologies, but other countries like India and the Gulf States are increasingly pulling R&D and innovation out of Europe.

FIGURE 3:

Selection of global innovation clusters outside of Europe




⌘ Tel Aviv, Israel
① Digital & AI
② Deep Tech
⌘ Riyadh-Neom, Saudi Arabia
① Clean Energy
② Advanced Industry
⌘ Dubai-Abu Dhabi, UAE
① Digital & AI
② Advanced Industry
⌘ Delhi NCR, India
① Digital & AI
② Fintech
⌘ Tokyo, Japan
① Advanced Industry
② Mobility
⌘ Seoul, South Korea
① Semiconductors
② Digital & AI
⌘ Bangalore, India
① Digital & AI
② Deep Tech
⌘ Chennai, India
① Mobility
② Advanced Industry
⌘ Taipei-Hsinchu, Taiwan
① Semiconductors
② Advanced Industry
⌘ Singapore, Singapore
① Pharma & Biotech
② Semiconductors
⌘ Sydney, Australia
① Pharma & Biotech
② Deep Tech
⌘ Beijing, China
① Digital & AI
② Advanced Industry
⌘ Wuhan, China
① Pharma & Biotech
② Advanced Industry
⌘ Shanghai-Hangzhou, China
① Advanced Industry
② Fintech
⌘ Shenzhen, China
① Digital & AI
② Advanced Industry
⌘ Hong Kong, China (SAR)
① Fintech
② Pharma & Biotech

2.1 STICKY PLACES CAN KEEP SOME R&D IN EUROPE…

Despite intensifying global competition for R&D investment, European locations demonstrate a remarkable degree of structural resilience. Established R&D footprints are, in most cases, relatively stable – the product of decades of cumulative investment, institutional relationships, and corporate identity.

A pronounced home country and home region bias is observable across ERT Members and European-based multinationals in general: firms rarely relocate their initial primary HQ-linked R&D sites. Where companies maintain two strong centres of gravity, this is typically the legacy of historical mergers rather than a deliberate choice to divide R&D capacity. Corporate history, in other words, remains a powerful location determinant.

Also, prior investment acts as a powerful anchor. In several sectors, R&D activities that are tightly coupled to production assets and academic partnerships are thus structurally comparatively resistant to relocation – they cannot simply be transplanted to greenfield sites without significant loss of functionality. Within corporate R&D networks, specialisation tends to follow the technological profile of the associated production facility, creating path dependencies that further entrench existing locations.

Established long-term university-firm partnerships deepen this stickiness. Campus-based collaboration agreements, joint laboratories, and long-standing relationships with specific research groups are inherently place-bound and not readily transferable. Access to these partnerships is often exclusive rather than open, making them difficult for competitors to replicate and risky to walk away from. In concrete terms, many potentially attractive world-class universities in foreign markets e.g. in the US and China already have similar agreements with domestic firms and may exhibit limited openness to European firms, specifically when their national governments prioritise domestic collaboration.

A growing concern in innovation and industrial policy is that, although Europe continues to benefit from a substantial stock of established R&D activities and scientific capabilities, it may be losing ground in attracting investment in next-generation technologies. This challenge is particularly evident in the pharmaceutical sector, where recent investment patterns suggest a divergence between Europe and competing regions such as the United States and China. While investments announced in Europe have often focused on maintaining, upgrading, or expanding existing production and research infrastructure, the United States and China have attracted a growing share of investments in emerging technological domains, including personalised medicines, cell and gene therapies, antibody-drug conjugates, and other advanced biopharmaceutical platforms (e.g. $500 billion investment commitments in US-based biopharmaceutical manufacturing and infrastructure in 2025 alone from the private sector (see PhRMA, 2025). Such trends raise concerns about Europe's ability to capture future growth opportunities, develop strategic capabilities in frontier technologies, and maintain its long-term competitiveness within rapidly evolving innovation ecosystems.

2.2 ...BUT R&D RELOCATION INTO NON-EUROPEAN CLUSTERS UNDERMINES TECHNOLOGICAL LEADERSHIP

The resilient locational persistence described above is real but not unconditional. Europe cannot strategically rely on it as a mechanism that ensures continued leadership in a time of rapid technological change and technological shift. When reinvestment in established European sites is no longer maintained – whether through a gradual and incremental budget reallocation, change of emphasis in new investments or explicit strategic reorientation towards non-European markets – the resulting shift tends to be irreversible. Once the institutional relationships, talent networks, and physical infrastructure that underpin a cluster presence are allowed to atrophy, rebuilding them from scratch will become extraordinarily costly and time-consuming.

At the moment, several forces are actively pulling R&D activity away from Europe:

Lead market dynamics:

Emerging and fast-growing markets outside Europe attract R&D investment (incl. proximity to actors setting tomorrow's technology standards) and markets that reward differentiated innovation through pricing, reimbursement, procurement, and customer adoption.

Regulatory arbitrage:

Firms may relocate specific R&D activities to jurisdictions where the regulatory environment is more permissive, faster-moving, or offers first-mover advantages in novel technology domains.

Local content requirements:

Market access in major economies increasingly comes with conditions that mandate a degree of local R&D activity, compelling firms to build capability outside Europe.

Corporate magnet effects:

The geographic clustering of lead companies – major competitors, strategic suppliers, and key clients – creates gravitational pull. Where the most important commercial relationships are concentrated, R&D investment tends to follow

The role of talent, scientific excellence, and venture capital is real but threshold-dependent: these factors influence decisions at the margin but rarely override fundamental market or regulatory imperatives. Financial incentives are similarly bounded – only subsidies of truly substantial scale will alter the calculus of location decisions which, from a market perspective would otherwise be taken differently. Subsidies at a level, therefore, that European nations could hardly provide, given current EU State Aid rules.

3. DEEP DIVE: THE ROLE OF CLUSTERS IN SPECIFIC INDUSTRIES

Europe's industrial landscape is undergoing profound transformation, driven by geopolitical shifts, technological change, and the transition to a climate-neutral economy. Against this backdrop, sector-specific dynamics are becoming increasingly important for shaping effective policy responses. While some industries remain strongly anchored in capital-intensive assets and local ecosystems, others are more mobile and driven by global competition for talent, innovation capacity, and market access (see figure 4).

At the same time, many sectors face common challenges, including constrained private investment in research and development, increasing international competition – particularly from Asia and the US (see for instance the shift of pharma industry's share of global revenue over the last two decades from Europe to the US, Efpia 2025) – and regulatory as well as structural barriers within Europe. Public policy therefore plays a critical role in enabling industrial transformation by strengthening framework conditions, supporting innovation ecosystems, and ensuring a playing field globally.

The following sub-chapters highlight key characteristics, current challenges, and priority needs across six strategic industries. They provide a basis for identifying targeted policy measures to enhance Europe's competitiveness, resilience, and capacity for sustainable growth.

CHEMICAL INDUSTRY

The chemical industry remains highly dependent on capital-intensive assets, with R&D closely linked to large-scale industrial infrastructure. Policymakers face a sector under dual economic pressure from rising raw material costs and weak downstream demand in B2B markets. Targeted policy intervention is needed to strengthen access to key enabling technologies, as limited private investment capacity constrains strategic R&D. This includes facilitating collaborative innovation platforms, improving access to financing, and supporting the scale-up of sustainable and digital technologies. Circular economy systems – including mechanical and chemical recycling, design for circularity, and industrial symbiosis – represent a further key innovation field in which European clusters can establish global leadership, provided sufficient scale-up infrastructure and regulatory support are in place.

PHARMACEUTICAL INDUSTRY

The pharmaceutical sector is primarily R&D- and science-driven and operates largely independent of direct public subsidies, but its long-term competitiveness in Europe increasingly depends on strong market demand that rewards therapeutic value. Public policy should therefore prioritise not only sustained investment in scientific excellence, research infrastructure, and talent development, but also framework conditions that enable innovative medicines to achieve timely uptake and adequate returns. In particular, sustainable financing of health systems, value-based pricing and reimbursement, and efficient market access pathways are essential. Regulatory and health system reforms should therefore focus on increasing efficiency, adaptability, and responsiveness to innovation.

