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CHARTING A EUROPEAN PATH TO COMPETITIVENESS

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Recommendations

Since the release of Mario Draghi's seminal diagnosis of Europe's economic woes, competitiveness has been at the front of the EU's policy agenda. There is growing recognition that – as Europe's labour force shrinks – the EU must become more innovative and embrace better use of technology throughout all sectors of the economy and society to increase its productivity. In turn, this requires a constellation of major reforms to unlock firms' access to risk-tolerant capital, to develop the single market, to ensure lower and more predictable energy prices, and to refocus public and private R&D on more ambitious and disruptive innovations.

Yet, more than one year on, progress in implementing Draghi's recommendations has been slow – and new priorities have risen up the agenda.

The first of these priorities is a renewed focus on **economic security.** While a growth-focused industrial strategy would focus on areas where Europe could gain a technological lead, the re-election of Donald Trump in the US and growing concern about the EU's dependence on others across much of the tech stack has led to a **renewed focus on digital sovereignty,** in particular. In practice, this has meant growing support for creating or supporting European alternatives to US tech services – which if poorly targeted could divert industrial policy resources that could be used to create new innovations where Europe could have an enduring comparative advantage.

The second, related, priority is to reconsider whether the EU's **approach to regulation** – including its traditional focus on depoliticising enforcement, not discriminating between firms based on country of origin, or its focus on protecting fundamental rights – needs to change to reflect a global environment where power, not rules, reign supreme. In particular, there is a growing concern that some regulation stands in direct opposition to innovation.

The third question is **why the EU has proven unable to deliver growth policies**. After all, many of Draghi's recommendations are not new – on the contrary, many of them have been on the agenda for decades. Understanding Europe's innovation and growth problem therefore requires looking deeper at the **shape and evolution of the EU's governance and institutions** and how they have failed to deliver the right political incentives and regulatory environment for long-term growth.

The three papers in this report capture how these various factors have impacted the bloc's efforts to increase its capability to innovate, commercialise innovation, and use this to deliver faster economic growth.

Digital sovereignty

The first paper in this report focuses on the relationship between digital sovereignty and competitiveness. It highlights how, in the long run, competitiveness and technological sovereignty can align: Europe's sovereignty will be under great threat if it falls further behind in innovation. And equally, Europe's digital competitiveness will be further at risk if it excludes foreign technologies and pursues an autonomous cul-de-sac set of technologies which cannot compete globally. But in the short run, the EU faces a dilemma about how to balance improving the use and diffusion of technology

throughout the EU – even if that means continuing to rely primarily on foreign technology – with efforts to manage political risk.

The paper lays out a framework for policy-makers to best align competitiveness and sovereignty. Procedurally, it suggests that in balancing the two, policy-makers should identify which particular threats to sovereignty they should prioritise; quantify the likelihood and consequences of those risks materialising; and then assess which types of intervention are most proportionate and consistent with growth. The paper explores several potential models of intervention:

- **Creation of an end-to-end tech stack, based on principles of openness and interoperability**. However, as digital supply chains are global and rely on local specialisation, this option poses the biggest tension with growth – and its technical and economic plausibility is questionable. It would likely require protection of 'strategic' European firms – directly or via discriminatory regulation or public procurement rules – rather than promoting economic dynamism.
- **Pursuing European alternatives in a few targeted parts of the tech supply chain which are seen as particularly sensitive to reduce the EU's existing dependencies**. This approach requires prioritisation – and could be targeted at where, with some public support, an EU option could plausibly be competitive in the long run.
- **Mitigating sovereignty risks through regulation or softer measures to give European customers confidence in foreign technology.** This solution is most consistent with the EU pursuing technology diffusion as its primary competitiveness goal. However, relying solely on this strategy will not boost the EU's presence in high-growth sectors in the long term.

While a combination of strategies will be necessary, the EU will have to also adopt a more 'offensive' approach by doubling down on Europe's existing technology leads and pursuing leads in emerging technologies. The goal should be to increase other countries' dependencies on the EU – rebalancing Europe's unilateral dependencies. This requires getting the basics rights, like ensuring the right infrastructure and regulatory environment is in place to foster local innovation and investment.

Digital transformation and EU policies

The second paper takes the starting point that Europe's future growth will rely on today's general-purpose technologies — notably advanced connectivity, cloud, and AI. It assesses how the EU performs on these levers, how the EU's current policies are shaping outcomes, and where recalibration may be necessary.

The paper digs into the **cause of Europe's lag in productivity and innovation**. It finds that a key driver is low levels of private sector R&D spending, along with this R&D being concentrated in mid-tech industries (automotive, chemicals, transport) rather than high-tech. Even within these sectors, however, Europe's R&D spending converts to proportionately less productivity growth. The paper concludes that public R&D can help address the problem by rebalancing towards higher-impact, higher-tech innovation, and consolidating R&D and industrial policy funding to support scale.

The paper concludes that the growth of US tech giants is likely to be a result, rather than a cause, of the US's ability to achieve higher productivity growth – which implies that **Europe should not simply emulate the US model without addressing underlying causes such as the lack of a single market**. In the meantime, the EU should accept **ICT manufacturers and telecom providers will probably play a more active** role in Europe's innovation ecosystems than digital platforms. And – echoing the

conclusions of the first paper – Europe should aim to outperform the US in the diffusion and productive use of ICT and digital technologies across its industrial ecosystem.

EU regulation and institutions

The third paper examines two underlying dilemmas which have emerged since the Draghi report. The first is the question of whether the basic principles of European regulation should be updated to reflect a global environment of growing protectionism and use of power over respect for open markets, stable rules and inclusive international institutions. The second is how and why the EU institutions have held back Europe's attempts to deliver growth-oriented policies.

On the question of regulation, the paper sees the often-perceived distinction between regulation and innovation as artificial and simplistic. **Regulation can either help or hinder innovation and growth depending on the context and design**, and regulation is the basis of the EU's biggest economic achievement – its single market. There are growing concerns about the quality of EU regulatory design, and the paper therefore suggests that innovation should be a clearer and more prominent objective of EU law-making, and a core metric against which the impact of legal proposals and the past performance of laws should be assessed, along with changes to ensure rules actually result in a true single market. There are also a more profound questions about whether the EU's approach to regulation is too naïve. The paper suggests caution about departing from principles of better regulation, however: adopting an approach that seeks to actively disadvantage foreign firms has risks and costs, and these require a robust and evidenced-based assessment of costs and benefits.

However, the EU's failure to enact sensible reforms – despite being recommended for decades – demands a **reassessment of whether the EU's institutional framework, and the political incentives it creates, are fit for purpose**. Here, the paper examines how weak coordination between policy areas, fragmented enforcement regimes, and overlapping responsibilities among institutions have long impeded the delivery of growth-enhancing reforms. It suggests a range of institutional changes, such as a reorganization of the Commission and the creation of a European Digital Agency (EDA) to oversee pan-European digital regulation, to help improve the coherence of policy-making.

Recommendations

The papers collectively provide a suite of recommendations to help deliver on Mario Draghi's vision of a Europe which is able to innovate, commercialise those innovations, and see the emergence of high-tech firms which are successful across Europe and internationally.

In relation to **digital sovereignty**, this report recommends that:

- The European Commission should acknowledge and **openly confront the policy trade-offs** necessary to address both competitiveness and digital sovereignty, and how these trade-offs may play out over the short run and the long term.
- The Commission should do so in a **systematic** way. It should identify which specific threats to sovereignty to prioritise; quantify the likelihood and consequences of those risks materialising; and then assess which types of intervention are most proportionate and consistent with growth.

- The Commission will likely need to adopt a range of approaches to balance sovereignty and competitiveness. But it should make those **choices led by evidence and with realism** about the technical and economic plausibility of Europe entering into markets where it has little presence today: particularly those with strong network effects, economies of scale or scope, or first-mover advantages. It needs to prioritise – and target industrial policy measures at where, with some public support, an EU option could plausibly be competitive in the long run.
- The EU should focus primarily on an 'offensive' rather than a 'defensive' approach to sovereignty. **Rather than eliminate dependencies, Europe should double down on existing technology leads and pursuing leads in emerging technologies, in order to rebalance Europe's unilateral dependencies.** This requires getting the basics rights, like ensuring the right infrastructure and regulatory environment is in place to foster local innovation and investment.

In relation to **digitisation**, this report recommends a range of measures including that:

- The European Commission and member-states **rebalance public R&D toward high-impact, high-tech missions.** They should align their R&D strategies, concentrating resources at EU level to achieve critical mass and ensure R&D translates into productivity gains.
- The Commission should **strengthen the research-to-deployment pipeline,** helping to fund cohesive innovation ecosystems.
- The Commission and the European Investment Bank should conduct **in-depth ex-ante impact assessments for public (or publicly-incentivised) infrastructure investments.** They should require demand-responsiveness audits before committing to large-scale digital infrastructures, prioritizing areas with high knowledge spillovers, strong absorptive capacity, and regional adoption readiness.
- The Commission should **redesign its Digital Decade Index and targets**. The Commission should focus primarily on ensuring productivity-enhancing outcomes and introduce dynamic benchmarking against US digital trajectories to help ensure the EU maintains competitive parity.
- The Commission should **create EU-level funding instruments to support developing intangible capital**. These could include support for skills development, software-development toolkits, organizational-change support, and data-asset governance, enabling firms—especially SMEs—to maximize productivity gains from cloud and AI adoption and reduce the "productive-adoption gap" between EU and US firms.

In relation to **regulation and institutions**, this report's recommendations include that:

- EU law-makers should explicitly and consistently adopt **innovation as a clear, prominent objective of EU regulation**. In doing so, the Commission should develop 'innovation metrics' to enable a robust, evidence-based assessment of a regulation's effects, strengths, and weaknesses.
- EU law-makers must **adapt the EU's institutional design and ways of working to strengthen the single market**: adopting clearer rules, preventing member-state "gold plating", adopting stronger enforcement against member-states failing to adopt single market rules, and using

creative legal tools to overcome member-state vetoes in areas where a functional single market would deliver significant economic value.

- Before using regulation to tilt the playing field in favour of European companies, the Commission should **identify and address areas where existing regulation does not today reflect principles of better regulation** in ways which harm the interests of European firms.
- The **better regulation principles and guidelines should be more consistently and rigorously applied in the law-making process**, including with comprehensive impact assessments which better identify the causality links between rules, conducts of firms and consumers, and innovation and long term consumer welfare. Impact assessments should be considered and updated throughout *all stages* of the legislative process.
- The Commission should adopt measures to **help scale-up national policy successes** – giving member states strong incentives to adopt best-practice regulatory approaches and praising good performers, while 'naming and shaming' member states that do not perform well.
- To adapt to the rapid technological change in many markets, European regulators should draw on **responsive and participatory regulation**, which emphasises the strategic use of external actors to enhance compliance and oversight, and use mechanisms like regulatory sandboxes and use of big data to lower the burdens of regulation.
- To improve the EU's ability to coherently manage policy trade-offs and deliver growth, **the EU institutions should be reorganised** to avoid dispersion of policy tools within different EU institutions, and between the EU institutions and national governments. This should include regulatory coordination across member-states, across legal domains and economic sectors.
- The **European Commission** should enhance its strategic planning and foresight, reinternalise essential expertise, and create **stronger separation – or even a break up - to better address the internal tensions between its increasingly multiple functions** (initiator of EU regulation, geo-political government of Europe, orchestrator of EU industrial policy, guardian of the single market, regulator of Big Tech, and evaluator of the effects of EU regulation).

The various parts of this report echo a number of familiar themes: the need for Europe to maintain openness to global technologies when relevant, to protect the fundamentally sound principles that have guided most European regulation to date, and to identify and adopt an evidence-based and proportionate approach when balancing difficult policy trade-offs. Increasing European companies' effective use of technology will be essential to short-term competitiveness, while also laying the groundwork for aligning economic growth, technological leadership and economic security in the long run.

This report reflects a common vision for Europe. Rather than repeat past industrial policies – which aimed largely at unambitiously replicating successful business models – it envisages a Europe that will instead nurture its potential to lead in future technologies. In this way the EU can neutralise, or even reverse, what have become concerning unilateral dependencies across the continent's tech supply chains – while delivering a stronger economy to improve Europeans' quality of law and position the bloc to better defend its values.

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Issue Paper

Can the EU reconcile digital sovereignty and economic competitiveness?

Zach Meyers

Executive Summary

The EU faces several economic headwinds – but three issues are of particular concern. The first is the EU's competitiveness problem. As Mario Draghi's 2024 report on European competitiveness argued, this is fundamentally a problem of low economic growth, which can only be solved by the bloc embracing better use of technology throughout all sectors of the economy to increase its productivity. The second is the behaviour of the EU's major trading partners, which is causing the bloc to focus more on its technological sovereignty, reflecting broad recognition in Europe that the EU's technological dependencies are too widespread and too one-sided. The third is that the actions necessary to address both problems – reforms to boost business dynamism and economic growth, on the one hand, and to better enable the commercialisation of innovation in Europe – have been on the agenda for decades. The EU has simply not delivered them.

The relationship between competitiveness and digital sovereignty is complex. Boosting productivity requires improving the use and diffusion of technology throughout the EU. For now, the EU is not a global leader in most technologies expected to be key to future economic growth, and so remaining open to foreign technology is an imperative. However, a path to digital sovereignty requires Europe to become stronger at innovation – even if that is, in the short term, innovation over the top of existing, mostly non-European, technologies.

In the long term, competitiveness and technological sovereignty can align: Europe's sovereignty will be under even greater threat if it falls further behind in innovation. However, many of Europe's past industrial policies have pitted these two priorities against each other. On the one hand, many industrial policies have protected incumbent industries (like vehicle manufacturing) from change, rather than accepting – and forcing European firms to accept – global technological and geopolitical changes and their disruptive economic impacts. On the other hand, Europe has pursued sovereignty-focused initiatives like the cloud computing federation GAIA-X, which focused on sovereignty at the expense of growth – focusing on reducing foreign dependencies rather than building sustainable business models. European digital industrial policy in the past has taken too little account of unavoidable market dynamics such as 'first mover' advantages, the EU's financial capabilities, and Europe's comparative strengths and weaknesses.

Lack of realistic and properly calibrated ambitions, and an unwillingness to openly acknowledge and confront the complex relationship between competitiveness and digital sovereignty, has too often led to promises to deliver 'everything, everywhere, all at once' but an inability to effectively prioritise. An unwillingness to openly confront trade-offs has also contributed to disjointed policies – with a lack of coherence across state aid, trade, foreign, competition, industrial and innovation policy.

The European Commission has proposed a European Competitiveness Fund to support more projects aiming to boost the bloc's technological sovereignty. At the same time, the Commission is designing proposals like the Cloud & AI Development Act to boost use of technologies like cloud and AI, and perhaps also to support 'sovereign' technological solutions. **However, even if the Commission's ambitions make it through the political process, it will still need to ruthlessly prioritise**: the Commission's proposed Competitiveness Fund would dedicate about €55 bn to digital leadership, so even if member-states do not water the proposal down, the figure pales in comparison to the cost of building an end-to-end set of European options, which even its proponents estimate at €300 bn. **In**

this context, this issue paper lays out a framework for policy-makers to prioritise and to best align competitiveness and sovereignty.

The paper proposes that policy-makers start by **clearly identifying which particular threats to sovereignty they wish to address**, and then to **quantify both the likelihood and consequences of those risks materialising**. This can help inform an evidence-based approach to prioritisation. Some of these risks – like the US triggering a 'kill switch' to suspend cloud services, on which countless European firms depend – may be of very low likelihood, but have very significant economic impacts. **A European competitiveness strategy cannot plausibly ignore these significant risks to its growth prospects.**

The paper then explores four potential models for supporting technological sovereignty, assessing how consistent each one is with the bloc's growth prospects. These models comprise:

- **Creation of an end-to-end tech stack – from basic connectivity through to data centres, operating systems, AI models and end-user software – based on principles of openness and interoperability**. The paper doubts **that it is plausible for the EU to ensure competitive options throughout the end-to-end tech stack**. Digital supply chains are global and rely on local specialisation. Countries like China which are trying to control end-to-end stacks have only done so with the use of massive subsidies, the exclusion of foreign suppliers at significant cost, and other policy tools which the EU cannot replicate. Furthermore, merely ensuring the *availability* of EU technological solutions may provide only marginal benefits in the event that EU customers have to jettison a foreign tech supplier at short notice. More importantly, such an approach is likely to require protection of 'strategic' European firms from foreign competition – directly or via discriminatory regulation or public procurement rules – rather than promoting economic dynamism. This may encourage more take-up of European services – but it risks discouraging take-up of technologies generally, undermining the bloc's path to greater competitiveness. Moreover, it seems highly unlikely that the funding necessary to build such an end-to-end stack will be available – meaning the EU must take a more targeted approach.
- **Pursuing European alternatives in a few targeted parts of the tech supply chain which are seen as particularly sensitive to reduce the EU's existing dependencies**. This approach requires prioritisation, which might require for example that investments (i) target the most sensitive parts of the value chain; (ii) address dependencies with partners which seem particularly untrustworthy or which are particularly one-sided; (iii) are needed because alternative approaches (like relying on foreign firms' 'sovereign cloud' solutions) are demonstrably insufficient; and (iv) at the very least, have a viable technical and business case (or require an affordable amount of ongoing subsidy). While aspects of this approach are likely to be an important part of a digital sovereignty agenda, it retains some of the disadvantages – including to economic competitiveness – of creating an end-to-end tech stack, and therefore should be adopted only in narrow and targeted areas.
- **Pursuing leads in emerging technologies to increase other countries' dependencies on the EU – giving Europe more leverage in its trading relationships.** This approach is potentially the most growth-enhancing. But it requires getting the basics right, like ensuring enabling infrastructure and a regulatory environment that will foster local innovation and investment

– all of which demands more rapid adoption of most of Mario Draghi's recommendations. This approach will require the EU to get better at 'picking winners' in industrial policy through more evidence-based and less politicised decisions; to be more willing to let economic losers fail; to provide more subsidy and long-term policy certainty; to develop its single market; and to be more willing to accept economic disruption. Finally, having more advantages is not itself enough: the EU also needs to be willing and able to leverage these advantages when dealing with its major trading partners. The EU's approach to trade negotiations with the US President suggests it is not yet willing to fully exploit its own strengths, in order to protect its interests in preserving the open markets and free trade on which the EU's economic model has thrived.

- **Finally, Europe may use its market strength to mitigate sovereignty risks – by requiring firms to provide services which reduce Europeans' exposure to 'weaponisation' of dependencies; and/or ensure workable fall-back options if such weaponisation occurred.** This is likely to be one option pursued by the upcoming Cloud & AI Development Act. This solution has one primary benefit when it comes to competitiveness: to the extent it is cheaper than other forms of achieving sovereignty, it is most consistent with the EU pursuing technology diffusion as its primary means of boosting competitiveness – at least in the short term. These measures must be pursued in an open, evidence-led manner. However, relying solely on this strategy will do nothing to boost the EU's presence in high-growth sectors in the long term.

A combination of the last three solutions – defensive investments to ensure European suppliers in some core technologies, offensive steps to build out EU capabilities in areas where it can act as a global 'chokepoint', and measures to mitigate political risks from using non-EU providers – will therefore likely be necessary.

To best align digital sovereignty with competitiveness, Europe's strategy should shift away from trying to eliminate all its dependencies: this will take years, cost money that is not available, and risks slowing tech take-up. It should identify where in global supply chains it can add value – aiming to achieve enough technological supremacy in enough parts of the supply chain that its dependencies will no longer be so unilateral. At the same time, it must reform itself so it can better leverage these advantages to protect its values.

Europe's digital sovereignty will be under greatest risk if it excludes foreign technologies and pursues an autonomous cul-de-sac set of technologies which cannot compete globally, as Japan experienced. A significant risk is that – faced with more external threats and aggressive economic policies from other major powers – Europe will repeat its past industrial policies, by giving too much attention to creating European versions of foreign firms' services and not enough attention to Europe's potential to lead in future technologies. A shift is essential because until now Europe's approach to digital industrial policy is the worst of both worlds: delivering neither growth nor sovereignty.

1. Introduction

Mario Draghi's 2024 report on European competitiveness[1] paints an alarming picture of the EU's economic prospects. The report's prognosis is serious: the EU has lost business dynamism; the relative cost of doing business in the bloc has increased; and the global political environment has become more hostile to Europe's trade-intensive business model. Since then, the new US administration has posed even greater challenges for Europe's economic model by backing away from many forms of international co-operation, imposing new tariffs against the rest of the world, and threatening to retaliate against the EU's attempts to regulate its own market. This is causing an important shift in the EU's priorities, with digital sovereignty (the ability of the EU to regulate digital infrastructure and services in Europe) a priority at least on par with increasing growth. Yet the fundamental problems which are in Europe's power to address – such the need to increase business dynamism and use of technology to increase productivity, and its need to enhance local innovation to boost digital sovereignty – have been set out in numerous previous reports, ranging from the Lisbon Strategy of 2000[2] to Mario Monti's single market strategy of 2010.[3] The EU has simply not delivered them.

The relationship between competitiveness and digital sovereignty is complex. Boosting productivity requires improving the use and diffusion of technology throughout the EU. For now, the EU is not a global leader in most technologies expected to be key to future economic growth. So Europe's path to digital sovereignty will likely require it to work with and innovate over the top of existing technologies wherever they come from.

In the long term, competitiveness and technological sovereignty can align: Europe's sovereignty will be under even greater threat if it falls further behind in innovation. A new approach to digital industrial policy could help insulate Europe from geopolitical threats and boost Europe's digital sovereignty: a significant threat to Europe's sovereignty is that it falls even further behind in innovation. Examples like Airbus demonstrate that the EU can create successful industrial policies – which boost competition, support local industry and generate global technological leadership. However, in the past European policy-makers have often responded with industrial policy ambitions which were poorly designed and pitted the two priorities against each other. Too often, EU leaders have adopted ambitions which were based on creating European versions of foreign successes, rather than a sober assessment of which investments would boost growth and which risks to European sovereignty could be realistically mitigated. Much of the EU's past digital industrial policies, for example, have been unrealistic in assuming they would create commercial successes, because they failed to appreciate global market dynamics (such as the first-mover advantages which several US tech firms have enjoyed), the EU's financial capabilities, and the EU's comparative strengths and weaknesses.[4] For example, Europe has pursued sovereignty-focused initiatives like the cloud

[1] Mario Draghi, 'The future of European competitiveness', September 2024.
[2] Lisbon European Council, 'Presidency Conclusions', March 2000, https://www.europarl.europa.eu/summits/lis1_en.htm.
[3] Mario Monti, 'A New Strategy for the Single Market: at the Service of Europe's Economy and Society', 9 May 2010.
[4] The European Commission, for example, has been advised to "urgently carry out a reality check" on its chips strategy by the European Court of Auditors, with its targets being widely viewed as aspirational and not something that can be realistically achieved: European Court of Auditors, 'The EU's strategy for microchips',

computing federation GAIA-X to boost technological sovereignty, which did not prioritise and failed to deliver economic growth. On the one hand, many industrial policies have aimed to protect growth at the expense of innovation: for example, by protecting incumbent industries like vehicle manufacturing, rather than accepting global technological changes and their consequent technological and economic disruptions.

Lack of realistic and properly calibrated ambitions, and an unwillingness to openly acknowledge and confront the complex relationship between competitiveness and digital sovereignty, has too often led to promises to deliver 'everything, everywhere, all at once' but an inability to effectively prioritise. An unwillingness to prioritise has also contributed to Europe lacking a clear strategy with disjointed policies – with a lack of coherence across state aid, trade, foreign, industrial and innovation policy – and a corresponding lack of clear, future-proof and innovation-friendly regulation.

The current Commission's Political Guidelines[5] emphasise the need to stimulate innovation – for example by giving more emphasis to innovation in competition policy, financing computing power for Europe's AI industry, increasing access to data, and boosting research spending – but still do not recognise all of the trade-offs required to deliver this innovation. For example, the Guidelines and the EU's Competitiveness Compass recognise that start-ups need help to grow and expand, [6] but the EU needs to also ensure the flip-side: that unsuccessful firms can fail quickly and their resources and workers can be reallocated to more productivity-enhancing sectors or firms. The Competitiveness Compass[7] similarly promises to address low-hanging fruit like cutting regulatory reporting requirements, but it does not deliver a coherent vision for the European digital sector. Although the Commission has proposed a European Competitiveness Fund, even the Commission's own proposal is far less than many supporters of an ambitious digital industrial policy have called for. This which makes it even more important that Europe sets realistic ambitions, that it ensures those ambitions are targeted at achieving growth, and that EU leaders finally confront the trade-offs between their different goals.

There is widespread agreement that Europe needs to boldly change its approach.[8] This issue paper is the first paper in CERRE's EU Competitiveness Forum. It explains the overall framework in which to analyse Europe's economic problems, particularly in the digital sector. It then explores how to reconcile the need for economic growth with furthering Europe's digital sovereignty.

Special Report 12/2025, 2025, p 18. Despite its target of the EU achieving a 20% share of the global market of chip manufacturing, it is likely to only maintain the EU's current 8% share and has been criticised for lacking a "clear strategic direction about to what end the semiconductor sector is supported beyond increasing market share": Johanna Breuer, Anton Spisak and Alexandr Burilkov, 'The GLOBSEC Tech Adoption Tracker: Assessing the EU's strategies on semiconductor manufacturing, AI adoption, and defence tech', June 2025.

[5] Ursula von der Leyen, Europe's Choice: Political Guidelines for the Next European Commission, 2024–2029, July 2024.

[6] Claudie Moreau and Nicoletta Ionta, "Commission to slash startup bureaucracy under new plan", Euractiv, 14 May 2025. The EU already has high levels of start-ups and similar levels of market entry as the US, however: Oyun-Erdene Adilbish et. al., "Europe's productivity weakness: Firm-level roots and remedies", CEPR, VoxEU, 24 February 2025.

[7] European Commission, 'A Competitiveness Compass for the EU', COM(2025) 30, 29 January 2025.

[8] See Kai Zenner et. al., 'The "European Way": A Blueprint for Reclaiming our Digital Future', 2025.

2. Understanding Europe's competitiveness problem

Economists largely agree that European economic growth has disappointed in recent decades. The EU's languid growth in comparison to China is expected, given China's lower level of development and ability to enjoy 'catch up' growth. But the EU has also consistently underperformed against the US, which was until recently experiencing blistering levels of growth considering its position already at the technological frontier.[9]

Yet the reasons for Europe's slow growth are contested. The European economy is suffering from numerous headwinds at the same time:

- Much of Europe's economic growth in recent decades has been due to the strength of its goods exports[10] – with domestic consumption and investment providing very little growth. Yet **Europe's export-oriented growth model is now under enormous stress**. The US and China are adopting increasingly protectionist policies. China's rise up the manufacturing value chain and growing technological capabilities threaten Europe's traditional stronghold in exporting high-end goods: Europe's high-tech manufacturing industries are facing a third straight year of declining production.[11] Europe suffers high production and energy costs. This has led many of Europe's successful industrial sectors to demand European governments provide public subsidy and loosen regulations to support their continued ability to export and compete in world markets in order to protect the status quo.
- Just as exports are under stress, the EU is one of the world's largest importers and its major trading partners now seem **increasingly prepared to weaponise their trading relationships for geopolitical ends**, as illustrated by China's recent export controls on rare earths and the US President's threats to retaliate against the EU's rules regulating digital services. This has contributed to calls for the EU to 'de-risk' its supply chains, for example by diversifying its sources of imports and boosting support for European alternatives to foreign products and services. In comparison, the EU has been relatively unwilling and insufficiently unified to weaponise the degree to which others are dependent on it – as demonstrated by its recent acceptance of new US tariffs on EU-originating imports[12] and its unwillingness to use tools like its Anti-Coercion Instrument.
- **Several employment-rich sectors important to the EU economy, like vehicle manufacturing, are undergoing profound changes**. One reason is other countries' subsidisation and economic models. But technology also plays an important part: the shift from combustion engine to electric vehicles, for example, has undermined Europe's legacy strength in combustion engine technology, and increased the EU's reliance on products like batteries (and upstream inputs

[9] Gideon Rachman, 'Europe has fallen behind America and the gap is growing', Financial Times, 19 June 2023.
[10] This is illustrated in the fact that while the EU's share of the global economy is in decline, its share of global trade has remained relatively stable: see discussion in Aslak Berg, 'Europe and the global economic order', CER policy brief, 22 January 2025.
[11] Orgalim, 'Third year of production decline looms', press release, 2025, https://orgalim.eu/wp-content/uploads/Orgalim-Economics-and-Statistics-Report-Spring-2025.pdf.
[12] Caroline Alexander, 'Harsh Reality of US Trade Deal Stirs EU Angst', Bloomberg, 29 July 2025.

like rare earths) where there is little domestic production. The transition to electric vehicles will also lead to a massive reduction in the number of jobs the sector requires, since electric vehicles are significantly less complex to assemble. In 2024, Europe lost 54,000 jobs in the automotive supply industry.[13]

- **In digital technology and services – the economic sector which is likely to matter the most for Europe's future economic growth and its geopolitical security – Europe's leadership has fallen far behind the US and China**. It lags its global rivals in seven of the eight most critical technologies[14] – for example, only 6% of AI start-up funding is going to European firms – and only four of the world's 50 largest tech companies are European. As Europe's digital regulation becomes a topic of geopolitical threats,[15] the bloc's lack of leadership in technology contributes to the EU's slow economic growth, but increasingly also puts into question Europe's sovereignty: its ability to protect its economy and assert its values.
- Simultaneously with all these challenges, **Europe's productivity growth is stalling** – but the continent has a combination of labour shortages, a declining population meaning this problem could get worse before it gets better, and opposition to large-scale immigration, all of which mean this problem will be very difficult to solve.

This suggests a litany of interconnected problems facing the European economy, all of which might be described under the broad rubric of a 'competitiveness problem' and which impact, or threaten to impact, Europe's growth. Many of these problems are related to technology: Europe has too little presence in critical and high-growth parts of the ICT sector, being reliant on foreign companies in areas like cloud computing, AI, digital platforms; its lack of success in the electric vehicle market is at least partly due to the vehicle manufacturing sector's unwillingness to accept change. This creates confusion about how to disentangle root causes from symptoms. Many of the economic problems are not new: many were identified, and solutions proposed, in initiatives like the Lisbon Strategy of 2000,[16] its 2005 update,[17] and in the Europe 2020 Strategy of 2010-2020.[18] Yet they remain unaddressed – suggesting that the EU's inability to deliver reforms is itself a major headwind to economic progress.

It is not always clear which of these problems the EU wishes to prioritise in its competitiveness strategy. This contributes to an unwillingness, or inability, to confront the EU's limitations and the necessary trade-offs. Instead, there are too often assertions that the EU can achieve all its objectives at once: that it can have high levels of innovation, protect incumbent industries and firms, provide workers with high levels of protection, remove excessive dependencies and diversify its supply chains, all while running export surpluses. The full consequences of policy and regulatory proposals for the EU's different priorities are often not fully considered until the point when they are being

[13] European Association of Automotive Suppliers, 'Job losses escalate as demand stays below expectation', 15 January 2025.
[14] Digital Europe, 'The EU's Critical Tech Gap: Rethinking economic security to put Europe back on the map', 20 June 2024.
[15] Mathieu Pollet, 'Trump can pull the plug on the internet, and Europe can't do anything about it', Politico, 18 June 2025.
[16] Lisbon European Council, 'Presidency Conclusions', March 2000, https://www.europarl.europa.eu/summits/lis1_en.htm.
[17] European Commission, 'Working together for growth and jobs: A new start for the Lisbon Strategy', 2 February 2005.
[18] European Commission, 'Europe 2020: A strategy for smart, sustainable and inclusive growth', 3 March 2010.

implemented.[19] When it comes to industrial policy, the EU's plans often rely on enormous headline figures, which obscure the fact that levels of EU funding for its industrial ambitions are often very low and boosted by heroic assumptions about member-state co-funding and private sector co-investment.

A more sober approach would accept and openly tackle trade-offs and the need to prioritise: it would assess carefully when and how the solutions to different problems might conflict, and produce quantified evidence to explain how those trade-offs have been managed.

To prioritise, problems first need to be clearly and precisely identified and described. Here, Draghi's overall diagnosis is clear: Europe's 'competitiveness crisis' is fundamentally a problem of low productivity. In turn, this requires improving the use and diffusion of technology throughout the EU. There is a good evidence base to support this finding:

- **Some of the difference between EU and US growth rates is demographic (such as the US having a younger average workforce) or connected to deliberate policy choices by European governments** (such as limiting immigration, not encouraging employees to work for longer, or not using the fiscal space available to stimulate the economy).[20] There is little political appetite across Europe to change these policy decisions – a path to growth must work with Europe's existing social model.
- M**ost of the economic gap between the EU and the US is down to productivity per hour worked**. In particular, total factor productivity – or the otherwise unexplained reasons for increases in output, excluding labour and capital deepening, which economists attribute to the adoption of new technologies and working practices – has been significantly stronger in the US compared to Europe from 2008 to at least 2021.[21] For example, in the construction sector, only 40% of EU firms report having adopted digital technologies, compared to 61% in the US.[22] The EU has a proportionately larger public sector than the US: which may be a significant contributor, since the public sector tends to be slower than the private sector in adopting technology and boosting its productivity.
- Draghi argues this productivity gap is almost entirely down to the size and success of the US tech sector, and the ECB attributes two-thirds of the productivity gap to tech.[23] The US tech sector admittedly has astonishing levels of productivity: productivity of US listed tech firms increased by about 40% in the last 20 years while productivity of EU listed tech firms was stagnant.[24] **However, productivity growth of non-tech firms has also been significantly higher in the US than in Europe since 2014.**[25] Broad swathes of the US economy – particularly the services sector – generally enjoy high productivity growth, thanks to their greater use of

[19] Marco Bassini et. al., 'Better Law-Making and Evaluation for the EU Digital Rulebook', CERRE, January 2025, p 3.
[20] Aslak Berg, 'Why Europe should not worry about US out-performance', CER insight, 13 December 2023.
[21] Dan Turner, et. al., 'What should the UK learn from "Bidenomics"?', Harvard Kennedy School, M-RCBG Associate Working Paper Series, No. 252, figure 14.
[22] European Investment Bank, 'Who is prepared for the new digital age?', 20 April 2020, https://www.eib.org/en/publications/online/all/eibis-digitalisation-report.
[23] Christine Lagard, 'The transformative power of AI', ECB speech, 1 April 2025.
[24] Oyun-Erdene Adilbish, et. al., above n 6.
[25] Dan Turner, et. al., above n 21, figure 15.

tech and their willingness to invest more in R&D and ICT than their European equivalents.[26] Over the period 1995-2005, US productivity growth in services averaged 3.2% per year, compared to 0.9% in Europe.[27] **That is consistent with a substantial economic literature showing that it is firms which use technology in ways that boost their productivity derive more economic value from the technology than those which create it.**[28] That is likely to become even more true if – as seems likely – there is more effective competition in providing technologies like AI than there has been in some existing digital markets (and therefore even more of the value of AI will be enjoyed by consumers and firms which use AI, rather than the firms providing it).[29]

- Various other aspects of Europe's economic problems are simply symptoms of Europe's poor take-up for technologies. For example, Europe's lack of technology leadership is likely to be caused, at least in part, by the fact that European business customers and consumers are cautious in trying out new technologies and using them to drive productivity, which deprives European tech firms of a local customer base – encouraging them to move to the US to grow.

We will examine why European businesses and consumers are cautious in adopting new technologies in a future issue paper in this project. However, technology diffusion will require significant changes to the European economy. For example, Europe has been relatively good at incorporating industrial technologies into its manufacturing processes. It has relatively strong levels of productivity in producing high-tech goods like airplanes and components for low-carbon energy production.[30] However, in those sectors Europe is often at or close to the technological frontier already. Services comprise 70% of the European economy and are where EU productivity badly lags behind. The EU's focus must be on incorporating today's existing ICT services in ways that boost productivity in the European services sectors. Furthermore, while AI will have many benefits for industry (for example in optimising supply chains), its potential impact is likely to be much higher for services. **To maximise the productivity benefits of these technologies will require a structural shift in Europe's economy, with labour or capital being reallocated to services as they become more productive**.

Accepting this need for economic disruption will be difficult enough for the EU. However, a growth-first approach might involve trade-offs with other economic challenges facing the EU. Draghi's own report highlights a number of these, including the need to balance competitiveness with technological sovereignty in areas like cloud computing and AI.[31]

[26] Pittaway, "What should the UK learn from 'Bidenomics'?"; Adilbish, et. al., above n 24; Bart van Ark, et. al., 'ICT and productivity in Europe and the United States: Where do the differences come from?', The Conference Board, 2003.
[27] Isabel Schnabel, 'From laggard to leader? Closing the euro area's technology gap', European Central Bank speech, 16 February 2024.
[28] John van Reenan, et. al., 'The Economic Impact of ICT', Enterprise LSE, January 2010.
[29] Zach Meyers and Marc Bourreau, 'A competition policy for cloud and AI', CERRE issue paper, June 2025.
[30] Eurostat, 'Labour productivity and unit labour costs by industry', 29 July 2025.
[31] Draghi, above n 1, page 24.