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

This sector underpins the digital economy and is characterised by massive R&D investments and rapid innovation cycles together with shifts in ecosystems and value chains. The sector is critical for competitiveness and resilience since many other sectors rely on it. Europe has a leadership position in the development of advanced and trusted connectivity technologies. Policy efforts should focus on strengthening the European scientific base while prioritising the attraction, development, and retention of top talent. A key priority remains the creation of favourable conditions for maintaining R&D in Europe, for leading the development of global standards , while protecting innovation with a robust and high-quality patent system.

AUTOMOTIVE INDUSTRY

The automotive sector continues to show strong regional anchoring – structure and employment-wise. R&D and innovation are still closely tied to established industrial clusters, but global sourcing of both platforms and specific technologies are clearly observable. However, ongoing structural transformation, driven by electrification, digitalisation, and new mobility concepts, requires significant adaptation of value chains and supplier networks. Policymakers should support this transition through measures that enable industrial upgrading, foster collaboration, and encourage knowledge transfer, including learning from leading international competitors. Risk-sharing mechanisms and support for applied, collaborative research will be essential.

ENERGY SECTOR

The energy sector is central to competitiveness and for achieving Europe's climate and industrial policy objectives. It underpins electrification, digitalisation, and the transition to a circular economy. Strong alignment with decarbonisation targets requires continued and coordinated public investment to mobilise entire ecosystems. Policy priorities should support a broad range of solutions that effectively deliver carbon emissions reduction while ensuring economic sustainability and system resilience. Policy priorities should include accelerating the deployment of renewable energy, electrification of the economy, expanding and modernising grid infrastructure, promoting low-carbon energy carriers and fuels, such as advanced biofuels and other innovative solutions, and enabling the integration of digital technologies and artificial intelligence. Ensuring regulatory stability and investment certainty will be critical to maintaining momentum.

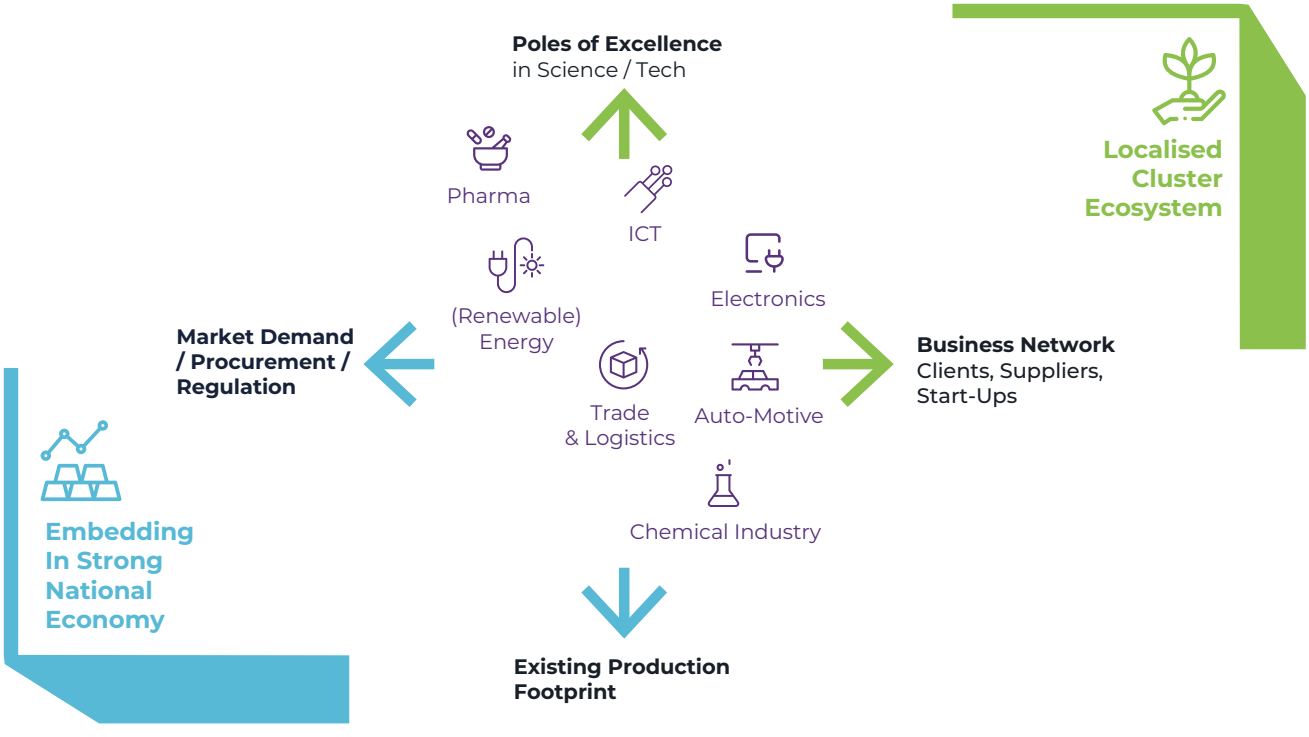
TRADE & LOGISTICS

Trade and logistics are key enablers of industrial competitiveness and rely on integrated, end-to-end value chains. Policy should support stronger collaboration across firms, clusters, and regions to facilitate innovation and service development. At the same time, regulatory asymmetries with global competitors, particularly in digital platforms and e-commerce, pose challenges that require coordinated responses at the European level. Reducing market fragmentation and improving cross-border interoperability will be essential to enable scaling and enhance efficiency within the Single Market.

The following figure 4 assigns the six sectors into the general framework introduced further above. Obviously, the key factors that drive performance, growth and global impact of innovation clusters affect the specific industries differently. While for instance investments in the pharmaceutical industry tend to prefer clusters with a strong scientific base, the chemical industry is more oriented to existing production footprints and integrated locations.

FIGURE 4:

Performance factors matter with different emphasis for different sectors



4. EUROPE'S COMPETITIVENESS RISKS IRREVERSIBLE DECLINE WITHOUT URGENT ACTION

In light of these fundamental global pull factors, the abovementioned structural stickiness of European clusters should not breed complacency. A clear directional shift is underway: new investments and growth in R&D are disproportionately flowing into clusters outside of Europe, driven by a combination of market dynamics, more permissive regulatory environments, and competing state aid public investment strategies.

The United States and China offer large, relatively homogeneous internal markets with streamlined regulatory frameworks that allow faster product development cycles approval and market entry,

Scientific capacity in leading non-European economies, primarily China, is expanding rapidly, and in some technology fields has already matched or surpassed European levels.

Pursuing a deliberate strategy of economic upgrading and transformation, Gulf region economies are deploying substantial sovereign amounts of capital to build domestic science and innovation infrastructure at speed, pursuing a deliberate strategy of economic transformation.

At the same time, Europe retains strategically significant core assets that prevent wholesale divestment. Home-base environments – built over generations through the co-evolution of firms, universities, research institutes, and public institutions – represent a form of embedded strategic capital that cannot be easily replicated elsewhere. Also, these assets are not simply inherited; they are actively maintained and, in the best cases, continuously renewed. The risk, however, is that as a result of increasing investment in alternative global markets, reinvestments in Europe will remain low, leading to a depreciation of industrial assets – slowly at first, then rapidly, as the self-reinforcing dynamics of clusters work in reverse.

5. KEY QUESTIONS FOR EUROPEAN FIRMS IN THE COMING DECADE

As the global innovation landscape continues to shift, European firms face two fundamental strategic questions that will define their competitive positioning in the years ahead:

How can corporate innovation investment in European geographies be preserved or increased – even as market dynamics, simpler regulation or science environments elsewhere create compelling reasons to invest outside Europe?

Which specific assets, conditions, and policy commitments would be sufficient to prompt firms to choose Europe as the preferred location for new R&D investments, rather than merely retaining what already exists?

These questions do not have universal answers. The right strategy will differ by sector, technology maturity, firm size, and the nature of the competitive environment. However, they represent the core strategic challenge that both companies and policymakers must engage with explicitly – and collaboratively – if Europe is to maintain its position as a leading hub for innovation-driven economic activity.

Currently, the following eight central challenges – or pain points – hamper the reinvigoration of corporate investment in Europe:

A FRAGMENTED AND LESS THAN DYNAMIC MARKET ENVIRONMENT

Despite decades of integration efforts, Europe's single market remains incomplete, particularly in services, capital markets, and digital sectors. Differing national regulations, tax regimes, and consumer standards force companies to adapt their operations country by country, raising costs and limiting scale. Europe often does not provide sufficiently innovation-rewarding demand conditions, including fragmented reimbursement systems, slow uptake, and limited use of value-based approaches. This fragmentation prevents European firms from achieving the size and efficiency of their US or Chinese counterparts. The result is a less competitive, less attractive environment for large-scale corporate investment.

LACK OF CRITICAL MASS IN INDUSTRIAL ECOSYSTEMS

Europe's industrial base is spread across many countries and regions and at the same time separated across national lines, making it difficult to generate self-reinforcing cycles of investment, talent, and growth alike to those found in Silicon Valley or the highly integrated industrial zones of China. Without access to such geographically centred clusters of sufficient critical mass, European industries struggle to attract anchor investors, retain top talent, and develop the shared infrastructures required to prevail in global competition.

DECREASING MOMENTUM AND FRAGMENTATION IN SCIENCE AND TECHNOLOGY

Europe has historically been strong in fundamental research but increasingly struggles to translate this into commercial innovation and scalable technology companies. Investment in R&D as a share of GDP lags behind the US and now even China, and Europe has seen a persistent "brain drain" of top talent to more dynamic ecosystems. The continent has failed to produce globally dominant tech platforms, weakening its position in key future industries like artificial intelligence, biotechnology, and even advanced manufacturing.

INSUFFICIENTLY COMPETITIVE AND PREDICTABLE IP FRAMEWORKS

Concerns about eroding IP standards are often linked to fears of lower investment attractiveness, reduced technology commercialisation, and a potential loss of competitiveness relative to regions with stronger and more predictable IP regimes. There is a need in Europe for globally competitive IP standards. Furthermore, intellectual property frameworks that are fragmented across jurisdictions, subject to regulatory uncertainty, or characterised by slow and costly enforcement can weaken incentives for innovation and investment. For innovative firms, particularly in research-intensive sectors, uncertainty regarding the scope, duration, or enforceability of IP rights increases commercial risk and may discourage long-term R&D commitments. Sector-specific concerns – such as debates over patent eligibility, supplementary protection certificates, data exclusivity, or technology transfer rules – can further affect the attractiveness of a cluster or the EU as such for innovation activities.

LACK OF GROWTH CAPITAL

Europe suffers from a persistent shortage of venture and growth capital relative to the scale of its economy, particularly at the scale-up and growth stage. Fragmented capital markets, risk-averse institutional investors, and the underdevelopment of pan-European equity markets mean that promising companies frequently seek funding – and ultimately relocate – to the US.

The proposed Savings and Investment Union has yet to deliver the deep, integrated financial ecosystem needed to keep homegrown innovation and growth companies on European soil.

OVERREGULATION AND A LACK OF SPEED AND FLEXIBILITY, E.G. IN MARKET APPROVAL

European businesses face one of the world's most complex regulatory environments, with high compliance burdens. Lengthy approval processes – whether for pharmaceuticals, chemicals, or digital technologies – delay time-to-market and reduce the return on investment. While regulation often serves important social and environmental goals, the pace and rigidity of implementation can stifle innovation. Streamlining without lowering standards is a key challenge policymakers have yet to adequately address.

HIGH INPUT PRICES

European companies face significantly elevated costs for energy, labour, and raw materials compared to many global competitors. The energy price shock triggered by the war in Ukraine has been particularly damaging for energy-intensive industries such as chemicals, steel, and manufacturing. These elevated costs erode profit margins, reduce competitiveness in global markets, and make Europe a less attractive location for new industrial investment. Without structural solutions to energy costs and more incentives for the circular economy, this challenge risks becoming permanent. Accelerating electrification, supported by the rapid deployment of renewables and grid infrastructure, will be critical to structurally reducing energy costs and improving Europe's long-term industrial competitiveness.

INCOMPLETE AND INCREASINGLY VULNERABLE VALUE CHAINS

Europe's supply chains have been exposed as fragile, particularly following the COVID-19 pandemic and geopolitical disruptions such as the war in Ukraine. Heavy dependence on external suppliers for critical inputs – from semiconductors to rare earth materials – creates strategic and operational risk. Reshoring and diversification efforts are underway but remain costly and slow. This vulnerability makes long-term investment planning more uncertain and riskier for European businesses.

6. RECOMMENDATIONS

I. CREATE INTEGRATED MARKETS AND COHERENT REGULATORY & IP ENVIRONMENTS THAT INCENTIVISE INNOVATION

Only through a structural integration of the European market and innovation landscape can a critical mass of expertise and resources be built that is sufficient to compete with the world's largest markets. Currently, Europe's innovation system is highly fragmented compared to those of the US or China: unnecessary regulatory frameworks, IP environments, funding systems and administrative barriers prevent talent, capital and knowledge from flowing freely across borders. To remain competitive on the global stage, Europe needs a move towards a genuinely common integrated market and innovation space – comparable to the single market for goods and services. This would imply that researchers, companies and investors from the EU, UK, Switzerland and EEA states must be able to collaborate seamlessly with each other without being hampered by national regulatory boundaries.

RECOMMENDATIONS FOR POLICYMAKERS:

➔ Strengthen demand-side conditions and supply-side enablers for industrial innovation in Europe

Even the most promising innovation will fail without a sufficiently large and reliable market to support its development and scaling. Innovation follows not only science, talent, and capital, but also markets that reliably reward superior products and technologies. Europe must therefore strengthen demand-side conditions, including value-based pricing, innovation-oriented reimbursement, lead-market creation, and faster uptake of novel solutions, like AI. At the same time, Europe must strengthen supply-side conditions for industrial innovation, including access to competitive energy and feedstock, accelerated permitting for industrial and AI datacentre infrastructure, and targeted support for large-scale demonstration and scale-up facilities.

➔ Make public procurement more accessible to innovative firms and globally competitive

Public procurement accounts for approximately 14% of EU GDP – an enormous lever that has thus far been insufficiently exploited for innovation promotion. The upcoming Public Procurement Act is an opportunity to reframe government spending from simply a cost-containment exercise to a means of targeted investment in strategic sectors, such as moving away from the widespread use of price-only criteria in tenders and towards more holistic frameworks that appropriately value innovation. At national level, the UK's Innovate UK Smart Grants model

demonstrates how state-driven demand can be used as a targeted innovation engine. Germany has been piloting similar approaches since 2024 through its "Innovation Procurement Programme", which should be scaled up at EU level. Crucially, procurement officers within public authorities must be appropriately trained and provided with legal certainty to act boldly.

➔ Ensure globally competitive IP frameworks

Globally competitive intellectual property frameworks are a core determinant of R&D location decisions. Europe must ensure predictable, enforceable, and innovation-supportive IP regimes that enable firms to capture returns on high-risk, long-cycle investments. Unclear or commercially hostile IP regulations at universities are one of the most frequent reasons why potential academic spin-offs either fail to materialise or decide to relocate abroad.

➔ Create a "Fifth freedom" for research & innovation within the EU and collaborate with the UK, Switzerland, recognising pan-European value chains

In the face of intensifying competition from the United States, China and emerging markets, Europe cannot afford a siloed innovation model. The EU, UK, and Switzerland should be treated as a strategically interdependent innovation space, with seamless collaboration in research, talent, investment, and commercialisation – this requires a mindset shift of European policymakers recognising the realities of today's global competition and responding to the challenge collectively. Within this context, the Commission's plans for a binding European Research Area (ERA) Act are an opportunity to provide the legal framework for a genuine "fifth freedom" – the free movement of knowledge, research and innovation. However, this framework must be given real substance: Member States must translate ERA commitments into binding national law, rather than treating them as non-binding political declarations of intent. This includes the mutual recognition of research qualifications, the opening up of national research infrastructures to European partners, and the abolition of residency requirements in national funding programmes. Cross-border research and development collaboration across Europe should be promoted through targeted financial incentives and enabled through simplified administrative frameworks. More specifically, joint funding programmes – such as those under Horizon Europe – should be more strongly oriented towards multinational consortia that explicitly include partner organisations from the UK, Switzerland and EEA states.