3. The relationship between economic growth and digital sovereignty

In recent years, the EU has given more emphasis to the importance of digital sovereignty, including in the European Economic Security strategy of June 2023.[32] The Spanish presidency's "ResilientEU2030" paper also proposes a strategy for economic security.[33] The concept was recently defined by the European Parliament's Committee on Industry, Research and Energy as "the capacity to design, develop and scale up digital technologies needed for the competitiveness of our economy, the welfare of our citizens and the EU's open strategic autonomy in a globalised world" including "the EU's ability to make autonomous decisions".[34]

Concerns about digital sovereignty have been supercharged by the Trump presidency, which has fuelled concern that the US might exploit the EU's reliance on US tech services.[35] In this context it is important for policy-makers to clearly identify which particular threats to sovereignty they wish to address. For example, when it comes to cloud services concerns might include that foreign governments can access EU firms' data;[36] or threaten to withdraw or suspend services (i.e. a 'kill switch') important to the European economy in order to compel the EU to act in a certain way, such as to reduce its regulation of foreign tech firms.[37] Similarly, in AI, concerns might be that the EU will be wholly reliant on foundation models which are trained in ways inconsistent with EU values – for example, with bias or a lack of transparency.

It is equally important that policy-makers quantify, as best they can, the likelihood of these risks materialising and the degree of harm they would cause. For example, US government requests to access data rarely appear to demand access to the customer content stored by government or enterprise clients, and Amazon reports that no requests have resulted in disclosure of such data held outside the US to the US government since at least 2020.[38] The plausibility of some of the more extreme US interventions – such as 'kill switches' – might be questionable, given they would not only harm Europe but also permanently damage the perceived reliability and trustworthiness of the US's largest technology firms. However, it seems clear from the US administration's decisions and appointments that it is both concerned by EU policies[39] and that the administration's interests differ from those of the US's largest tech firms.[40] More broadly, if the EU is wholly reliant on foreign technologies like the provision of large AI foundation models, then there will be a risk that those

[32] European Commission, 'European Economic Security Strategy', 20 June 2023.
[33] Spain's National Office of Foresight and Strategy, 'Resilient EU2030', 2023.
[34] European Parliament, 'Report on European technological sovereignty and digital infrastructure', 11 June 2025, 2025/2007(INI).
[35] Kai Zenner et. al., above n 8.
[36] Zach Meyers, 'Can the EU afford to drive out American cloud services?', CER insight, 2 March 2023.
[37] Kai Zenner et. al., above n 8 ; Mathieu Pollet, 'Trump can pull the plug on the internet, and Europe can't do anything about it', Politico, 18 June 2025.
[38] Amazon, 'Law Enforcement Information Requests', July-December 2024, available at https://www.amazon.com/gp/help/customer/display.html?nodeId=GYSDRGWQ2C2CRYEF.
[39] White House, 'Memorandum: Defending American Companies and Innovators From Overseas Extortion and Unfair Fines and Penalties', 21 February 2025.
[40] For example, the President's appointees to the Federal Trade Commission and the Department of Justice have continued to pursue cases against tech firms brought under previous administrations, despite the Republican party's traditional light-touch approach to antitrust.

models would not be developed in line with EU values – though that can be mitigated by the EU helping to ensure the availability of data for AI models to be trained on (particularly in less-common European languages). The likelihood of these risks and their severity must be kept in perspective (not least because foreign providers will likely continue to want their products to be taken up in the lucrative European market, so are unlikely to voluntarily adopt measures which would raise questions about their reliability). However, **a European competitiveness strategy cannot plausibly ignore these significant risks to its growth prospects – digital sovereignty must have an important role in the EU's economic plans**.

The EU has spent several years building up an armoury of tools to boost its economic security, including the Anti-Coercion Instrument,[41] which allows the Commission to respond to countries which threaten the EU economically. The Commission can design responses to such threats, including applying tariffs, excluding a country's firms from public procurement opportunities, or enacting measures targeting their investments in the EU. However, the EU's ability and willingness to use these types of tools will be limited if the foreign country can influence the EU's critical infrastructure or services and the EU has no similarly powerful form of retaliation. That currently seems true in the digital sector since the EU is reliant on constant and uninterrupted access to digital services like cloud computing provided by foreign firms, whereas other countries rely on access to European technology and equipment, like ASML's chip-making tools, a cease-sale of which would not cause the same level of sharp and immediate economic damage. While the EU has always been a trade-intensive and open economy, there is a growing view that the bloc's tech dependencies are too unilateral and one-sided.

The relationship between competitiveness and digital sovereignty is therefore complex. For example, boosting productivity requires improving the use and diffusion of technology throughout the EU. In the short term, at least, Europe is starting from behind in most core technologies, such as cloud computing and AI; focussing primarily on technology diffusion may therefore increase the EU's dependencies.

A similar dilemma between competitiveness and technology diffusion has already played out in relation to the telecommunications network equipment market. The costs of excluding and removing 'high risk' equipment vendors from European telecommunications networks was made with little detailed analysis of its impacts on growth, security or resilience – and has reportedly cost approximately €45bn in productivity growth, and weighs heavily on the profitability of European telecommunications firms.[42] In that case, the EU at least had firms such as Nokia and Ericsson who would benefit. **The sovereignty/competitiveness dilemma is even greater when it comes to managing today's productivity-enhancing technologies in Europe, such as AI and cloud computing: unlike in telecoms network equipment, in AI and cloud computing it is not clear whether EU firms will emerge who will be globally competitive over the long run.**

The EU will have to confront this problem in its upcoming Apply AI Strategy, which aims to boost diffusion of AI across industry and the public sector. Even if a European competitiveness strategy boosts European tech products specifically, these products will themselves often be reliant on foreign cloud computing, AI, operating systems, devices, browsers, and other digital infrastructure. Attempts

[41] Regulation (EU) 2023/2675.

[42] GSMA Intelligence, 'Economic impact assessment of 5G supply chain restrictions in the EU', April 2019, https://d110erj175o600.cloudfront.net/wp-content/uploads/2019/10/GSMA-report-Cost-of-ban.pdf.

to increase European firms' use of EU technology will (at best) have to happen in parallel with increasing use of foreign tech services and infrastructure.

Concerns about growing dependency on foreign ICT suppliers has led to increasing calls for the EU to take more steps to boost its economic sovereignty in tech. There are several models for such intervention.

3.1 An end-to-end tech stack?

Some proponents suggest funding an end-to-end European tech stack – from basic connectivity through to data centres, operating systems, AI models and end-user software – largely through consortiums of existing European tech firms, based on principles of openness and interoperability.[43]

Ensuring the availability of more EU providers might be a useful step and promote more competition. However, **it is not plausible for the EU to ensure globally competitive options throughout the end-to-end tech stack**: digital supply chains are deeply interconnected. The technological sophistication of processes like chip-making means that certain countries and geographies are globally dominant at certain parts of the supply chain. Even in parts of the supply chain where the EU is dominant, such as the provision of chip-making equipment, the EU's leading companies rely heavily on a complex set of suppliers: chip-making equipment provider ASML, for example, has over 5,000 suppliers in its total supplier base, over half of which are outside Europe, including 1,375 from Asia and 1,355 from North America.[44] Furthermore, many downstream tech services have exploited economies of scale and network effects which mean there is a first-mover advantage: that means even where building a replacement European service might be technically plausible, it is unlikely to be commercially successful or enjoy the quality as early equivalents. Countries like China which are trying to control end-to-end stacks have only done so with the use of massive subsidies and the exclusion of foreign suppliers – options which are not politically viable at similar scale in the EU – and with the availability of rare earths and similar advantages which the EU does not have. The Commission's proposed Competitiveness Fund would dedicate about €55 bn to digital leadership. Member-states are likely to water that proposal down, but even if they do not, the figure pales in comparison to the cost of building an end-to-end set of European options, which even its proponents estimate at €300 bn.

Even at a single point of the tech stack, **an approach based on openness and interoperability may be too slow to be feasible**. The GAIA-X consortium, for example, was a European cloud computing initiative, originally envisaged to provide standards for interoperability between cloud computing services, thereby helping numerous smaller European players with fewer features compete with their much larger and more feature-rich US competitors. However, GAIA-X has struggled to achieve much agreement, much less setting interoperable standards, among its participants. Interoperability requirements for cloud services have also been pursued in the EU's Data Act but progress here is also likely to be slow. While openness and interoperability may be important in some contexts, if open governance mechanisms are used to agree on standards for interoperability these can be slow and tedious for participants to agree, making them less agile and able to compete in fast-moving sectors.[45] The economic literature suggests insisting on requirements like interoperability and openness may

[43] Francesca Bria et. al., 'EuroStack – A European Alternative for Digital Sovereignty', 2025.
[44] ASML, Annual Report, 2023, p 325.
[45] Zach Meyers, 'Which Governance Mechanisms for Open Tech Platforms', CERRE issue paper, January 2025.

have positive or negative effects on innovation, depending on the characteristics of the particular market.[46] Such requirements need to be imposed cautiously rather than as an overarching principle. As explained below, competition rather than co-operation sometimes provides better incentives for firms to innovate and improve their security.

Furthermore, **merely ensuring the *availability* of EU providers may provide only marginal sovereignty benefits** for several reasons. First, it is not technically easy for companies to immediately and seamlessly switch services from foreign to a 'European sovereign' tech solution at short notice. Second, in the event that large numbers of European companies suddenly had to replace their use of foreign services with European ones, those European companies would often lack the capacity to take on the new demand without massive new investments,[47] and they would almost certainly need to procure components like chips and server racks from outside the EU. An EU supply chain would therefore only fully protect against political risk if it 'pre-empted' what foreign governments might do by immediately requiring European companies to stop using foreign services and instead use 'sovereign' solutions, regardless of their price or quality. For this reason, any requirement to tilt the playing field towards the use of sovereign solutions would have to be narrow to minimise any cost to European economic growth.

Finally, this approach will also risk inefficiency and reducing competition. This is because the policy may require **protecting European firms (which are treated as too important to fail because their existence is critical for European sovereignty) rather than allowing them to thrive or decline on their own merits**. This is a particular risk since Europe cannot replicate many successful US business models in a cost-competitive way. For example:

- The EU lacks firms which have a large-scale set of consumer-facing digital platforms, which was the basis for each of the largest US cloud computing companies – so it is unlikely a European firm could compete head-to-head with a US firm in that space. Forcing European business customers to use more expensive European cloud computing companies would simply lower those customers' own competitiveness and divert valuable funds away from technology diffusion.
- Parts of the Commission's AI Continent Action Plan appear to boost investments where Europe has no comparative advantage. For example, the business case for 'AI Gigafactories', data centres designed for training AI models is not clear, and few AI firms in Europe appear to have called for this type of public investment. The provision of computing power to train AI models is a scale business, where almost all of the successful players such as Amazon, Microsoft, Google and CoreWeave operate globally. Providing computing power for AI is also very energy-intensive, so it is very unlikely that the EU – given its structurally high energy costs – would have a comparative advantage in this sector. In particular, the €20 billion the Commission envisages for AI Gigafactories pales in comparison to the private sector investments being announced in other parts of the world, such as the $500 billion Stargate joint venture between OpenAI, Softbank and Oracle announced in the US.[48]

[46] Ibid.
[47] US cloud service providers currently provide the vast majority of services to the EU market: Pollet, above n 15.
[48] Jennifer Jacobs, 'Trump announces up to $500 billion in private sector AI infrastructure investment', CBS news, 22 January 2025.

- Similar questions arise about the Plan's desire to reduce Europe's dependence on other parts of the world for AI chips: the Plan does not, for example, demonstrate much insight into why the EU's numerous previous chip-making ambitions have all repeatedly failed to stem Europe's declining share in chip design and chip-making markets, much less reach the Commission's previous targets to grow the sector. Intel, for example, has withdrawn a number of promised investments from Europe; and in the meantime the EU has apparently promised in its trade deal with the US President to buy significant quantities of US AI accelerator chips. Rather than producing chips or AI-training supercomputers, the EU's comparative advantage may be in fine-tuning AI foundation models and producing downstream services, particularly those connected with Europe's industrial base, which would not necessarily require massive public investment in the most complex computing or chip-making facilities. Instead, it would require assurance (for example through regulation, which we discuss below) that AI foundation models are available and built in a way that is consistent with EU values.

Policy-makers' unwillingness to let sovereignty-oriented projects succeed or fail on their merits is also demonstrated by the temptation to 'tilt the playing field' in favour of the European sovereign solutions, for example by encouraging 'buy European' in public procurement processes. The upcoming Cloud & AI Development Act will reportedly include a number of measures that might provide advantages to European cloud computing firms, including in (though perhaps not limited to) public procurement. We will discuss the role of regulation in a European competitiveness strategy in an upcoming paper. However, it suffices now to point out that European digital industrial policy should aim to improve, rather than limit, competition – for example by lowering barriers to entry and ensuring customers are free to switch to different options that better meet their needs. Where markets are effectively competitive, competition will usually remain the most effective way for businesses which use ICT to determine how much control and security they need, and how to weigh different types of risk, and for ICT providers to identify the most cost-effective way to meet customers' requirements. Regulatory requirements that pre-empt users' choices (for example by only allowing the purchase of 'sovereign' solutions) can be double-edged: on the one hand they may encourage more take-up of *European* services, but they also may *discourage take-up of technologies generally*, by reducing choices and making some services more burdensome to access. This type of approach to digital sovereignty needs to be tightly targeted, with the potential to benefit sovereign solutions weighed against the potential negative impacts on:

- Competition within Europe (for example from excluding foreign providers and/or relying on collaboration rather than competition between European tech firms);
- The competitiveness of many European firms which rely on foreign ICT products, services and components; and
- The global competitiveness of EU sovereign solutions, for example because ensuring immunity from foreign laws may severely limit an EU company's possibilities to do business overseas. For example, to be immune from the US CLOUD Act, a European cloud computing company would have to limit its business in the US – severely limiting its access to global customers. Furthermore, this would make the EU cloud company less competitive in Europe, since many European businesses have a presence in the US and would prefer a cloud computing provider which can serve all their locations (i.e. offering a 'one stop shop').

This implies that industrial policy measures aimed at reducing the EU's reliance on foreign tech services should be as narrow as possible. For example, as Draghi recommends in his report, the EU could require use of local cloud computing services only for a very limited set of highly secure data.[49] Or public procurement processes could be designed to ensure that large government buyers of cloud computing insist on interoperable solutions that allow rapid switching between different cloud computing providers, or insist that large buyers source cloud computing services from multiple countries.

3.2 Targeted European alternatives

A more targeted approach might be to pursue European alternatives in a few targeted parts of the tech supply chain which are seen as particularly sensitive to reduce the EU's existing dependencies. The premise of this approach is that 'onshoring' the entire tech supply chain in Europe is not possible. This requires prioritisation, which might require for example that alternatives are pursued where an evidence-based assessment reveals that the following criteria are all met:

- the alternative targets the most sensitive parts of the value chain which put the European economy or democracy at risk – for example, data relevant to national or European security, which should not be subject to access under foreign laws or the possibility of a 'kill switch', or social media services;
- the alternative addresses dependencies with partners which seem particularly untrustworthy or which are particularly one-sided;
- alternatives (like relying on foreign firms' 'sovereign cloud' solutions, described in section 3.4) do not provide sufficient assurances; and
- at the very least, it is technically and commercially possible for Europe to produce a 'minimum viable product'[50] as an European alternative – taking into account factors like network effects, first mover advantages, and the likelihood of being able to replicate functionality in proprietary solutions.

Cloud computing seems like an obvious area where this option could be pursued. However, there are a wide range of other services – such as payments systems, social media and digital advertising – that might warrant further exploration.[51] However, keeping such an approach targeted – and ensuring decisions are evidence-based and not informed by lobbying from domestic firms seeking protection – is a difficult challenge. We set out below in section 3.4 an institutionalised process by which it could be determined whether the criteria are met.

This approach has two advantages. First, it is more realistic than seeking an end-to-end European tech supply chain. Second, if it only applies in the narrow use cases identified after a careful evidence-based assessment, then the EU could more plausibly force the use of the sovereign solution, and any cost to

[49] Brian Williamson, 'Cloud – capturing the silver lining for Europe', Communications Chambers, April 2025.
[50] Bria et. al., above n 43, p 17.
[51] Many of these are listed in the European Parliament Committee on Industry, Research and Energy report of 11 June 2025: see above n 34.

competitiveness from being required to use the service (or adopting regulation that tilts the playing field) would be minimised.

The main difficulty with this approach is that European living standards, and European businesses, rely on the availability of many tech services, often with very complex supply chains and interdependencies – any one of which could be weaponised. The value of ensuring a 'sovereign option' in just one part of that chain (and for only the most sensitive workloads or uses) is questionable; there are likely to be many sensitive parts of the value chain where vulnerabilities remain.

3.3 Pursuing leads in emerging technologies

While the first two options are primarily defensive and aimed at reducing the EU's dependencies, a third option would be to take a more offensive approach, and focus on increasing other countries' dependencies on the EU.

Digital sovereignty and growth might therefore be reconciled by the **EU pursuing technological leadership in emerging technologies like 6G and quantum[52] where the EU has existing strengths but no global leader has emerged yet, and strengthening its position in sectors like chip-making equipment where the Dutch firm ASML remains the global leader**. From a tech sovereignty perspective, this approach would not eliminate Europe's dependencies – but it could give Europe more future leverage in its trading relationships, and therefore ensure the EU's enduring dependencies are less one-sided. Furthermore, this approach could be more growth-centric industrial policy than trying to inject European players in markets where they have not found their own competitive edge.

This policy could be pursued by focusing on getting the basics rights, like ensuring the right infrastructure and regulatory environment are in place to foster local innovation and investment. That would include, for example, ensuring that regulation does not unnecessarily get in the way of market-led innovation and investment. For example, regulatory barriers continue to pose significant constraints on the rollout of important infrastructure and assets like data centres and broadband networks, and EU regulation needs to provide a reliable and effective system of intellectual property rights ensuring sufficient rewards are available for innovating. Importantly, these types of improvements to regulations often do not require significant public investment.

Unlike the first two strategies, this model of pursuing digital sovereignty would also acknowledge that high-tech supply chains are global and that pursuing 'indigenous' supply chains is unrealistic. Instead of excluding foreign tech, the EU's goal should be to adopt them, use them to develop expertise, and then develop global leadership over such technologies.

However, the main risks of this approach for growth are three-fold.

First, the EU is increasingly focused on pursuing a more targeted and proactive industrial policy,[53] which implies to some extent 'picking winners': that is, deciding which **firms or sectors have a viable path to becoming successful without an ongoing need for public subsidy**. This policy therefore carries a high risk of misjudging future technology and commercial trends. For example, the EU's digital

[52] European Commission, 'Quantum Europe Strategy: Quantum Europe in a Changing World', COM(2025) 363, 2 July 2025.
[53] Rabah Arezki and Jean-Pierre Landau, 'Picking Winners Is Difficult and Costly', IMF, September 2024.

industrial policy to date has relied heavily on the expectation that 'edge computing', where cloud servers are located closer to end users, is a technology which would take off. If it did, the technology would be very convenient to the EU's strategic goals: helping to more easily protect the EU's data sovereignty, by ensuring data is kept within Europe, and it could offer a new set of commercial propositions which EU cloud computing firms could use to win market share from US hyperscalers. There remains potential for edge computing to develop in the context of AI, but for now enthusiasm for the technology in Europe has not been met with significant commercial deployment. The risks of 'picking winners' can be mitigated by ensuring an evidence-based approach, ensuring decisions are made based on the best available technological and commercial evidence (rather than factors like equity), are subject to critical scrutiny, and resist capture by industries and companies. It will also require some guesswork about future trends: identifying Europe's comparative advantages is complex enough, but policy-makers will also have to consider how their plans compete with, or fit around, the industrial policies of other countries. Policy-makers must also be ready to accept that many beneficiaries will be ill-chosen and be prepared to let them fail.[54] The need to accept firm failure helps explain the difference between high levels of innovation in the US and the lower levels in Europe. In many European sectors, only a few "superstar" firms are at the technological frontier.[55] Shifts in productivity generally come from leaders increasing their market share and laggards leaving the sector or (as, for example, in the accommodation sector) all firms quickly becoming innovation-savvy.[56] However, Europe suffers from a lack of dissemination of technology leadership from leading firms to others in the same market.[57] This may indicate a lack of effective competition and a regulatory environment that inappropriately protects less-efficient and less innovative firms.

Second, entry into many (but not all) emerging digital markets either requires very large up-front capital or the markets are subject to economies of scale, where competing players accept very low margins for a lengthy period in the hope of eventually earning a payoff if they 'win' the market. A successful industrial policy in these types of markets may require very significant public subsidy for a lengthy period of time, and it is not clear that the EU has always been realistic about the scope of the funding required or the timescale required for success. Take chips, for example. The European Commission's 2013 chips strategy failed to reverse the decline in the EU's share of the global chip-making market.[58] And the European Commission, for example, has been advised to "urgently carry out a reality check" on its 2022 chips strategy by the European Court of Auditors, with its targets being widely viewed as aspirational and not something that can be realistically achieved given the funding available.[59] This risk can be mitigated by providing significant sums and providing long-term certainty about the public support on offer.

[54] Réka Juhász et. al., 'The New Economics of Industrial Policy', August 2023, available at https://drodrik.scholar.harvard.edu/sites/scholar.harvard.edu/files/dani-rodrik/files/the_new_economics_of_ip_080123.pdf.

[55] Isabel Schnabel, 'From laggard to leader? Closing the euro area's technology gap', ECB Speech, 16 February 2024.

[56] Since customers mostly buy accommodation online, accommodation providers have no choice but to digitise.

[57] European Central Bank, 'Key factors behind productivity trends in EU countries', ECB occasional paper, December 2021.

[58] European Commission, 'A European Strategy for Micro- and Nanoelectronic Components and Systems', COM(2013) 298, 23 May 2013.

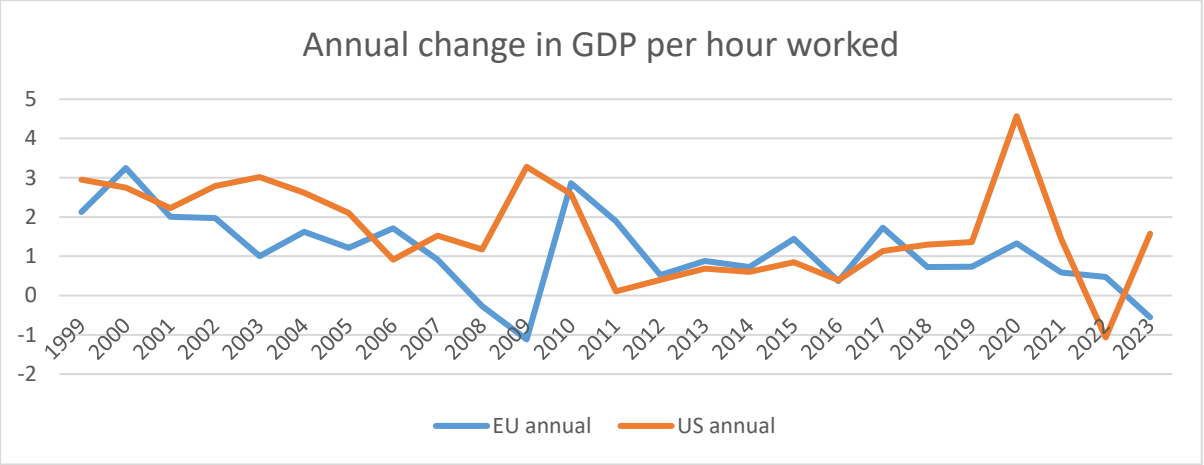
[59] European Court of Auditors, 'The EU's strategy for microchips', Special Report 12/2025, 2025, p 18.

Third, succeeding at new technologies will require the EU to revisit the reasons why the continent failed to reach the forefront of many of today's technologies like digital platforms. This comes down to two factors: regulatory predictability and providing suitable returns on investment. The EU now has a potential advantage over the US and China in providing regulatory predictability, if it can maintain policy consistency. However, in part because of the regulatory environment, returns on investment could be improved. The key problem is the lack of a properly functioning single market – barriers to trade in services within the EU are estimated by the IMF to be the equivalent of a 45% tariff – and to capital markets in Europe. The Commission is taking steps to ensure that regulation does not encourage firms to 'stay small', and its Competitiveness Compass and Single Market Strategy aim to reinvigorate the single market by reducing barriers to cross-border business, which will help innovative small firms scale across Europe more easily.[60] In particular, the Commission proposes in its Competitiveness Compass a '28th regime' to streamline labour, tax and insolvency rules for certain types of innovative firms.[61] If member-states finally back this idea, it could significantly improve the ability of innovative firms to grow across Europe and displace less-innovative incumbents. Similarly, ensuring adequate protection of and ability to commercialise intellectual property rights will be key since Europe is currently good at conducting basic research but performs less well at attracting investment to commercialise good ideas at scale.

However, success may also require a different view of risk-taking in the EU and a significant willingness to allow and accommodate economic (and, inevitably, social) disruption. For example, **a comparison with the US shows that the country's ability to take advantage of economic disruption is a significant factor in its ability to achieve productive growth**. The chart below shows that much of the gap in productivity (i.e., GDP per hour worked) arose in three periods. The first was the period 2001-05, which many economists attribute to US firms innovating using ICT technologies like productivity software and the internet, both of which had become widely available in the 1990s. But the other two periods are related to shocks: in the aftermath of both the financial crisis of 2008-09 and Covid in 2020-21, a wide gap opened up between US and EU productivity growth. For example, while both the US and EU economies shrunk in 2020 due to Covid and both enjoyed a rapid recovery in 2021, US growth has reverted to a level above 2% per year, while the EU's has remained stuck at around 1%. In part, this appears to be that the US allows firms to fail and employees to lose their jobs, allowing resources to shift from less productive firms or sectors to more productive ones.[62]

[60] European Commission, 'The Single Market: our European home market in an uncertain world – A Strategy for making the Single Market simple, seamless and strong', COM(2025) 500, 21 May 2025.
[61] European Commission, 'A Competitiveness Compass for the EU', COM(2025) 30, 29 January 2025.
[62] Dan Turner, et. al., above n 21.

Figure 1.[63]



Europe must therefore better allow resources to leave (even iconic) sectors and firms. Many firms currently soak up a significant proportion of the labour market and available capital while providing a drag on overall EU productivity. The US tends to have stronger 'up or out' dynamics:[64] successful US firms grow faster, and failing US firms leave the market more quickly. In comparison, Europe has a more static economy – with more firms remaining in the market despite having mediocre performance and less change between sectors.[65] This is illustrated in the continued focus on private sector R&D in the mid-tech automotive sector in Europe – while the US has shifted much of its R&D spending to high-growth, high-tech industries.[66]

Comparing the US and EU responses to Covid provides an illustrative example. US stimulus went directly to workers, which could use the money as they wished, rather than EU-style furlough schemes which rewarded firms for keeping people in their jobs even if they had no productive work.[67] The US model gave workers incentives to leave their roles and switch to higher-paying jobs with more successful firms. The massive spike in productivity growth in the US in 2020 compared to Europe seems to have been driven by high levels of labour market churn, business formation, and market exits freeing up resources to shift to more productive firms. In comparison, European support led to the phenomenon of 'zombie firms'.[68] Too strong a focus on protecting Europe's existing firms and sectors risks perpetuating this lack of dynamism – inhibiting the economy from adapting to structural changes, misallocating resources, and dampening competitive pressure for firms to take risks with technologies. This implies that, to achieve technology leadership, **the EU will have to embrace a more dynamic economy**.

Many policy-makers find it difficult to adequately mitigate the risks of a proactive and targeted industrial policy. For example, when accepting economic disruption, job losses and firm closures are

[63] Source: IMF World Outlook 2025.
[64] Oyun-Erdene Adilbish, et. al., above n 6.
[65] Albert Bravo Biosca, 'New evidence on 'creative destruction' in Europe and the US', in Simon Tilford and Philip Whyte (eds), *Innovation: How Europe Can Take Off*, Centre for European Reform, 2011.
[66] C Fuest, et. al., 'EU Innovation Policy: How to Escape the Middle Technology Trap', 2024.
[67] Jean-Benoit Eymeoud, 'Contrasting U.S. and European Job Markets during COVID-19', Federal Reserve Bank of San Francisco, 22 February 2021.
[68] Tobias Helmersson, 'Corporate zombification: post-pandemic risks in the euro area', ECB Financial Stability Review, May 2021.

highly visible and interpreted as obvious signs of the failure of a government's economic policies. The beneficiaries of such closures – such as SMEs and firms which are yet to enter the market – are far less visible. This can make it difficult for politicians to adopt policies that promote – or at least tolerate – the risk and disruption necessary for innovation to thrive. However, as we will explain in a future paper, prioritising innovation and growth can be uniquely difficult for the EU to achieve given its institutional constraints, such as the competing demands of other policy imperatives like EU cohesion. This suggests that an 'offensive' strategy to boost growth and address unilateral dependencies may require changes to how the EU works.

Finally, the EU suffers from one structural weakness that must be addressed before it can leverage its global technological leadership: it needs to be more willing and able to weaponise others' dependencies on it, like some of its major trading partners are doing. The EU's approach to negotiating a trade deal with the US is illustrative: in the face of a threat of unprecedented transatlantic tariffs, the EU was unwilling to 'play tough', holding back on retaliation, refusing to use new tools at the Commission's disposal like the Anti-Coercion Instrument, and being reluctant to seriously threaten retaliation in services. In part this is likely because EU member-states believe that Europe's current dependency on the US – for defence and for important technological services – is so great that 'playing tough' is not an option yet, but will be once the EU can be pulled away from excessive dependence on the US. Investment in the defence sector may therefore be useful both to increase the EU's leverage in negotiations with the US, and because defence investment can often gestate commercially valuable innovations in its own right, as it has with GPS, computers, the Internet and nuclear power.[69]

Another interpretation is that the EU is simply too beholden to existing incumbent industries which wanted certainty and continuation of the status quo. In the past, the EU has failed to negotiate well with the US in a range of areas where the EU had strengths, such as in relation to export controls on sales of chip-making machinery to China. This implies that the EU needs more unity – or that structural changes are necessary to help EU trade negotiators act more autonomously in a way which befits the current geopolitical environment. Without both willingness and ability to weaponise its strengths, like its trading partners do, increasing its technological leadership may be insufficient to give the EU more global leverage. We will revisit the question of how EU institutional structures could be reformed in a future issue paper in this project.

3.4 Regulatory mitigation

A final option is for **Europe to use its market leverage to mitigate sovereignty risks – by requiring firms to provide assurances and options that either (i) reduce Europeans' exposure to 'weaponisation' of dependencies; and/or (ii) ensure workable fall-back options if such weaponisation occurred**.

This is likely to be one option pursued by the upcoming Cloud & AI Development Act, though whether it will have the effect of excluding foreign firms from (part of) certain markets remains to be seen.

Private cloud solutions -for example, where data centres are used which are disconnected from the public internet - can be provided by European companies but have limited functionality compared to public cloud options. To protect European data from the main US laws which allow law enforcement

[69] See Mariana Mazzucato, *The Entrepreneurial State* (2013).

and intelligence agencies to collect data (i.e. the CLOUD Act and FISA), and against 'kill switch' risks, however, major global cloud computing providers have put in place 'sovereign' solutions. These may include a range of characteristics such as:

- commitments to put European data centres under the oversight of European board of directors that consists exclusively of European nationals;
- localising data so it is stored only in Europe, often with technical solutions such as Amazon's Nitro system, Microsoft's Confidential Compute and Google's Confidential Virtual Machines, which can help ensure only the customer, and not the cloud computing provider, can access a customer's data, even when the data is being actively processed in the cloud environment;
- contractual commitments to litigate any order to cease its cloud services in court; and
- contingency arrangements so cloud services can operate independently in the event of a disruption and (as a last resort) be seamlessly handed over to local partners, with local EU citizens provided with the source code needed to maintain the service.[70]

Some of these solutions involve joint ventures with EU cloud computing partners, with European data accessible only by EU partners.

Similar solutions could be envisaged for other ICT goods and services – for example, by ICT goods providers agreeing to stockpile equipment in the EU in case of impeded trade flows, or ICT software suppliers agreeing to store their code in the EU and ensure local partners are constantly in a position to provide a local service. For example, in the payments sector, a number of countries have demanded local backup payment processing systems which can be run (if necessary) independently of global payment networks like Visa and Mastercard.[71] The EU could also mandate that firms develop their services based on interoperable standards to ensure business customers have a wider range of choices. This could be pursued to complement with the EU's current efforts (as set out in the Competitiveness Compass) to diversify suppliers in sectors where EU customers are currently reliant on companies from a small number of countries. Greater reliance on trusted third countries may help provide more diverse and resilient supply chains without the EU or its member-states resorting to subsidising European or national champions.

There are two main constraints to using regulation to impose sovereignty requirements:

- First, today's sovereign cloud solutions may not provide complete assurance. For example, contractual commitments may not override a firm's statutory obligation, and while a statutory obligation cannot override a technical safeguard (such as encryption), the scope and strength of any technical safeguards need to be assured. For example, data which is only stored in cloud computing environments can be encrypted so that it can only be read by the customer and not the cloud computing platform (so long as the cloud computing platform does not have the

[70] Brad Smith, Microsoft, 'Microsoft announces new European digital commitments', 30 April 2025; see also Judson Althoff, Microsoft, 'Announcing comprehensive sovereign solutions empowering European organizations', 16 June 2025; Amazon, 'Built, operated, controlled, and secured in Europe: AWS unveils new sovereign controls and governance structure for the AWS European Sovereign Cloud', 3 June 2025.
[71] See Tass, 'International acceptance of Mir cards grows despite sanctions — Bank of Russia', 7 April 2025.

right to view the data for operational purposes), but this does not extend to use of applications offered as part of cloud services (i.e. software-as-a-service or Saas).[72]

- Second, sovereign options will still have a significant cost to the supplier involved, and it can be assumed that at least some of these costs will be passed through to EU business customers – impacting their cost bases or possibly making some of them less likely to take up new technologies like cloud computing. In theory, however, these could be less expensive than the public cost of supporting new European competitors.

This solution has one primary benefit when it comes to competitiveness: to the extent it is cheaper than other forms of achieving sovereignty, it is most consistent with the EU pursuing technology diffusion as its primary competitiveness goal – at least in the short term. However, relying solely on this strategy will do nothing to boost the EU's presence in high-growth sectors in the long term.

In the past, measures to impose 'sovereignty' requirements in the EU have sometimes been progressed without much transparency nor in an evidence-led manner. For example, under the last Commission, there were efforts to inject sovereignty requirements into the proposed EU Cloud Certification Scheme. This instrument was prepared under the Cybersecurity Act which was intended to address technical rather than political risks. Consequently, the process lacked the appropriate levels of transparency, predictability or accountability given the requirements would have had significant political and economic consequences. Rather than pursue sovereignty requirements in an ad hoc fashion, requirements for firms to make these types of commitments could be formalised institutionally. For example, most member-states have a system of screening foreign direct investment and the US has a Committee on Foreign Investment in the United States (CFIUS), an inter-agency committee which reviews the security implications of foreign investments into the US. These institutions are already empowered to impose rules like supply guarantees and 'golden shares' to protect national security. However, such an institution would need to have a broader remit in order to cover existing investment and vulnerabilities and to examine the broader concept of 'sovereignty' rather than just 'security'. This would need to be adopted proportionately and in narrow sectors, and with sufficient transparency and predictability. It could then provide European businesses with more certainty about the safe use of foreign ICT products and services.

[72] Johan David Michels et. al., 'Storm Clouds are Building: Surveillance, Sovereignty, and State Interests', SSRN, 3 February 2025.

4. Balancing growth and sovereignty

None of these solutions provides a complete resolution to the EU's sovereignty dilemma in tech; nor do any of these solutions imply growth can be pursued without any cost (at least in the short term) for EU tech sovereignty. They will all involve some cost, which might be borne by either the public or the private sector, and may impact tech dissemination, competition and productivity.

They also all involve trade-offs in terms of control, security and cost: requiring the EU to accept some degree of risk and, in some cases, to trade off different types of risk (e.g. political risk from foreign laws against risks from traditional cybersecurity threats). A combination of some of these solutions – defensive investments to ensure European suppliers in some core technologies, offensive steps to build out EU capabilities in areas where it can act as a global 'chokepoint', and measures to mitigate political risks from using non-EU providers – will therefore likely be necessary.

In deciding where to adopt each solution, the first step must be to quantify the costs and risks of its proposals. This includes:

- the costs to taxpayers from supporting industrial policy;
- the costs which will be borne by the private sector, for example where European companies face fewer choices of supplier or might be less willing to adopt new technologies. The direct costs and the long-term productivity costs of different types of sovereignty policies both need to be understood; and
- the long-term impacts on sovereignty of simply focusing on boosting EU firms' take-up of technology. For example, improving take-up of tech in Europe could significantly boost local innovation in the long run. One reason why EU tech start-ups move to the US is that American firms are faster to exploit new technologies, in turn creating more demand for tech firms' services. Boosting demand for new tech, even if in the short term US companies absorb most of that demand, will create a more promising environment for European innovators in future. **If industrial policy to 'de-risk' from foreign technologies was limited and targeted, that would help investors and firms discover where Europe has the most potential to produce innovative and globally competitive services** – even if that means building on top of foreign platforms and services. This does not doom the EU to be a "digital colony" where it only provides supplementary value-added services over foreign infrastructure. In sectors with dynamic and innovation-led competition, like the digital sector, there are many examples of value-added services becoming new focal points for digital ecosystems – just as AI agents, for example, might become the key way in which users interact with a variety of different operating systems and other platforms, rendering those agents more important in the digital ecosystem than these previously powerful gatekeeping services.[73]

[73] Friso Boeston and Jan Krämer, 'AI Agents and Ecosystems Contestability', CERRE, 5 November 2024.

5. Conclusion

If the EU takes Draghi's prescription seriously, and focuses on technology-led productivity growth, it will need to focus on increasing European companies' effective use of technology. It ought to be realistic about its capabilities to achieve this; honest about where other policy imperatives like digital sovereignty might come into conflict with technology diffusion; and clear about how the trade-offs between different priorities are being handled.

In some cases, the tension between different goals – such as economic growth and tech sovereignty – might be overstated: for example, lack of technology diffusion in Europe might be a cause, rather than a symptom, of its lack of tech leadership. In other cases, there may be a balance to be struck between seeking economic growth on the one hand and minimising excessive dependencies and threats to European sovereignty on the other. **But it would be unwise for the EU to continue to pretend that these trade-offs do not exist**. The risk is that – faced with more external threats and aggressive economic policies from other major powers – Europe will hunker down on its existing approach to innovation, which has delivered neither growth nor sovereignty. In fact, pursuing technological autonomy poses perhaps the greatest threat to Europe's digital sovereignty. That approach may appear to work for a while – but as Japan found in the 1990s, this approach risks creating a cul-de-sac which cannot compete globally in the long run.

This will require the EU to be more realistic in its priority-setting. It should be clear about which goals it seeks to pursue and prioritise, and in which circumstances. Questions about how to reconcile trade-offs are reflected, but not fully resolved, in the Draghi report – which points to the need to close the innovation gap with the US and China, while also enhancing Europe's sovereignty and reducing excessive dependencies.

In this paper we have clarified what a 'competitiveness strategy' should aim to achieve and how. We also point to how the Commission could better acknowledge and address trade-offs between competitiveness and sovereignty to promote the long-term prospects for the European tech sector. A clearer understanding of what a 'competitiveness strategy' should aim to achieve will be essential to help policy-makers better make evidence-based decisions about how to balance the EU's strategic objectives.

Issue Paper

Competitiveness, Digital Transformation and EU Policies

Antonio Manganelli

Executive Summary

Why this matters, now

Europe's competitiveness challenge is fundamentally an innovation and productivity one. Price-based competitiveness strategies are neither durable nor sufficient in an era of geo-economic fragmentation: only innovation-led competitiveness can sustain growth and resilience, driven by frontier R&D, effective commercialisation, and wide technology diffusion. Today's general-purpose technologies (GPTs) — notably advanced connectivity, cloud, and AI — are key levers. This report aims to assess how the European Union (EU) performs on these levers, how the EU's current policies are shaping outcomes, and where recalibration may be necessary.

Key cross-cutting findings

1. **What are the principal causes of the EU's innovation gap?**

   EU's competitiveness problem is principally based on innovation and productivity lags. The shortfall is driven by private R&D. Sectoral composition also plays a negative role for Europe, with R&D concentrated in mid-tech industries (automotive, chemicals, transport) rather than high-tech. Finally, EU has weaker productivity returns from R&D spending and underperforms on ICT and AI patenting relative to its research output.

   A remedy is to rebalance public R&D toward high-impact, high-tech innovation and promote cross-sector private financing partnerships. Because productivity gains increase with scale, fragmented public/private R&D funding and industrial policies should be consolidated. Simply spending more on R&D - though likely necessary - will not suffice: the EU also needs to improve the returns on that spending.

2. **To what degree are the creation and scaling of EU-based technology firms essential to competitiveness?**

   The EU has produced few digital firms with global scale. Capital markets are shallow for equity and later-stage growth; corporate venture capital from EU mid-tech champions often flows to US startups, reinforcing the "mid-tech trap. As a result, the EU depends on foreign countries for the great majority of its digital products, services, and infrastructure.

   On the other side, not all the US productivity advantage is directly derived from its major tech platforms: these may instead also be one of its results. Therefore, trying to emulate a "US model" without addressing the underlying problems could be ineffective and very inefficient. A polycentric digital architecture, where EU ICT manufacturers and telecom providers play a more active role, may represent a more appropriate and balanced path for the EU.

3. **How effectively is the EU performing in the diffusion and productive utilisation of digital technologies?**

The EU performs well on rollout of digital infrastructures and is broadly in line with other major jurisdictions for take-up of digital services. It nonetheless lags in the development and productive uptake of more advanced infrastructures and services (e.g., 5G stand-alone and cloud and AI that are deeply integrated in companies' productive processes). Indeed, Europe's labour productivity gap concentrates where ICT is produced and where it is intensively used.

Moreover, European firms convert ICT investment into productivity gains less effectively, largely due to smaller average firm size and under-investment in complementary intangibles - skills, software, and organisational capital - needed for enabling digital transformation. Strengthening mechanisms that boost intangible investment would help close this gap. More broadly, Europe should aim to consistently outperform the United States in the diffusion and productive use of ICT and digital technologies across its industrial ecosystem.

Trade-offs

- **Maintaining a balance between IP-holders and downstream innovators.** It is important to promote downstream incremental innovation and diversification; on the other hand, it is crucial to maintain stable upstream licensing revenues to sustain EU R&D intensity and innovation-led competitiveness. The latter is especially true in strategically relevant industrial segments where EU innovators are globally competitive (e.g., cellular/IoT equipment).

- **Strategic autonomy vs diffusion.** Curtailing market access for non-EU digital services risks slowing ICT adoption and reducing quality and choice. In those cases, where substantiated economic security risks arise, carefully designed measures may be warranted. Overall, the approach should be case-by-case, proportionate, and risk-based—privileging enabling policies that build credible EU alternatives while preserving access to frontier technologies.

- **Demand-led connectivity investment vs anticipatory (public) investment.** Anticipatory public (or publicly incentivised) investments are risky yet can be justified in some circumstances. However, such anticipatory investment should be contingent on a rigorous ex-ante impact assessment of demand-side dynamics, the infrastructure's transformative nature (and thus limited responsiveness to demand-pull), and the net economy-wide effects.

Policy recommendations

- **Rebalance public R&D toward high-impact, high-tech missions.** The European Commission (DG Research & Innovation) and EU Member States should align their R&D strategies through the Horizon Europe Strategic Research and Innovation Agenda and the proposed European Competitiveness Fund, concentrating resources at EU level to achieve critical mass and ensure R&D translates into productivity gains.

- **Strengthen the research-to-deployment pipeline**. DG Research & Innovation should redesign Horizon Europe calls to fund cohesive innovation ecosystems—linking large firms, start-ups/SMEs, universities, and venture finance within regional clusters. Condition grants on demonstrated commercialisation pathways and downstream technology adoption.

- **Maintain a balanced regime for intellectual property rights.** The European Commission (DG Grow and DG Connect) should aim to preserve incentives for EU upstream innovators by rejecting overly prescriptive ex-ante licensing controls, while promoting industry-led initiatives to foster SME participation and incremental downstream innovation.

- **Ensure strategic-autonomy measures are risk-based and proportional**. The European Commission should operationalise the Digital Decade targets and CAIDA framework by restricting "resilience" measures to genuinely critical public-sector workloads and high-risk dependencies, while avoiding blanket restrictions on foreign investment or technology diffusion that would slow EU innovation ecosystems and delay AI/cloud deployment.

- **Conduct in-depth ex-ante impact assessments for public (or publicly incentivised) infrastructure investments.** DG Connect and the European Investment Bank should require demand-responsiveness audits before committing to large-scale digital infrastructures, prioritising areas with high knowledge spillovers, strong absorptive capacity, and regional adoption readiness.

- **DG Connect should redesign Digital Decade Index and targets**. Shift metrics from technology availability and service adoption to adoption with productivity-enhancing outcomes — disaggregated by sector and region. Also introduce dynamic benchmarking against US digital trajectories to maintain competitive parity.

- **Create EU-level instruments for intangible capital**. The European Commission (DG Connect, DG Grow and DG Research) should establish dedicated funding streams for skills development, software-development toolkits, organisational-change support, and data-asset governance, enabling firms—especially SMEs—to maximise productivity gains from cloud and AI adoption and reduce the "productive-adoption gap" between EU and US firms.

Why this matters, beyond

Recent seminal reflections from former Italian prime ministers Mario Draghi and Enrico Letta converged on a single diagnosis: innovation is the engine of competitiveness and dictates the ability for the EU to compete geopolitically, and Europe lags in this area. Policy to enhance the EU innovation system and increase competitiveness is not easy, but it is necessary - and innovation matters for reasons that go beyond competitiveness metrics.

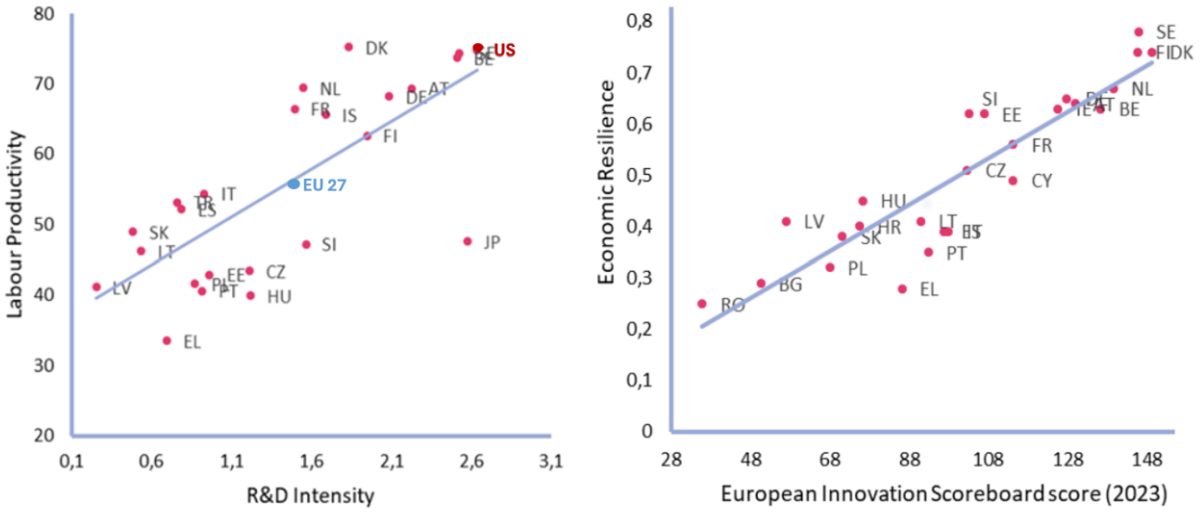
Innovation-driven economic growth can expand the “size of the pie”, increasing the potential for shared prosperity and welfare improvements: this is what prevents international trade from necessarily becoming a “zero-sum game”. Historically, innovation and technological progress have reshaped trade patterns, enabled globally integrated value chains, and made the world profoundly more cooperatively interdependent - and they can likely do so again.

1. Introduction: Competitiveness, Innovation and Productivity

In his report "The future of European Competitiveness", Mario Draghi calls for decisive action to close Europe's widening innovation gap, accelerate digital transformation, and strengthen its capacities in key technologies domains—from semiconductors to cloud, AI and quantum technologies. At the same time, Draghi highlights the need to address persistent deficiencies in connectivity infrastructures and digital skills, both of which are essential to resolving the bloc's competitiveness problem.

The competitiveness concept embraced by Draghi clearly and strongly centres on innovation, as opposed to reducing prices by either depreciation of the real exchange rate or a reduction in unit production costs. While short-term price-based competitiveness is often unsustainable in the long-run,[74] innovation-based competitiveness leads to increased productivity and economic growth over time.[75] Research and innovation are crucial to boost Europe's (long-term) competitiveness: they are the main drivers of productivity and are directly correlated with economic resilience.[76] (**Figure 1**)

Figure 1 – Research & Innovation impact on productivity and economic resilience



[74] Relying on exchange rate depreciation as a means of enhancing trade competitiveness is inherently unsustainable, as its short-term benefits are offset by adverse long-term effects. Depreciation increases the domestic currency cost of imported goods, which in turn raises import prices and fuels inflation. Higher inflation erodes purchasing power and discourages domestic investment, ultimately constraining productivity growth. A more durable approach is to improve competitiveness by reducing unit production costs, thereby enabling exports to gain market share without currency manipulation. Yet, this strategy also faces limits: sustained export expansion can place upward pressure on the exchange rate, gradually eroding the initial cost advantage. Moreover, aggressive cost-cutting risks undermining product quality and curtailing long-term investment, which may compromise the very foundations of competitiveness over time.

[75] Aghion P., Howitt P. (1992) A Model of Growth Through Creative Destruction, in Econometrica, 60(2), 323–351; Aghion P., Howitt P. (1998). Endogenous Growth Theory. This kind of economic growth is supposed to expand the "size of the pie," increasing the potential for shared prosperity and welfare improvements, making it compatible with the idea that relations between countries may be characterised as a "positive-sum game" rather than a "zero-sum game".

[76] Steeman J-T, Hobza A, Canton E, Di Girolamo V, Mitra A, Peiffer-Smadja O, Ravet J (2024) Why investing in research and innovation matters for a competitive, green, and fair Europe - A rationale for public and private action – EU Commission R&I Paper series.

Note: Graph on the left: business expenditure in R&D (BERD) measured in percentage of gross domestic product (GDP) 2020 and labour productivity 2021 (based on Eurostat). Graph on the right: Economic Resilience Index 2023[77] and EU Innovation scoreboard[78].

A greater focus on innovation is particularly vital in today's geopolitical and economic landscape, which is increasingly defined by trade frictions, tariff escalations, and strategic decoupling among major economies.[79] In such a setting, price-based advantages are easily eroded by sudden tariff shocks or retaliatory measures, and access to foreign markets can no longer be taken for granted. [80] This elevates the strategic value of non-price competitiveness, particularly that one rooted in frontier innovations coupled with consequent widespread and effective diffusions.

Indeed, as international trade relations become increasingly adversarial, countries with strong innovation ecosystems are better positioned to shape global standards, attract investment, and sustain market relevance despite new barriers—often even influencing global demand itself. In this sense, innovation not only enables firms to move up global value chains but also builds economic resilience and reinforces competitiveness, empowering nations to exercise greater bargaining power in geopolitical negotiations. In a world where trade rules are increasingly driven by strategic and power dynamics, long-term, innovation-driven competitiveness emerges as both an economic asset and a geopolitical lever.[81]

These issues become even more critical in the case of General Purpose Technologies (GPTs) - innovations capable of generating broad-based productivity gains and sustained economic growth across virtually all sectors. GPTs share three defining features: (i) they are pervasive in their application, (ii) capable of improvement over time, and (iii) able to catalyse complementary innovations that extend their transformative reach. [82] Classic examples include electricity and computers, followed by the internet and advanced connectivity. Today, the most transformative GPT is artificial intelligence (AI), which sits at the centre of this analysis as a key driver of Europe's future competitiveness.

Innovation-driven competitiveness can be achieved primarily through three key drivers: (i) pushing the boundaries of frontier innovation; (ii) commercialising research into scalable, market-ready products; and (iii) fostering widespread technology adoption to embed digital tools and advanced

[77]Zoe Institute for Future-fit Economies (2024) The Economic Resilience Index: Assessing the ability of EU economies to thrive in times of change. This composite index comprises 27 indicators grouped into six resilience dimensions: Economic Independence, Education & Skills, Financial Resilience, Governance, Production Capacity, and Social Progress & Cohesion. These dimensions are derived from 96 resilience characteristics mapped across four provisioning actors (households, businesses, state, and communities) and three resilience capacities (absorption, recovery, and adaptation).

[78] EU Commission (2024) European Innovation Scoreboard 2023. The European Innovation Scoreboard (EIS) 2025 provides a comparative assessment of research and innovation performance across 39 European countries using a measurement framework organised around four main pillars—Framework conditions, Investments, Innovation activities, and Impacts—comprising 32 indicators distributed across 12 innovation dimensions.

[79] Baba C., Lan T., Mineshima A., Misch F., Pinat M., Shahmoradi A., Yao J., van Elkan, R. (2023) Geoeconomic Fragmentation: What's at Stake for the EU, IMF Working Paper No. 2023/245.

[80] As exemplified by the import tariff policy adopted by the United States under the Trump administration — a policy that was, in fact, preceded and later accompanied by a broader global resurgence of protectionist measures since 2020, perhaps less visible but not necessarily less intense.

[81] Conversely, while raising trade barriers may yield short-term gains in price competitiveness, such protectionist measures tend to generate negative, self-reinforcing spillovers over the longer term — including reduced innovation, slower productivity growth, and heightened risks of global retaliation.

[82] Bresnahan T., Trajtenberg M. (1995), General Purpose Technologies: 'Engines of Growth'?, Journal of Econometrics 65, 83-108.

digital services across economic sectors and society. [83] These innovation drivers are interdependent and mutually reinforcing - for instance, European firms that invest in the adoption of advanced digital technologies consistently exhibit a higher propensity to engage in innovation and R&D.[84] This shows that digitalisation is not merely a support function, but a catalyst for firms to innovate more rapidly, integrate into global value chains, and sustain competitiveness in increasingly knowledge-intensive markets.

This interdependence strongly echoes Enrico Letta's 2024 report "Much More Than a Market", which strongly reaffirms the critical importance of a fully functioning Single Market for Europe. [85] At the same time, it calls for a transformative conceptualisation by placing the free movement of research, knowledge, and innovation at the heart of the European project. Building on the existing four freedoms, this proposed "fifth freedom" is not simply a valuable addition but a transformative force - crucial to enhancing the effectiveness of the others in an increasingly knowledge-based global economy.

Indeed, Europe's "competitiveness crisis" is fundamentally rooted in insufficient innovation capacity and lagging productivity growth. The European Commission itself has recently articulated this diagnosis, stating that "*Europe has not kept pace with other major economies, due to a persistent gap in productivity growth. … The root cause is a lack of innovation. Europe is failing to translate its ideas into new, marketable technologies, and failing to integrate those technologies into its industrial base*."[86]

The European Union's efforts to enhance competitiveness and drive productivity through digital transformation are currently embodied in two comprehensive policy frameworks: the EU Competitiveness Compass and the Digital Decade Policy Programme 2030.[87]

The Digital Decade Policy Programme (DDPP) [88] sets out concrete targets to enhance the EU's digital performance across four key dimensions: (i) a digitally skilled population and workforce; (ii) secure and sustainable digital infrastructures; (iii) the digital transformation of businesses; and (iv) the digitalisation of public services. To translate these priorities into measurable commitments, the European Commission has established quantified benchmarks aligned with the Digital Economy and Society Index (DESI). [89]

Complementing this framework, the EU Competitiveness Compass (CC) [90] identifies three strategic pillars, of which the first—closing the innovation gap—and the third—reducing strategic dependencies—are closely linked to the deployment of ICT and the development of robust digital

[83] Mazzucato M., Perez, C. (2023) Redirecting growth: inclusive, sustainable and innovation-led. In A Modern Guide to Uneven Economic Development.
[84] European Investment Bank (2022) Investment Report 2021/2022. Recovery as a springboard for change.
[85] Letta's vision fundamentally emphasises the completion and deepening of the Single Market as an indispensable precondition for innovation-driven competitiveness. Indeed, 60% of exporting from European firms – and 74% from firms with cutting-edge innovation – signal clearly that the intra-EU market fragmentation (due to different national consumer protection standards, value-added tax, labelling, and licensing requirements) is still a big obstacle to business opportunities.
[86] European Commission (2025) A Competitiveness Compass for the EU - COM (2025) 30 finals.
[87] A detailed description of Digital Decade Policy Programme 2030 and 2025 Competitive Compass can be found in the **Annex**.
[88] Decision (EU) 2022/2481 establishing the Digital Decade Policy Programme 2030.
[89] The DESI (Digital Economy and Society Index) is the set of indicators through which the European Commission has monitored the "digital performance" of EU companies and Member States since 2015. It was updated in 2021 to align with the Digital Decade Compass.
[90] European Commission (2025) A Competitiveness Compass for the EU, cit.

ecosystems. Moreover, the Compass integrates several flagship initiatives designed to advance the objectives of the Digital Decade, including the forthcoming Digital Networks Act (proposal expected in Q4 2025) and the Cloud and AI Development Act (proposal expected in Q1 2026).

This report examines Europe's approach to digital transformation, with particular attention to the mutually reinforcing roles of innovation and productivity in sustaining long-term competitiveness. It evaluates how current EU policy frameworks contribute to these objectives, assessing whether ongoing initiatives are delivering results or require strategic recalibration.

Section 2 analyses the EU's performance across the core drivers of innovation-led competitiveness, benchmarking outcomes against those of the United States. Section 3 delves more deeply into the adoption and diffusion of ICT across Member States, focusing on three foundational pillars of digitalisation: advanced connectivity, cloud infrastructures, and artificial intelligence. Section 4 concludes by synthesising the main findings and presenting policy recommendations to enhance the effectiveness of Europe's innovation and digital transformation agendas.

As complements to the report's main sections, three thematic appendices are included: A) The Mid-Tech Trap and Access to Finance, B) Strategic Autonomy and the Cloud and AI Development Act, and C) Digital and ICT Ecosystems Orchestration. These appendices offer deeper analyses of key cross-cutting issues and are structured as appendices to facilitate readability and coherence. They are, however, consistently referenced throughout the report, forming an integral part of its overall analytical narrative and argumentation.

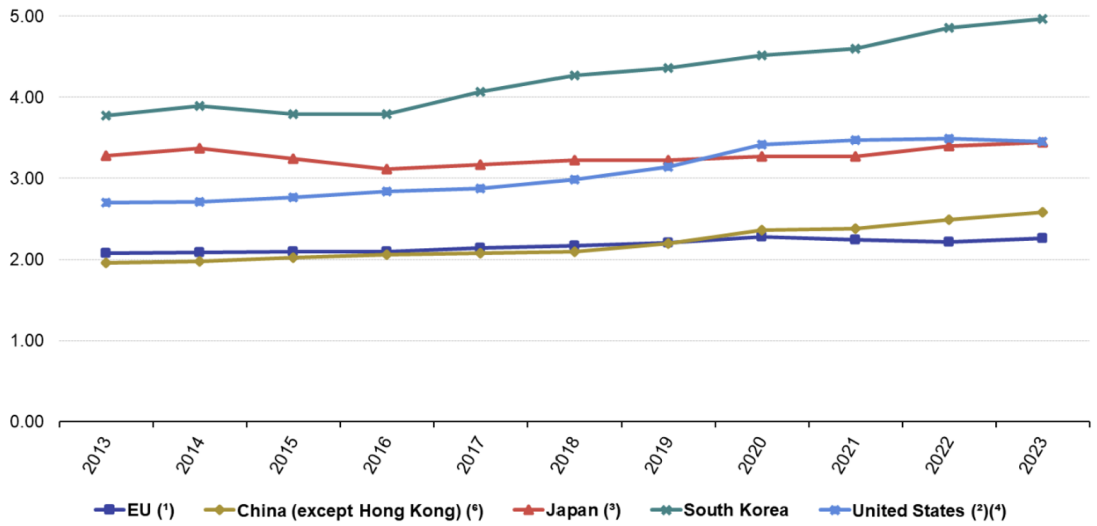
2. Competitiveness Drivers in EU and US

2.1 R&D, Sector Specialisation and Productivity

It is widely recognised that the European Union faces persistent gaps compared with other major economies in both research and development (R&D) and productivity performance.

The EU R&D expenditure (GERD), as a percentage of GDP, remains stagnant and significantly lower than that of the United States and other major economies - a pattern that has persisted for a considerable period (**Figure 2**). In 2023, the EU devoted 2.26% of its GDP to R&D, well below the figure recorded in the United States (3.45%), Japan (3.44%), and the global frontrunner South Korea (4.96%). China reached 2.58%, continuing to increase its spending and further widening its positive divergence from the EU.

Figure 2 – Gross domestic expenditure on R&D (GERD) as % of GDP, 2013-2023



Source: Eurostat and OECD database

It is important to underline that this EU-US gap in R&D is not due to differences in public investment, but rather to starkly different levels of private sector involvement (Business Expenditure on Research and Development, BERD). In fact, public R&D percentage of GDP was relatively similar in both regions - approximately 0.7% in 2023. However, it is also crucial to note that public R&D funding in the EU is often fragmented across national programmes and lacks the strategic coordination characteristic of federal R&D in the US. As a result, the effectiveness and impact of public R&D investment may differ significantly between the two economies. [91]

[91] In the United States, almost all public R&D spending is financed directly from the federal budget. In the European Union, by contrast, around 95% in 2021 comes from the budgets of the 27 Member States, with only a small share provided at EU level. Crucially, these national public R&D investments are not systematically coordinated to align with EU-wide strategic priorities, resulting in fragmentation and missed opportunities for scale. In 2023 more than half of the EU member states public R&D

When examining the world's leading private R&D investors, US-based companies dominate the rankings: six of the top-ten and twelve of the top-twenty firms are headquartered in the United States. In contrast, the European Union counts only one company among the top ten and two among the top twenty. As a result, the aggregate share of global Business Expenditure on R&D (BERD) attributable to US firms is more than twice that of the EU: 42.3% versus 18.7%.

One key factor underlying this phenomenon is the structure of corporate financing in Europe, which is predominantly based on debt financing. This model is poorly suited to support both (i) R&D and innovation-enhancing activities, and (ii) other intangible investment, which are critical to the productivity return of ICT investments. By contrast, firms in the United States benefit from substantially greater access to equity financing and venture capital[92], which are more appropriate for funding high-risk, intangible-intensive innovation: indeed, being able to raise equity finance makes firms 13 percentage points more likely to innovate.[93] (see **Appendix A**)

This gap becomes even more striking when focusing the R&D-intensive digital sectors - specifically ICT hardware and software. In terms of private sector investment, US companies account for 53% of total global digital R&D, while the combined contribution of EU-based digital firms amounts to only 8.9% (**Figure 3**). China has markedly strengthened its position, increasing its share of global digital R&D from 7.1% in 2014 to 19.4% in 2023. During the same period, the EU's share declined from 13.7% to 8.9%, highlighting a persistent and widening digital innovation gap. [94]

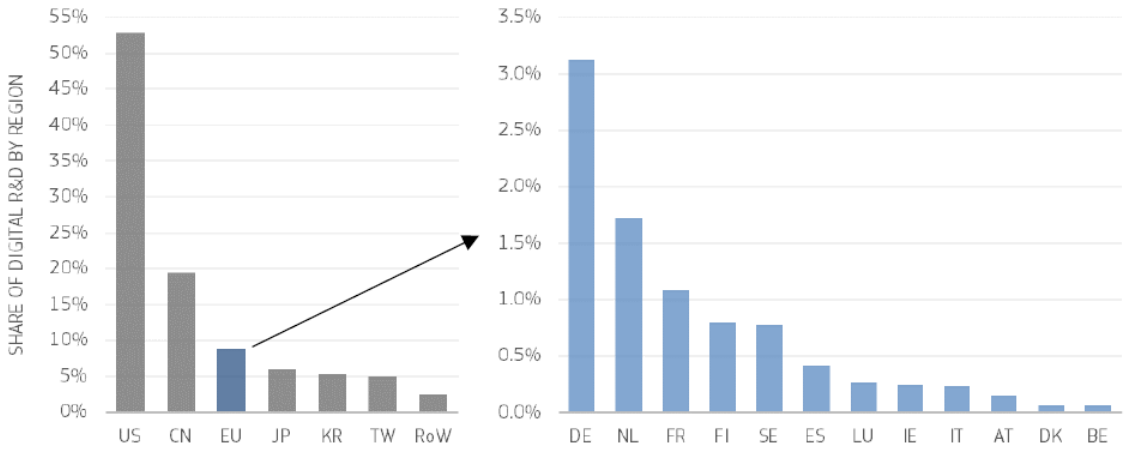
Figure 3 – R&D investment shares by global region and EU countries in digital sectors, 2023

budget - 52.47% - is allocated through "undirected funding" aimed at the general advancement of scientific knowledge, enabling researchers to pursue innovative ideas, that may not necessarily align with immediate policy goals or EU-wide priorities. Thus, funding directed towards specific, predefined socio-economic objectives within EU governments accounts for 47.53%. In contrast, the US allocates a staggering 92.15% to such predefined mission-oriented objectives, while China, Japan and South Korea allocate 69.46%, 68.98% and 79.51% respectively. See, Benoit F., Karvounaraki A., Stevenson A., Ravet J. (2025) EU R&D Investments explained – EU commission – R&I paper series.

[92] The average market capitalisation of US companies has historically been much higher than that of European companies, with the gap having widened significantly since 2010. In 2022, US companies achieved, on average, a market capitalisation that was 3.3 times higher than that of EU companies. See Gati Z., Lambert C., Ranucci D., et al, (2024), Examining the causes and consequences of the recent listing gap between the United States and Europe, European Central Bank, available at: https://www.ecb.europa.eu/press/fie/box/html/ecb.fiebox202406_07.en.html.

[93] European Investment Bank (2025) Investment Report 2024/2025: Innovation, integration and simplification in Europe

[94] See, Nindl E., Napolitano L., Confraria H., Rentocchini F., Fako P., Gavinan J. and Tuebke, A. (2024) The 2024 EU Industrial R&D Investment Scoreboard, EU Joint Research Centre.



Source: The 2024 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG R&I

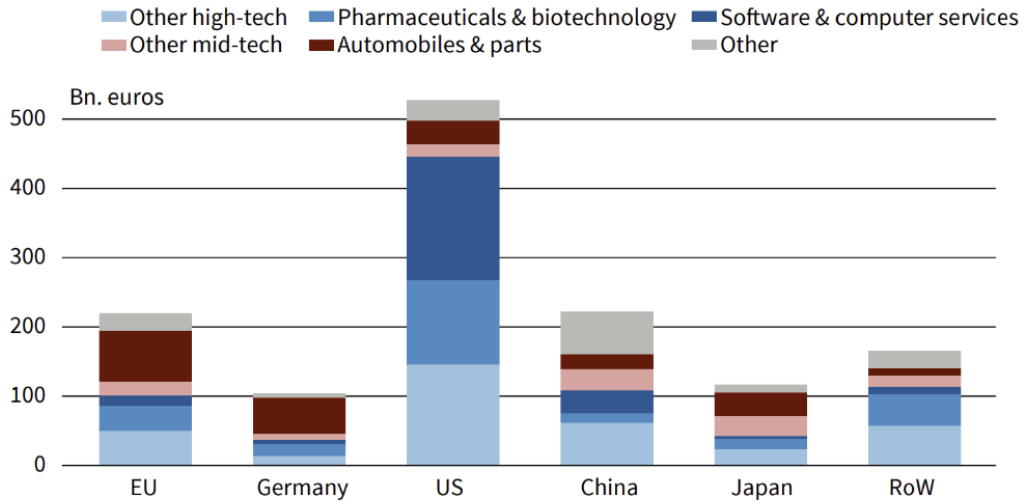
World's top four R&D investors are US-based digital companies - Alphabet, Meta, Apple, and Microsoft - whereas the only two EU companies among the top 20 are in the automotive sector (Volkswagen and Mercedes-Benz).[95] Among the top 50 digital companies, only three are headquartered in the EU: SAP, Siemens, and Ericsson, with Nokia and ASML closely following.

This pattern reflects, firstly, the significantly larger size of US (tech) firms; however, it also points to a broader structural difference in the propensity to invest in R&D across economic sectors. Indeed, the fundamental distinction between Business Expenditure on R&D (BERD) in the two regions is not only quantitative but also sectoral. The United States tends to concentrate its investments in "high-tech" sectors, notably software, computing, and biotechnology, whereas European firms invest more heavily in "medium-tech" industries such as automotive, chemicals, and transportation. [96]

This imbalance may itself represent a challenge, as it suggests that Europe could be facing a so-called "mid-tech trap" — discussed in greater detail in **Appendix A**. This condition describes economies and firms that remain concentrated in mature industries with limited potential for high-growth innovation[97] (**Figure 4**).

Figure 4 - BERD by technology level, top 2500 companies

[95] In 2023, the automotive sector accounts for 34.2% of total EU business R&D expenditure, representing approximately €73 billion annually, which makes Europe the world's largest investor in automotive, surpassing Japan (€33.6 billion), the US (€33.6 billion), and China (€22.2 billion).
[96] Meyers Z. (2025) A framework for understanding EU competitiveness – CERRE Report.
[97] Fuest, C., Gros, D., Mengel, P., Presidente, G. and Tirole, J. (2024) How to Escape the Middle Technology Trap - A Report by the European Policy Analysis Group.



Source: Dietrich et al (2024) based on data from Industrial R&D Investment Scoreboard (2023)

Due to the mid-tech trap, the relatively lower aggregate business R&D expenditure in Europe can be explained, in the first instance, by a "structural composition effect". This effect arises because R&D-intensity (R&D expenditure as a percentage of revenues) is much higher in those high-tech sectors that are under-represented in the European economy compared to the United States. [98]

However, beyond this structural explanation, there is also evidence of an "intrinsic effect" [99]: EU firms within each industry are characterised by a lower R&D intensity in comparison with their US counterparts.[100] A rational and empirically robust explanation for this is that the R&D stock has a positive impact on productivity that differs markedly between the EU and the US across all macro sectors, as European firms that do invest in R&D tend to face greater difficulty in converting those investments into productivity gains.[101]

As a result, US firms not only benefit from a greater concentration in high-tech industries, which supports the structural effect, but also demonstrate superior efficiency in leveraging R&D investments - not only in high-tech sectors but across the board, even though in the high-tech this gap is much more pronounced.[102]

[98] For example, in 2023, private-sector R&D intensity stood at 4.8% in the automotive industry, 8.2% in ICT hardware, and 10.9% in ICT software. See WIPO (2024), Global Innovation Index 2025: Innovation at a Crossroads; and Nindl E., Napolitano L., et al. (2024) cit. A more granular analysis reveals that Cellular and IoT technologies display particularly high R&D intensity - approximately 19.8% - second only to biotechnology. This is highly relevant from an innovation and competitiveness perspective, given Europe's strong position in Cellular and IoT technologies, where firms such as Ericsson and Nokia rank among the leading global vendors.

[99] The basic difference is that structural effects relate to the relative size of industries within the economy, while intrinsic effects focus on how much companies in those industries invest in R&D in each economy.

[100] Ortega-Argilés R., Brandsma A. (2010) EU-US differences in the size of R&D intensive firms: do they explain the overall R&D intensity gap?, Science and Public Policy, Volume 37, Issue 6, Pages 429–441; Moncada-Paternò-Castello P., Grassano N. (2022), The EU vs US corporate R&D intensity gap: investigating key sectors and firms, in Industrial and Corporate Change, Volume 31, Issue 1, 19–38; Adilbish O-E, Cerdeiro D., et al. (2025) Europe's productivity weakness: Firm-level roots and remedies – CEPR VOXEU Colums , available at: https://cepr.org/voxeu/columns/europes-productivity-weakness-firm-level-roots-and-remedies

[101] Ortega-Argilés R., Piva M., Vivarelli M. (2014) The transatlantic productivity gap: is R&D the main culprit? Can. J. Econ. 47, 1342–1371.; Nindl E., Napolitano L., Confraria H., Rentocchini F., Fako P., Gavinan J. and Tuebke, A. (2024), cit.

[102] See, Castellani D., Piva M., Schubert T., Vivarelli M. (2019) R&D and productivity in the US and the EU: Sectoral specificities and differences in the crisis, Technological Forecasting and Social Change, Volume 138, 2019, Pages 279-291.

Thus, the EU faces two intertwined challenges: (i) a lower overall level of business expenditure in R&D, and (ii) weaker productivity returns from R&D spending, regardless of industry. While much of the policy debate has so far concentrated on increasing R&D[103], it must be considered that lower R&D investment may just be a rational response by firms to a lower expected return due to a limited ability to convert R&D into productivity gains. So, merely pushing for more R&D investment by the private (or public) sector - even if probably necessary - may be insufficient.