➔ Implement actions to speed & centralise market approval

The fragmentation of market regulation, evaluation frameworks, and reimbursement and procurement rules across Europe is one of the most powerful brakes on innovative companies.

In general, a centralised agency could better coordinate Notified Bodies, harmonise interpretation and create a focal point to ensure alignment with other EU legislation and initiatives at horizontal level. The Commission's proposed revision of single market legislation in 2024/2025 offers a relevant entry point. Wherever possible, technical standardisation should be coordinated at European level rather than duplicated nationally including greater harmonisation of standards and certification frameworks to reduce duplication and speed up market access across Member States. The objective must be a genuine "approve once, sell everywhere" principle that makes Europe as attractive for innovative companies as the US federal market.

The European Medicines Agency (EMA) is one of Europe's success stories that other sectors could consider replicating. It shows how centralisation (in this case, human medicinal products) can reduce complexity through a single regulatory system that makes it easier to bring medicines to market across multiple countries. But the EMA also holds cautionary lessons for other sectors. Regulatory progress can be undermined by misalignment with national payers, who ultimately decide whether and when patients can access medicines. Without closer alignment, efficiency gains at EU level risk being lost downstream, delaying access for patients.

RECOMMENDATIONS FOR INDUSTRY:

➔ Help policymakers to identify core priorities and pain points

Policymakers often face competing demands and limited resources, making it essential to clearly understand the most pressing priorities and challenges. A structured approach to identifying core priorities and pain points can help decision-makers focus efforts where they will have the greatest impact. This may involve gathering evidence from stakeholders, analysing available data, and regularly assessing emerging issues. Improving visibility into key concerns and unmet needs results in policymakers who can develop more targeted, effective, and responsive policies that better address the needs of communities and organisations.

➔ Make use of and actively pilot new options provided – do not give up on the European market

Organisations should actively explore and pilot new opportunities emerging within the EU regulatory and intellectual property landscape. While compliance requirements can present challenges, the evolving regulatory and IP environment also offers mechanisms designed to support innovation, competitiveness, and the development of new technologies. Engaging proactively with these frameworks can help organisations identify viable pathways for growth, reduce uncertainty, and capitalise on opportunities available within the European market.

Businesses should adopt a holistic, cross-sector perspective that jointly addresses the entire European value chain rather than optimising isolated components. From chemicals and advanced materials to pharmaceuticals and manufacturing, each vertical depends on shared horizontal, foundational inputs such as energy, resources, critical raw materials, digital connectivity, and a healthy workforce to generate competitive and sustainable outputs. Strengthening Europe's economic resilience therefore requires coordinated alignment across these interdependent layers of the value chain. By fostering partnerships that connect actors end-to-end and by jointly advancing and piloting emerging technologies – such as industrial AI, advanced manufacturing, and sustainable material innovation – organisations can unlock synergies that benefit all participants. This integrated European approach not only accelerates innovation adoption across sectors but also reinforces the continent's industrial competitiveness and strategic autonomy. Rather than fragmenting efforts or deprioritising the European market, stakeholders should actively collaborate to ensure that each part of the value chain can access, test, and scale new technological opportunities – creating shared value and long-term economic strength.

II. ENABLE DEEP ACCESS TO CAPITAL MARKETS AND FUNDING TO BACK FLAGSHIP CLUSTERS AT EUROPEAN SCALE

The capital deficit facing European start-ups and scale-ups is well documented: whilst significantly more venture capital per capita is available in the US or China, European companies – particularly in the growth phase – lack sufficient funding to scale into global champions. This results in promising European companies either being sold early to US or Asian investors or later relocating their headquarters to more capital-friendly jurisdictions. The mobilisation of both additional public and private capital sources of start-up and growth capital – coordinated across national borders – must therefore be a strategic priority for Europe's economic future.

RECOMMENDATIONS FOR POLICYMAKERS:

➔ Create strong scalable demand for innovation including where the state is core customer

Governments and public institutions should play an active role in creating and scaling demand for innovative products and services, particularly in sectors where the state is a major purchaser. Through innovation-friendly procurement practices, pilot programs, and outcome-based contracting, public authorities can provide early market opportunities that help innovative companies validate, refine, and scale their solutions. Strong and predictable demand signals can reduce market uncertainty, accelerate the adoption of new technologies, and stimulate private investment in innovation while improving public services and societal outcomes. In the United States,

government procurement and targeted demand stimulus – through bodies such as DARPA or NASA – ensure that domestically developed innovations find a guaranteed first market. Europe, by contrast, fragments its demand across 27 national procurement systems, which prevents economies of scale and frequently gives foreign providers a structural advantage. A coherent European demand strategy – from public procurement to market regulation – is therefore a fundamental prerequisite for motivating more companies to achieve commercial breakthroughs with enabling newly developed technologies in Europe.

➔ Speed up the implementation of the EU Savings & Investment Union

Accelerating the implementation of the EU Savings & Investment Union would help unlock private capital and direct more savings towards productive investments across Europe, particularly in strategic sectors such as energy, the green transition and innovation. A faster and more integrated capital market framework can improve access to financing for innovative companies, support business growth, and strengthen the EU's global competitiveness. Swift implementation would also enhance cross-border investment opportunities, increase market efficiency, and help mobilise the long-term capital needed to finance innovation, digital transformation, and the green transition.

➔ Improve existing market measures (e.g. European Innovation Council) by focusing on key technologies

Policymakers should strengthen existing innovation support mechanisms by concentrating resources and incentives on technologies that are strategically important for Europe's future competitiveness and resilience. A more targeted approach can help ensure that funding, expertise, and support are directed towards areas with the greatest potential for economic impact, technological leadership, and societal benefit. Sharpening the focus of initiatives such as the European Innovation Council (EIC) on key technologies will result in accelerating innovation, reducing fragmentation, and better positioning Europe in global competition for emerging industries. The EIC Fund with its equity instrument is an important step forward but must be substantially expanded in both volume and accessibility. France's "France 2030" programme and Germany's "Zukunftsfonds" Germany's "SPRIND" Agency, "High-Tech Start-Up Fund", "DeepTech & Climate Fonds", and "Future Fund" represent national approaches that can serve as models for a coordinated European strategy, and whose best practices should be systematically transferred and scaled.

➔ Unlock private investments for start-ups & scale-ups by enabling co-investment structures

The most significant capital deficit in Europe exists at the scale-up stage – that is, when companies require between €50 million and €500 million to expand internationally. European pension funds manage trillions of Euros but invest barely any of it in venture capital, due to regulatory constraints. Reforming the relevant investment rules could

mobilise substantial resources. Implementation could follow the example of the UK's "Mansion House Compact" initiative, under which major pension funds voluntarily committed allocations to UK growth capital and could mobilise substantial resources. The Capital Markets Union, since 2024 being advanced under the rebranded "Investment and Savings Union" initiative, must contain concrete measures to open institutional investors to scale-up financing if it is to deliver on its transformative ambitions.

RECOMMENDATIONS FOR INDUSTRY:

➔ Advocate for the implementation of the Savings & Investment Union

Firms should support and advocate for the effective implementation of the Savings and Investment Union to strengthen Europe's capital markets and improve access to financing. A more integrated and efficient investment ecosystem can help channel private savings into productive investments, supporting innovation, business growth, and economic competitiveness across the EU. Successful implementation would also enhance cross-border investment opportunities, increase market resilience, and provide companies – particularly innovative and high-growth firms – with better access to the capital needed to scale.

➔ Consistently push towards making (more) pension fund money available

Firms should continue to point to ways to increase the allocation of pension fund capital to innovative companies and growth-oriented investment opportunities. Pension funds represent a significant pool of long-term capital that can help finance innovation, support the scaling of emerging businesses, and strengthen economic competitiveness. Appropriate regulatory frameworks and risk-management mechanisms can help ensure that greater participation in innovation financing is achieved while maintaining the fiduciary responsibilities and long-term objectives of pension fund investors.

➔ Joint public start-up funds and contribute firms' expertise & experience to them

Private firms should collaborate to establish joint start-up funds that combine public financing with private-sector investment, expertise, and networks. Such partnerships can help address funding gaps for early-stage companies while improving investment decisions through the involvement of experienced industry participants. Beyond providing capital, firms can contribute valuable market knowledge, technical expertise, mentorship, and strategic guidance, increasing the likelihood that innovative start-ups successfully develop, scale, and compete internationally.

III. ATTRACT & ENABLE FREE FLOW OF TOP TALENT AND DO MORE TO PROMOTE KEY EUROPEAN CLUSTERS

The competition for highly skilled talent is global – and Europe is currently losing its talents too readily to the US, Canada and other attractive destination countries. At the same time, significant mobility barriers persist within Europe that prevent talent from moving to where it would be most productive. This challenge has particular relevance not least against the background of the need to focus on 'flagship clusters'. For skilled professionals from third countries, access to Europe remains complex, slow and inconsistent from one Member State to another, despite the existence of the Blue Card system. A comprehensive reform of mobility rules, both internally and at Europe's external borders is therefore a fundamental prerequisite for Europe to build the talent base for its innovation ambitions demand. Furthermore, a better promotion of key European clusters and incentivising global top talent to joint undertakings in key European clusters needs to be put high on the agenda.

RECOMMENDATIONS FOR POLICYMAKERS:

➔ Offer visas valid across all EU Member States to talent from abroad

The EU Blue Card has existed for over a decade but is barely used in many Member States, because parallel national visa schemes continue to operate and are often more attractively designed. The revised Blue Card Directive of 2021 brought initial improvements, but implementation remains inconsistent. All Member States should be required to establish the Blue Card as the primary channel for highly skilled immigration, with standardised processing times of no more than 30 days and digital-first application processes. In addition, a European "talent visa" for start-up founders and researchers – modelled on Germany's Chancen-Aufenthaltsrecht or the Dutch Start-up Visa – should be introduced, offering fast and straightforward access for highly qualified individuals.

➔ Intensify the work to advance intra-EU portability of pension & social benefits

Even where skilled professionals are formally entitled to move between EU countries, many are deterred by the prospect of losing accrued pension or parental leave entitlements that they have accrued or, health insurance rights coverage or parental leave entitlements. The portability of social benefits within the EU is in principle governed by EU regulations, but in practice remains complex and prone to errors. Hence, the Commission and the Member States should work towards establishing a digital European social security account, transparently and portably managing worker entitlements across national borders, which would be a transformative step forward. The European Commission has been discussing initial steps in this direction since 2024 under the "European Social Security Pass" initiative; this must be accelerated and extended to cover all relevant benefit categories.

➔ Simplify procedures to enable regular cross-border work and globally competitive work

Today, short-term cross-border assignments of researchers and skilled professionals frequently fail due to bureaucratic obstacles: social security obligations, tax rules for short stays and differing employment law regimes make assignments of just a few weeks cumbersome and expensive. Europe needs a simplified regulatory framework for short-term assignments – analogous to taking the simplified A1 certification procedures that already exist in rudimentary form but must go a step further and systematically expand them. Digital one-stop solutions for notification obligations and a harmonised tax protocol for short stays of under 90 days would be further concrete first steps to facilitate short term mobility. The European Parliament has been discussing reforms to the Posted Workers Directive since 2024 that could provide a useful point of entry here.

➔ Create a "Fifth freedom" for researchers within the EU (European Research Area Act) and enable mutual benefits with European partners (e.g. UK, Switzerland)

The proposed "fifth freedom" would add free movement of knowledge, researchers, and innovation to the EU's existing four freedoms (goods, services, capital, people). A European Research Area Act enshrining this principle would remove remaining barriers – fragmented visa regimes, non-portable grants, inconsistent recognition of qualifications – that still slow cross-border research collaboration within the EU. Extending mutual benefits to associated partners like the UK and Switzerland is equally important. Both countries host world-class research institutions, and structured association agreements would let talent and funding flow in both directions, strengthening European science as a whole while giving associated states a stake in EU framework programmes. Done well, the policy could make Europe a more attractive destination for global talent, accelerate knowledge transfer from lab to market, and reinforce the bloc's strategic autonomy in critical technologies.

RECOMMENDATIONS FOR INDUSTRY:

➔ Incentivise top European and global talent to concentrate in key European clusters

Firms should actively attract and retain top European and international talent by creating compelling career opportunities, competitive compensation packages, and strong innovation eco-systems within key European clusters. Concentrating highly skilled professionals, entrepreneurs, researchers, and investors in strategic hubs can generate powerful network effects, accelerate knowledge exchange, and foster collaboration across industries. Strengthening clusters by focusing on the attraction of talents has significant positive effects on the innovation performance of firms (e.g. by enhancing their innovative capacity, improving productivity, and contributing to the development of globally competitive innovation eco-systems in Europe).

➔ Incentivise global top talent to join undertakings in key European clusters

Firms should develop targeted strategies to attract and retain world-class talent from across the globe, particularly in sectors that are critical to Europe's future competitiveness. This may include offering competitive compensation, clear career development pathways, opportunities to work on cutting-edge technologies, and support for international relocation and integration. By attracting top talent to undertakings located in key European innovation clusters, firms can strengthen their capabilities, accelerate innovation, and benefit from the concentration of expertise, networks, and resources that drive long-term growth and global competitiveness.

➔ Promote synergies in European clusters that can create a halo-effect that motivates people to get involved

Firms should actively foster collaboration within European innovation clusters by building partnerships with start-ups, research institutions, investors, and other industry players. Strong synergies between these actors can create a positive "halo effect," whereby the success, visibility, and reputation of a cluster attract additional talent, investment, and entrepreneurial activity. The contribution to vibrant and interconnected ecosystems results in firms helping to create environments that inspire participation, encourage innovation, and reinforce the attractiveness of European clusters as destinations for ambitious individuals and organisations.

IV. STRENGTHEN PUBLIC-PRIVATE ALIGNMENT TO ANCHOR INNOVATION IN EUROPE & SCALE FOR IMPACT

Europe's ability to compete in emerging technologies depends not only on its research and industrial strengths but also on its capacity to translate innovation into globally scalable businesses. In capital-intensive sectors, the primary bottleneck is often the transition from pilot to industrial scale, which requires significant infrastructure, long investment cycles, and regulatory alignment. Achieving this requires closer alignment between public institutions and private-sector actors to reduce fragmentation, concentrate resources, and strengthen innovation ecosystems. A more coordinated approach could focus on a limited number of flagship innovation clusters that bring together firms, research institutions, investors, and public authorities. A concentrated support for selected lead clusters in key technological areas – without entirely abandoning the cohesion rationale – is necessary to create European clusters with critical mass that can become internationally visible and competitive. While, mindful of European realities, such ambitions could still target polycentric structures instead of single lead clusters, it is essential to mark a clear departure from a watering-can principle and/or a diluted conception of cluster that considers every low threshold centre of relative excellence as worthy of support. Consolidating high-profile public-private partnerships within the leading clusters can help align strategic priorities, accelerate commercialisation, and mobilise investment in key technologies. In parallel,

targeted subsidies to encourage the co-location of complementary actors and the establishment of one-stop shops for policy liaison and funding access can reduce barriers to collaboration and growth. Together, these measures can help anchor innovation activities in Europe and create the scale needed to compete globally

RECOMMENDATIONS FOR POLICYMAKERS:

➔ Designate a limited number of "flagship clusters" per sector/domain

The EU should officially designate flagship clusters, analogous to national programmes such as Germany's "Leading Edge Clusters/Future Clusters" or France's "Pôles de Compétitivité". These clusters should be supported with a comprehensive, long-term secured funding package. Anchor firms – that is, established large companies or leading scale-ups that act as a gravitational centre for the cluster – should be given specific, particular dedicated support, including facilitated access to European funding programmes, preferential consideration in infrastructure measures and political visibility. The selection of flagship clusters should be based on technological strengths, existing research infrastructure and private sector investment readiness. The designation of flagship clusters should also ensure a balanced and inclusive approach, recognising existing industrial strengths across Europe. A European key cluster monitoring system should transparently measure progress and link the allocation of funds to performance indicators. Importantly, these proposed efforts are different from Europe's current cluster policy that primarily aims at supporting various low threshold networks.