Importantly, the relatively lower R&D stock among EU firms may be even more significant at the firm level than at the aggregate level. If R&D effectiveness is subject to a "threshold effect", only large-scale investments are likely to yield substantial productivity gains.[104] This consideration also underscores structural constraints within the EU, such as the smaller average scale of firms and the fragmented nature of both public and private R&D funding and industrial policies. [105]

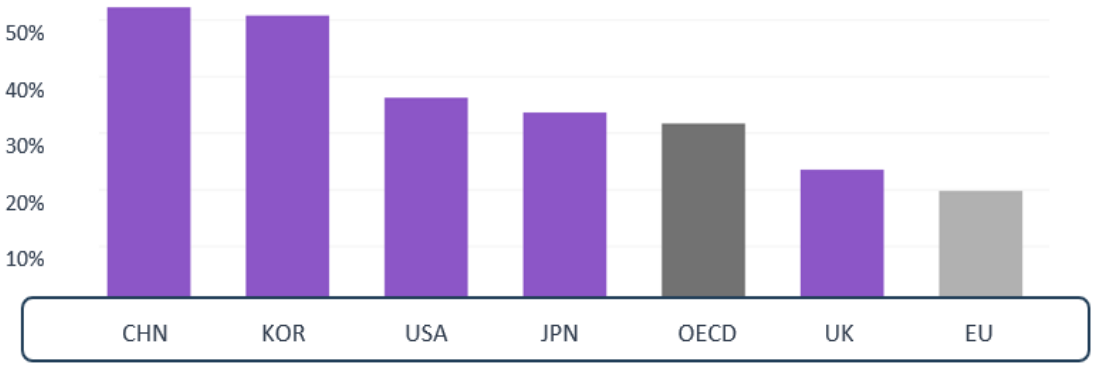
2.2 R&D, Patents and the Innovation Chain

The concentration of EU R&D investment in the automotive and other medium-technology industries, combined with the relatively lower effectiveness of this spending, has a compounding negative effect on innovation performance and widens the technological gap in productivity-enhancing technologies, particularly in digital domains.[106]

Beyond its impact on productivity, the contribution of R&D to innovation-based competitiveness is typically assessed by examining how efficiently private and public organisations transform R&D investments into viable "new ideas," notably patents.[107] Looking specifically at the percentage of ICT-related patents[108] (**Figure 5**), it is evident that the EU, with 19.7% of its total IP5 patent families,[109] lags significantly behind other major economies, as well as the OECD average.

[103] Also, the Draghi report emphasises that "*failure to meet the 3% target for R&D expenditure set by EU leaders over two decades ago is a fundamental reason why the EU lags behind the US and China*".
[104] See, Castellani D., Piva M., Schubert T., Vivarelli M. (2019), cit.
[105] See, Bianchini N., Ancona, L. (2023) Artificial intelligence: Europe needs to start dreaming again. Schuman Papers n°728.
[106] European Commission (2024) Science, Research and Innovation Performance of the EU 2024. A competitive Europe for a sustainable future
[107] See, Nindl E., Napolitano L., Confraria H., Rentocchini F., Fako P., Gavinan J. and Tuebke, A. (2024), cit. Although patents, as well as labour productivity assessed in the previous section, is imperfect output indicators of R&D effectiveness (since not all ideas and inventions are patented) they serve as useful proxies for the expected results of R&D investment. More broadly, patents are constantly used as one of the main indicators for "innovation intensity" both in academic research and policy reports. As mere examples: OECD (2009) Patent Statistics Manual; Griliches, Z. (1990) Patent Statistics as Economic Indicators: A Survey, in Journal of Economic Literature, 28, 1661-1707; Acemoglu D., Akcigit U., Kerr W. (2016) Innovation Networks, NBER Working Paper 22783; Aghion, P., Bloom, N., Blundell, R., Griffith, R., Howitt, P. (2005) Competition and Innovation: An Inverted-U Relationship, in Quarterly Journal of Economics, 120(2), 701-728;
[108] ICT patents are identified using International Patent Classification (IPC) codes that encompass thirteen areas: (i) high-speed networks, (ii) mobile communication, (iii) security (e.g. encryption), (iv) sensors, (v) high speed computing, (vi) high capacity data storage, (vii) large capacity information analysis (e.g. big data analytics), (viii) Cognitive computing, (ix) Human interface technologies, (x) Imaging and sound technology, (xi) Information and communication processing technology, (xii) Electronic measuring (e.g. radio navigation), and (xiii) Others (e.g. hybrid computers).
[109] A patent family is a group of patent applications filed in multiple jurisdictions for the same invention, usually based on the priority date of the first filing. An IP5 patent family means the invention has been protected in all five major jurisdictions (EPO – European Patent Office; USPTO – United States Patent and Trademark Office; JPO – Japan Patent Office; KIPO – Korean Intellectual Property Office; CNIPA – China National Intellectual Property Administration). Filing in all IP5 offices is expensive and usually indicates high strategic and commercial value and thus reserved for technologies with large potential markets and long-term strategic importance.

Figure 5 – ICT patents as a share of total IP5 patent families – 2020 data

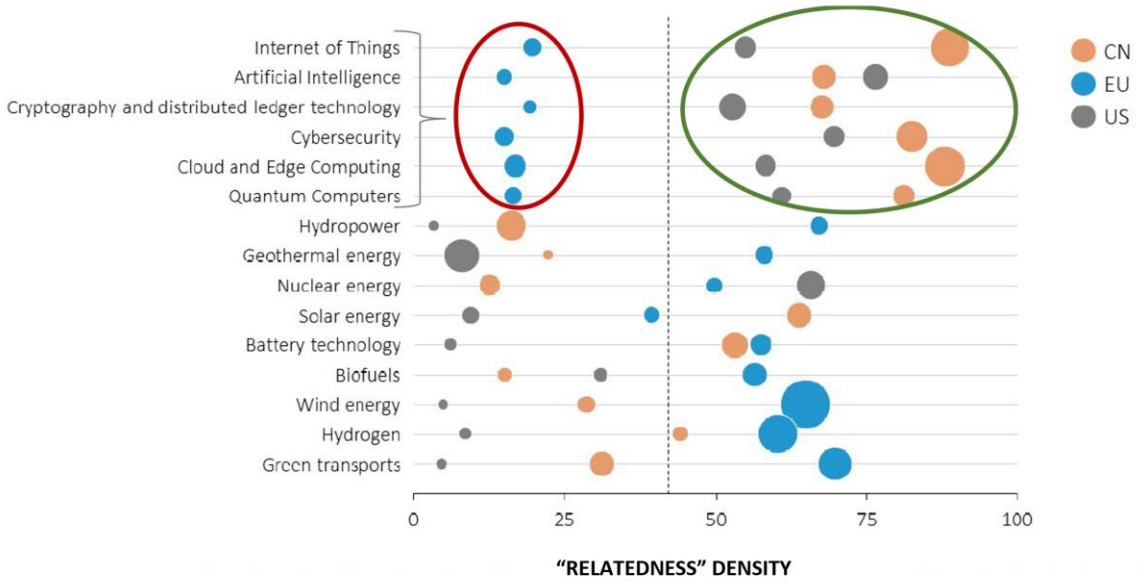


Source: elaboration on OECD STI Micro-data Lab

The EU's weaker performance in ICT patenting, consistent with the "mid-tech trap" narrative, may point to a broader and persistent weakness in innovation-driven competitiveness. As previously noted, since ICT and digital technologies serve as multi-layered general-purpose technology (GPT), the EU's underperformance in ICT-related patenting is likely to have wider repercussions, affecting its position in advanced technologies and deep-tech domains.

This dynamic is at the basis of the meaningful illustration of the competitive positioning of different economies across technological domains, based on patents data (**Figure 6**). In addition to capturing the degree of existing specialisation in patenting for each technology (depicted by bubble size), the analysis gives primary emphasis to the ease with which a country can develop comparative advantage, measured by a "relatedness density" index: the extent to which a technology is related to others in which the country is already competitive. The visualisation clearly shows that, while the European Union maintains strong leadership in clean energy technologies, it exhibits notable weakness in digital and ICT innovation - a gap further amplified by low "relatedness" density. As a result, the EU significantly lags behind the United States and China in these strategic domains.

Figure 6 – EU position in complex technologies and "relatedness density" – 2019/2022



Source: Industrial R&D Investment Scoreboard (2023)

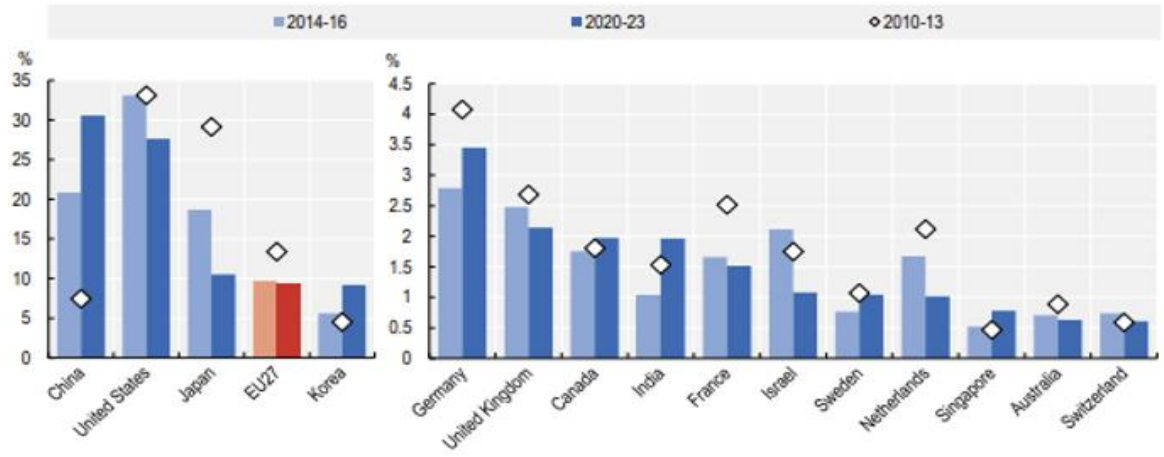
Indeed, also when examining artificial intelligence (AI), data on patent applications in AI-related technologies[110] reveal a pronounced geographical concentration of innovation, with the United States and China accounting for the overwhelming majority of filings. By contrast, both Japan and the European Union lag considerably behind[111] (**Figure 7**). Between 2020 and 2023, inventors from China patents. China's share has risen sharply since

Figure 7- Share of countries in total AI patents, PCT

of total AI patents. By contrast, the United States had a small decline from 33% in 2010–13 to 27% in 2020–23. Japan's contribution fell significantly, from 29% in the early 2010s to 10.5% in the most recent period. The EU27 experienced a decline of about four percentage points compared with 2010–13.

[110] Only filling under the Patent Cooperation Treaty (PCT) are considered, in order to eliminate jurisdictional misalignments. The Patent Cooperation Treaty (PCT), administered by the World Intellectual Property Organisation (WIPO), is an international treaty that streamlines the process of seeking patent protection in multiple countries. Rather than filing separate national or regional patent applications, inventors and applicants can submit a single "international" application under the PCT, which is legally recognised by over 150 contracting states. This simplifies the initial procedural and administrative requirements for protecting an invention globally.

[111] OECD (2025) Identifying emerging AI technologies using patent data: a semi-automated approach – Technical Paper - September 2025; Filippucci F, Gal F, Jona-Lasinio C, Leandro A, Nicoletti G (2024) The impact of Artificial Intelligence on productivity, distribution and growth: Key mechanisms, initial evidence and policy challenges - OECD Artificial Intelligence Papers n 15.



Source: elaboration on OECD, STI Micro-data Lab

This pattern highlights an expanding technological divide in AI innovation further reinforcing the impression that sustained ICT R&D investment is associated with a stronger ability to generate new frontier patents.

The results of this international benchmark on AI patents contrast sharply with another typical indicator of innovation - namely, the number of scientific publications related to AI. In this respect, the European Union demonstrates a strong research base, ranking second worldwide in AI-related scientific output, between China (leading) and the United States (third).[112]

This asymmetry indicates, as widely recognised, that the innovation pipeline in the EU's digital and ICT sectors weakens in subsequent stages of development, since much of the knowledge generated by European researchers fails to translate into patents and/or remains commercially underexploited.[113] This is consistent with the EU relatively low 'R&D-to-patent' elasticity, indicating a weaker conversion of R&D investment into patentable inventions compared to firms in other global regions.[114]

A key factor behind this dynamic is that high-tech R&D in Europe tends, on average, to be less integrated into "innovation clusters" able to enhance capacity to transform research first into patents and then into marketable outcomes as it happens in the US. Such clusters typically include large tech firms, networks of smaller innovators and start-ups, as well as universities and venture capital actors, which play a pivotal role in supporting commercialisation and scaling.[115] Moreover, as described in the following section, US tech firms tend to have much larger in scale and to be vertically integrated, facilitating both an easier transition of innovation to market and its widespread diffusion.

In partial contrast to this general trend, between 2000 and 2023, the EU ranked second worldwide in quantum patenting with around 16% of the total, behind the US (32%) but ahead of Japan (13%) and China (10%). This strong performance likely reflected the prioritisation and coordination at EU level of investments in quantum technologies - €7 billion of public money allocated so far, second only to China's public funding. However, private investment remains a critical weakness. In sharp contrast to

[112] European Commission (2024) Science, Research and Innovation Performance of the EU 2024. A competitive Europe for a sustainable future.
[113] Draghi (2024); Letta (2024).
[114] See, Nindl E., Napolitano L., Confraria H., Rentocchini F., Fako P., Gavinan J. and Tuebke, A. (2024), cit.
[115] Draghi (2024); Letta (2024).

the US and China, where corporate funding drives much of the momentum, none of the world's top ten technology companies by quantum investment are based in the EU: five are American and four are Chinese.

Another innovative yet consolidated industrial segment, where Europe has been traditionally leading, is advance connectivity, cellular and IoT technology. As stressed by both Draghi and Letta, this industrial segment is crucial for the EU due to a few reasons. Firstly, advanced connectivity is a foundational GPT and thus is one of the core drivers and multipliers for innovation and economic growth. Moreover, leadership in connectivity technologies and equipment matters not only in economic terms, but also under public interest and geopolitical viewpoints, as it is key for cyber-resilience and protection of citizens' data as well as strategic to Europe's collective security. Finally, EU-based technology firms, such as Nokia and Ericsson, are very well positioned in the innovation development and global supply of telecom equipment. They devote a very high share of their revenue to R&D – around 19-21% R&D intensity, highlighting that cellular and IoT technology is one of the few high-tech sectors where Europe has maintained a global competitive positioning. Each of these is crucial for innovation-based competitiveness as well as fundamental for securing Europe's competitive edge in such a crucial standard-based industry.[116]

This overall context underscores the need to maintain an intellectual property rights (IPR) framework that enables firms to invest in research and development and foster innovation in such a crucial sector. This is even more critical in the EU, because, as noted above, European innovators have lower expected returns on R&D investments compared to US; and the EU financial system does not adequately support high-risk, long-term innovation projects.

Moreover, main EU technology innovators are not vertically integrated, implying that they cannot directly deploy and commercialise their innovations downstream, free or at low cost, like non-EU large, vertically integrated conglomerates, which can remunerate their investments through sales of products and services to end-user markets.

In such a setting, trade-offs between the upstream and downstream layers of the innovation pipeline may emerge[117]: in order to be more competitive for widespread commercial diffusion and for incremental product innovation, downstream deployers - in the EU, particularly automotive and mid-tech sectors players - may seek short-term cost reductions, while upstream technology developers

[116] "*Europe's competitiveness, technological sovereignty, ability to reduce dependencies and protection of EU values … will also depend on how successful European actors are in standardisation at the international level.*" See European Commission (2022) An EU Strategy on Standardisation – COM (2022) 31 final. Standards definition in the ICT sector is necessary to develop and take advantage of strong economies of scale and network effects. Nevertheless, ICT standardisation has become a core geopolitical lever and European leadership in global standard-setting has been one of the continent's few enduring advantages in digital technologies, particularly in mobile communications, although China has embraced a strategic state-led approach to broaden its influence. See, Mi-jin Kim, Doyoung Eom, and Heejin Lee (2023) The geopolitics of next generation mobile communication standardisation: The case of open RAN, 47 Telecommunications Policy 102625; Faaborg-Andersen S., Lindsay Temes L. (2022) The Geopolitics of Digital Standards.

[117] For a general reference to innovation dynamics in a vertically integrated setting, see Liu X (2016), Vertical integration and innovation, in International Journal of Industrial Organisation, Volume 47, 88-120.

need to rely on stable licensing revenues to recoup R&D investments and sustain future innovation.[118]

Depending on the specific industrial segment, downstream deployers and product innovators are highly diversified. In the case of smartphones, they are almost exclusively large technology companies based in the United States or China which, as noted in the previous section, invest heavily in R&D.[119] However, such investments do not *per se* contribute to increasing EU R&D intensity or to developing EU-specific comparative advantages in competitiveness.[120]

Differently, the R&D downstream investments by EU large deployers in the automotive sector and other mid-tech industries has a twofold effect: on one side, increase the overall EU R&D intensity, but, on the other side, nurture the mid-tech trap. (see **Appendix A**, with regards also of the VC percentage by EU-based companies that is directed to US-based startups). Consequently, maintaining effective incentives for upstream innovation in those high-tech sectors where EU is well-positioned may provide with one element for counteracting its mid-tech path dependency.[121]

In contrast, the downstream R&D investments made by major EU players in the automotive sector and other mid-tech industries have a dual effect: on one hand, they do contribute to raising the overall R&D intensity within the EU; on the other, however, they reinforce the "mid-tech trap." (See **Appendix A**, including data on the proportion of venture capital from EU-based firms directed toward US-based startups.) As a result, sustaining effective incentives for upstream innovation - particularly in high-tech sectors where the EU holds competitive advantages - may offer a crucial means of counteracting this path dependency toward mid-tech specialisation.

That said, given the high number of SMEs in Europe - particularly within the Internet of Things (IoT) sector - fostering their active engagement and participation as EU-based implementers, and potentially as upstream innovators, would significantly strengthen Europe's innovation-driven competitiveness. Such efforts could also help counter the current trend of EU start-ups and scale-ups expanding into the US market (see **Appendix A**), while at the same time promoting incremental

[118] A description and assessment of this composite balance (that in standard-based industry revolves around the FRAND – fair, reasonable and non-discriminatory - concept) falls outside the scope of this report. In very general economic terms, it depends on quite a few factors, at the different levels of innovation chain, e.g., the magnitude and variety of positive spillover into the economy; the different risk and time-horizon of investments; the intensity of R&D (percentage of revenues); the differentiation of revenues, i.e., possibility of remunerating R&D with downstream sales. Overall, all these contribute to determine the different elasticity of the "invention supply" - Shapiro C. (2007) Patent Reform: Aligning Reward and Contribution, in Innovation Policy and the Economy Volume 8, yet in light of the different type of complementarities among innovations and substitutabilities between different complementors - Teece D.J. (2018) Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world, in Research Policy 47.

[119] See De Coninck R., von Muellern C., Zimmermann S., Mueller K. (2022) SEP Royalties, Investment Incentives and Total Welfare – CRA report for Fair Standards Alliance ASBL.

[120] These R&D investments are predominantly made outside Europe, with innovation diffusing downstream on a global scale. Analytically, it would be highly relevant - though empirically challenging - to isolate any share of this R&D spending that yields competitive advantages specifically for the EU. This would include R&D investments explicitly tailored to EU contexts or channelled through EU-based firms via targeted R&D programs. By contrast, infrastructure investments - discussed in more detail in the section below - allow for more straightforward attribution, as they are geographically anchored and more directly linked to downstream technological diffusion. Indeed, as elaborated in Sections 2.3 and 3, the dynamics shift considerably when examining downstream diffusion: once innovations are embedded in globally marketed products and services, the inability of EU firms to adopt or effectively utilise these technologies results in significant competitive disadvantages.

[121] Of course, this mechanism alone is insufficient to break path dependency without complementary policies addressing venture capital gaps, innovation governance, single market fragmentation, and direct support for breakthrough innovation in high-tech sectors. See Fuest, C., Gros, D., Mengel, P., Presidente, G. and Tirole, J. (2024), cit.

innovation and diversification. These dynamics are crucial if Europe is to effectively "capitalise on further waves of digital innovation." [122]

In this regard, the EU could consider promoting industry-led initiatives aimed at integrating innovative SMEs into ecosystems "orchestrated" by its largest technology companies. Such a composite coordination framework could combine: (i) innovation capacity-building, through mentorship, technical training, and intellectual property support; (ii) downstream R&D coordination, via pilot projects, co-innovation spaces, and structured commercialisation pathways; and (iii) network coordination and interoperation. This approach would help strengthen synergies between leading industry actors and SMEs, fostering a more cohesive and dynamic European innovation ecosystem. (see **Appendix C**)

In sum, maintaining an appropriate balance that effectively align incentives along the entire innovation pipeline is crucial for enhancing Europe's competitiveness. On one hand, as discussed in the following section, it is very important to ensure efficient and inclusive pathways from research to market—also by promoting downstream incremental innovation and diversification; on the other hand, it is crucial that this balance does not shift too far toward cost reduction — for instance through a weakening of patent protections, as such tilt would risk undermining the very innovation ecosystem and the innovation-based competitiveness that the EU seeks to reinforce.

2.3 Productivity, Scaling of Tech Companies and ICT Diffusion

In this innovation context, EU's labour productivity (LP) (as well as total factor productivity - TFP) is approximately 20% lower than that of the United States, reflecting a downward trend that began in the mid-90s.[123] (**Figure 8**)

Figure 8 – EU versus US labour productivity 1890 . 1995-2022 (US=100)

[122] Draghi Report.

[123] Bergeaud A. (2024) The past, present and future of European productivity, in European Central Bank Forum report. Moreover, in 1990, the European Union (then comprising 12 member states) accounted for 26.5% of global GDP. Today, despite expanding to 27 member states, the EU's share has declined to 16.1%, while the United States has maintained a stable share of approximately 26%.

Source: Draghi Report (2024)

This productivity gap has been considered the long-tail of "*Europe's failure to capitalise on the first digital revolution led by the internet – both in terms of generating new tech companies and diffusing digital tech into the economy*".[124] As underscored in the Draghi Report, over the past two decades, when the ICT sector (i.e., the manufacturing of computers and electronics and information and communication activities) is excluded, labour productivity growth in the EU has largely mirrored that of the US.

The resulting EU-US productivity balance reflects, in part, the US stronger performance both in sectors where ICT is produced and in sectors that make intensive use of ICT, such as professional, administrative, and support services, as well as finance and insurance. In these industries, the U.S. benefited from an earlier, more widespread, and more effective adoption of ICT technologies, and thus benefits from higher productivity multipliers.[125] On the other hand, as detailed in **Appendix A**, the EU outperforms the US in terms of productivity within mid-tech sectors.

Altogether, this evidence suggests that the EU-US productivity gap is primarily concentrated in two closely related dimensions of the ICT sector: one within the ICT sector - representing the supply side of technologies and digital services - and another in the demand side. The former dimension relates to the creation and scaling of technology-driven firms, an area in which the EU has significantly lagged behind the US in producing globally dominant tech and digital companies (with the few upstream exceptions described in the previous section). The latter dimension, by contrast, is related with the diffusion and effective exploitation of digital technologies across the broader economy, where EU companies (particularly SMEs) have been less successful in translating digital adoption into labour productivity gains.[126]

Regarding the supply-side ICT dimension, the shortage of European digital and technology companies that successfully scale to a global level is a matter of concern for several reasons:

- Weaknesses in EU R&D capacity—both upstream and downstream, depending on the specific ICT segment—and in the commercialisation of key digital innovations, which are critical drivers of productivity. [127]
- Reduced generation of localised spillover effects, which limits the reinforcement of regional innovation clusters and technological hubs.[128]
- Fewer opportunities for the emergence of EU-based "orchestrators" capable of building and coordinating broad-based ecosystems that foster and accelerate technological advancement and diffusion (see **Appendix C**).[129]

[124] Draghi Report.
[125] Indeed, in the OECD, an exogenous $10 billion increase in value added within high-tech sectors has been estimated to lead, over the subsequent three years, to an average productivity gain of 0.22%, compared with a modest 0.02% in low-tech sectors. See Cerra R., Crespi F. (2025) High Tech Economy, Annual Report – CED.
[126] Bergeaud A. (2025), cit.
[127] Marcus S., Rossi M.A. (2024), Strengthening EU digital competitiveness Stoking the engine – RSCAS paper.
[128] Matray A. (2021) The local innovation spillovers of listed firms, in Journal of Financial Economics 141.2 (2021): 395- 412. Financial economics literature shows that geography of firms that are focal for innovation matters: there is a Causal identification of a link between spatial concentration of innovative activities and increases in innovation. Activities of listed firms' research labs have a direct effect on innovation of local private firms.
[129] European Commission (2024) White Paper: How to master Europe's digital infrastructure needs? - COM (2024) 81 final.

- A lack of technological and digital leadership, which diminishes the EU's ability to shape the trajectory of technological and digital developments—and their applications—in ways that reflect European values and principles. This, in essence, strikes at the core of what is meant by "digital or technological sovereignty". [130]

In sum, although digital technologies and services are obviously globally accessible, where technology-driven firms are based and invest brings significant economic and geopolitical meaning - currently the EU depends on foreign countries for over 80% of its digital products, services and infrastructure.[131] In this regard, Draghi and, consequently, the Competitiveness Compass point at the need to reduce EU external dependencies which "could become vulnerabilities in a situation where trade fragments along geopolitical lines."[132]

This notion of "strategic autonomy" is examined in greater details in the **Appendix B**; however, it is important to highlight here some inherent and crucial trade-offs – points also emphasised by Draghi, who noted that any such policy should be:

- "*based on careful, case-by-case analysis*", targeting industry segments with genuine strategic value and security needs; and
- balanced, meaning that "*the EU must find a middle way between promoting its domestic [cloud] industry and ensuring access to the technologies it needs*".[133]

First, non-EU providers are not only selling digital services within the European market but are also actively building their own digital ecosystems, across multiple levels of the material–immaterial continuum.[134] This includes investments in tangible assets such as data centres, content delivery networks, research facilities, and workforce development. [135] In particular, investments in EU-localised digital infrastructures involve significant irreversible location-specific investments[136] - which are potentially stranded costs[137], creating exit barriers. In other words, the greater the investment, the stronger the interdependence between US tech and digital companies and the European digital economy, and, consequently, the lower the risk of "geopolitical weaponisation".

In this regard, according to BEREC, total global investment in internet infrastructure – comprising hosting, transport and delivery - by major user-facing US tech companies amounted around 751 billion euros over the period 2011–2021. This includes 75 billion euros in 2011-2013; 260 billion euros in

[130] Indeed "sovereignty" is a political concept that finds its foundation into the factual capacity of making political visions and legal provisions effective. EU digital sovereignty thus refers to the political capacity to decide how the technology would impact on EU people and EU core values and principles, without being conditioned externally by being dependent technically and/or economically.

[131] European Commission (2024) Report on the state of the Digital Decade 2024.

[132] Draghi Report (2024).

[133] Ibidem.

[134] Manganelli A., Nicita A. (2022) Regulating digital markets. The Eu approach.

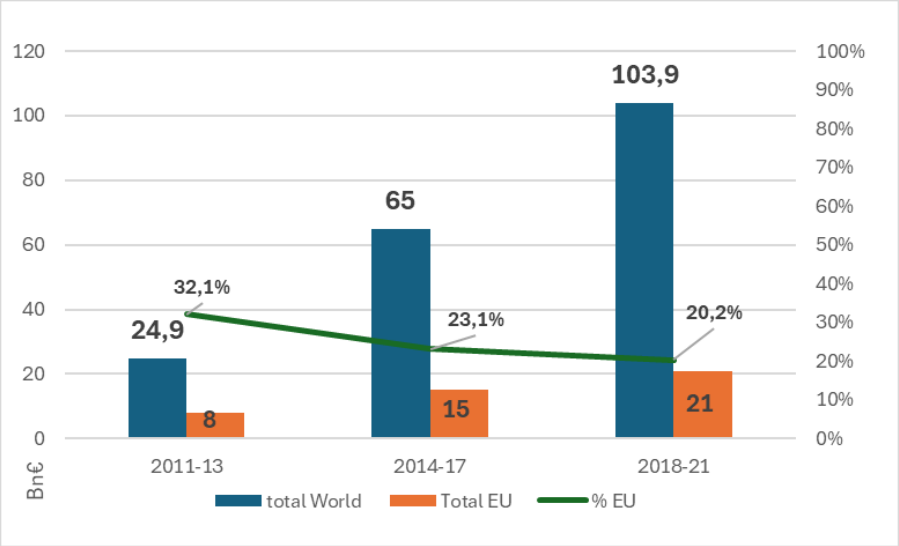
[135] Bauer M., Pandya D. (2024) ICT Beyond Borders: The Integral Role of US Tech in Europe's Digital Economy, ECIPE Policy Brief 06/2024; BEREC (2024) Report on the entry of large content and application providers into the markets for electronic communications networks and services – BoR (24) 139.

[136] Differently from classical hold-up theory, where the anticipation of opportunistic behaviour ex post discourages ex ante relationship-specific investments, which in most cases do not take place, in this context such investments have already occurred.

[137] Note that these stranded costs are "potential" not definitively stranded costs. This distinction is important since these costs become stranded only if geopolitical weaponisation occurs. Under normal market conditions, the company continues operating profitably. Thus, this is all about risk reduction through the creation of "interdependence" - the investments reduce the probability that either side would pursue weaponisation, because both sides would face significant costs from doing so.

2014-2017; and 416 billion euros in 2018-2021.[138] Specifically, within Europe, the average annual investment in internet infrastructure for these firms was around 170 billion euros over the same period 2011-2021, representing roughly 23% of their global spending (**Figure 9**).[139]

Figure 9 - Average annual expenditure by large global CAPs for internet infrastructures (hosting, delivery, transport)



Source: Elaboration on BEREC (2024) from Analysys Mason (2022) data

Second, any limitation on the supply of digital services from non-EU providers requires careful consideration, given their current pivotal role in Europe's digital transformation. Achieving greater independence too rapidly in the short term could entail significant risks—such as slower diffusion of digital technologies, lower service quality, and reduced consumer choice. This trade-off underscores the inherent complexity of the EU's industrial and digital policy landscape[140]: striking the right balance is therefore crucial to ensure that efforts to enhance strategic autonomy do not inadvertently undermine the very innovation cycle that the Competition Compass seeks to accelerate.

Regarding the demand-side, namely, the diffusion of ICT and digital services across the broader economy, the causal relationship between ICT investment and labour productivity gains is well established, yet it encompasses two interrelated key dimensions: (i) level of adoption and (ii) effectiveness of usage. Achieving productivity enhancement therefore depends on progress in both areas. Equally, for policymakers, it is essential to monitor not only the extent of ICT adoption but also how effectively these technologies are used to generate tangible economic outcomes.

This distinction is supported by econometric evidence showing that, even when European firms invested in ICT, the resulting productivity gains achieved were more modest than those recorded in the United States over the entire period 1995-2019.[141] Recent empirical analysis further reveal that

[138] BEREC (2024), cit. - based on Analysys Mason (2022) The Impact of tech companies' network investment on the economics of broadband ISPs.
[139] The decreasing percentage, from 32.1% to 20.2%, does not seem to be indicating a gradual decoupling, yeti t seems the effect of increasing investment trends in other part of the world. However, it would be interesting to see updated data for the following period.
[140] Mayers Z. (2025), cit.
[141] Cette, G., Devillard, A., & Spiezia, V. (2022). Growth factors in developed countries: A 1960–2019 growth accounting decomposition. Comparative Economic.Studies, 1-27.

the marked transatlantic productivity divergence observed between 1995 and 2005 stems not only from differences in the volume of ICT investment, but more importantly from EU firms' limited ability to effectively exploit ICT infrastructure, and this inefficiency is estimated to account for approximately 80% of the observed productivity gap.[142]

Indeed, while digitalisation and the diffusion of GPTs offer substantial potential benefits to economy and society, these benefits are neither automatic nor immediate.

Realising productivity gains from ICT adoption requires strategic commitment of resources, and development of complementary skills and investments, both at the firm and workforce level, moreover organisational and sectoral restructuring around the new technological capabilities is often necessary. All these can be categorised as investments in non-R&D intangible assets (which are often partially measured in national accounts).

Therefore, ICT diffusion boosts productivity primarily among firms that also invest in complementary capabilities and intangible capital that enhance the effectiveness of ICT adoption - such as organisational expertise, human capital and training, software, brand equity, data assets. [143] Firms lacking such complementarities may fail to translate digital investments into productivity improvements. [144]

There is, again, a structural dimension related to firm size since the productivity gains from digitalisation vary significantly across companies of different scales. Larger firms are generally better positioned to realise productivity gains from digital technologies because they have more resources for complementary investments and can spread the fixed costs of digital adoption over a broader revenue base.[145] This dynamic helps to explain the greater difficulties faced by European firms in adopting digital technologies: SMEs constitute 99.8% of all EU businesses, with micro-enterprises (those with fewer than 10 employees) alone accounting for 93.3%. In contrast, only 0.2% of EU firms have more than 250 employees. [146]

In the context of the EU–US comparison, intangible assets represent approximately 20% of total assets in the EU, compared to 50% in the United States. When the asset boundary is extended to include intangible assets not captured in national accounts—primarily non-R&D-related intangibles—the share increases for both regions, yet a substantial gap remains - intangibles account for about 40% of total assets in the EU versus 60% in the US. This persistent disparity may represent an additional structural factor contributing to the long-standing transatlantic productivity gap.[147]

[142] Gordon R.J., Sayed H. (2020) Transatlantic technologies: The role of ICT on the evolution of U.S. And European productivity growth, in International Productivity Monitor, 38 (2020), pp. 50-80; Bloom N., Sadun, R., Van Reenen J. (2012) Americans Do IT Better: US Multinationals and the Productivity Miracle, in American Economic Review 102, 167-201.

[143]Corrado C., Haskel J., Jona-Lasinio C., Iommi M. (2016) Intangible investment in the EU and US before and since the Great Recession and its contribution to productivity growth - EIB Working Papers 2016 / 08; Nikolov P., Simons W., Turrini A., Voigt P. (2024) Mid-Tech Europe? A Sectoral Account on Total Factor Productivity Growth from the Latest Vintage of the EU-KLEMs Database – EU commission Discussion Paper 208, July 2024.

[144] Nucci F., Puccioni C., Ricchi O. (2022) Digital Technologies and Productivity: a firm-level investigation for Italy, MEF WP N°3 - April 2022; Anghel B, Bunel S.et al. (2024) Digitalisation and Productivity - ECB Occasional Paper No. 2024/339.

[145] Anderton R., Botelho V., Reimers P. (2023) Digitalisation and productivity: gamechanger or sideshow?, ECB working paper series, No 2794.

[146] See, Draghi Report.

[147] Corrado C., Haskel J., Jona-Lasinio C., Iommi M. (2016), cit.

Finally, it is important to emphasise that productivity gains from ICT adoption, even for firms undertaking complementary investments, are not immediate but instead require time to materialise.[148] In the short term, even negative effects on productivity may emerge because of these "digital disruption costs".[149] Indeed, such transformations - encompassing workforce upskilling, organisational restructuring, and process reengineering - are often time-consuming and complex, characterised by high uncertainty and significant resistance to change.

Delays in obtaining positive outcomes from diffusion and adoption of ICT and digital technologies have been always empirically observed: firms making significant digital investments tend to improve both labour productivity (LP) and total factor productivity (TFP), yet, typically with a lag of several years, on average, five years post-adoption.[150] This enduring phenomenon of misalignment between sustained investment in digital technologies and the slower-than-expected growth in productivity indicators is known as the "productivity paradox" of information technology.[151]

Building on this background, the following section 3 carries out and in-depth assessment of the diffusion of ICT and digital services in the EU, focusing on three foundational pillars of the digital transformation: advanced connectivity, cloud infrastructures, and artificial intelligence.

[148] Brynjolfsson E., Rock D., Syverson C. (2021) The Productivity J-Curve: How Intangibles Complement General Purpose Technologies, in American Economic Journal: Macroeconomics vol. 13, no. 1, January 2021, (pp. 333–72).
[149] Pérez C.J., Ponce C.J. (2015) Disruption costs, learning by doing, and technology adoption, in International Journal of Industrial Organisation, Volume 41, 64-75.
[150] E.g., Brindusa A, Bunel S (2024) Digitalisation and productivity, ECB Occasional Paper Series n. 339; Brynjolfsson E., Hitt L.M. (2003) Computing Productivity: Firm-Level Evidence. Review of Economics and Statistics 85, 793-808.
[151] Brynjolfsson E. (1993) The productivity paradox of information technology - Communications of the ACM. 36 (12): 66–77.