➔ Consolidate high-profile public-private partnerships for innovation

Public-private partnerships (PPPs) for innovation have their greatest impact when physically anchored on university and research campuses, where knowledge generation and applied development meet directly. Models such as the MIT Media Lab, the Karlsruhe Institute of Technology (KIT) with its close industry ties, Germany's "Research Campus" initiative, the UK's Catapults, or the Brainport/Eindhoven High Tech Campus demonstrate how campus-based PPPs can function effectively. At the EU level, the existing Joint Undertakings and Important Projects of Common Euro-pean Interest (IPCEI), for example in healthcare, advanced connectivity, semiconductors or hydrogen, could serve as a framework for such campus partnerships – under the conditions that European companies have equal conditions for participating regardless of geographic origin and that the IPCEI process becomes much faster and simpler. Long-term funding security of at least ten years is essential in order to reflect the time horizons required for fundamental research.

➔ Provide targeted subsidies, co-investment & sandboxes to facilitate co-location

Investors, be it venture capital funds, corporate venture arms or business angels, who establish a physical presence in designated clusters should be attracted through targeted incentives. These should include tax relief on capital gains from cluster investments, simplified access to European co-financing instruments such as Invest EU, and the opportunity to test new financing models within regulatory sandboxes. The UK's Enterprise Investment Scheme or Finland's model of tax-incentivised start-up investment could serve as reference points. Regulatory sandboxes at European level should be developed allowing innovation outside the established regulatory framework to take risks and drive regulatory science.

➔ Establish professional one-stop shops for policy liaison, access to funding and local collaboration

A central obstacle for businesses within clusters is the complexity of the funding landscape: European, national and regional programmes overlap, are difficult to navigate and require considerable administrative effort. Professional one-stop shops, physically anchored within the cluster and staffed by experienced personnel, should serve as the central point of contact for all funding enquiries, permitting procedures and networking activities. Estonia's "Enterprise Estonia" model and various types of lead cluster organisations in Germany's "Mittelstand-Digital-Zentren" demonstrate how such structures can operate successfully. At EU level, the existing Enterprise Europe Network offices could be upgraded into genuine cluster service centres that proactively engage local companies and integrate them into the cluster ecosystem.

RECOMMENDATIONS FOR INDUSTRY:

➔ Champion firms' involvement in these (flagship) clusters at every available opportunity

Firms should, where strategically relevant, actively engage in flagship innovation clusters and promote their participation through strategic partnerships, industry initiatives, and public forums. Strong involvement in these clusters enables companies to access talent, knowledge, research capabilities, and investment networks that can accelerate innovation and growth. The supporting and contributing to leading European clusters has the effect that firms can help strengthen ecosystem development, enhance the global reputation of these hubs, and create opportunities for collaboration that benefit both individual organisations and the broader innovation landscape.

➔ Commit serious financial co-investment

Firms should demonstrate a strong commitment to cluster-related innovation by partnering with public institutions and providing meaningful co-investment in strategic innovation initiatives, building on existing significant industrial investments and long-term commitments already made by European firms. Public-private co-investment can help mobilise larger pools of capital, share

risks, and accelerate the development and commercialisation of new technologies and solutions. By contributing significant co-investment (e.g. in-kind) alongside public funding, firms can strengthen the impact of innovation programs, foster long-term collaboration, and help build a more dynamic and competitive innovation ecosystem.

➔ Invite suppliers and key clients in negotiations to co-locate

Firms should encourage key suppliers, customers, and strategic partners to establish a presence within the same innovation clusters where they operate. Co-location can strengthen value-chain integration, facilitate closer collaboration, and accelerate the exchange of knowledge, ideas, and expertise. More interconnected ecosystems can result in firms improving innovation outcomes, increasing operational efficiency, and generating network effects that enhance the attractiveness and competitiveness of the cluster as a whole.

➔ Take ownership of these processes and seek to actively nurture a cluster around key sites

Firms should take a proactive leadership role in building and strengthening innovation clusters by encouraging clients and strategic partners to co-locate and participate in joint investment initiatives. Rather than relying solely on public-sector efforts, companies can actively coordinate stakeholders, facilitate collaboration opportunities, and help attract complementary businesses to key locations. Firms can create stronger innovation networks, generate agglomeration benefits, and enhance the long-term competitiveness and attractiveness of the cluster when a vibrant ecosystem around major sites through sustained engagement and co-investment is nurtured.

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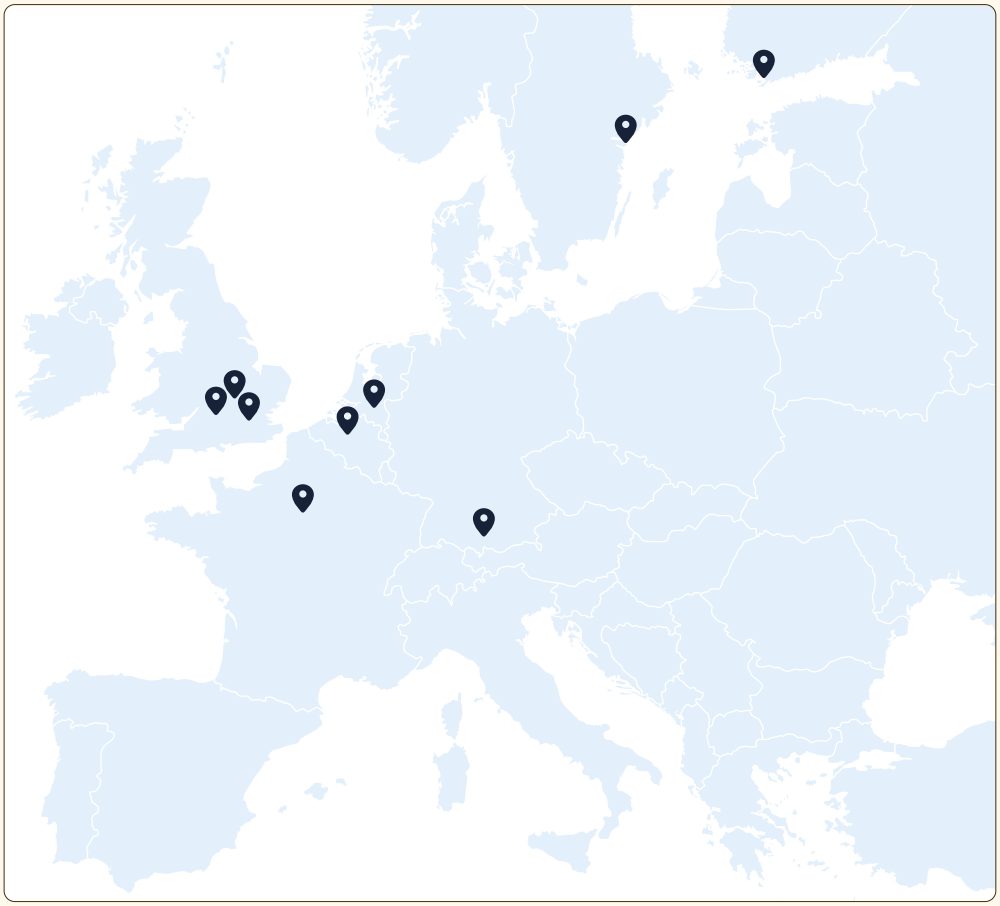
ANNEX:
EUROPEAN CLUSTER CASE STUDIES

NOTE ON DATA SOURCES AND ESTIMATION METHODOLOGY FOR THE FOLLOWING CASE STUDIES

Quantitative indicators sourced from the WIPO Global Innovation Index 2025 (GII 2025) – including PCT patent applications, VC deal counts, scientific publications, and global cluster rankings – are cited directly and attributed accordingly. All other figures (employment, R&D expenditure, number of firms and startups) represent estimated ranges (marked ~) for which no single authoritative cross-cluster primary source exists with comparable methodology and coverage.