3. Diffusion of ICT and Digital Technology

3.1 The Dynamic of Digital Technology Diffusion

The transformation of innovation into sustainable productivity growth and welfare gains ultimately depends on the broad-based adoption and effective utilisation of technologies by firms, public institutions, and individuals. Such adoption often occurs not through radical breakthroughs, but through successive waves of incremental innovation. Moreover, without a clear pathway from research to market, even the most advanced innovations may fail to yield economic returns, weakening both the business case for innovation and the dynamic efficiency of the broader system.

Digitalisation transformation, referring to the process of using ICT and digital technologies and embedding them into everyday economic and social activities, is one of the main forces driving structural and organisational changes in the global economy. Digital technologies and services, by changing business models, creating new revenue streams, and transforming operations or social interactions, can generate positive effects both at micro (productivity gains) and macro (GDP growth) levels. In the meantime, digitalisation generates endogenous vast amounts of complementary innovation and opportunities for cross-fertilisation among previously separate fields.[152]

Therefore, all ICTs should be viewed as a unique networked, multi-layered GPT ecosystem, in which foundational layers support the emergence of successive, higher-order GPTs. Each of these layers satisfies the classic criteria of general-purpose technologies - pervasiveness, potential for continuous improvement, and facilitation of complementary innovations - across various points on the material-immaterial continuum. [153]

Conceptualising ICT in this layered manner helps to explain the cumulative and mutually reinforcing dynamics of digital transformation, where advancements in one layer unlock new possibilities in others. This interplay creates positive feedback loops that can significantly amplify structural productivity growth across the economy.

Indeed, innovation generates positive externalities and scope economies, with new technologies serving as stepping stones for further innovation: for instance, it has been empirically demonstrated that artificial intelligence (AI) innovation exhibits strong dynamic returns, through learning effects, and builds on complementarities with prior developments in network and communication technologies.[154]

Digital transformation encompasses a broad set of changes across sectors, services and technologies. To provide a focused and meaningful analysis, this paper concentrates on three foundational enablers:

[152] Rossi, M. A. (2024) EU technology-specific industrial policy. The case of 5G and 6G, in Telecommunications Policy, 48.
[153] Manganelli A., Nicita A. (2022) Regulating digital markets. The Eu approach.
[154] Igna I., Venturini F. (2023) The determinants of AI innovation across European firms, Research Policy Volume 52, Issue 2, March 2023.

advanced connectivity, cloud computing, and artificial intelligence – which currently form the core infrastructure and intelligence layer of digital and ICT ecosystems.

In the subsequent sections, the economic impact and diffusion level of those key ICT and digital technologies are assessed, in view of the Digital Decade Policy Programme (DDPP) targets, and in constant reference to international benchmarking, particularly vis-à-vis the United States, to gauge the European Union's competitive performance.

Given that these technologies constitute integral components of a multilayered digital ecosystem, it is essential to examine the distinct functional relationships that shape their dynamic interplay in driving productivity gains and fostering economic growth. First, particular attention is devoted to the interaction between the deployment of connectivity networks (connectivity supply) and the adoption of connectivity (connectivity demand) - a relationship that is critical also for the financing and long-term sustainability of infrastructure investment. Equally important is the nexus between connectivity adoption and the diffusion of advanced digital services, such as cloud computing and artificial intelligence, where strong complementarities and feedback effects emerge.

3.2 Impact of BB and Ultra BB Connectivity

Broadband Internet has probably been one of the key priorities for policy makers around the world in the two decades across the last decades since it has been considered as a primary engine for innovation and economic growth.

Over the past two decades, the EU has progressively raised its digital connectivity ambitions: the 2010 Digital Agenda[155] aimed for universal basic broadband (30 Mbps) and coverage for 50% of households at 100 Mbps, while the 2016 Gigabit Society [156] set Gigabit connectivity (i.e., 1 Gbps = 1000 Mbps) as goal of for all main socio-economic drivers (e.g., education, government services, transport hubs, digitally intensive enterprises) and a universal access to at least 100 Mbps - extendable to 1 Gbps, for all European households even in rural and remote areas.

Most recently, the 2021 Digital Compass states that "*it is our proposed level of ambition that by 2030 all European households will be covered by a Gigabit network, with all populated areas covered by 5G*".[157] These targets have been confirmed and coupled with a compelling enforcement system by the Digital Decade Policy Programme (DDPP 2030), which also calls for the deployment of 10,000 secure edge computing nodes and investment in quantum computing infrastructures. (see the **Annex**)

The evolving EU industrial policy rests on the foundational assumption that the increased deployment of fixed and mobile broadband is positively associated with economic development. This principle underpins much of the European Union's digital and industrial strategy, which recognises broadband infrastructures not merely as utility assets, but as a general-purpose technology (GPT) — characterised

[155] European Commission (2010) Communication on A Digital Agenda for Europe—COM (2010) 0245.
[156] European Commission (2016) Communication on Connectivity for a Competitive Digital Single Market—Towards a European Gigabit Society— COM (2016) 587 Final.
[157]European Commission (2021) Digital Compass 2030, The European way for the Digital Decade – COM 2021/118 final.

by wide applicability, and by their ability to generate pervasive positive externalities, productivity gains, and broad-based economic growth across both the digital ecosystem and the wider economy.

As with all GPTs, the transformative potential of ultra-broadband (UBB) arises primarily from its complementarity with other innovations, enabling both process improvements and the creation of new digital products and services. Today, advanced network connectivity is considered essential not only for communications but also for next-generation digital activities — including artificial intelligence (AI), virtual and augmented reality (VR/AR), commercial and industrial Internet of Things (IoT) applications. These technologies are progressively migrating toward edge-cloud architectures, thereby requiring ubiquitous, robust and secure high-speed fixed and mobile connectivity.

As for general efficiency enhancement, BB has always considered a driver to stimulate productivity by lowering costs and facilitating more efficient business processes while enabling innovation and new business models through, for example, e-commerce, big data analytics, and remote collaboration.[158] The extensive use of the Internet reduces the cost of information, enables remote working, cuts production and distribution times, optimises business processes, increases innovation capacity and provides access to training channels to improve the quality of the workforce. [159] For consumers and workers broadband access supports digital skill acquisition, lowers barriers to ICT services, and improves access to information, education, and employment opportunities.

Generally speaking, the economic literature agrees on the positive impact of broadband and ultra-broadband on economic growth: quite a few seminal analyses recognised a strong positive causal effect of the deployment of telecommunications networks and services on GDP growth. [160] However, most of this first wave of literature does not refer to fibre /Very High-Capacity Networks (VHCN) connectivity and/or do not consider the level of adoption of connectivity as a crucial variable.[161]

The most recent studies, specific to UBB and fibre investments, have confirmed those positive results, yet with some limitations. In summary, (i) UBB and fibre investment have a positive incremental effect on economic growth, however (ii) returns on such investments decrease as installed speed/capacity and coverage increases - potentially meaning that 100% fibre coverage may not be the socially optimal choice; and (iii) adoption of connectivity services to substantial proportions of the population is more important in driving economic growth than the mere network deployment.[162]

[158] Bakhshi H., & Mateos-Garcia J. (2012) Rise of the Datavores: How UK Businesses Can Benefit from Their Data. London: Nesta.

[159] Briglauer W., Cambini C., Gugler K., Sabatino L. (2025), Economic Benefits of High-Speed Broadband Network Coverage and Service Adoption: Evidence from OECD Member States, In Industrial and Corporate Change, pp. 1-40.

[160] Roller L. e Waverman L. (2001) Telecommunications Infrastructure and Economic Development: A Simultaneous Approachin American Economic Review. 91(4): 909-923; Czernic N., O. Falk, T. Kretschmer e L. Woessmann (2011), Broadband Infastructure and Economic Growth, in The Economic Journal, 121, 505-532; Gruber H., J.Hätönen, P.Koutroumpis, (2014), Broadband access in the EU: An assessment of future economic benefits, in Telecommunications Policy, 38(11), 1046-1058.

[161] Most of analysis relates to instances in which end users were unconnected or connected to very low bandwidth connections and are ulteriorly connected to functional broadband (still <100Mbps). Most of them are empirical studies based on data up to 2012 and therefore are not directly related with the current connectivity targets, as connectivity targets are not aiming to increase broadband penetration but rather achieve full EU-wide coverage to gigabit-capable networks.

[162] Briglauer, W. e Gugler, K.P. (2018), Go for Gigabit? First Evidence on Economic Benefits of (Ultra-)Fast Broadband Technologies in Europe, in Journal of Common Market Studies, 57(5), 1071–1090; Koutroumpis, P. (2019) The economic impact of broadband: Evidence from OECD countries, in Technological Forecasting and Social Change, 148, 119719; Briglauer W., Cambini C., Gugler K., Sabatino L. (2025) Economic Benefits of High-Speed Broadband Network Coverage and Service Adoption: Evidence from OECD Member States, In Industrial and Corporate Change, pp. 1-40.

There is a further new strand of economic literature that examines the relationship between ultra/broadband access and business development and productivity, showing that technological innovation and high connection speeds have a positive effect on (i) productivity of firms, both in terms of total factor productivity (TFP) and labour productivity (LP);[163] and on (ii) the entry of new firms in those sectors with greater use of digital technologies and large proportions of highly skilled workers.[164] However, as with the impact on economic growth, the productivity-enhancing effect of broadband is substantial but subject to diminishing returns once a certain quality threshold is reached. In addition, the positive socioeconomic effects materialise only when broadband is actively adopted and utilised on the demand side, rather than through mere availability on the supply side. [165]

Importantly, all these findings align with studies indicating that investments in ICT yield productivity gains only or mainly when accompanied by complementary measures and non-R&D intangible assets, such as staff training, adoption of new organisational practices and software adoption.[166] This indirectly confirms again that the uptake and effective utilisation of broadband services are critical to generate economic impact, compared to the mere availability of the technology itself (that represents however a pre-requisite).

3.3 Diffusion of Connectivity and the Role of EU Targets

In 2024 Europe's FTTH households coverage reached an estimated 69.2% - better than South Korea's 67.4% and the USA's 54.8% - and with a significant annual growth of 8.4%; while, the overall Europe's gigabit-capable coverage (≈VHCN[167]) reached an estimated 82.5% in 2024, with an annual growth of 4.5, as compared to the higher figures in China with 99.0%, in South Korea with 97.6%, in the USA with 90.3%, and in Japan with 93.9%.[168]

As for mobile networks, EU 5G average coverage is 94% of the population in 2024, which is comparable with other regions of the world; however, the actual 5G take-up in Europe (35.6%) is currently much lower compared to the US (96.5%) and China (73.1%). Furthermore, when looking at the coverage of

[163] Cambini C., Grinza E. Sabatino L. (2023) Cambini, C., Grinza, E., & Sabatino, L. (2023) Ultra-fast broadband access and productivity: Evidence from Italian firms, in International Journal of Industrial Organisation, 86, 102901.
[164] Cambini, C., Sabatino, L. (2023) Digital highways and firm turnover, in Journal of economics & management strategy, 32(4), 673-713.
[165] Briglauer, W., Krämer, J., Palan, N. (2024) Socioeconomic benefits of high-speed broadband availability and service adoption: A survey, in Telecommunications Policy, 48(6).
[166] Brynjolfsson E., Rock D., Syverson C. (2019) Artificial Intelligence and the Modern Productivity Paradox: A Clash of Expectations and Statistics, in A. Agrawal, J. Gans, & A. Goldfarb, The Economics of Artificial Intelligence (pp. 23-60); Nucci F., Puccioni C., Ricchi O. (2022), cit.; Corrado C., Haskel J., Jona-Lasinio C., Iommi M. (2016), cit.
[167] One of the main objectives of the European Code of Electronic Communication - Directive UE 2018/1972 - is to "promote connectivity and access to, and take-up of, very high-capacity networks, including fixed, mobile and wireless networks, by all citizens and businesses of the Union". Consistently with the technological neutrality principle, the definition of VHCNs, at art 2(2) of the Code - serves the purpose of defining minimum performance standards that ensure adequate levels of connectivity: those standards are today more easily achievable through fiber-optic technologies, but it does not exclude the use of alternative technological solutions, provided that these are capable of guaranteeing "similar network performance in terms of available downlink and uplink bandwidth, resilience, error-related parameters, and latency and its variation". From this perspective, Article 82 of the European Code entrusts BEREC with the task of issuing guidelines to specify the technical criteria that a network must meet to be classified as a Very High-Capacity Network (VHCN).
See BEREC, Guidelines on Very High-Capacity Networks (2023) - BoR (23) 164.
[168] Analysis Mason (2024) Report for Connect Europe.

5G stand-alone (SA),[169] it covers only a fraction of the EU population: at the end of 2024, 5G SA coverage of the population reached only 40% in Europe, against 91% in North America and 45% in the Asia-Pacific area, despite the EU almost doubling the number of its commercial 5G SA networks in 2024.[170]

According to the latest "State of the Digital Decade"[171], there is a small delay in the deployment of VHCNs to be able to meet the connectivity target in 2030. Furthermore, while 5G (non-standalone) coverage already exceeds the target trajectory (94.3% in 2024 and expected to reach 100% by 2027, three years ahead of schedule), no specific target exists for 5G Standalone (SA).

Regardless of the EU's performance against the DDPP targets, the economic and econometric evidence presented in the previous section suggests that those targets themselves may be somehow arbitrary, marked by an inefficient supply-side bias rooted in a rationale mixing-up industrial policy and "universal service" type of considerations.

A key effect of very ambitious networks deployment objectives, that are far beyond what market forces can autonomously deliver, is the increase in the scope for public investment and support to fulfil the presumed investment gap.[172] This implies a re-allocation of public funds from other socially desirable objectives, [173] which, under an economic viewpoint[174], should take place only if (i) a significant portion of existing positive externalities are not reflected in the current ultrafast BB demand level, or (ii) there is a willingness to pay (WTP) unmet by current supply.[175]

Analysis in the previous section raised some doubts about point (i), and consequently on the overall social impact deriving from the Commission's connectivity targets and whether this justifies the costs,

[169] 5G Standalone (SA) refers to the full deployment of 5G infrastructure, including both the radio access network and a new 5G core, enabling advanced features such as ultra-low latency, network slicing, and improved energy efficiency. Unlike 5G Non-Standalone (NSA), which relies on existing 4G infrastructure, 5G SA delivers the complete performance benefits envisioned for next-generation networks and is essential for industrial and mission-critical applications.
[170] Analysis Mason (2024), cit.
[171] European Commission (2025) State of the Digital Decade 2025: Keep building the EU's sovereignty and digital future - COM (2025) 290 final. This is the latest annual assessment of Member State progress and identification of gaps requiring targeted action. See the **ANNEX**.
[172] For example, a 2023 study estimated that the share of public funding required to complement private investment to achieve the EU's connectivity targets amounts to approximately 35% for FTTH networks and 29% overall. See WIK-Consult (2023) Investment and Funding Needs for the Digital Decade Connectivity Targets – Study for the European Commission. Similarly, the European Parliament (2024) Future-Proof Network for the EU: Full Fibre and 5G, underlined the scale of the investment challenge and the crucial role of public funding in bridging the gap. More broadly, the Recovery and Resilience Facility (RRF) has allocated €13.6 billion to digital connectivity initiatives across 21 Member States. The Connecting Europe Facility (CEF) Digital programme provides an additional €2.07 billion for the period 2021–2027. At the Member State level, between 2014 and 2023, the European Commission approved, under State aid decisions, a total aid amount of €61.97 billion for broadband deployment. During the same period, Member States also communicated, under the General Block Exemption Regulation (GBER), an overall budget of €28.84 billion, bringing the total approved aid to €90.70 billion. Out of this total, €22.78 billion (in current prices) was actually spent between 2014 and 2023. See European Commission (2025) State Aid Scoreboard 2024.
[173] Manganelli A., Nicita A. (2020) The governance of Telecom markets.
[174] Beneath a socio-political perspective lies an even more complex challenge: allocating resources among various public spending priorities - such as education, healthcare, social security, and family benefits, which vary significantly across EU member states.
[175] Parcu P. L., Rossi M. A. (2020) State Aid Policy in the Broadband Sector: Public Announcements, Investments and Crowding Out, in P. L. Parcu, G. Monti, & M. Botta (Eds.), EU State Aid Law (pp. 99–120).

public and private, of achieving such objectives, particularly when it comes to remote and rural areas.[176]

By setting high uniform standards (e.g., symmetrical 1 Gbps connectivity) across vastly diverse territories, the EU framework imposes challenging financial burdens on Member States, especially in rural or sparsely populated areas. Indeed, uniform targets do not reflect differences in: (i) local industrial structure and productivity potential; (ii) demographic patterns and population density; (iii) existing infrastructure and baseline digital maturity.[177]

In other words, the VHCN impact and the demand heterogeneity are not adequately addressed, possibly undermining cost-effectiveness. In addition, also allocative inefficiencies may arise when high-performance networks are rolled out in areas with low adoption potential, while economically strategic zones may still lack targeted high-bandwidth infrastructure or more advance connectivity needs, especially for mobile connectivity, as for example 5G stand-alone or 6G. Therefore, very high supply-side targets could also induce intensification of trade-offs, particularly between coverage and performance.

As for point (ii), empirical studies suggest that while final consumers exhibit significant WTP for a basic-to-high-speed broadband upgrade, their WTP for ultra-high-speed services (e.g., 1 Gbps FTTH) is often marginal.[178] This implies that supply-led infrastructure expansion may outpace effective demand, at least in the short-medium term.

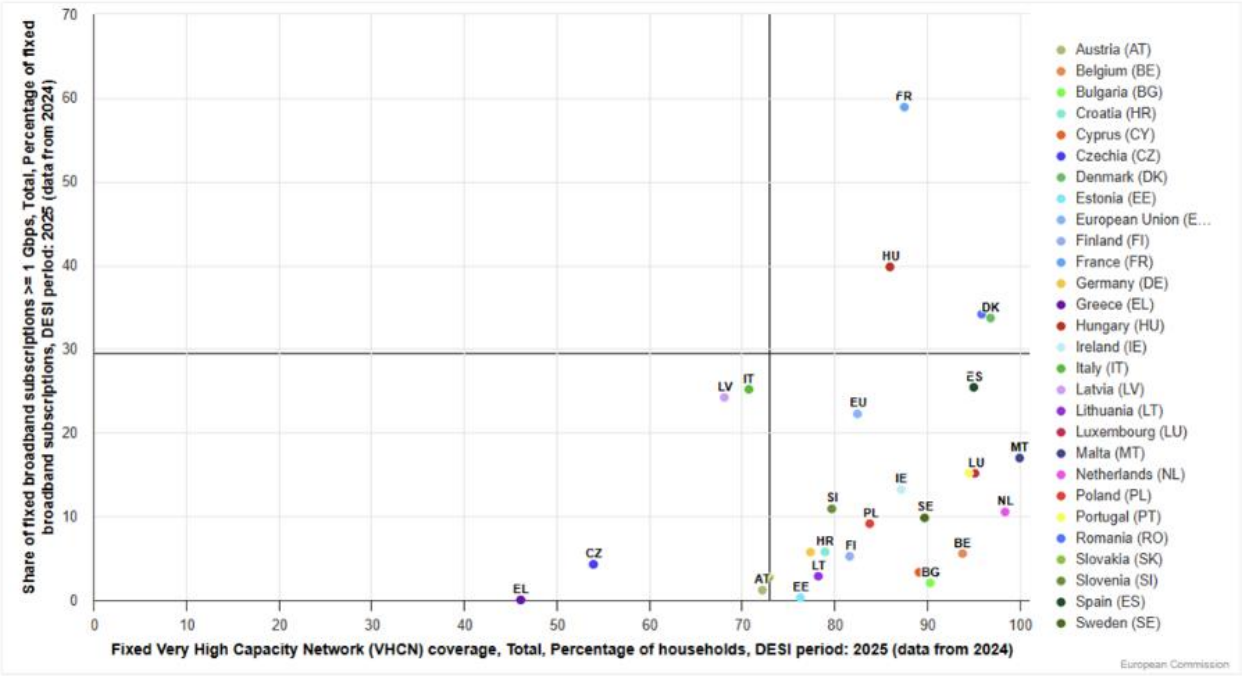
Indeed, connectivity demand in the EU has remained relatively low in comparison to the coverage already provided by existing VHCN infrastructures, particularly in certain national markets. In 2024, only 22.3% of fixed broadband subscriptions were at speeds of 1 Gbps or higher (up from 18.5% in 2023), against a coverage of 82.5%. As such, as evident in the following **Figure 10**, there is still need for significant progress in this area: great majority of EU countries (as well as EU average) in the down-left quadrant, indicating a good deployment associated with a scarce take-up.

[176] In the case of fibre deployment, however, a more pragmatic factor must be considered: existing copper networks are nearing the end of their operational life and will need to be anyway replaced. From the supplier's perspective, fibre offers a more efficient alternative, with lower maintenance requirements and significantly reduced labour costs due to fewer faults — even if the immediate benefits to end users are limited. In any event, these operational considerations suggests that decisions on how and when to upgrade infrastructure may, in many cases, be best driven by the market upon commercial considerations rather than public mandates. This is also why the transition from copper to fibre networks ought to be largely led by the market dynamics, encompassing users' demand, and not necessarily by defining an EU-wide copper switch-off date, as envisioned in the consultation of the forthcoming Digital Network Act – see European Commission (2025) Call for evidence for an impact assessment for a Digital Networks Act (DNA).

[177] Emergence of Fixed Wireless Access (FWA) as a pragmatic deployment alternative across rural and remote areas provides empirical evidence that uniform gigabit connectivity targets were insufficiently calibrated to local economic and demographic realities. FWA delivers lower performance than gigabit fibre infrastructure—typically offering 100-300 Mbps rather than symmetric 1 Gbps—yet achieves deployment costs substantially below fibre, particularly in sparsely populated territories where per-household infrastructure costs become prohibitively high under universal gigabit mandates. FWA adoption suggests that differentiated technology standards calibrated to local demand, cost structures, and productivity potential would have achieved broader connectivity objectives at significantly lower public and private expenditure, while respecting the revealed preferences of end-users and infrastructure investors.

[178] For example, also Liu Y.-H., Prince J., Wallsten S. (2018) find that "households' valuation of bandwidth is highly concave, with relatively little added value beyond 100 Mbps", and Fackler, T., Falck, O., & Krause, S. (2022) found that there is decreasing marginal willingness to pay for speed, at least once a desired broadband speed level is reached, i.e., upgrades to 30 Mbit/s and 50 Mbit/s are valued less than 16 Mbit/s. See, Liu Y.-H., Prince J., Wallsten S. (2018) Distinguishing bandwidth and latency in households' willingness-to-pay for broadband internet speed, in Information Economics and Policy, 45, 1–11, and Fackler T., Falck O., Krause S. (2022). High-speed broadband Internet and real estate prices, in Journal of Urban Economics, 127.

Figure 10 – Giga-connectivity adoption and VHCN deployment



Source: EU commission DESI INDEX (2025)

Nevertheless, the DDPP does not set explicit targets for connectivity adoption - even though such metrics are regularly monitored. This asymmetry may have tilted public interventions and investments toward infrastructure deployment, at the expense of stimulating demand,[179] which is now arguably the more pressing constraint. Demand for connectivity is not only a matter of socio-economic diffusion and productivity growth, but also a key determinant of financial returns on past and future investments. As noted, in well-functioning markets, these returns are vital signals that incentivise private investment, R&D, and innovation. [180]

In this context, greater attention should be given to understanding the wide disparities in adoption rates across Member States, and this analysis should inform efforts to remove barriers to adoption. This may also justify setting adoption-related targets at both EU and national levels.

[179] For example, revisiting the state aid guidelines on broadband networks to ensure that (a) recipients of public funds have the appropriate incentives to meet ultrafast BB adoption targets, as well as roll-out targets; (b) state aids are used to provide users with demand-side incentives to adopt new technologies more quickly and in greater numbers. See Feasey R., et al. (2024) Ideas for the future of EU Telecommunications regulations, CERRE Report. In that policy paper is expressed a general preference to use public funds to support 'demand pull' measures to extend network coverage over 'supply push' subsidies since the main benefits of a new network are driven by usage rather than by its deployment. Or also exploring the use of collective purchasing programmes, organised and administered by local authorities or non-profit bodies, to promote collective adoption of ultrafast BB in areas where such infrastructures have already been built (as well as to promote deployment in areas where they have not). See, Bourreau M., Feasey R., Hoernig, S. (2017) Demand-Side Policies to Accelerate the Transition to Ultrafast Broadband, CERRE Report.

[180] As also the European Commission has acknowledged: "[the] perception of attractiveness of advanced digital networks by private investors is of crucial importance for the future of connectivity. Certain investors have underlined that the mobilisation of private investments requires a clear business case that is predicated on profitability and higher margins. Profitability depends on the take-up of enhanced fixed and mobile networks, which is itself linked to the development and increased take-up of data intensive applications and use cases, e.g., based on edge computing, AI, and IoT." European Commission (2024) WHITE PAPER How to master Europe's digital infrastructure needs? - COM (2024) 81/2.

Despite these critiques, EU connectivity targets in the last decade have been instrumental in steering investments, fostering long-term technological ambition, and (once the DDPP has been in force) promoting coordination across Member States. While concerns about their uniformity, supply-side bias, and weak linkage to effective demand are valid, they should not obscure the rationale for targeted "anticipatory (public or publicly-incentivised) investment".

As previously noted, research shows that productivity gains from broadband and general-purpose technologies (GPTs) often materialise with a time lag. This is because adoption and complementary capabilities tend to follow infrastructure deployment only after an adjustment period. Hence, early investment in infrastructure can be economically justified, in high-potential areas where tipping point[181] and adequate return on investment could be reached. Moreover, infrastructure inertia, high fixed costs, and "regulatory bottlenecks" make a completely "reactive deployment" unfeasible or anyway not easily and quickly responsive to market demand.

This argument is especially strong for so-called "transformational infrastructure" - technologies that enable entirely new services, rather than just improving the quality of existing ones by providing incremental upgrades. In fact, the latter can be more easily driven by current demand. For instance, this seems to be the case for 5G SA, or edge-cloud micro-infrastructure, that are not merely enabling faster or better versions of previous services but represent a functional shift in digital infrastructure and associated services.

That said, this logic does not justify homogeneous deployment or uniform performance thresholds across all geographies and sectors. For "anticipatory investment" to be effective, it must reflect differentiated productivity effects, externalities, and absorption capacity. In other words, a market-led dynamic remains essential since signalling where value is likely to emerge and where infrastructure early building can translate into long-term economic returns. For example, 5G SA deployment in suburban residential areas may yield limited benefits, while in industrial corridors, transport hubs, or industrial and logistics nodes, it can function as a transformational productivity enabler.

Viewed through this lens, the current trajectory of gigabit connectivity deployment, while below DDPP targets, likely reflects a realistic absorption pattern considering current adoption gaps. Rather than accelerating this path indiscriminately, it would be more efficient to encourage the deployment and diffusion of advanced technologies such as 5G Standalone — and prospectively, 6G — in areas where their economic and societal returns can be maximised. This of course draws a clear distinction between end-users' services, and B2B and tailored industry services.

[181] Tipping points are not only those at end-users' level, i.e., critical mass and economies of scale on the demand-side. Very often they could emerge within supply chains or enterprise ecosystems, for instance (i) when enough enterprises adopt private 5G, then vendors, device makers, and developers align to support it; (ii) once cloud-native 5G SA cores are deployed at scale, the cost and risk of launching new services (e.g., network slices) drop significantly.

3.4 Impact of Cloud and AI

Cloud computing and artificial intelligence are increasingly seen as key enablers of productivity, innovation, and competitiveness in the digital economy. Their combined effects are expected to reshape how firms operate, scale, and compete across sectors.

In particular, cloud computing can enable significant cost savings by exploiting scale economies in the provision of computing resources, thus avoiding inefficient under-utilisation of on-premises IT capacities. In particular, cloud computing drastically reduces the need for upfront fixed capital investments as it can be provisioned on a variable cost basis proportional to the utilisation of computing resources.[182] These characteristics allows firms to quickly and flexibly scale up and allow for organisational agility as well as flexibility to quickly adapt to changes in customers' demand.[183] Therefore, cloud usage can increase the productivity of firms, as it allows them to quickly customise IT to their specific needs.[184]

Considering all these elements, cloud appears to be different from earlier IT technologies that mainly reinforced the scale advantages of incumbents,[185] since it may allow startups to grow by reducing their IT fixed costs. Nevertheless, empirically, the likelihood of using cloud computing is anyway positively related to the size of firms - this is not a direct causation, yet it depends on presence of in-house IT personnel, and the share of firm's turnover generated via the Internet.[186] These results confirm again a clear complementarity between technology and knowledge, suggesting that the use of cloud technologies improves productivity, but without knowledge the new technology may not be adopted at all.

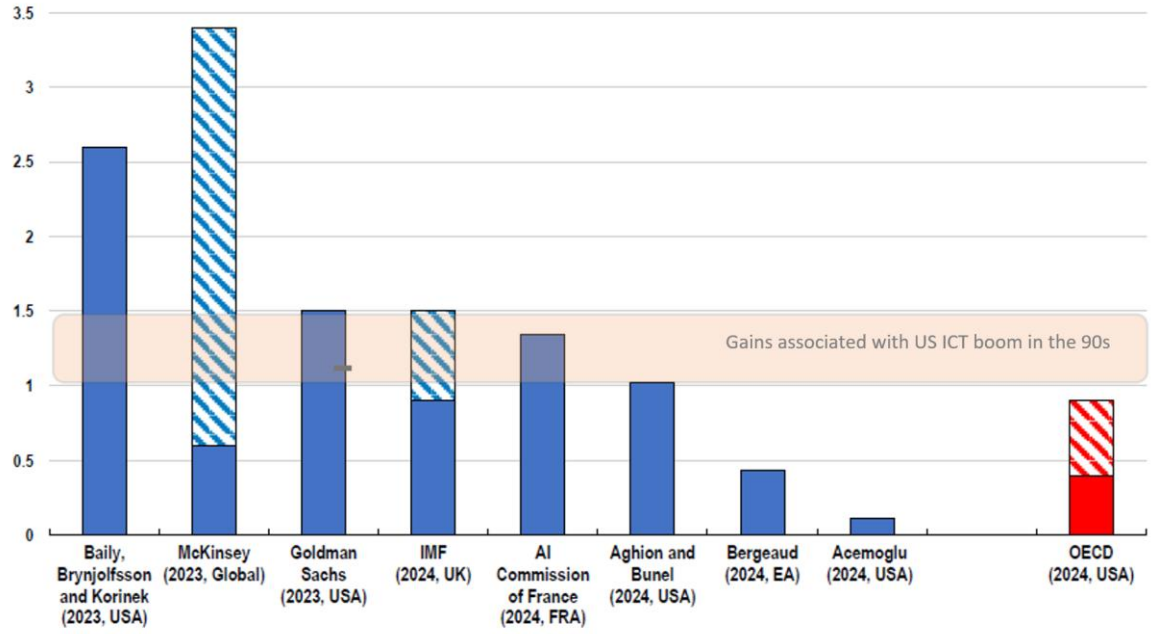
Cloud services and infrastructures are also a key enabler of digital services and an important driver of innovation for the entire economy, for example, with regards to Artificial Intelligence (AI). In turn, AI is perceived as the most transformative general-purpose technology (GPT) of our time: AI is likely to represent a catalyst for productivity across several sectors by, inter alia, the automation of routine tasks, process optimisation, and support to data-driven decision-making.[187] Moreover, AI may facilitate access to new markets, since products and services can be more customised, varied and of higher quality.

[182] Gal P., Nicoletti G., Renault T., Sorbe S., Timiliotis C. (2019) Digitalisation and productivity: in search of the holy grail - firm-level empirical evidence from EU countries - OECD Economics Working Papers No. 1533 (2019).
[183] De Stefano T., Kneller T., Timmis J. (2023) Cloud Computing and Firm Growth, in the Review of Economics and Statistics; Marston S., Li Z., Bandyopadhyay S., Zhang J., Ghalsasi A. (2011) Cloud computing—The business perspective, in Decision Support Systems, 51(1), 176-189; Makhlouf R. (2020) Cloudy transaction costs: a dive into cloud computing economics, in Journal of Cloud Computing, 9(1), 1-11.
[184] Duso T., Schiersch A. (2025) Let's switch to the cloud: Cloud usage and its effect on labor productivity, in Information Economics and Policy, Volume 70, June 2025.
[185] Lashkari D., Bauer A., Boussard J. (2019) Information Technology and Returns to Scale, in American Economic Review, vol. 114, no. 6, June 2024 (pp. 1769–1815).
[186] T. Duso, A. Schiersch (2025), cit.
[187] Szczepański M. (2019) Economic Impacts of Artificial Intelligence (AI) - EPRS | European Parliamentary Research Service.

Nevertheless, while AI demonstrates remarkable potential to enhance productivity at individual level, it should not be presumed that these micro-level gains will necessarily translate into equally large aggregate benefits. Several factors suggest that the macroeconomic impact may be more limited.[188]

As a matter of fact, there are quite a few different recent studies trying to quantify the expected macroeconomic impact of gen-AI on productivity: results, reported below (**Figure 11**), are very heterogeneous.[189]

Figure 11 – Comparing AI's predicted macro-level productivity gains across studies



Source: OECD (2024) Note: Predicted increase in annual labour productivity growth over a 10-year horizon due to AI (in percentage points). The estimates refer to the countries shown in brackets. When the source presents a range of estimates as the main result, the lower and upper bounds are indicated by striped areas.

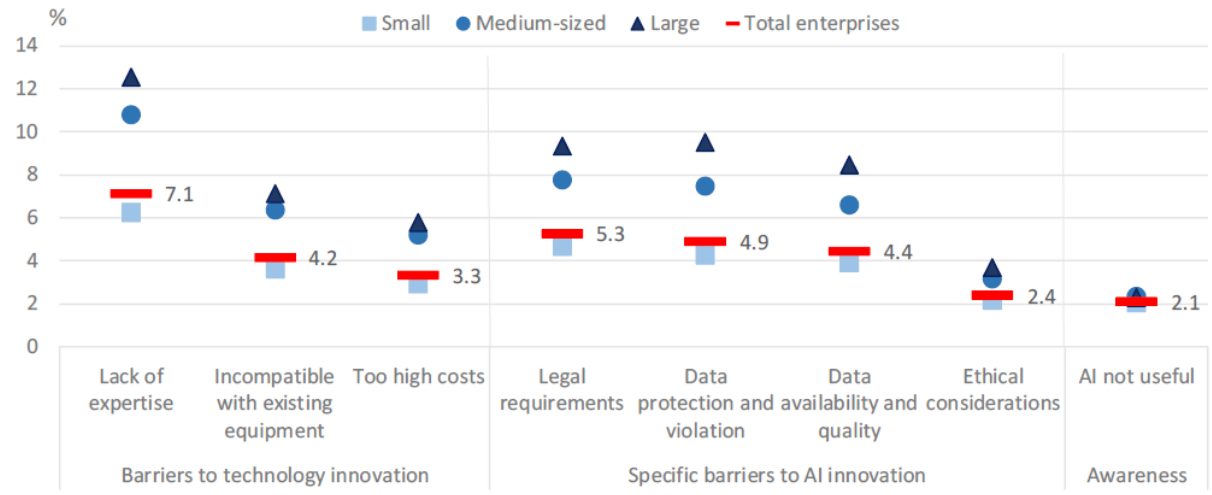
[188] First, AI's transformative effects are concentrated in cognitive and knowledge-intensive activities, such as information and communications technology, finance, and professional services, whereas tasks with a substantial physical component (e.g., construction, much of manufacturing, and personal services) remain relatively unaffected unless complemented by advanced robotics. Second, because of general equilibrium dynamics and the complex interdependencies within production networks, aggregate productivity gains cannot simply be calculated by summing improvements across individual sectors. For instance, if efficiency gains from AI lead to lower prices but are not matched by a proportional increase in demand, the market may reach saturation quickly. In such cases, labour and capital may shift toward sectors where AI has less impact on productivity, thereby diluting the potential economy-wide benefits and limiting the net effect on overall output. See, Filippucci F., Gal P., Schief M. (2024) Miracle or Myth? Assessing the macroeconomic productivity gains from Artificial Intelligence - OECD Artificial Intelligence Papers, n 29.

[189] For instance, Briggs and Kodnani (2023) suggests an optimistic view based on their large aggregate productivity growth estimates, amounting to 1.5 percentage point (p.p.) labour productivity boost per year, comparable to the size of total productivity growth observed over the past decades. In contrast, Acemoglu's (2024) assessment is much more cautious, based on the small growth effects (on the order of 0.1 p.p. labour productivity gains per year) he projects using a task-based aggregation framework and Hulten's (1978) theorem. Aghion and Bunel (2024) use the framework in Acemoglu (2024) but rely on different assumptions from the literature to arrive at numbers that are in between but closer to the optimistic end of the spectrum (around 1 p.p. point boost).