These estimates were derived through a structured, AI-assisted triangulation process: two researchers independently generated estimates using large language model (LLM) queries with systematically varied prompt formulations; results were cross-checked for consistency; and final ranges were validated against available primary sources (national statistics offices, cluster organisation publications, industry association reports, and peer-reviewed cluster studies). Where validated primary sources provided firm figures, those took precedence. Residual uncertainty is reflected in the width of the stated ranges. This process constitutes a structured form of document synthesis supported by generative AI tools, applied where conventional citation-based sourcing would yield either no data or methodologically incomparable figures across clusters.

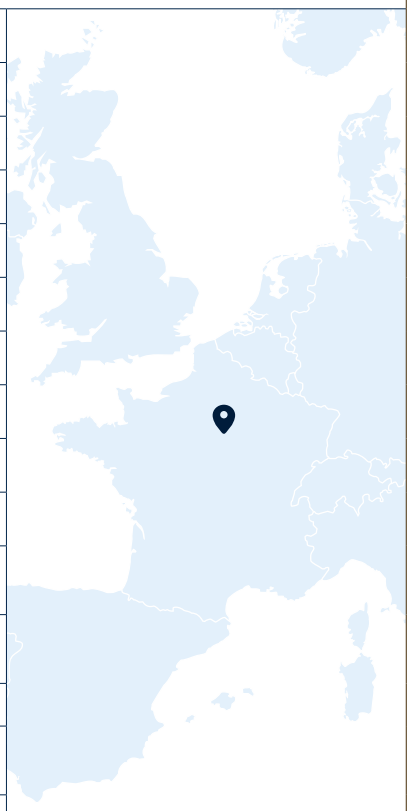


GOLDEN TRIANGLE		
Cluster Location	**Cambridge, London, Oxford (United Kingdom)**	
Anchor Firms	AstraZeneca	AstraZeneca
	NOKIA	Nokia
	GSK	GSK
	vodafone	Vodafone Group
	arm	ARM Holdings
	DeepMind	DeepMind
Strategic ERT Sectors	Life Sciences, Biotechnology, Biomanufacturing, AI & Deep Tech	
No. of Tech Companies	~45,000–55,000 (of which ~3,600-6,500 in Life Sciences)[1]	
No. of Startups	~20,000	
PCT Applications (2020–2024)	11,711 (WIPO GII 2025)	
VC Deals (2019–2023)	11,560 (WIPO GII 2025)	
Scientific Publications (2019–2023)	91,508 (WIPO GII 2025)	
R&D Expenditure p.a.	~€18-24 bn	
Employment	~180,000-280,000 tech employeess, of which about half in Life Sciences	
Global Innovation Cluster Ranking (intensity)	Cambridge 2nd, Oxford 5th, London 19th (WIPO GII 2025)	
Global Innovation Cluster Ranking (absolute size)	London 8th, Cambridge 69th, Oxford 77th (WIPO GII 2025)	
Key Academic & Research Institutions	University of Cambridge, University of Oxford, Francis Crick Institute, Alan Turing Institute, UCL, Imperial College London, King's College London	
Key Clinical Infrastructure	NHS teaching hospitals: Addenbrooke's, Oxford University Hospitals, UCLH, Guy's & St. Thomas'	
Regulatory Environment	MHRA expedited/adaptive regulatory pathways (approximating a regulatory sandbox)	
Industry–Academia Integration	AstraZeneca Discovery Centre physically co-located with Addenbrooke's Hospital on Cambridge Biomedical Campus (part of >£1 bn total Cambridge investment)	
Cross-Sector Synergies	Connection to London's AI ecosystem supports transition to digital health	
Key Cluster Mechanism	Local buzz: geographic proximity between world-class academia, anchor pharma, and active clinical environment enables rapid informal exchange of tacit knowledge	
Niche Rankings & Global Benchmarks	Rank – Lead Reference Cluster(s) (~employment)	
Life Sciences / Pharma	*#3 globally – Boston-Cambridge MA (~150-200k[2]); SF Bay Area (~400-550k)*	
Fintech	*#1-2 globally – New York (~200-350k)*	
AI Research	*#3-5 globally – San Francisco (~100-150k); Beijing (~500-700k)*	

1. estimated range (marked everywhere with "~"); see methodological note above for further information
2. estimations for total number of employees in the mentioned reference clusters

ISAR VALLEY		
Cluster Location	**Munich, Bavaria (Germany)**	
Anchor Firms	SIEMENS	Siemens AG,
	BMW GROUP	BMW Group,
	infineon	Infineon
Strategic ERT Sectors	Automotive, Smart Manufacturing, Advanced MedTech, Energy, Industrial/ Edge AI	
No. of High-Tech Companies	~4,000-6,500 (approx. 1,500-3,000 in smart manufacturing and automotive)	
No. of Startups	~2,500	
PCT Applications (2020–2024)	10,925 (WIPO GII 2025)	
VC Deals (2019–2023)	988 (WIPO GII 2025)	
Scientific Publications (2019–2023)	26,986 (WIPO GII 2025)	
R&D Expenditure p.a.	~€10-13 bn	
Employment	~120,000-180,000 tech employees (about two thirds in smart manufacturing and automotive)	
Global Innovation Cluster Ranking (intensity)	16th globally; Germany's #1 cluster (WIPO GII 2025)	
Global Innovation Cluster Ranking (absolute size)	27th globally (WIPO GII 2025)	
Key Academic & Research Institutions	Technical University of Munich (TUM, 36% of publications), LMU Munich (31%), Max Planck Society (8%)	
Leading Patent Applicants	BMW (16%), Huawei (13%), Siemens (6%)	
Industry–Academia Integration	Industry-on-Campus models: capital-intensive hardware shared between corporations and spin-offs (Siemens, BMW, SAP)	
Key Public Funding Programme	€3.5 bn High-Tech Agenda Bavaria (1,000 new professorships, 13,000 jobs in AI and high-tech)	
ERT Member Contributions	BMW and Siemens provide proprietary data, manufacturing lines, and infrastructure for joint R&D with startups	
Key Cluster Intermediaries	Munich Cluster for Systems Neurology, Munich Quantum Valley, local digital hubs	
Talent Strategy	International recruitment; English-language programmes; talent-friendly visas; EU-level recognition of foreign degrees	
Key Cluster Mechanism	Robust multi-level public funding (state, federal, EU) matched with industrial B2B co-investment; industry-on-campus model bridges hardware gap for startups	
Niche Rankings & Global Benchmarks	Rank – Lead Reference Cluster(s) (~employment)	
Automotive R&D / Mobility Tech	*#2-3 globally – Toyota City-Nagoya (~500k)*	
Industrial AI / Manufacturing Autom.	*#4-6 globally – San Jose-SF (~400-550k); Beijing (~500-700k)*	
MedTech Hardware	*#8-12 globally – Boston (~150-200k)*	