Indeed, to fully leverage AI's productivity potential - especially at macro level - still requires complementary digital infrastructure and skills, as for earlier digital technologies.[190] Therefore, bad predictions (such as the recent MIT report[191]) should not be alarming per se. Like all general-purpose technologies (GPTs), according to the transformation hypothesis, full productivity-enhancing potential of AI will likely take time to materialise, as it requires not only widespread adoption but also the accumulation of significant complementary skills, organisational change and investments, often concentrated in intangibles, that take time to build and can be difficult to finance.[192]

In the case of AI, this includes data assets, cloud computing capacity, digitally skilled labour, and new business models. These factors in the short-term work as obstacles to AI adoption (**Figure 12**): in 2024 7.1**%** of all EU27 enterprises cited a lack of relevant expertise as the main reason for not having adopted AI (getting to more than 12% between large firms); 4**%** pointed to incompatibility with existing equipment, software, or systems, while 3% mentioned excessive costs.[193] Those are the same common barriers to innovation, which remain relevant for AI adoption.

Figure 12 – Share of Enterprises not using AI technologies by main reason and firms size (%), EU27 2024



Source: OECD (2025)

In this context, the role of digital platforms has become increasingly crucial, particularly through their ability to seamlessly integrate digital technologies by creating, orchestrating, and coordinating digital ecosystems. As technology becomes more advanced and is built upon multiple interconnected layers, the effective use and coordination of diverse technologies and layers - often developed by different firms/complementors - becomes essential for enhancing productivity. This could be observed also in

[190] Corrado C. et al. (2021), New evidence on intangibles, diffusion and productivity - OECD Science, Technology and Industry Working Papers, No. 2021/10. In addition to previous ICT technologies, a widespread productive usage of AI could be influenced also by infrastructural bottleneck as availability of fixed and mobile VHCN, storage capacity and enormous computing power as well as the deployment of edge computing capacity.

[191] https://fortune.com/2025/08/18/mit-report-95-percent-generative-ai-pilots-at-companies-failing-cfo/.

[192] Corrado C., Haskel J., Jona-Lasinio C. (2021) Knowledge Capital and Productivity Growth in the EU, in Economics of Innovation and New Technology, 30(5), 455–483; Brynjolfsson E., Rock D., Syverson C. (2019) Artificial Intelligence and the Modern Productivity Paradox, in A. Agrawal, J. Gans, and A. Goldfarb (Eds.), The Economics of Artificial Intelligence: An Agenda (pp. 23-57).

[193] Kergroach S., Héritier J. (2025) Emerging Divides in the Transition to Artificial Intelligence - OECD Regional Development Papers No. 147; Eurostat (2024). Statistics on the Use of Artificial Intelligence by Enterprises.

the diffusion of AI and reduction of structural barriers that traditionally slowed the adoption of earlier digital technologies. (see **Appendix C**)

As for the digital skills gap, it has become evident across most sectors and is particularly pronounced, exceeding 11%, in high-tech industries such as computer and electronics manufacturing, and in knowledge-intensive services. This likely reflects the more advanced and intensive use of digital technologies in these sectors.

More broadly, indeed, Europe still lacks the deep pool of digitally trained workers that mass adoption requires; just over 10 million ICT specialists, which is about 5.0% of the labour force, are available today. As for consumer utilisation, basic digital skills are lacking among nearly half the adult population, leaving 44.4% of citizens unable to use common online tools or protect themselves from cyber-risks.[194] This area should be a top priority for policymakers, deserving focused attention and substantial allocation of resources.

3.5 Diffusion of Cloud and AI and the Role of EU Targets

In 2023, 38.97% of enterprises reported using intermediate or advanced cloud computing services. [195] However, uptake varied significantly by enterprise size: while nearly 38% of small and medium-sized enterprises (SMEs) adopted cloud solutions, the rate was much higher among large enterprises, at nearly 70%. Considerable disparities also exist across EU Member States, with adoption rates ranging from 73% in Finland to below 20% in Greece, Bulgaria, and Romania.

It is important to note that these figures offer limited insight into actual productivity growth and competitiveness. Cloud computing encompasses a broad and heterogeneous range of services, typically categorised by functionality.[196] Notably, the Software-as-a-Service (SaaS) ecosystem is highly diverse and varies significantly in terms of complexity and functionality. [197] Consequently, the impact of cloud services on productivity and economic growth depends heavily on the specific type of service adopted, but also – crucially - on how effectively these services are integrated and utilised within firms.

Despite these crucial differentiations, the Digital Decade Policy Programme (DDPP) defines cloud adoption in overly broad terms - as the percentage of enterprises using at least one “intermediate or sophisticated” cloud computing service. [198] This reflects an ongoing emphasis on surface-level indicators, rather than on the deeper economic and societal implications of cloud adoption. However,

[194] European Commission (2025) State of the Digital Decade 2025: Keep building the EU's sovereignty and digital future - COM (2025) 290 final.
[195] European Commission (2025), cit.
[196] A primary distinction lies between Infrastructure-as-a-Service (IaaS), which provides access to computing infrastructure and requires customers—usually businesses—to build or implement significant components of their final services, and Software-as-a-Service (SaaS), which offers ready-to-use applications with minimal need for additional development or integration by the end user. See Manganelli A., Schnurr D. (2024) Competition and Regulation of Cloud Computing Services - CERRE Report.
[197] As a matter of fact, in terms of economic function, SaaS applications are services delivered via the cloud rather than services of a generic “cloud market”.
[198] Defined as one among the following: finance or accounting software applications, enterprise resource planning (ERP) software applications, customer relationship management (CRM) software applications, security software applications, hosting the enterprise’s database(s), and computing platform providing a hosted environment for application development, testing or deployment.

even by this lenient definition, the EU's current pace of cloud adoption falls short of the DDPP's stated objective of achieving 75% adoption by 2030. Not necessarily being a meaningful information.

Likewise, AI is currently used by just a small fraction of enterprises: only 13.5% of EU enterprises deploy any form of artificial intelligence in 2024.[199] The mismatch is starkest among small businesses, where AI adoption lingers at just 12.6%, compared with 41% in large firms, reinforcing scale-based productivity divides. At the same time, uptake differs greatly among Member States, from 27.6% in Denmark to about 3.1% in Romania.

Currently, the adoption of AI is neither universal nor uniform. Many firms and workers have not yet found it worthwhile or feasible to integrate AI into their operations, whether due to cost, lack of expertise, insufficient perceived benefits or also an overestimation of the risks involved. This trend is not exclusively European, as official statistics indicate that adoption rates remain relatively low in all OECD area, 13.9% with US at 8.3%, confirming that AI adoption is still at an early stage compared to other ICT technologies.[200]

Specifically, in the EU the generic percentage of enterprises using AI is well below the expected DDPP trajectory, supposed to get to 75% by 2030. The target of 75% of enterprises using AI is expected to be reached in 2042 if no further actions are taken.

It is important to highlight that several "consumer-oriented" and "user-friendly" AI applications have instead experienced remarkably rapid adoption. For example, as widely known, ChatGPT reached 100 million users within just two months - faster than any previous internet application. [201] As a result, the uptake of AI among EU and global firms has accelerated significantly since 2024.

However, while the swift diffusion of AI may be partly attributed to its usability and accessibility, the technology's real impact depends heavily on how it is deployed—specifically, for which tasks, by whom, and what is level of expertise and trust in generative AI. [202] Off-the-shelf AI tools can be quickly adopted to automate routine or "easy-to-learn" tasks. Yet, achieving a deep and transformative integration of AI into production systems remains a long-term endeavour requiring significant adaptation, investment, and organisational change.

In sum, although AI and cloud targets are inherently demand-side measures and reflect how technologies are being leveraged within the economy, setting absolute numerical targets for adoption may offer limited economic insight. Firstly, adoption targets focus on means rather than on outcomes. For example, evidence suggests that (i) many EU firms use cloud and AI services in superficial ways, with little operational impact, and (ii) often lack managerial capacity or complementary skills to

[199] EU enterprises utilised various AI technologies, with no single technology dominating. In 2024, 6.88% used AI for written language analysis (text mining), followed by 5.41% using natural language generation. Other technologies, such as speech recognition, machine learning for data analysis, workflow automation, and image recognition, were used by 3.23% to 4.78% of enterprises. Only 1.01% used AI for autonomous machine movement.
[200] Kergroach S., Héritier J. (2025) Early Divides in the Transition to Artificial Intelligence - OECD Regional Development Papers No. 147; Filippucci, Gal, Jona-Lasinio, Leandro, Nicoletti (2024), cit.
[201] From its commercial introduction, it took 75 years for the telephone to reach 100 million users; 16 for mobile phones; 7 for the World Wide Web; 2.5 years for Instagram; 9 months for TikTok; and only two months for Chat GPT.
[202]Calvino F., Reijerink J., Samek R. (2025) The effects of generative AI on productivity, innovation, and entrepreneurship – OECD Artificial Intelligence Papers n 39.

achieve productivity gains.[203] In a nutshell, current quantitative targets largely neglect the quality, relevance, or depth of digital transformation, and this extends also to the other targets regarding skills and public service.[204]

Secondly, the homogenous, formalistic, and quite arbitrary setting of targets can be a source of inefficiencies in the focus of policy makers and public funding: expecting 75% of all EU businesses to adopt cloud or AI technologies ignores sector-specific use cases, opportunity costs, and variation in technology spillovers. Indeed, the uptake of cloud and AI services as well as related challenges differ from sector to sector, and it has been widely recognised that Europe should develop AI for specific use cases and vertical applications, especially in industrial sectors where it could hold competitive advantages – which is "even more critical than raw supercomputing power".[205] This is also aligned with the Apply AI Strategy[206], recently published by the EC, which has sector-by-sector targeted measures to boost AI adoption across 10 key industry sectors and the public sector (see **Annex**).

Therefore, a recalibrated approach should: (i) introduce ex-ante rigorous impact assessments to inform target setting; (ii) adapt goals to sectoral and regional economic logic; and (iii) shift from headline adoption rates to depth, quality, and productivity of use.

In this perspective, a more economic approach would: (i) differentiate adoption across sectors and industry segments according to their expected impact; (ii) prioritise the timing of adoption in sectors with the highest multiplier effects; and (iii) geographically reflect both complementarities in technology development (e.g., between industrial AI, edge computing, or 5G SA/6G) and differentiated regional capabilities. Such an approach would ensure that the EU focuses not on symmetry for its own sake, but on the strategic allocation of resources where returns to public and private investment are highest.

By refining its framework in this way, the Digital Decade could evolve from a mere ICT and digital checklist into a *coherent industrial strategy*, aligned with Europe's economic structure, policy capabilities, and long-term growth potential.

A complementary and pragmatic step would be to (also) adopt dynamic targets, benchmarking progress against the United States to assess whether the EU is lagging or leading. Accordingly, EU policy frameworks - particularly the Digital Decade targets - should integrate a dynamic competitiveness dimension by institutionalising some form of "yardstick competition":[207] adoption

[203] Bencivelli L., Formai S., Mattevi E., and Padellini T. (2025) Embracing the digital transition: the adoption of cloud computing and AI by Italian firms – Bank of Italy occasional paper n. 946.

[204] For example, (i) technology depth: firms may report cloud adoption but lack integration into workflows; (ii) skill alignment: not all ICT training meets actual labour market needs; (iii) Public service quality: public e-services may be technically online, yet fragmented, insecure, or user-unfriendly.

[205] "*Sectoral AI applications are even more critical than raw supercomputing power. Here, Europe has a real advantage: its firms hold more than half the global market in industrial automation solutions, a cornerstone of industrial AI. Yet only around 10% of manufacturing firms used AI last year*". See Mr. Draghi intervention at High Level Conference – "One year after the Draghi report: what has been achieved, what has changed" 16 September 2025.

[206] European Commission (2025) Apply AI strategy – COM(2025) 723 final.

[207] The concept of yardstick competition was originally introduced by Shleifer (1985) to describe a regulatory mechanism whereby firms' performances are compared against each other to incentivise efficiency and discourage rent-seeking. See Shleifer, A. (1985), A Theory of Yardstick Competition, in The RAND Journal of Economics, Vol. 16, No. 3, pp. 319–327. For more recent discussion of yardstick competition in innovation policy contexts, see OECD (2010), Measuring Innovation: A New Perspective, and OECD Competition Committee (2023), Competition and Innovation: A Theoretical Perspective, which discusses how benchmarking and comparative performance mechanisms can support innovation objectives.

indicators should be adjusted periodically (e.g., once every two years) in line with US performance trajectories, ensuring that EU targets consistently exceed concurrent US achievement levels.

Indeed, while current levels of AI adoption among European firms appear broadly comparable to those in the United States, [208] as previously described, the EU faces persistent structural constraints stemming from industrial composition and firm-size distribution. These disadvantages create a dynamic handicap: even when adoption rates temporarily converge, Europe's underlying capacity to translate adoption into productivity gains and competitive advantage remains constrained relative to US peers operating at greater scale and with superior access to capital. Recognising these systemic disadvantages, the EU should aspire to consistently outperform the United States in the diffusion and targeted adoption of digital and advanced technologies to overcome its structural disadvantages and progressively narrow the innovation and productivity gaps that have accumulated over the past two decades.

[208] According to the 2024 AI Index Report, the proportion of European firms reporting the use of AI technologies saw a significant rise in 2023, nearly matching that of North America (57% compared to 61%). See, Maslej, N., Fattorini, L., et al. (2024) The AI Index 2024 Annual Report – at AI Index Steering Committee, Institute for Human-Centered AI, Stanford University.

4. Conclusions

4.1 Key Findings

This paper has examined the European Union's innovation ecosystem and digital transformation through the lens of competitiveness, revealing a complex interplay between structural constraints and policy design shortcomings that continue to hinder EU innovation and productivity growth.

To this end, section 2 assessed the EU's performance on the principal drivers of innovation-led competitiveness and benchmarked these outcomes against those of the United States. Section 3, in turn, has expanded the analysis of adoption and diffusion of ICT across Member States, with particular attention to connectivity, cloud infrastructures, and artificial intelligence.

In pursuing this analysis, the paper addressed crucial cross-cutting policy questions, including:

- What are the principal causes of the EU's innovation gap, and to what extent are current EU policies contributing to close it?
- To what degree are the creation and scaling of EU-based technology firms essential to competitiveness, and what trade-offs might this entail for broader digital diffusion?
- How effectively is the EU is performing in the diffusion and productive utilisation of digital technologies, and how robust and meaningful is the contribution of the DDPP targets?

Before addressing each specific questions, it is important to acknowledge that, although this paper does not directly engage with the implementation of the Single Market, the effective integration and consolidation of a unified EU Single Market - comprising 440 million consumers and 23 million companies – emerges as a fundamental structural condition for enabling all core drivers of innovation-based competitiveness.

The Single Market is pivotal for multiple dimensions of competitiveness, e.g., enhancing frontier innovation capacity, also through EU-level coordination of public R&D spending; allowing the scaling-up of young, innovative companies and large industries capable of competing globally; mobilising greater volumes of private finance; fostering broader technology adoption across sectors; stimulating intangible investment to unlock productivity potential of ICT investments; and strengthening domestic demand and overall investment.

Accordingly, the answers to the cross-cutting policy questions, as well as the recommendation in the next section, are premised on the progressive implementation of the Single Market reform agendas proposed in Letta and Draghi policy paper, which are fundamental for building a sustained innovation-driven competitiveness in the EU.

On the first core policy question— the innovation gap—this paper finds that EU competitiveness deficit stems not only from the lower quantity of R&D investment, but more importantly from its limited capacity to translate research and innovation into productivity-enhancing outcomes. Large-scale investments are likely to yield more substantial productivity gains, which is calling for consolidating the fragmented nature of both public and private R&D funding and industrial policies. In addition, the weaker performance in ICT patenting may underscore a broader perspective weakness in innovation-driven competitiveness, which should be addressed by maintaining an effective and

balanced IPR framework system that incentivise innovation and support competitiveness. While the Competitiveness Compass offers a broad and ambitious policy agenda, for the moment it still falls short of adequately addressing the chronic failure to convert R&D efforts into measurable productivity gains.

On the second question—the creation and scaling of EU-based tech companies— the evidence highlights structural impediments that also underlie the innovation gap. These include Europe's mid-tech industrial base, fragmented digital markets, a firm landscape dominated by SMEs, and shallow capital markets—conditions that hinder the emergence of globally competitive technology firms. As a result, the EU has struggled to foster digital champions. However, it is worth stressing that not all the US productivity advantage is directly derived from its major tech platforms, while these may instead also be one of its results. So going trying to emulate a "US-model" without addressing the underlying problems could be ineffective and very inefficient. Thus, attempting to replicate the US model may be neither feasible nor desirable. Instead, a polycentric digital architecture, where telecom providers and ICT manufacturers play a more active role, may represent a more adequate and balanced path for the EU. In this regard, the Competitiveness Compass includes promising initiatives - such as the proposed "28th regime" and measures to deepen venture capital markets - though actions related to reducing strategic dependencies must be carefully designed to avoid creating complex trade-off between fostering the scale up of EU companies and ensuring broad-based digital diffusion.

On the third question—the achievement and effectiveness of digital diffusion targets— the EU performs well in terms of basic digital infrastructure and digital services, aligning broadly with other major jurisdictions. However, it continues to lag in both the development and usage of some of the more advanced infrastructures and services. Moreover, like at higher levels of the innovation chain, European firms exhibit a lower capacity to translate ICT investments into productivity gains. This is primarily due to smaller average firm size and limited capacity to invest in the complementary intangible assets—such as skills, software, and organisational capital—required for effective digital transformation. Therefore, those disadvantages should be addressed, also through mechanisms for enhancing financing for companies' intangible investments. Yet, in any case, Europe should aim to outperform the US in the diffusion and productive use of ICT and digital technologies across its broader industrial ecosystem. These structural weaknesses are currently not meaningfully addressed by the Digital Decade Policy Programme (DDPP), which retains a strong supply-side and homogenous target-setting bias. By prioritising coverage over adoption, and adoption over economic performance, the DDPP overlooks the critical importance of demand heterogeneity and sectoral context in driving digital impact.

4.2 Policy Recommendations

Drawing on the key findings and the overall analysis, the following policy recommendations are proposed:

Recommendation 1 - Rebalance public R&D funding toward high-impact innovation in high-tech sectors

To address current funding patterns that disproportionately benefit established, medium-technology sectors, the EU should:

- reallocate public R&D subsidies toward mission-oriented innovation in high-tech sectors, and
- strengthen coordination of R&D efforts among member states, concentrating funding to support breakthrough innovation with greater systemic and cross-sectoral impact.

Recommendation 2 - **Foster cross-sectoral financing partnerships for market-oriented high-tech R&D**

Facilitate structured partnerships between EU mid-tech and EU high-/deep-tech firms to develop joint financing vehicles, such as corporate venture funds or co-investment platforms, dedicated to market-oriented R&D in Europe.

Recommendation 3 – **Maintain a balanced intellectual property rights (IPR) framework to foster innovation-driven competitiveness**:

Maintain a balanced intellectual property framework able to support EU innovation, especially in sectors with high R&D intensity and where R&D is inherently market oriented. Given the peculiar characteristics of EU innovation ecosystem and critical role of licensing revenues in financing European innovation, the EU should preserve IP protection, while promoting industry-based solutions to encourage involvement, upstream and downstream, of EU innovative SMEs in order to further stimulate incremental improvements and differentiation in the innovation ecosystem.

Recommendation 4 - **Enhance the productivity yield of R&D through stronger innovation–deployment alignment**

To increase the effectiveness and productivity impact of R&D investment, the EU should:

- Ensure that R&D support is tied to downstream adoption incentives, including demand-pull levers like tax credits, and
- Foster cohesive innovation ecosystems, by promoting partnership among large market actors (upstream and downstream), start-ups, public research institutions, universities, and financing entities.

Recommendation 5 - Strengthen regulatory impact assessment to support competitiveness and innovation

Ensure that ex-ante impact assessments for digital/ICT policymaking and regulation systematically include:

- Profitability analysis of EU ICT-intensive firms, recognising that declining profitability can discourage capital reallocation toward high-tech sectors, thereby reinforcing the “mid-tech trap.”

- Appraisal of the orchestration function within a contestable, fair digital ecosystem—as a source of value creation, a bridge from R&D to market, and a catalyst for the adoption and diffusion of digital technologies.

Recommendation 6 - **Apply proportional and risk-based principles to strategic autonomy measures**: When strategic autonomy actions are deemed necessary, they should be defined and implemented in accordance with proportionality and risk-based principles, by:

- Assessing the impact of strategic autonomy measures on the diffusion and uptake of ICT and digital technologies.
- Concentrating autonomy efforts and associated costs where security considerations or systemic dependencies clearly justify intervention, while distinguishing between measures targeting service for private entities and those for governments and public administrations;
- Framing tread-offs and proportionality assessments to differentiate (where feasible) between "enabling" measures aimed at fostering EU-based alternative supply chains, and "restrictive" measures designed to directly limit the presence of non-EU providers.

Recommendation 7 - **Adopt differentiated target-setting aligned with economic potential and regional characteristics**

Implement differentiated digital targets that reflect regional economic potential and structural characteristics. Rather than pursuing uniform "universal service" coverage, policy should prioritise high-impact deployments in economically strategic areas, those most likely to generate transformational productivity gains and broader spillover effects.

Recommendation 8 - Institutionalise ex-ante impact assessments for digital infrastructure investment

Introduce systemic ex-ante impact assessments for digital infrastructure investment, particularly where anticipatory public (or publicly incentivised) investments are envisaged. Such assessments should account for market absorption capacity, heterogeneous returns, and regional economic logic, externalities, and productivity multipliers, ensuring that investments are both demand-responsive and economically justified.

Recommendation 9 - Redesign digital adoption targets toward outcome-based, dynamic benchmarking

To shift from uniform, quantity-based digital adoption targets toward differentiated, outcome-oriented objectives, including skills acquisition, effective utilisation rates, and productivity impact metrics. Also, to establish a dynamic transatlantic benchmarking framework to align EU performance targets with U.S. trajectories, ensuring that EU consistently exceed concurrent US achievement levels.

Recommendation 10 - Create EU-level financing instruments for intangible capital formation

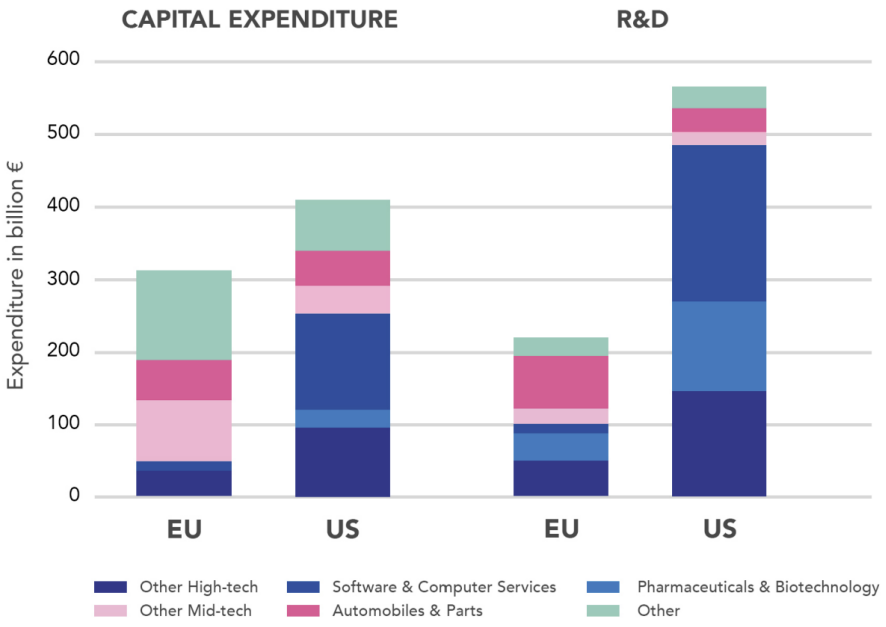
To establish dedicated EU-level financing mechanisms to support intangible capital formation, including organisational innovation, software development, and workforce training. These instruments should address the structural limitations of Europe's debt-based financing system, which

insufficiently supports intangible investments—a crucial component in enhancing the productivity returns of ICT adoption.

Appendix A: "Mid-Tech Trap" and access to finance

US companies invest heavily in high-tech sectors such as software and biotechnology, where R&D intensity and profit margins are high, while European firms remain largely concentrated in mid-tech industries like automotive and mechanical engineering.[209]

Figure 13 - CAPEX and BERD by industry sector (2023)



Source: Gros et al. (2024) based on EU Industrial R&D Scoreboard.

In the US, high-tech sectors tend to generate a virtuous cycle: larger market shares lead to more R&D investment, which reinforces technological leadership and global competitiveness (**figure 13**). In contrast, Europe's path dependency on mid-tech sectors has led to what has been defined as "middle technology trap", [210] where innovation is mostly made of small incremental improvements and incentives for disruptive high-tech innovation remain weak, ultimately limiting the scale and dynamism of Europe's innovation ecosystem. This situation implies a misalignment between R&D investment and breakthroughs in sectors generating higher value added and where R&D has a higher impact on firms' productivity. [211]

Nor can Europe compete sustainably and profit from high-volume, low-tech manufacturing (textiles, basic consumer-goods assembly, commodity production) that relies on labour-intensive, standardised processes where low labour costs are decisive - sectors where European labour costs are 10-20 times

[209] Meyers Z. (2025) A framework for understanding EU competitiveness – CERRE Report.
[210] Fuest C., D. Gros, Mengel P.-L., Presidente G., Tirole J. (2024) EU Innovation Policy - How to Escape the Middle Technology Trap - IEP@BU report.
[211] Ortega-Argilés, R., Piva, M., Vivarelli, M. (2015) The productivity impact of R&D investment: Are high-tech sectors still ahead?, in Economics of Innovation and New Technology, 24(3), 204–222; Czarnitzki D., Thorwarth S. (2012). Productivity effects of basic research in low-tech and high-tech industries, in Research Policy, 41(9), 1555–1564; Kancs, d'Artis, Siliverstovs, B. (2016) R&D and non-linear productivity growth, in Research Policy, 45(3), 634–646.

higher than Asian competitors. Europe has experienced sustained disinvestment from these industries without fully transitioning to high-tech, thus remaining "trapped" in the middle(-tech) where there is stable but slow growth as well as progressively declining profit margins.

Europe has seen sustained disinvestment from these activities without a full pivot to high tech, leaving it 'trapped' in the middle-tech segment: stable but slow growth, and steadily eroding profit margins.[212]

These EU-US divergent trajectories toward high-tech have developed over the past two decades: in 2003, the US and EU both counted automotive companies among their top R&D investors; however, while the US transitioned toward high-tech - by 2022 its top R&D spenders were all software companies, the EU, as well as Japan, remained anchored in mid-tech sectors like automotive. [213]

Figure 14 - Top-3 R&D spenders and their industries compared over time

	2003	2013	2023
EU	Mercedes-Benz (auto) Siemens (electronics) Volkswagen (auto)	Volkswagen (auto) Mercedes-Benz (auto) Bosch (auto)	Volkswagen (auto) Mercedes-Benz (auto) BMW (auto)
US	Ford (auto) Pfiser (pharma) GM (auto)	Microsoft (software) Intel (hardware) Merch (pharma)	Alphabet (software) Meta (software) Apple (hardware)
JPN	Toyota (auto) Panasonic (electronics) Sony (electronics)	Toyota (auto) Honda (auto) Panasonic (electronics)	Toyota (auto) Honda (auto) NTT (telecom)

Source: Data from the EU Industrial R&D Scoreboard (2024)

The US was able to shift its industrial base toward higher-growth and higher-margin sectors, counteracting the typical path dependencies that characterise innovation and industrial specialisation, [214] while the EU remained locked into its historical trends.

A key factor underpinning this divergence has been found in the profitability differential (**figure 15**)**:** in the US, high-tech firms enjoy a roughly 7 percentage point margin advantage over mid-tech firms, creating a strong incentive for capital reallocation. In Europe, this margin is only about 3 percentage

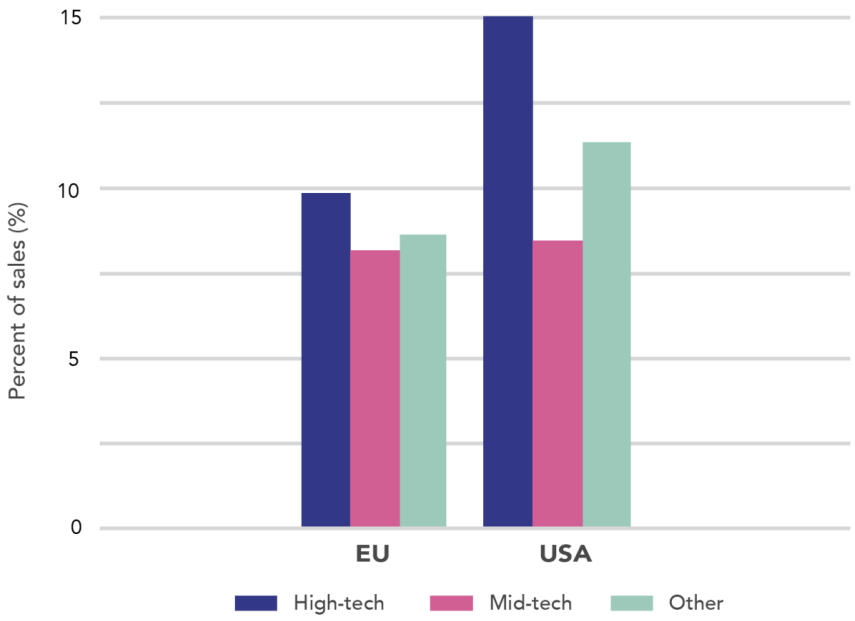
[212] Even the EU automotive sector - Europe's largest - industry now faces existential pressure. The EU export-oriented growth model confronts increasingly protectionist policies from both the US and China; moreover, the technological shift to electric vehicles, on one side, and the importance of in-vehicle and networked software applications, on the other side, is eliminating traditional European competitive advantages, based on mechanical engineering.).

[213]In 2023, the automotive sector accounts for 34.2% of total EU business R&D expenditure, representing approximately €73 billion annually, which makes Europe the world's largest investor in automotive, surpassing Japan (€33.6 billion), the US (€33.6 billion), and China (€22.2 billion).

[214] See, e.g., Acemoglu D. (2023) Distorted innovation: does the market get the direction of technology right?, AEA Papers and Proceedings, in American Economic Association 113; Aghion P., Antonin C., Bunel S. (2021) The power of creative destruction: Economic upheaval and the wealth of nations; Aghion P., et al. (2016) Carbon taxes, path dependency, and directed technical change: Evidence from the auto industry, in Journal of Political Economy 124.1 (2016): 1-51. Melitz M., Redding S. J. (2021) Trade and Innovation - NBER Working Paper No. w28945.

points, offering much weaker signals for industrial transformation and often not compensating (at least in the short term) the costs of transaction. [215]

Figure 15 – Average profit margin by sector (2003-2022)



Source: Gros et al. (2024) on data from Industrial R&D Investment scoreboard 2023

This transformation was also driven in the US by strong total factor productivity (TFP) growth in the ICT and software-producing sectors, further amplified by the positive externalities generated within R&D-intensive clusters. These clusters —comprising large corporations, startups, universities, and venture capital firms—played a pivotal role in fostering innovation. Not only did they stimulate entrepreneurship[216], but they also enabled firms to rapidly acquire cutting-edge technological capabilities, particularly in emerging fields often rooted in university research.[217]

Such a dynamic and integrated environment facilitated the rapid development and diffusion of digital technologies in the United States, in stark contrast to the more cautious and incremental innovation patterns observed in much of Europe. In contrast, Europe's innovation system lacks comparable scale-driven loops, constraining the emergence of global technology champions and dampening incentives for high-risk, frontier investment.

Moreover, the EU outperforms the US in terms of productivity within mid-tech sectors. This advantage reflects the higher concentration of EU firms (and larger firms) operating in mid-tech industries, and their higher physical capital expenditure (**Figure 13**). Capex has a greater impact on productivity in low- and medium-tech firms than in high-tech ones, as higher levels of output per worker (Labour

[215] Gros D., Mengel P-L, Presidente G. (2024) What Investment Gap? Quality Instead of Quantity - IEP@BU Policy Brief; Dietrich A., Dorn F., et al. (2024) Europe's Middle-Technology Trap, in EconPol Forum, 25(4), 33-39.
[216] Delgado, M., Porter, M. E., Stern, S. (2010) Clusters and entrepreneurship, in Journal of economic geography, 10(4), 495-518.
[217] Mohnen, P., Hoareau, C. (2003) What type of enterprise forges close links with universities and government labs? Evidence from CIS 2, in Managerial and decision economics, 24(2-3), 133-145; Valero, A., & Van Reenen, J. (2019) The economic impact of universities: Evidence from across the globe, in Economics of Education Review, 68, 53-67.

Productivity) are often driven by tangible capital deepening, such as increased investments in machinery, equipment, and physical infrastructure aimed at enhancing workforce efficiency.

This pattern is also closely aligned with the structure of corporate financing in Europe, where firms rely predominantly on debt financing - an instrument naturally suited to supporting tangible, physical investments that can serve as collateral. By contrast, debt is inherently ill-suited for early-stage innovation and generally inadequate for large-scale, high-risk investment projects. This marks a significant transatlantic divergence in the financing of innovation[218]: compared with their U.S. counterparts, European firms face greater constraints in accessing equity financing and venture capital. As underscored by both Draghi and Letta, these structural disadvantages in accessing deep, long-term "patient capital" [219] have resulted in a persistent shortfall for Europe in developing and scaling new technologies to their full commercial potential.

As specified later for the automotive, the sector specialisation and the structure of financial system are interdependent self-reinforcing factors in the mid-tech trap: in facts, over 80% of venture capital investment by EU based large companies—which are unlikely to be financially constrained—finance US-based startup.[220] In addition, there is a huge gap in financing for later-stage growth between the EU and the US.[221]

EU scale-up firms have raised, on average, 50% less capital than their US counterparts in the last ten years. [222] As a result, many EU-originated innovative firms, especially start-ups and scale-ups, turn to U.S. venture capital and view expansion into the vast, unified American market as a more attractive and feasible growth strategy, rather than facing the substantial challenges of operating across the fragmented landscape of the European Union.[223]

The result, as well known, is a striking scale deficit: by their tenth year, European digital scale-ups have raised 50% less capital than their Silicon Valley peers and the number of "unicorns" established in the EU, in 2024, has reached 286 units, still lagging significantly behind China (397) and the US (1687).[224]

The EU automotive sector provides a complementary and instructive perspective on this dynamic. In response to the digital and technological transformation impacting the industry, companies are directing investments toward the technological innovations reshaping the sector: autonomous

[218] Aghion L., Howitt P., Levine R. (2018) Financial development and innovation-led growth, in Handbook of finance and development (pp. 3-30); Garcia-Macia D. (2017) The financing of ideas and the great deviation - International Monetary Fund Paper No. 2017/176.

[219] In this context, "patient capital" refers to investment that is willing to accept longer payback periods and higher uncertainty in order to support breakthrough R&D and the scaling of innovative companies. This type of financing — prevalent in the US, where large venture funds and capital markets sustain multi-year innovation cycles, and in China, where state-backed investment plays a similar role — is far less accessible in Europe. The result is that promising European firms often struggle to secure the resources needed to compete globally, leading in some cases to relocation abroad or acquisition by non-European players.

[220] Gros D., Mengel P-L, Presidente G. (2024), cit.

[221] Quas A., Mason C., Compañó R., Testa G., Gavigan J. P. (2022) The scale-up finance gap in the EU: Causes, consequences, and policy solutions, in European Management Journal, 40(6), 833-844.

[222] Fratto C., Gatti M., Kivernyk A., Sinnott E., van der Wielen W. (2024) The scale-up gap: Financial market constraints holding back innovative firms in the European Union, at: https://doi.org/10.2867/382579; European Investment Bank (2025), cit.

[223] Weik S., Achleitner A-K., Braun R. (2024), Venture capital and the international relocation of startups, in Research Policy, Volume 53, Issue 7; Arnold, N. G., Claveres, G., & Frie, J. (2024) Stepping Up Venture Capital to Finance Innovation in Europe - IMF Working Paper No. 2024/146.

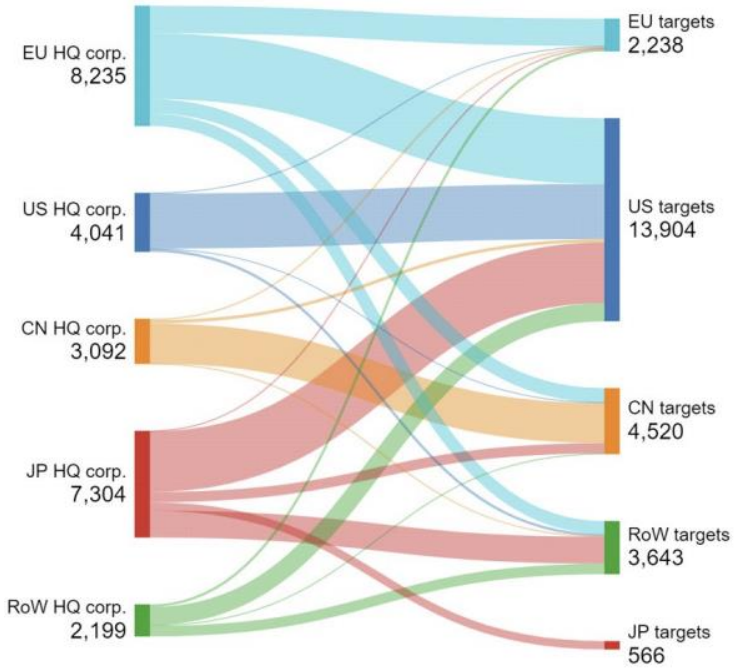
[224] European Commission (2025) Digital Decade in 2025: progress and outlook – Commission Staff Working Document, SWD (2025) 290 final.

driving, advanced sensor technologies, and related digital capabilities. This is done through several strategies, prominently including Corporate Venture Capital (CVC). [225]

EU automotive leaders are deploying CVC at levels comparable to their Japanese competitors and higher to US and Chinese ones. Notably, high-tech newcomers to automotive, such as Tesla and BYD (respectively headquartered in US and China), are primarily recipients of venture capital financing, including corporate VC, rather than themselves deploying venture capital into other startups – this also explains the reduced magnitude of US and Chinese VC financing from the automotive leaders.

A clear and meaningful pattern emerges when examining where automotive CVC investors, organised by their headquarters' regions, are allocating capital to fund startups. The overwhelming majority of global automotive CVC flows to US-based startups, including investments by both EU and Japanese automotive leaders (**Figure 16**). [226] In contrast, CVC from leading Chinese and US automotive firms is invested predominantly domestically.

Figure 16 - CVC investment flows between regions, EUR million



Source: Gavigan et al. (2024)

These geographic dynamics reveal two critical insights:

- First, consistency across sectors. The CVC-to-VC ratio between the US and EU for automotive mirrors the broader pattern across all sectors. From 2010 to 2023, automotive companies invested 6.21 times more CVC capital in the US than in the EU- virtually identical to the 6.27x ratio for total VC investment across the two economies during the same period. This suggests

[225] Gavigan J., Fákó P., Compañó R. (2024) Corporate Venture Capital in the Automotive Sector - JRC Working Papers on Corporate R&D and Innovation (CoRDI) No 02/2024

[226] Gavigan J., Fákó P., Compañó R. (2024), cit. The analysis is carried out considering those VC deals involving the top five R&D investing automotive companies by corporate HQ location for EU, US, China, Japan and ROW (rest of the world)

the VC gap is not automotive-specific but structural, reflecting the EU's problematic functioning of equity financing.[227]

- Second, reinforcement of the mid-tech trap. EU and Japanese automotive firms' decision to invest their CVC predominantly outside their home regions, rather than in their own innovation ecosystems, risks deepening their domestic mid-tech trap. By channelling capital to US-based ventures rather than funding domestic high-tech startups, European automotive companies (i) further incentivise the systemic transfer of EU innovative start-up to US; and (ii) cause a transfer abroad of those capitals that are specifically meant to reallocate resource from mid-tech to high-tech.

[227] Ibidem.

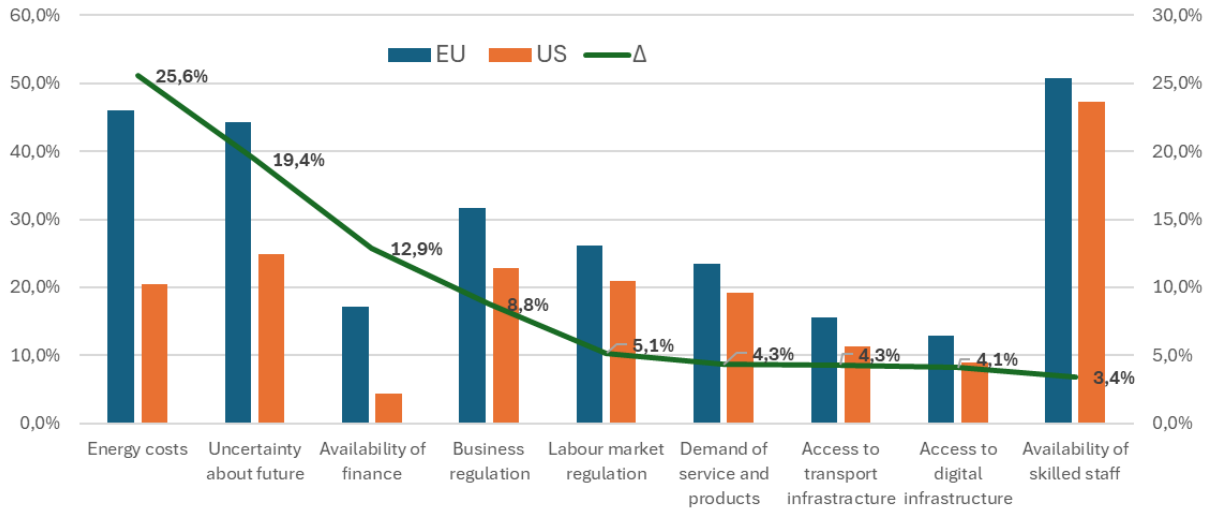
Appendix B: Strategic Autonomy and the Cloud and AI Development Act

I. EU digital companies scale and EU Strategic Autonomy

Draghi and Letta reports have markedly stressed that European companies remain overwhelmingly small: SMEs represent 99.8% of all EU firms - with micro-enterprises alone accounting for 93.3% of the total, while only 0.2% of businesses employ more than 250 workers.

A recent survey by the European Investment Bank (EIB)[228] assesses firms' perceptions of investment barriers across the European Union that inhibit scaling. The findings (figure 17) show that the most significant obstacles to investment include the availability of skilled personnel, high energy costs, uncertainty about the future, and restrictive business and labour market regulations. When compared with the United States, these factors - apart from skill shortages, which are similarly reported overseas - remain major sources of competitive disadvantage for European firms: energy costs (25.6% EU-US gap), uncertainty about the future (19.6%), business regulation (8.8%), and labour market regulation (5.1%). In addition, limited access to finance represents one of the most substantial negative differentials relative to U.S. firms, with a 12.9% gap—equivalent to an approximately 3:1 ratio (see **Appendix A**)

Figure 17 - Major investment impediment (perceived) in the EU and in the US



Source: Elaboration on data from EIB Investment Survey 2025 - European Union overview

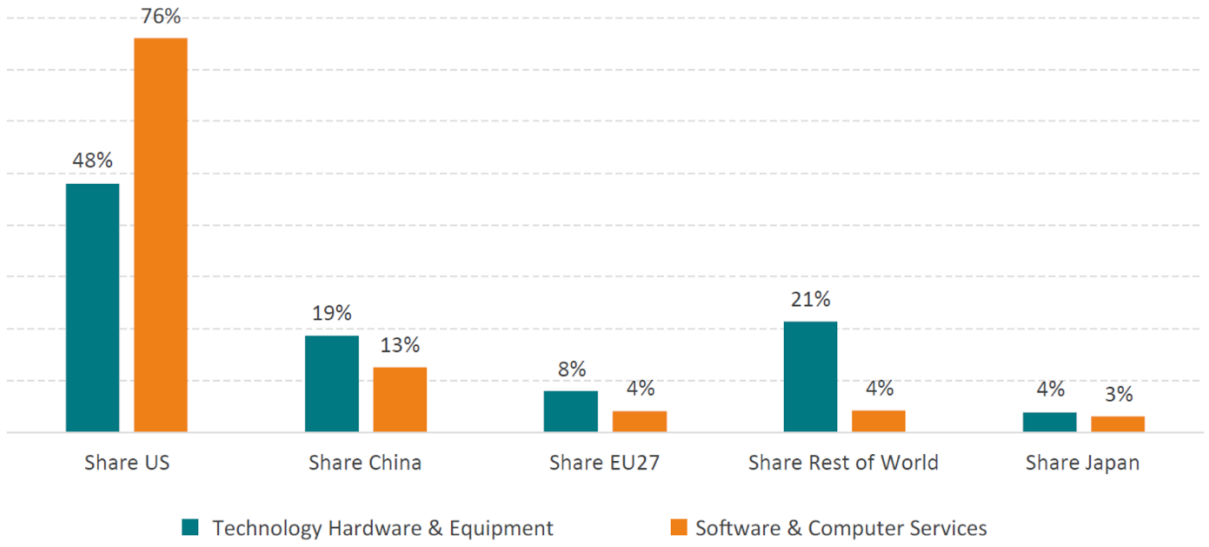
This skew is even sharper in the digital economy, where most EU players are start-ups, and where just four EU-headquartered tech firms (i.e., ASML, SAP, Siemens and Schneider Electric) make it into the global top-50 by market capitalisation, while the US-based "big tech" - Apple, Microsoft, Alphabet, Amazon, Nvidia, Meta - are the most capitalised companies in the world, each one dwarfing the combined EU largest ones. Notably, no European company established from the ground up in the past

[228] European Investment Bank (2025) Investment Survey 2025 - European Union overview.

fifty years has reached a market capitalisation exceeding EUR 100 billion. In contrast, all six U.S. companies valued above EUR 1 trillion were founded within this same timeframe.

The largest US tech firms are also the heaviest investors, as for ICT capital expenditure and R&D. As noted, EU-headquartered companies represent a relatively low investment share in key global ICT investments – 8 % in technology hardware and equipment, compared to 48% of the US share, and 4 % in software and computer services, compared to 76% for US.

Figure 18 – Share of Capital expenditure and R&D in Global investments by leading Tech companies, 2022



Source: European Commission (2023) EU industrial R&D Investment Scoreboard

This situation, on one side, shows the importance of US technology solutions for Europe's digital economic transformation,[229] yet, on a different perspective, also underscores the fact that, currently the EU depends on foreign countries for over 80% of its digital products, services, infrastructure.[230]

In this regard, Draghi is of the opinion that EU ought to reduce its existing large external dependencies, as those "could become vulnerabilities in a situation where trade fragments along geopolitical lines."[231]

Following this line, the third pillar of the EU Competitiveness Compass - complementing the first pillar focused on closing the innovation gap (see **Annex**) - targets the reduction of strategic dependencies and the enhancement of security. Both pillars ultimately seek to bolster the EU's "strategic autonomy", but they do so from different angles and on distinct timelines. This divergence makes their coordination particularly important and complex.

The enduring concept of "strategic autonomy" [232] - initially meaningfully framed as "open" strategic autonomy - highlights the European Union's ability to act independently in key areas while maintaining

[229] Bauer M., Pandya D. (2024) ICT Beyond Borders: The Integral Role of US Tech in Europe's Digital Economy, ECIPE Policy Brief 06/2024.
[230] Eu Commission (2023) Report on the state of the Digital Decade 2023.
[231] Draghi Report (2024), cit.
[232] Cagnin C., Muench S., Scapolo F., Stoemer E., Vesnic Alujevic L. (2021) Shaping and securing the EU`s Open Strategic Autonomy by 2040 and beyond - JRC paper; Kroll H. (2024) Assessing Open Strategic Autonomy - JRC paper.

constructive global partnerships. It entails the capacity to decide when and how to exercise such independence, reinforcing a vision of "interdependence" - rather than independence - supported by credible alternatives that reduce vulnerability to critical dependencies.

This objective can be pursued through policy responses that broadly fall into two types of action:

- Measures aimed at fostering EU-based alternative supply chains ("enabling"), and
- Measures designed to restrict or limit the presence of non-EU providers ("restrictive").

Although their boundaries are not always clear-cut, and may be not mutually exclusive, as policies may contain both elements, the distinction matters analytically and normatively.

Of these, the second approach, focused on limiting the supply from non-EU providers, requires careful evaluation – particularly if enforced in a short timeframe. Indeed, any dependency underlies a need, and whether alternative EU providers exist and can be supported to such an extent to provide the same variety and quality of service is not a trivial question and very much depends on the specific sector and service we are considering. A quest for greater independence in the short term always carries potential risks, including slower digital diffusion, lower service quality, and reduced consumer choice. Such trade-offs highlight the complexity of the current policy landscape[233]: striking the right balance is therefore essential to ensure that efforts to secure autonomy do not inadvertently hinder the innovation cycle that the Competition Compass aims to accelerate.

Instead, the first approach is increasingly viewed in a more favourable light, as it aligns with long-standing structural gaps in EU industrial policy and actively promotes the development of European industry. As Mario Draghi recently emphasised, in a shifting geopolitical context where all major powers are moving to reduce external dependencies and reclaim strategic autonomy, the EU must articulate a coherent industrial policy, centrally coordinated and strategically guided. [234]

An enabling approach can be understood, in terms of market outcome, as the industrial policy equivalent of pro-competitive regulation that counteract structural and economic advantages and boost competition. This approach can progressively enable European firms to compete more effectively, both in private markets and in public procurement. However, it should be carefully designed since, like pro-competitive regulation, enabling policies may face two constraints: (i) threshold effects - insufficient support fails to overcome structural disadvantages, yielding costs without competitive benefits; and (ii) dependency effects - excessive or prolonged support can create dependency on the public intervention rather than building genuine capacity.

In addition to the type of action ("enabling" versus "restrictive"), another dimension of a strategic autonomy policy contributes substantively to define and frame its potential trade-offs: the scope of the action, i.e., measures targeting service for private entities (consumers and businesses) as opposed

[233] Mayers Z. (2025) A framework for understanding EU competitiveness – CERRE issue paper.

[234] While Member States have begun adjusting their strategies with more assertive industrial and strategic policies, these efforts at EU level are often uncoordinated and fragmented, diluting their collective impact. Coordination challenge is twofold: (i) between Member States: National-level interventions often lead to duplicated efforts, and divergent standards, and neglected cross-border externalities, weakening the effectiveness of Europe-wide action; and (ii) across policy domains: in leading global economies like the US and China, industrial policy is increasingly multi-dimensional, linking fiscal incentives, trade enforcement, and foreign economic tools into integrated national strategies, while replicating this in the EU context requires strong alignment between national priorities and EU-level governance.

to measures targeting services for governments and other public administrations ("private" versus "public"). [235]

Policy options targeting services for public bodies do not necessarily imply smaller trade-offs in economic terms; rather, the analytical framework may be subject to a shift reweighing when national security enters the equation. In these domains, a precautionary approach could be considered more justified, in order to prioritise protection against low-probability but high-consequence risks (foreign surveillance, infrastructure disruption, coercive leverage) even when such risks cannot be precisely quantified. This contrasts with the proportionality principle, which is adopted in EU law as a regulatory principle and widely recognised to promote market efficiency. Therefore, invoking security to justify precautionary measures cannot be extended indiscriminately, but should be accurately evaluated and targeted.

In this context, the Draghi Report acknowledges that it is important that EU companies maintain a foothold in areas where "technological sovereignty" is possible and required, such as advanced connectivity, security, and encryption. While as for "cloud sovereignty" Draghi's opinion is that "*the EU should ensure that it has a competitive domestic industry that can meet the demand for 'sovereign cloud' solutions. To achieve this goal, the report recommends adopting EU-wide data security policies for collaboration between EU and non-EU cloud providers, allowing access to US hyperscalers' latest cloud technologies while preserving encryption, security and ring-fenced services for trusted EU providers. At the same time, the EU should legislate mandatory standards for public sector procurement.*"

Indeed, despite the expansion of EU cloud providers, US hyperscalers still accounts for about 70% of the market for infrastructure as a service (IaaS) and hosted private cloud. As noted, despite the pro-competitive cloud policies enacted by the EU,[236] this trend is expected to persist due to the economics of the sector. [237] Again, this signals both a large dependency as well as an investment gap for Europe (private and/or public funds) to fill in order to satisfy that need (or part of that need) in alternative ways.[238]This is even more complex considering that it is an objective for the EU to increase that need, by incentivising more EU companies to use different kind of cloud services and use it in a productive-enhancing way.

II. The Cloud and AI development Act

[235] This distinction is generally clearer than the enabling/restrictive dichotomy, as the end-user category is more readily identifiable, though grey zones persist in public-private partnerships, critical infrastructure, and dual-use technologies.
[236] Specifically, the Data Act (Regulation 2023/2854) chapter VI and VIII – recently become effective and applicable, and the Digital and Markets Act (Regulation 2022/1925), which has been marked by conceptual and enforcement challenges as far as cloud services are concerned. See Manganelli A. (2025) Policy responses to competition concerns in cloud computing services, in Cloud Services and Competition Policy - Concurrences No 8-2025 On-Topic.
[237] See Manganelli A., Schnurr D. (2024) Competition and Regulation of Cloud Computing Services – CERRE Report.
[238] "It is too late for the EU to try and develop systematic challengers to the major US cloud providers: the investment needs involved are too large and would divert resources away from sectors and companies where the EU's innovative prospects are better." Draghi Report (2024).

One of the EU's key policy responses is the forthcoming Cloud and AI Development Act (CAIDA), a central legislative pillar of the Competitiveness Compass (see **Annex**).

The CAIDA legislative proposal, initially scheduled for Q4 2025, is now expected for Q1-2 2026 and is supposed to be structured around three main pillars: (i) Research & Development, (ii) Autonomy, and (iii) Deployment.

The first pillar, (i) Research & Development, focuses on strengthening data processing infrastructures, software, and related services, with a strong emphasis on fostering the widespread adoption of advanced digital technologies. As outlined above, although the European Union benefits from a long-standing tradition of scientific excellence - particularly within its universities and public research institutions - it continues to lag behind the United States and Asia in converting research outputs into market-ready products and achieving broad market diffusion.

The second pillar, (ii) Autonomy, aims to establish a secure, EU-based cloud infrastructure designed to support narrowly defined, highly critical use cases - particularly those requiring elevated levels of data security, such as in the public sector. This initiative seeks to create the conditions necessary for the EU cloud industry to develop sovereign and secure processing capabilities that can adequately serve these mission-critical and strategic needs.

The third pillar, (iii) Deployment, will be implemented through the adoption of concrete quantitative targets, most notably the objective of tripling the EU's data processing capacity within the next five to seven years. This expansion will be underpinned by the development of highly sustainable data centres, addressing a key shortfall in the Union's digital infrastructure. Currently, the EU hosts only about one-third as many data centres as the United States, which considerably constrains its capacity to support large-scale data storage and AI-related processing. [239]

As for Deployment, the objective of tripling the EU's data centre capacity within the next five to seven years is consistent with, and substantially reinforces, the Digital Decade Policy Programme (DDPP) targets. However, as discussed earlier in the context of connectivity, supply-side targets - such as infrastructure deployment - must be assessed against both current and projected demand to ensure a sound rationale for "anticipatory public (or publicly-incentivised) investment". In the case of data centres and AI factories, demand and willingness-to-pay trends are strictly linked with the increase for AI-related workloads, which require substantial data storage and processing capacity.

As noted in the discussion on connectivity, another important consideration in assessing anticipatory public investment relates to the presence of externalities not captured by existing market demand. In the context of cloud infrastructure, such externalities may also be negative, arising from the risk - actual or perceived - associated with the reliance on non-EU-based cloud infrastructure for highly critical use cases. If addressing these risks is necessary to ensure resilience, sovereignty, and trustworthiness of the EU's digital ecosystem, it is however essential to narrowly frame those risks and considering that those negative externalities are mainly internalised either by public subsidies, crowding-out private investments, or by business and end-users, through higher prices or lower quality. This is the "insurance cost" mentioned by Draghi, which should be, on one side, mitigated by

[239] Savills Research (2024) European Data Centres Navigating the new data-centric frontiers, available at: https://pdf.euro.savills.co.uk/european/european-commercial-markets/spotlight-european-data-centres---may-2024.pdf.

cooperation and, on the other side, effectively minimised – i.e., defined trough a proportional and not precautionary kind of assessment.

Indeed, while CAIDA primarily appears to focus on promotional or "enabling" measures aimed at strengthening the EU's domestic cloud and AI industries, certain provisions about "Autonomy" may in operate as "restrictive" measures, limiting market access for non-EU providers. In this respect, the distinction between enabling and restrictive measures can often be highly blurred, raising questions about the balance between industrial policy objectives and the principles of open competition.

In this context, "cloud sovereign solutions" developed by major hyperscalers have emerged, triggering an ongoing debate on what truly constitutes sovereignty in the cloud domain: whether the mere localisation of infrastructure within the EU suffices, or whether genuine sovereignty requires that cloud providers be European-owned and operated. Alternatively, could transatlantic partnerships, if adequately governed and compliant with EU data protection and security standards, also align with the EU's sovereignty objectives?

This debate is primarily legal and jurisdictional in nature, [240] extending beyond questions of technical architecture or of adoption of technical and organisational requirements-based cybersecurity certification scheme. Therefore, a primary task for CAIDA would be to provide clear definitions avoiding uncertainty reducing fragmentation, as well as ensuring consistency with existing legislation, particularly looking at the interplay with data-related regulatory provisions included in the Data Act and the Digital Markets Act.[241]

For example, how would be framed the interplay with all the different interoperability and data portability obligations in the DMA, Data Act and also GDPR? Or, more generally, what would be the relationship with the Data Act provisions aiming at putting in place safeguards against unlawful international governmental access and transfer of non-personal data?[242] Answering these questions is not trivial, and therefore it calls for clarification and further caution about the effect of new provisions.

While these legal considerations about "restrictive" provisions are undoubtedly important, their substantive implications are even more important and can vary significantly in terms of impact on the market, demand satisfaction and evolution – all of which should always be taken into consideration within any policymaking regulatory assessment.

[240] Companies may remain subject to the laws of their home jurisdictions, even when data or operations are physically located abroad. Namely, US cloud providers remain subject to American law regardless of where they operate their infrastructure, so to the Clarifying Lawful Overseas Use of Data Act ("Cloud Act"), enabling US authorities to compel companies to provide data regardless of its physical location, and "FISA Section 702" that allows surveillance of non-US citizens' data stored by American companies outside the US. Of course, all these procedures are constraint by legal substantive and procedural limitations and are not that different – in terms of impact on users' rights - from similar legislation active in EU member states.

[241] Respectively, Regulation 2023/2854 and Regulation 2022/1925.

[242] Art. 32 (chapter VII) of the Data Act states that: "providers of data processing services shall take all adequate technical, organisational and legal measures, including contracts, in order to prevent international and third-country governmental access and transfer of non-personal data held in the Union where such transfer or access would create a conflict with Union law or with the national law of the relevant Member State".

Appendix C: Digital and ICT Ecosystems Orchestration

I. The Role of "Orchestrator"

US tech companies are global "digital champions" by virtue of their global scale, massive investments in R&D and infrastructures and their constant industrial and commercial focus on the newest key technologies. (see **Appendix B**)

Nevertheless, their global prominence is also due to their role of de *facto* "coordinators" in broad digital ecosystems. Frequently positioned at the core of platform-based models, they orchestrate a vast array of complementors, including developers, users, and businesses, through tightly governed digital platforms. [243]

Unlike markets with a static structure, digital orchestrators actively structure and foundationally shape ecosystem interactions, by setting governance rules and procedures to ensure smooth internal interactions, reducing transaction costs, enabling complex multi-party collaboration, and aligning incentives of complementors to invest in quality enhancements and in specialised complementary services.[244]

This orchestration activity does not only leave substantial scope for complementors to innovate independently, but is aimed to enhance the quality, user experience, and ultimately the overall value of the platform ecosystem.[245]

Indeed, in the digital economy, those companies that combine very large scale and coordinating influence are usually able to:

- Advance in the innovation process by virtue of large investments in R&D, also absorbing some of the inherent risks of frontier innovation, particularly by investing in R&D where expected returns are highly uncertain;
- Enable a distributed model of innovation and value generation; and
- Support and stimulate technology advancement and widely spread its diffusion.

In practice, centralised control over the main key ecosystem assets retained by orchestrators (particularly those that are non-rival and scalable, e.g., data infrastructure, AI models, and algorithms) is pivotal for the well-functioning of the ecosystem.

[243] See, Jacobides M., Cennamo C., Gawer A. (2018) Towards a Theory of Ecosystems, in Strategic Management Journal 39, no. 8 (2018): 2255–76; Kretschmer T., Leiponen A., Schilling M., Vasudeva G. (2022) Platform Ecosystems as Meta-Organisations: Implications for Platform Strategies, in Strategic Management Journal 43, no. 3 (2022): 405–24.

[244] They do so by establishing governance rules that preserve quality and incentivise investment, sharing data insights, and making available technology tools such as software development kits, i.e., provide the necessary tools, guidelines, and economic incentives for businesses or complementors to provide those services that align with the ecosystem's needs. See, Jacobides M., Cennamo C., Annabelle Gawer A. (2022) Externalities and Complementarities in Platforms and Ecosystems: From Structural Solutions to Endogenous Failures, in Research Policy 53, no. 1; Autio E. (2022) Orchestrating Ecosystems: A Multi-Layered Framework, in Innovation 24, no. 1 (2022): 96–109.

[245] Kretschmer T., Leiponen A., Schilling M., Vasudeva G. (2022) Platform ecosystems as meta-organisations: Implications for platform strategies, in Strategic Management Journal 43: 405-424.

On the other side, centralised control is also strategic, since it allows orchestrators to internalise a relevant portion of the value produced in the ecosystem and entrench their position at its core. [246].

This twofold effect and the consequent fundamental economic tension seem to be a defining physiological characteristic of the contemporary digital economy, rather than a pathological one. Therefore, the difficult policy and regulatory challenge is not to eliminate the centralised orchestration or nullify centripetal forces of value of attraction, which may be neither feasible nor desirable when that activity substantially contribute to incremental value creation,[247] but to ensure that digital ecosystems remain sufficiently open and contestable to sustain innovation while providing fair opportunities for all participants to capture a fair value from their contributions.[248]

EU public policy has progressively sought to address this trade-off, through regulatory interventions aimed at enhancing contestability and fairness, through data access, non-discrimination and interoperability obligations. [249] In this context, it has had very challenging (and not always successful) to strike an effective and efficient balance, requiring nuanced approaches that recognise both the physiological characteristics of digital value creation and the need for public intervention to shape governance mechanisms that prevent abusive and strategic behaviours that affect contestability and fairness, as well as, ultimately, the well-functioning of the ecosystem.[250]

II. The EU "3C Network Vision"

Given the growing significance of ecosystem economics, the European Commission has envisioned a market evolution that would extend platform dynamics to the connectivity sector. This transformation builds on the virtualisation of electronic communications network functions and their progressive migration to cloud and edge environments.[251] The proposed *"3C Network – Connected Collaborative Computing"* framework envisions transforming today's connectivity manufacturers and service providers into sophisticated orchestrators of collaborative computing ecosystems. [252] According to the

[246] Helfat C., Raubitschek R. (2018) Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems, in Research Policy, Volume 47, Issue 8, 2018, Pages 1391-1399; Lei Shen, Qingyue Shi, Vinit Parida, Marin Jovanovic (2024) Ecosystem orchestration practices for industrial firms: A qualitative meta-analysis, framework development and research agenda, in Journal of Business Research, Volume 173, 2024.

[247] As noted above, asymmetric value distribution in digital ecosystems may serve important systemic functions: (i) Risk absorption; (ii) Coordination efficiency; (iii) Investment capacity; (iv) Quality assurance within the ecosystem. These functions also indicates that some degree of value concentration may be necessary for ecosystem stability and continued innovation. See Lei Shen, Qingyue Shi, Vinit Parida, Marin Jovanovic (2024), cit.; See, Jacobides M., Cennamo C., Gawer A. (2018), cit.

[248] Scott Morton F.M. (2025) Digital Platform Regulation: Making Markets Work for People; Crémer, J., de Montjoye, Y.A., Schweitzer, H. (2019) Competition Policy for the Digital Era. Report for the European Commission.

[249] Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act) OJ L 265/1

[250] See, with different perspectives: (i) Meyers Z. (2025) Which Governance Mechanisms for Open Tech Platforms? – CERRE Report; (ii) Cennamo C., Kretschmer T., Constantinides P., Alaimo C., Santaló J. (2023) Digital Platforms Regulation: An Innovation-Centric View of the EU's Digital Markets Act, in Journal of European Competition Law & Practice, Volume 14, Issue 1, January 2023, Pages 44–51; (iii) De Streel A., Feasey R., Kramer J., Monti G. (2021) Making the Digital Markets Act more resilient and effective – CERRE Report.

[251] The shift from proprietary, hardware-centric telecom infrastructure toward open, virtualised, and software-defined networks promises to revolutionise Electronic Communications Networks by enabling greater agility, flexibility, and innovation. See, BEREC (20023) Study on the trends and cloudification, virtualisation, and softwarisation in telecommunications - Report prepared for BEREC by Plum Consulting and Stratix, BoR (23) 208.

[252] Shared infrastructure and collaborative frameworks would lower individual capital requirements, while simultaneously amplifying collective innovation capacity. Moreover, this approach would serve as a strategic lever to secure Europe's global leadership in network equipment manufacturing, while fostering the development of complementary industrial capabilities across the broader digital value chain.

EU commission's white paper[253] , such an ecosystem would integrate the full spectrum of the digital value chain, ranging from semiconductors and computational capacity across edge and cloud environments, to radio technologies, connectivity infrastructure, data management, and applications. The ultimate and very ambitious goal would be to create a unified platform through which European companies can overcome long-standing scale disadvantages, and the fragmentation of the EU's digital landscape, which have hindered European digital competitiveness.

This policy vision is extremely challenging as today European industry relies heavily on non-EU cloud and digital platform providers, which are the *de facto* orchestrators of the EU digital ecosystems. At the same time, this represents a policy response to what is perceived to be a critical source of dependencies and incremental weakness with a view to the AI strategy, since, unlike the US or China, no large-scale EU tech companies currently animate the competition along the AI value chain. [254]

So far, this policy vision has not been operationalised. However, some untrivial obstacles can already be identified. First, while the risk-bearing function of an ecosystem can, in principle, be supported - or even fully undertaken - by public authorities through subsidies or strategic investments, the coordination function is far more challenging to replicate. Public bodies very often face substantial information asymmetries and misaligned incentives, which hinder their ability to deliver real-time orchestration or high-level strategic planning - essential in dynamic, fast-evolving digital ecosystems.

System orchestrators are often required to define non-negotiable or non-collaborative standards—such as API protocols, compliance frameworks, or security baselines—and enforce them in ways that do not constitute Pareto improvements, inevitably creating "winners and losers." Given the challenges posed by asymmetric information, the establishment of a publicly governed ecosystem appears both implausible and undesirable. Similarly, private collaborative governance models - such as the GAIA-X initiative[255] - tend to falter due to the absence of assertive steering by a private authority and the lack of a coherent private legal order.[256] These shortcomings typically manifest as: (i) the absence of a credible enforcement mechanism; (ii) the proliferation of vague or inconsistent standards/functioning rules; (iii) weak firm-level commitments, with participants easily exiting the ecosystem when it ceases to serve their interests; and (iv) unaddressed power asymmetries that undermine collective action.

The connectivity market may represent a partial exception, as industry-led collaborative standards continue to play a pivotal role. Nevertheless, identifying a clear *primus inter pares* among operators—and extending that influence across the broader digital ecosystem—remains highly challenging. Prominent European companies operating across various layers of the telecom value chain (e.g., Ericsson, Nokia, Deutsche Telekom, and Vodafone) are not inherently positioned as platform orchestrators, nor do they typically operate at-scale digital platforms. While some initiatives have

[253]European Commission (2024) White Paper: How to master Europe's digital infrastructure needs? - COM(2024) 81 final.

[254] From AI chips production to cloud computing infrastructures, passing through large application provider, which can deploy and integrate AI capabilities into end-user products and can leverage value from access to massive integrated datasets. See, Manganelli A. (2025) Foundation models and generative AI applications: what competitive concerns? , forthcoming in European Competition Journal - available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5242028.

[255] GAIA-X is a Franco-German-led European initiative launched in 2019 to develop a federated, secure data infrastructure for Europe aimed at promoting digital sovereignty and reducing dependence on non-European cloud providers. GAIA-X operates as an international non-profit organisation (AISBL) based in Belgium, developing (i) Standards and certification frameworks for data infrastructure compliance; (ii) Digital Clearing Houses (operated by providers like T-Systems and Aruba) to certify Gaia-X-compliant services; (iii) Sectoral "lighthouse projects" demonstrating practical applications in specific industries; (iv) Open-source principles ensuring transparency and interoperability.

[256] See Manganelli A., Nicita A. (2022), cit.

emerged,[257] these efforts have not come close to rivalling U.S. platforms in terms of scale, user base, or ecosystem integration.[258]

That said, European telecom operators and upstream vendors and innovators are not necessarily destined to be passive complementors. Although they may not evolve into global platform orchestrators, they still have the potential to assume more balanced and strategic roles in shaping a polycentric digital ecosystem, particularly in domains where decentralised infrastructures remain critical assets. Their influence will ultimately hinge on how complementarities and substitutability evolve across connectivity, cloud services, and application layers.[259]

Indeed, the architecture of digital and ICT ecosystems is not fixed but shaped by the evolution of technology. The historical centralisation of the internet was driven by the need for massive compute power and data aggregation, favouring hyperscaler dominance. However, as compute becomes cheaper and more distributed, models like edge computing, on-device computing, edge-AI may be able to partially reconfigure the landscape toward latency-sensitive, decentralised architectures – that could also benefit in terms of cyber-resilience, and protection of citizens' and business data.

In this emerging cloud-edge continuum, EU telcos and vendors of telecom equipment have an opportunity to leverage their physical infrastructure and regional coverage to participate in new service delivery models. Rather than replicating the scale of hyperscalers, the strategic horizon lies in building differentiated, multi-actor ecosystems — where orchestration is shared, context-dependent, and possibly based on multiple equilibria, shaped by the specific configuration of technological and market complementarities and substitutabilities.[260]

[257] For instance, Ericsson's Aduna: https://www.ericsson.com/en/press-releases/2025/7/ericsson-announces-completion-of-aduna-transaction, DT's T-Systems https://www.t-systems.com/de/en, and somehow also Vodafone's 5G slicing https://www.telecoms.com/5g-6g/vodafone-germany-launches-5g-slicing-tariffs.

[258] Real-world progress remains uneven and fragmented: most telco-cloud and NaaS (Network-as-a-Service) initiatives remain limited to internal, private and siloed infrastructure deployments and "specific functions such as 5G core" (with a limited 5G Stand Alone diffusion) rather than public, composable, service-oriented ecosystems. See, BEREC (2024) Report on Cloud and Edge Computing Services, BoR (24) 136.

[259] Since "the traditional boundaries between these various actors are increasingly blurred as they form part of what can be described as a computing continuum". European Commission (2024) White Paper, cit.

[260] The "traditional relationships" between telcos and digital platforms was one of complementarity, however an increasing two-sided substitutability is taking place. See BEREC (2024) Report on the entry of large content and application providers into the markets for electronic communications networks and services, BoR (24) 139; Manganelli A. (2024) End-users regulation, in The Future of European Telecommunications: In-depth Analysis – CERRE Report.

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Annex: Description of the Main EU Policy Actions

The EU pursuit of competitiveness and productivity-enhancing digital transformation is currently embodied in two pivotal and comprehensive policy frameworks: the Digital Decade Policy Programme 2030 and the EU Competitiveness Compass.

Digital Decade Programme 2030

To incentivise and monitor digitalisation across the EU, in 2022 the European Union has launched the Digital Decade Policy Programme 2030 (DDPP) [261] as a legally binding framework that represents the current EU's overarching digital transformation roadmap, and which aims to align digital progress with broader policy objectives of competitiveness, technological sovereignty, resilience, and inclusion.

The DDPP emerged from the Commission's 2030 Digital Compass Communication,[262] which laid out a vision for empowering citizens and businesses through digital transformation, by structuring Europe's digital ambitions along four cardinal axes: (i) Digitally skilled population and workforce; (ii) Secure and sustainable digital infrastructures; (iii) Digital transformation of businesses; (iv) Digitalisation of public services.

To translate these principles into actionable commitments, the Commission has established quantified targets, benchmarked against the Digital Economy and Society Index (DESI).[263] These include:

- Digital Skills and Professionals:
    - At least 20 million ICT specialists employed in the EU by 2030, with a focus on gender parity (from 7.8 million in 2019);
    - 80% of EU adults to have basic digital skills.
- Digital Infrastructures:
    - Gigabit connectivity for all households and 5G coverage in all populated areas;
    - 20% of global semiconductor production value to be based in Europe;
    - Deployment of 10,000 climate-neutral highly secure edge nodes;
    - Europe's first quantum-accelerated computer by 2025.
- Business Digital Transformation:
    - 75% of EU enterprises adopting cloud computing, big data, or AI technologies (from under 30% in 2020);
    - Ensuring over 90% of SMEs reach at least a basic level of digital intensity;

[261] Decision (EU) 2022/2481 establishing the Digital Decade Policy Programme 2030.
[262] European Commission (2021) 2030 Digital Compass: the European way for the Digital Decade – COM (2021) 118 final.
[263] The DESI (Digital Economy and Society Index) is the set of indicators through which the European Commission has monitored the digital competitiveness of Member States since 2015. It was updated in 2021 to align with the Digital Decade Compass.