PARIS-SACLAY / ÎLE-DE-FRANCE		
Cluster Location	**Paris-Saclay, Île-de-France (France)**	
Anchor Firms	Air Liquide	Air Liquide
	orange	Orange
	Capgemini	Capgemini
	L'ORÉAL	L'Oréal
	NOKIA	Nokia
	sanofi	Sanofi
	IPSEN	Ipsen
	THALES	Thales
		Mistral AI
	DASSAULT SYSTEMES	Dassault Systèmes
Strategic ERT Sectors	Life Sciences, Advanced Manufacturing, Defense, Applied AI	
No. of Companies	~14,000-18,000 (approx. 1,000-2,000 firms in and around AI)	
No. of Startups	~8,000	
PCT Applications (2020–2024)	16,328 (WIPO GII 2025)	
VC Deals (2019–2023)	4,085 (WIPO GII 2025)	
Scientific Publications (2019–2023)	60,680 (WIPO GII 2025)	
R&D Expenditure p.a.	~€25-30 bn	
Employment	~100,000-150,000 tech employees	
Global Innovation Cluster Ranking (intensity)	34th globally (WIPO GII 2025)	
Global Innovation Cluster Ranking (absolute size)	12th globally; Europe's #1 by absolute size (WIPO GII 2025)	
Key Academic & Research Institutions	Institut Polytechnique de Paris, Université Paris-Saclay (65,000 students, 15,000 researchers), CEA, Inria, Institut Pasteur, CNRS	
Startup Infrastructure	Station F (world's largest startup campus, central Paris)	
Clinical Infrastructure	AP-HP (largest hospital system in Europe; central to clinical trials infrastructure)	
Proximity to Regulatory Bodies	ANSM, HAS (Haute Autorité de Santé), CNIL	
Key State Industrial Policy	€1.8 bn French Quantum Plan; €109 bn AI investment programme; €54 bn France 2030 plan (€30 bn state + €24 bn private co-investment)	
R&D Tax Incentive	Crédit Impôt Recherche (CIR) – among the world's most generous R&D tax incentives	
Dual-Use / Defense Synergies	State-supported synergies between military, space, and civilian deep-tech (Thales, Dassault Aviation/Systèmes)	
Key Cluster Mechanism	"Entrepreneurial state" as first buyer (Defense Innovation Agency/AID) provides sovereign demand for early-stage technologies, de-risking private VC investment (cf. Mazzucato, 2018)	
Niche Rankings & Global Benchmarks	Rank – Lead Reference Cluster(s) (~employment)	
Nuclear / Atomic Energy R&D	*#1-2 globally – Oak Ridge-Washington DC area (~150-250k)*	
Defense + Dual-Use Deep Tech	*#2-4 globally – Washington DC (~300-450k); Boston/Raytheon-MIT (~150-200k)*	
Space Systems R&D	*#3–5 globally – Houston-Huntsville (~120-200k); Los Angeles (~80-120k)*	



BRAINPORT+		
Cluster Location	**Eindhoven (Netherlands) + Brussels-Antwerp (Belgium)**	
Anchor Firms	ASML	ASML
	PHILIPS	Philips
	NXP	NXP Semiconductors
	NOKIA	Nokia
	imec	IMEC
	AGFA	Agfa
Strategic ERT Sectors	Advanced Semiconductors, Smart Manufacturing, Advanced MedTech, Deep Tech	
No. of High-Tech Companies	~5,000-7,500 (150-300 core semiconductor firms)	
PCT Applications (2020–2024)	10,871 combined (Eindhoven: 7,184 PCTs – highest per capita in Europe) (WIPO GII 2025)	
VC Deals (2019–2023)	1,081 combined (Eindhoven: 185) (WIPO GII 2025)	
Scientific Publications (2019–2023)	32,458 (WIPO GII 2025)	
R&D Expenditure p.a.	~€3-6 bn	
Employment	100,000-150,000 tech employees (approx. 50% of them in semiconducting)	
Global Innovation Cluster Ranking – Eindhoven (intensity)	10th globally (WIPO GII 2025)	
Global Innovation Cluster Ranking – Eindhoven (absolute size)	65th globally (WIPO GII 2025)	
Global Innovation Cluster Ranking – Brussels-Antwerp	55th by size, 60th by intensity (WIPO GII 2025)	
Key Academic & Research Institutions	TU Eindhoven (71% of cluster publications), KU Leuven (Europe's most innovative university), Holst Centre	
Applied & Vocational Education	Fontys University of Applied Sciences, ROC (Regional Education Centre)	
Cross-Border Supply Chain Model	Open Supply Chain: ASML (sole EUV lithography supplier) relies on R&D from IMEC's 300mm pilot lines ~100 km away; ASML shares technology roadmaps with local supply chain	
Cluster Management	Brainport Development Organisation (public–private partnership for strategy, marketing, and cluster coordination)	
Key Infrastructure Investment	Project Beethoven: €2.5 bn state and regional investment in housing, grid infrastructure, and STEM education to support ASML, NXP, and supply chain scaling	
Key Cluster Mechanism	Cross-border Open Supply Chain model with deep interdependency between anchor firm (ASML) and nearby applied research infrastructure (IMEC); coordinated capability upgrades via shared roadmaps	
Niche Rankings & Global Benchmarks	Rank – Lead Reference Cluster(s) (~employment)	
Semiconductor Equipment – EUV Lithography	*#1 globally – no comparable cluster*	
Semiconductor Equipment – broadly	*#2-3 globally – Silicon Valley (~400-500k); Tokyo/TEL (~500-700k)*	
Medical Imaging / Diagnostics Hardware	*#5-8 globally – Boston (~150-200k); Tokyo (~500-700k)*	

NORDIC TELECOM HUB	
Cluster Location	**Stockholm (Sweden) + Helsinki (Finland)**
Anchor Firms	Ericsson; Nokia; KONE; Spotify; Klarna
Strategic ERT Sectors	Resilient Digital Infrastructures, 5G/6G, Cybersecurity, Enterprise Software
No. of ICT Companies	~6,000-8,500
No. of Startups	~4,000
PCT Applications (2020–2024)	8,945 (WIPO GII 2025)
VC Deals (2019–2023)	2,902 (WIPO GII 2025)
Scientific Publications (2019-2023)	32,317 (WIPO GII 2025)
R&D Expenditure p.a.	~€13-16 bn
Employment	~120,000-180,000 tech employees (approx. two thirds in telecommunications)
Global Innovation Cluster Ranking – Helsinki (intensity)	9th globally (WIPO GII 2025)
Global Innovation Cluster Ranking – Helsinki (absolute size)	60th globally (WIPO GII 2025)
Global Innovation Cluster Ranking – Stockholm (intensity)	11th globally (WIPO GII 2025)
Global Innovation Cluster Ranking – Stockholm (absolute size)	32nd globally (WIPO GII 2025)
Key Academic & Research Institutions	KTH Royal Institute of Technology, Karolinska Institutet (digital health); University of Helsinki, Aalto University, VTT (Finland)
Technological Heritage	GSM and significant parts of 3G/4G/5G standardisation originated in the cluster; Digital Communications = 37% of Stockholm patents, 25% of Helsinki patents
Standard-Essential Patents (SEPs)	Ericsson and Nokia hold among the world's largest 5G SEP portfolios (second to China)
Current R&D Focus	€250M+ 6G Flagship programme, open RAN architectures, AI-native networks
Software Ecosystem Spillover	Telecom/hardware heritage created digitally literate workforce; spawned software unicorns (Spotify, Klarna)
Public R&D Funding	Vinnova (Sweden), Business Finland
Market Creation	Early privatisation and coordinated spectrum policy created world's most demanding early-adopter consumer base
Standardisation Strategy	National funding for participation in 3GPP, ETSI, ITU; state-backed effort to dominate international standardisation bodies
Key Cluster Mechanism	Triple Helix model (industry-academia-government) enabling coordinated standardisation leadership and outcompeting heavily subsidised foreign competitors (cf. Etzkowitz & Leydesdorff, 2000)
Niche Rankings & Global Benchmarks	Rank – Lead Reference Cluster(s) (~employment)
5G/6G Standardisation (SEP count)	*#2 globally – Shenzhen-HK (~700-900k)*
Mobile Communications Infrastructure R&D	*#2-3 globally – Shenzhen–HK (~700-900k); Seoul/Samsung (~500-700k)*
Digital Health	*#5-8 globally – Boston (~150-200k); San Francisco (~400-550k)*

The publication has been produced by ERT's Committee for R&D, Innovation & Skills, co-chaired by ERT Members, Michel Demaré and Justin Hotard. The project would not have been possible without the initiation of former committee co-chairs Jon Symonds and Jim Hagemann Snabe. At the working level, the project overseen by Robert O'Meara at ERT and it benefited enormously from the guidance and support of Alberto Giummarra and Mirjam Storim in the early stages and Alexander Bobroske and Marc Vancoppenolle in the latter ones. Special thanks to all of the senior innovation experts who contributed to this and the public affairs experts in the working group.

For more information on the ERT's work on R&D, Innovation & Skills, contact: emma.argutyan@ert.eu

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Wael Sawan
Shell

Jonathan Symonds
GSK

+32 2 534 31 00
contact@ert.eu

www.ert.eu
@ert_eu

Boulevard Brand Whitlocklaan 165
1200 Brussels, Belgium