- To double the number of European unicorns.

- Digital Public Services
  - Full digitalisation of key public services, including interoperable e-health systems and records and digital identity solutions.

The programme facilitates large-scale, cross-border multi-country Projects addressing strategic digital capacity gaps. These projects, involving at least three Member States, can leverage various implementation mechanisms including joint undertakings, European Research Infrastructure Consortia, and the newly established European Digital Infrastructure Consortia (EDICs).[264]

The Digital Decade Programme employs a sophisticated and unprecedented governance framework combining monitoring, cooperation, and implementation mechanisms. In particular, it requires Member States to submit digital decade strategic "National roadmaps" (the first ones by October 2023) through which they propose national projected trajectories and describe policy plans, measures, and actions for reaching the targets. These roadmaps ensure coordinated EU-level national efforts while allowing for some regional specificities and different starting points. After having identified the national trajectories the enhanced Digital Economy and Society Index (DESI) serves as the primary monitoring instrument, tracking progress toward digital targets through Key Performance Indicators (KPIs) established via implementing acts. This system enables annual assessment of Member State progress and identification of gaps requiring targeted action, which are described into the Commission annual Reports on the "State of the Digital Decade".[265] Those are submitted to the European Parliament and Council, providing assessments of progress, identifying gaps, and recommending targeted actions. These reports feed into the European Semester process, ensuring integration with broader economic governance. The programme includes Adaptive Management and Cooperation Mechanisms: The European Commission is required to assess digital targets and definitions by June 2026, allowing for adjustments based on technical, economic, or societal developments. To this aim, a structured dialogue between the Commission and Member States ensures responsive governance, with mechanisms for peer review, joint commitments, and structured consultations when significant deviations from projected trajectories occur.

EU Competitiveness Compass

Considering the current geopolitical context and the EU's economic and industrial position, the European Commission has recently designated competitiveness as a structural and strategic priority. In 2025 a European Commission's Communication[266] introduced a Competitiveness Compass (CC): a guiding framework for the future EU industrial policymaking to address the EU's persistent decline in productivity growth and its erosion of technological leadership in comparison with major global competitors such as the United States and China.

[264] European Digital Infrastructure Consortia (EDICs) are EU-recognised legal entities that enable Member States to jointly develop and operate cross-border digital infrastructures. EDICs have capacity to enter contracts, own assets, hire staff, and manage funds. By pooling resources and expertise across the EU, EDICs are aimed to overcome the fragmentation and are typically used for large-scale projects such as quantum communication networks, federated cloud and edge systems, high-performance computing, blockchain-based public services, and cross-border digital identity.
[265] The most recent one is the 2025 Communication: European Commission (2025) State of the Digital Decade 2025: Keep building the EU's sovereignty and digital future - COM (2025) 290 final.
[266] European Commission (2025) A Competitiveness Compass for the EU - COM (2025) 30 final.

Several interlinked challenges are at the base of such a policy framework. First, Europe possesses strong assets, including a skilled workforce, a large single market, and a stable legal environment, yet it has remained constrained by long-standing structural barriers such as low levels of innovation commercialisation, fragmented markets, and high regulatory burdens.

At the same time, while the EU is confronted with intense global competition in innovation and industrial leadership from the United States and China, its position is further weakened by dependence on non-EU and highly concentrated parts of important supply chains, which leave it vulnerable to disruptions and geopolitical pressures.

Moreover, many of the key levers that shape competitiveness, such as taxation, labour policy, and industrial strategy, are still primarily in the hands of national governments. To match the scale and strength of other major global players, the CC aims to align EU and national policies.

The CC identifies three transformative imperative pillars: (i) closing the innovation gap, i.e., addressing Europe's productivity challenge through measures (ia) facilitating start-up creation and scaling, (ib) introducing a 28th legal regime for innovative companies,[267] (ic) enhancing venture capital markets, and (id) providing a targeted support for advanced technologies like AI, quantum computing, and biotechnology; (ii) a joint roadmap for decarbonisation and competitiveness, recognising that decarbonisation policies can drive growth when well-integrated with industrial and economic policies; (iii) reducing strategic dependencies and increasing Security, addressing supply chain vulnerabilities, promoting trade diversification, and strengthening defence industrial capabilities.

In addition, the Compass proposes five horizontal enablers to support competitiveness across all sectors: (i) simplification, aiming to reduce reporting burden by 25% for all companies and 35% for SMEs, as well as introducing comprehensive regulatory screening and modernisation efforts; (ii) Single Market Integration, aiming to remove residual barriers and preventing fragmentation to maximise continental scale benefits; (iii) financing, by developing a Savings and Investments Union and refocusing the EU budget through a European Competitiveness Fund; (iv) skills and quality Jobs, by creating a Union of Skills addressing labour market transformation and skills gaps; and (v) policy coordination, by implementing a Competitiveness Coordination Tool to align EU and national industrial and research policies.

From a broader perspective, the horizontal enablers in the Competitiveness Compass are crucial for enhancing both the efficiency and the effectiveness of the EU's economic and political systems. By targeting overregulation, Single Market integration, financing, skills, and policy coordination, the CC aims to address the main structural weaknesses that have long constrained Europe's competitiveness. Yet, these areas are marked by entrenched path dependencies and institutional inertia, which will make structural reform very difficult to achieve. It is nevertheless highly positive that the Compass not

[267] In the EU policy context, the "28th regime" refers to a legal or regulatory framework offered at the EU level as an optional alternative to national laws, rather than replacing them. The term "28th" was coined back when the EU had 27 national regimes, so the EU framework was effectively the "28th option." Even after Brexit, the concept is still used metaphorically. Initially used in debates on the European Contract Law, European Company Statute, and EU-wide IP rights, etc. – the Letta report revived and reframed it for today's context. Letta argued for an EU-level optional legal framework (effectively a "28th regime") for sectors where fragmentation blocks competitiveness — especially in energy, capital markets, digital, and defence. In his framing, it's a tool for faster integration without waiting for unanimous harmonisation.

only recognises these systemic bottlenecks but also elevates them to core priorities alongside its three transformational imperatives.

Among the three pillars, the first one, i.e., closing the innovation gap, stands out as the main driver for achieving an innovation-led competitiveness, directly looking at economic growth, productivity, and the capacity to generate and scale cutting-edge technologies.

For this reason, the Competitiveness Compass and the Digital Decade Programme should be seen as complementary and mutually reinforcing frameworks that jointly try to address Europe's challenges to create a comprehensive innovation ecosystem. The Compass incorporates key digital initiatives to advance in the pursuit of the Digital Decade objectives, namely: (i) the AI Factories Initiative and Apply AI Strategy support the Digital Decade's targets for AI adoption across enterprises; (ii) the EU Cloud and AI Development Act contributes to digital infrastructure development; (iii) Data Union Strategy facilitates the data sharing essential for digital transformation; (iv) Digital Networks Act addresses connectivity targets by improving market incentives for digital infrastructure investment. Also, the third pillar of CC, i.e., reducing strategic dependencies and increasing security, relates closely to the deployment of ICT and the development of digital ecosystems, as it confronts Europe's reliance on extra-EU technology companies and seeks to strengthen digital sovereignty.

EU AI Policy Action Plan (and Apply AI strategy)

In spring 2025, both the European Union and the US issued comprehensive policy frameworks aimed at accelerating the adoption and governance of artificial intelligence, reflecting a shared recognition of AI as a transformative driver of economic growth, competitiveness, and societal change. The European Union's AI Continent Action Plan[268] and the Americas AI Action Plan[269] each articulate ambitious agendas to enhance digital infrastructure, foster innovation, develop human capital, and promote the ethical and trustworthy use of AI technologies, although they differ markedly in their underlying strategic orientations, governance mechanisms, and economic policy approaches.

The EU's strategic approach encompasses two complementary dimensions: frontier AI development and widespread sectoral AI application. The EU framework is embedded within a binding regulatory structure, centred on the AI Act, which establishes a harmonised and enforceable set of market rules intended to safeguard fundamental rights, ensure market integrity, and consolidate the Union's position as a global standard-setter. This legal architecture is paired with an explicit pursuit of technological sovereignty, manifest in large-scale public investments in centralised infrastructure such as AI Factories, AI Gigafactories, and the expansion of EuroHPC-based high-performance computing capacity.[270] These initiatives are further supported by the Data Union Strategy, which envisages sector-

[268] European Commission (2025) AI Continent Action Plan, COM (2025) 165 final.
[269] The White House (2025) Winning the Race: Americas AI Action Plan.
[270] The EU has established 13 AI Factories as part of a €10 billion investment program, with the first facilities becoming operational by late 2025/early 2026. These facilities are built around Europe's world-leading EuroHPC supercomputers and serve as: (i) Open ecosystems providing AI startups, researchers, and industry with access to computing power (ii) One-stop shops for developing cutting-edge, trustworthy AI models and applications (iii) Platforms that more than triple the current EuroHPC AI computing capacity. Building on AI Factories, the EU announced AI Gigafactories as part of the €20 billion InvestAI initiative. These are: (i) Large-scale facilities equipped with approximately 100,000 state-of-the-art AI chips (four times more than current AI factories); (ii) Designed as the "largest public-private partnership in the world for trustworthy AI development"; (iii) Intended to enable development of the most complex AI models at unprecedented scale.

specific data spaces and specialised “Data Labs” to facilitate secure, standardised, and interoperable data sharing across the single market.

Complementing these infrastructure investments, the Apply AI strategy[271] (launched autumn 2025) shifts emphasis toward translating frontier AI capabilities into concrete sectoral applications where Europe possesses competitive advantages. Apply AI focuses on accelerating AI deployment across strategic industries—particularly manufacturing, automotive, healthcare, pharmaceuticals, and energy—through public-private partnerships, regional AI Factories with sectoral specialisation, and targeted innovation support. This approach recognises that while Europe may not lead in general-purpose Foundation models (FM), it can achieve proprietary competitive advantage through domain-specific AI solutions developed by leveraging Europe's abundant industrial data, manufacturing expertise, and world-leading positions in industrial automation and specialised sectors. The strategy operationalises this through sector-specific acceleration programs, skills development initiatives, regulatory sandboxes for high-impact applications, and public procurement mechanisms designed to create lead markets for European AI solutions, thereby embedding AI capabilities across Europe's industrial base rather than concentrating innovation in a narrow technology layer.

By contrast, the Americas AI Action Plan adopts a more decentralised and cooperative approach, prioritising regional interoperability, voluntary alignment of ethical frameworks, and flexible governance that accommodates diverse national regulatory environments. Its infrastructure strategy is driven by AI Innovation Zones and public–private testbeds, leveraging cross-border collaboration and market-led investment rather than centralised public provisioning. In the data domain, it favours privacy-preserving, interoperable frameworks that encourage, rather than mandate, participation, while in skills development it emphasises distributed training hubs and workforce retraining programmes tailored to national labour market needs.

Whereas the EU seeks to embed AI development within a cohesive legal and infrastructural ecosystem to assert regulatory leadership and strategic autonomy, the Americas approach reflects a more pluralistic, market-oriented model oriented toward fostering competitiveness, enabling policy experimentation, and maximising inclusivity across a heterogeneous regional landscape. These divergent models illustrate not only contrasting philosophies of economic governance but also differing geopolitical strategies which are also based on the different starting point in terms of scale and innovation rate of their tech and digital companies.

[271] European Commission (2025) Apply AI strategy – COM (2025) 723 final.

Issue Paper

EU Regulation and Institutions for Digital Competitiveness

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Executive Summary

Europe's digital competitiveness is constrained by fragmented and in some cases low-quality regulation, an incomplete single market, and institutional inefficiencies at the EU and national levels. Despite decades of proposals for regulatory reforms, implementation of these reforms has made little progress due to weak coordination among EU institutions, conflicts of interest within key bodies, and insufficient enforcement capacity. To foster innovation, growth, and strategic autonomy, the EU must rethink its regulatory frameworks and the institutional mechanisms that underpin them.

Regulatory design remains a critical barrier to innovation and growth. Overly complex rules, a lack of technological neutrality, excessive regulatory requirements imposed in sectors that discourage the entry of young European firms, and fragmented implementation slow the emergence of new technologies and limit the ability of firms to scale across Europe. Regulatory objectives are often poorly aligned with market realities, which constrains the EU's ability to support both incremental improvements and disruptive innovation. At the same time, trade-offs between technological neutrality, consumer protection, and strategic autonomy remain unresolved.

To address these challenges, **innovation should be a clearer and more prominent objective of EU regulation and integrated into impact assessments** so that policy-makers are forced to consider the potential impact of all policy initiatives on growth and competitiveness. Risk-tolerant, technology-neutral approaches should be applied particularly in emerging sectors such as artificial intelligence, digital services, and regulatory frameworks should be designed to allow iterative adaptation through sandboxes and pilot programs.

At the same time, harmonisation of standards across member-states is necessary to complete the **digital single market** and facilitate the scale up of national industrial successes. The Commission should also identify and address areas where existing regulation does not today reflect principles of better regulation in ways which harm the interests of European firms, before using regulation to tilt the playing field in favour of European companies. Stringent regulation can sometimes be justified by public policy objectives – but it should not be imposed without a careful impact assessment, including assessment of the impacts of regulation on innovation. More stringent regulation is not justified merely because it impacts sectors where European companies are not present: otherwise it risks creating a self-fulfilling prophecy.

The **process of making regulation also needs to be improved**. Evidence-based policy-making is essential. The EU institutions should strengthen ex ante impact assessments identifying better the causality links between rules, conducts of firms and consumers and innovation and long-term consumer welfare. They should also strengthen ex post evaluations, using iterative frameworks to refine policies before they are formally adopted. In addition, the Commission should adopt measures to **help scale-up national policy successes** – giving member states strong incentives to adopt best-practice regulatory approaches and praising good performers, 'naming and shaming' member states that do not perform well.

To adapt to the rapid technological change in many markets, European regulators should draw on **responsive and participatory regulation**, which emphasises the strategic use of external actors to

enhance compliance and oversight, and use mechanisms like regulatory sandboxes and use of big data to lower the burdens of regulation

However, regulatory reform – and changes to the process of making regulation – are insufficient. Recommendations in these areas do not address the underlying **reasons why delivering a competitiveness agenda has proven so difficult for the EU and national institutions**. Weak coordination between policy areas, fragmented enforcement regimes, and overlapping responsibilities among institutions have long impeded the delivery of competitiveness-enhancing reforms.

Policy alignment between the European Commission, member-states, and national regulators is essential, particularly in industrial, digital, and innovation policies. Likewise, **regulatory coordination must extend across countries and legal fields**. A systemic approach could involve establishing a European Digital Agency (EDA) to oversee pan-European digital regulation, complemented by national digital regulators responsible for implementing EDA decisions, monitoring compliance, and resolving disputes. Smaller firms could remain under the direct oversight of national regulators, ensuring proportionality and local responsiveness. Moreover, funding instruments such as the European Competitiveness Fund should be managed with independent technical oversight and with long-term approaches to ensure continuity beyond the tenure of individual Commissions. Such measures would reduce political interference in funding decisions and improve the allocation of resources toward growth-enhancing projects.

The European Commission itself must also address internal conflicts arising from its multiple roles as legislator, enforcer, evaluator, and geopolitical actor. Evaluating its own legislation can bias assessments, geopolitical priorities may conflict with impartial regulation, and legislative and enforcement responsibilities can create reluctance to penalize member-states. To mitigate these tensions, the **Commission should implement greater internal separation, dedicating distinct teams to legislation, enforcement, evaluation, and industrial strategy**. More ambitiously, structural reorganisation could divide the Commission into separate entities: a geopolitical executive for strategic decision-making, a regulatory authority to ensure impartial enforcement, and an internal market agency to manage competition and industrial policy. At the same time, building robust in-house **technical expertise, including engineers and data scientists**, is essential to reduce dependence on external consultants and ensure high-quality, context-specific policy advice.

Independent oversight and judicial capacity are equally important. The Court of Justice of the European Union must handle preliminary rulings efficiently to ensure coherent interpretation of EU law across member-states, while consideration should be given to establishing regional courts to manage technical and specialized cases more effectively. Similarly, the **European Court of Auditors** (ECA) should be empowered to conduct regular, systematic evaluations of legislative and regulatory outcomes. By collaborating with national audit offices and research institutions, the ECA can provide credible, evidence-based assessments that inform policy reform and improve transparency. Strengthening these mechanisms would reinforce public trust and ensure that enforcement, evaluation, and interpretation are conducted impartially and efficiently.

Ultimately, **Europe's competitiveness depends on the effective integration of innovation-friendly regulation with strong institutional governance**. Completing the single market for services and digital sectors, adopting risk-tolerant and iterative regulatory approaches, aligning funding instruments with

strategic priorities, and strengthening oversight and enforcement capacity are all necessary steps. By improving policy coherence, institutional performance, and regulatory effectiveness, the EU can enhance its global economic position while safeguarding fairness, consistency, and strategic autonomy. Success will require both visionary policy design and disciplined, evidence-based implementation, ensuring that Europe can anticipate emerging challenges and respond proactively to secure long-term growth.

1. What is holding back competitiveness?

1.1. Policies and regulation

Regulation serves a critical function in the European Union. With limited powers to spend, conduct foreign policy, or over security and defence, the **Union's most powerful tool is to regulate**.[272] Furthermore, **common regulation is the cornerstone of Europe's biggest economic achievement: its single market**. A more complete single market would intensify competition and innovation across Europe: helping the most innovative firms scale quickly and forcing laggards to leave the market, while providing stronger incentives for local innovation.[273] While the single market for goods is well-developed, in services the EU lags behind, despite the services sector accounting for around 70% of the EU's economy.[274] The International Monetary Fund estimates that internal barriers to the single market are equivalent to a tariff of 44% for goods and 110% for services.[275] Recommendations to deepen the single market have been repeatedly made in reports for the European Commission over the last 30 years – but progress has stalled and, in some areas, integration is even in reverse.[276] European policy-makers know which regulatory reforms are needed – the Draghi report reiterated many important recommendations made in previous reports on the EU single market – but the EU and national institutions and law-making processes have proven unable to fully deliver them.

Despite the important potential role for regulation in improving Europe's competitiveness, the narrative is now turning against it. Regulation can either help or hinder innovation and growth depending on the context and design.[277] The reports by Mario Draghi and Enrico Letta have echoed concerns by businesses and part of the academic literature that EU regulation has gone 'too far', and is excessively complex and burdensome.[278] In the last political cycle, there was at times a desire by EU law-makers to regulate quickly rather than to regulate well, and there is now some recognition that a number of the EU's recent laws, particularly those addressing sectors of the economy with high innovative potential, were not always well-designed. In response, the Commission is currently focused on a simplification exercise.[279] However, **there is an unanswered question about whether the problem is limited to regulatory design – or whether the EU's regulatory standards are too demanding, and the bloc's rules are too risk-averse.**

Even among some of those who acknowledge the importance of regulation, **there is increasing support for the view that Europe's approach to regulation is naïve and must evolve to more proactively support European firms, infrastructures and innovations**. At least on paper, Europe has traditionally adopted principles of better regulation – including principles of technology-neutrality, of

[272] G. Majone (1994) 'The rise of the regulatory state in Europe', *West European Politics* 17(3), 77-101.
[273] Communication from the Commission of 21 May 2025, A Strategy for making the Single Market simple, seamless and strong, COM(2025) 500.
[274] European Commission 2025 Annual Single Market and Competitiveness Report, COM(2025) 26.
[275] https://www.imf.org/en/News/Articles/2024/12/15/sp121624-europes-choice-policies-for-growth-and-resilience
[276] For instance, in telecoms, there are fewer operators providing services in multiple member-states than 15 years ago; the reason of this retreat – which may be financial, economic, political or regulatory – should be further explored.
[277] A. Bradford, The False Choice between digital regulation and innovation, Northeastern Law Review 119(2), 2024, 337.
[278] M Draghi, The future of European competitiveness; Part B: In-depth analysis and recommendations, Report to the European Commission, 2024; E. Letta, Much more than a market: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens, Report to the Council, 2024.
[279] Communication from the Commission of 29 January 2025, A Competitiveness Compass for the EU, COM(2025)30.

not discriminating between local and foreign players so that only the most competitive survive, and of depoliticising the enforcement of laws.[280] But this approach is under pressure as Europe's major trading partners are closing their markets and threatening to weaponise Europe's dependencies in order to retaliate against European regulation of their companies. To boost the bloc's digital sovereignty, **there is growing demand for regulation and institutions to play an active role in furthering European industrial policy and economic security**.

1.2. Governance and institutions

However, the European competitiveness problems may have more profound roots than regulation: lower-quality regulation may simply be a consequence of the governance and the institutions of Europe. In fact, few of the reforms set out in the Draghi Report – not only those on regulatory simplification, but also to boosting public and private investment, and improving the innovation ecosystems in Europe – are new. Most have been on the EU's agenda for decades, including in the Delors Report of 1993, the Lisbon Strategy of 2000 and in Mario Monti's single market strategy of 2010.[281] There are remarkable similarities between these reports, and yet again for the Draghi Report, delivery is too slow.[282] The problem for the EU is not identifying what to do: instead, the real problem is understanding and addressing why the EU and national institutions seem unable to deliver. This requires an analysis of the EU's current institutional capabilities and incentives to deliver a competitiveness agenda and how they could realistically be changed.

One factor is the **Commission's increasingly political nature among the EU institutions. This has meant a growing desire by the Commission to be seen to be "doing something", and doing something quickly, in response to crises.** The Commission's politicisation has also changed the nature of the Commission's role.[283] Its current powerful status differs from the technocratic role which the Commission had originally been intended to have – which was meant to be a counterweight to the more explicitly political institutions of the Parliament and the Council of Ministers. The politicisation of the Commission means that there is no longer a law-making body among the EU institutions which performs the 'technocratic' role of holding law-makers to account, insisting on regulatory good practice, and taking an expert and evidence-based approach. Increasingly, this role has shifted to institutions like the Regulatory Scrutiny Board within the Commission and the European Court of Auditors outside the Commission, which (as noted below) are lacking in the resources commensurate to their (growing) importance.

A related factor is that the **Commission leadership increasingly sees itself as needing to be popular for its own survival**. Prior to Brexit, many member-state governments might have been privately content to see Brussels imposing economically sensible laws even if they were unpopular - while at the same time publicly criticising the EU for the imposition. However, Brexit appears to have shown that such a strategy can dramatically backfire. Since then, the Commission has been particularly keen to address its perceived lack of popularity and legitimacy. However, this has contributed to an approach where the Commission tends to promise too much – making it difficult to openly and

[280] Commission Staff Working Document of 21 November 2021, Better Regulation Guidelines, SWD(2021) 305.
[281] Mario Monti, 'A New Strategy for the Single Market: at the Service of Europe's Economy and Society', 9 May 2010.
[282] European Policy Innovation Council, *The Draghi Observatory* (2025).
[283] L. van Middelaar, *Alarums and Excursions: Improvising Politics on the European Stage*, Columbia University Press, 2019.

transparently make evidence-based trade-offs which admit that difficult reforms have losers as well as winners.

A third factor is the **multiplication of the roles of the Commission, some of them being in tension**. In recent years, the Commission has seen its role increasingly be to champion legislative proposals. As the narrative shifts away from regulation and the EU's focus has had to turn towards areas like coordinating industrial policy and defence, the Commission increasingly relies on having member-states behind its proposals. This has led to a relationship where the Commission is a 'deal maker' with member-states, standing in sharp conflict with its role as a guardian of the EU law – and in particular the single market - which may need to take action against member-states where they fail to faithfully implement EU law.

Fourth, the Commission has become an increasingly bureaucratic institution, with implementation of policies often siloed within Directorates-General (and sometimes to individual teams) and insufficient coordination within the Commission. This has made it **more difficult for the Commission to identify where trade-offs between different policy goals need to be made and to address them in an evidence-based way up-front. And to make things worse, during the legislative process, those trade-offs are often only dealt with thanks to the now too common 'without prejudice' clause**, leaving them to be managed belatedly and often less transparently at the implementation stage.[284]

Fifth, the **European Parliament at times appears to advance an expansive rights agenda, sometimes to the detriment of other policy values and interests**. Several factors may contribute to this tendency, though a full exploration lies beyond the scope of this paper. Two possible explanations are, first, that rights-based regulation is among the more straightforward agendas for the Parliament to promote, and second, that championing rights offers a relatively accessible means of enhancing institutional legitimacy—particularly given that European elections often fail to generate clear, EU-level mandates due to their predominantly national focus. This expansive rights agenda is further reinforced by the Court of Justice, as evidenced, for example, in its interpretation of the GDPR.[285]

Sixth, in a political climate marked by rising populism and short-term electoral pressures, **Member States are often reluctant to support EU-level reforms that entail immediate costs in exchange for longer-term benefits. Even when such EU legislation is adopted, its transposition or implementation at the national level may diverge significantly**—sometimes involving additional requirements or "gold-plating."[286] As already noted, these practices risk undermining the coherence and functioning of the internal market.

[284] This is illustrated, for example, in the treatment of security issues in the Digital Markets Act, where the law only set out high-level principles (some of which assumed no conflict between the law's goal of contestability and other laws' objectives of improving cybersecurity): Z. Meyers, *Balancing security and contestability in the DMA: the case of app stores*, European Competition Journal, 20(3), 2024.
[285] Orla Lynskey, *The Foundations of EU Data Protection Law*, Oxford University Press, 2015.
[286] Mario Draghi, *The Future of European Competitiveness*, 2024.

2. Better Regulation for Competitiveness

This second section sets out the policy and regulation the EU should achieve in order to boost the bloc's ability to innovate and in this way sustainably increase its competitiveness, focusing on several specific issues: policy objectives, regulatory design, regulatory making and regulatory implementation.

2.1. Innovation Objectives and Metrics

As explained in the companion issue paper on competitiveness and digital transformation, the EU has two pathways to become more competitive.[287] The first path is to focus on pursuing incremental innovation and reducing costs. Adoption of digital technologies like AI – which, as a general purpose technology, will have applications in many economic sectors – by European businesses may help unlock new innovations and efficiencies, and help sustain the competitiveness of many important European exporting sectors. However, relying solely on reducing costs looks like a precarious approach in the long run, given the scale and industrial model pursued by China – which is fast encroaching on many of the sectors where Europe thought it had an enduring competitive advantage – and the widespread use of subsidies and tariffs, which is undermining the ability of countries to rely on comparative cost advantages. The second path is to **create and commercialise innovation which leads to more sustained increased productivity and economic growth over time**.[288] Innovation requires an ecosystem of enabling factors such as the availability of risk-tolerant and patient capital, a policy environment which tolerates failure and rewards success, an enabling regulatory framework, supporting infrastructures and energy, and the availability of skills. Leading in innovation is the only way in which the EU can sustainably boost its competitiveness.

This is why innovation should be a clearer and more prominent objective of EU regulation. As recalled in the Draghi Report, that is particularly important for digital markets where innovation is rapid[289] and is a key dimension of competition, and where the EU does not currently have many champions. In these markets, regulators will need to ensure they are not excessively focused on prices but also on investment and innovation, as long as these benefits are well-evidenced. This is because innovation tends to provide greater benefits to consumers than price decreases over the long run.[290] Too static an approach to supporting competition can therefore be detrimental and regulators must therefore think carefully about whether their approaches unnecessarily make it harder for firms to enter or leave markets.

At the same time, **policy-makers need to remain aware of the risk that even pro-innovation regulation can become 'entrenched' and remain unchanged for too long**. Even well-designed regulation which initially creates space for more innovation and competition may have some long-term negative consequences if it ossifies the market, encouraging businesses to rely excessively on regulation, which can be a low-risk business option, rather than their own capacity to take higher-risk,

[287] A. Manganelli, *Competitiveness, Digital Transformation and EU Policies*, CERRE, 2025.
[288] Ph. Aghion, C. Antonin, S. Bunel, *The Power of Creative Destruction: Economic Upheaval and the Wealth of Nations*, Harvard University Press, 2021. This kind of economic growth is supposed to expand the "size of the pie," increasing the potential for shared prosperity and welfare improvements, making it compatible with the idea that relations between countries may be characterised as a "positive-sum game" rather than a "zero-sum game".
[289] European Innovation Scoreboard 2025.
[290] See note 17.

higher-reward bets. This means even good regulation must be kept under frequent review, and the balance between promoting competition and promoting innovation may change over time as market and technological changes occur.

Good regulation also requires the development of innovation metrics that enable a robust, evidence-based assessment of a regulation's effects, strengths, and weaknesses. Admittedly, this is challenging: the relationship between regulation and innovation is complex, and innovation itself takes many forms and arises from diverse sources. Nevertheless, for each new EU regulation, it should be possible to identify the causal channels through which it may foster—or hinder—innovation, and subsequently assess, during regulatory implementation, whether these causal mechanisms materialise in practice.

Such analysis must also acknowledge that **not all innovation is of equal value**. Disruptive innovation, for instance, often yields more significant long-term economic gains than incremental innovation. While incremental improvements remain important, difficult questions arise when policy choices involve potential trade-offs between supporting incremental versus disruptive innovation.[291] Likewise, some forms of "innovation" may deliver limited or even negative economic effects, or may conflict with European social or cultural norms.[292] In these circumstances, there may be legitimate reasons for policymakers to steer innovation in particular directions, even if doing so may slow the overall pace of innovation.

2.2. Regulatory design and principles

2.2.1. Single market and discrimination intra-EU

One of the main bases of the EU's economic strength is its single market. Fundamentally, the single market is a promise of non-discrimination within the EU. Once a firm is licensed or authorised in one Member State, it should be able to provide its goods and services in any other part of the EU. In goods, the single market has boosted the EU's growth by promoting intra-EU growth at times when global trade was facing enormous challenges.[293] In contrast, the digital single market, in particular, is still far from being completed as sometimes member-states continue to pursue their own national interests rather than the European interest. The steps needed to complete the digital single market are well understood and are comprehensively described in both the Draghi and the Letta reports. Yet many important reforms remain unimplemented,[294] meaning that there are many areas where digital and telecoms firms must still struggle to negotiate individual member-state laws and regulations if they want to grow in scale across Europe, which drives up costs and limits competition. There are different reasons for this.

First, the **adoption of an EU law often does not mean full harmonisation - having the same rules across the single market** - **in practice** for several reasons:

[291] This trade-off was at the core of the DMA: See A. De Streel and P. Larouche, *The European Digital Markets Act: A Revolution Grounded on Traditions*, Journal of European Competition Law & Practice 12(7), 2021, 542-561.
[292] K. Yeung and S. Ranchordas, *An Introduction to Law and Regulation: Text and Materials*, 2nd ed, Cambridge University Press, 2024.
[293] L. Cernat, *The Critical Importance of the Single Market for Europe's Global Trade Performance*, ECIPE, May 2023.
[294] See note 11.

- If EU law takes the form of a directive, it must be transposed into national legislation, and the resulting laws often vary across Member States. In recent years, the Commission has sought to reduce its reliance on directives, favouring regulations, which are directly applicable. [295] However, even regulations frequently require accompanying national measures and enforcement is typically carried out by national authorities. These measures can lead to variations in how the regulation is applied across the single market. [296]
- In addition, some EU rules are unclear in practice because they result from complex political compromises, requiring interpretation by the courts at both national and EU levels. The EU Treaties provide a mechanism to ensure uniform interpretation through the preliminary ruling procedure, whereby a national court may refer questions to the European Court of Justice.[297] However, this process can take a considerable amount of time—sometimes several years—during which different Member States may continue to interpret and apply EU law inconsistently.

Second, **the enforcement of single market rules by the Commission through legal proceedings against Member States has declined in recent years**, reflected in a reduction in the number of infringement cases initiated.[298] While the Commission has defended this approach, arguing that a more collaborative relationship with Member States can often achieve better outcomes than strict legal action, there is limited evidence that this softer approach has been that effective. This may partly result from the Commission assuming a more political and influential role among EU institutions—particularly in proposing legislation that requires approval from Member States in the Council. In this context, the Commission may face difficulties in negotiating the adoption of its proposals while simultaneously acting as a stringent enforcer of EU law.

Third, **many of the remaining steps toward a fully functioning single market involve sensitive issues for Member States**.[299] Because the adoption of EU laws typically requires at least qualified majority voting—and in some cases unanimity—a small number of Member States can still block or delay reforms. This dynamic can be further reinforced by both internal and external geopolitical pressures, which may erode trust among Member States. While one might hope that heightened geopolitical risks would encourage Member States to cooperate in order to strengthen Europe's leverage with major global partners, in practice, increased risk awareness has led some national governments to adopt more protectionist policies. This can result both in slower adoption of EU legislation and in the application of national security measures in ways that make cross-border transactions within the EU more difficult and costly.

[295] For instance, the Data Protection Directive was replaced by the GDPR, and the E-Commerce Directive was complemented by the Digital Services Act which is a Regulation.
[296] For example, this is the case for GDPR, see the second Report on the application of the General Data Protection Regulation, COM(2024) 357.
[297] Article 267 TFEU.
[298] See https://www.siliconcontinent.com/p/the-myth-of-the-single-market; oonly 529 new cases were opened in 2023, the lowest in the last ten years.
[299] For example, member-states take different approaches to managing the risks associated with different telecoms vendors. And in areas like authorities' abilities to access telecoms firms' records for law enforcement purposes, member-states' practices and procedures vary dramatically.

To solve these problems, EU law-makers need to further **evolve its single market strategy[300] with a combination of steps which will require an overhaul of the EU's institutional design and ways of working**.

- First, **EU rules sometimes need to be clearer**, which could be achieved through more effective implementation of the Better Regulation guidelines across all EU institutions (see Section 2.3). Member States, in turn, should avoid "gold plating" and refrain from imposing more onerous or exacting requirements than those mandated by EU law when transposing directives or implementing regulations. [301]
- Second, creative solutions may be required to **overcome persistent Member-State vetoes** in areas where harmonisation would have the greatest economic impact. This could involve activating the passerelle clauses in the Treaties, which allow the European Council to shift from unanimity to qualified majority voting. [302] In addition, EU institutions could adopt a firmer and more transparent approach, publicly identifying Member States that block reforms and clearly communicating the economic costs of inaction.
- Third, **stronger systems of EU and national enforcement** are also necessary.[303] In addition, the Commission—or another designated single market authority—should strengthen the enforcement of single market rules, as discussed in Section 3.

2.2.2. Neutrality and discrimination extra EU

At the same time that differentiation between member-states remains stubborn and the single market remains incomplete, the EU also faces growing pressure to increase discrimination against firms outside the EU or with a connection to particular third party countries – in order to promote European digital sovereignty,[304] tackle threats to its economic security,[305] and maintain jobs in so-called strategic sectors like steelmaking in the bloc.[306]

Some of these calls represent a **fundamental shift in the direction of European regulation**, which has so far largely sought to apply the same standards to European and non-European firms alike in order to foster competition on a level playing field. This approach took the view that regulation should not 'pick winners', that tilting the playing field to promote European options would cost the economy more (by raising prices or reducing quality), and that good European solutions can emerge only when they have been proven to withstand competition.

As a first starting point, however, policy-makers – and those calling for change – need to **identify what 'European' means and what the qualifying criteria are**.[307] Is it about a firm's ownership, and what would that mean for publicly listed companies? Is it the location of their headquarters, staff, or assets? The definition will depend on the problem policy-makers are trying to solve, which is why policy-

[300] See note 2.
[301] Mario Draghi, *The Future of European Competitiveness*, 2024.
[302] Article 48(7) TEU.
[303] The Economist, *The sleeping policeman at the heart of Europe*, 3 July 2025.
[304] E.g. F. Bria et. Al., *EuroStack – A European Alternative for Digital Sovereignty*, 2025.
[305] Cmmunication of the Commission of 1 April 2025, ProtectEU: a European Internal Security Strategy, COM(2025)148.
[306] See, eg, the Commission's recent decision to hike steel tariffs: N. J. Kurmayer and T. Moller-Nielsen, *EU to hike steel duties to 50% in push for US tariff concessions*, Euractiv, 7 October 2025.
[307] See *Digital sovereignty for Europe*, EPRS Ideas Paper, July 2020.

makers need to be specific about their objectives. In some cases, those objectives may be in tension with innovation and competitiveness, as digital sovereignty has a (short term) price. For example, if policy-makers want companies to be immune from all foreign laws (including those like the US CLOUD Act which have extensive extra-territorial application), then the only European cloud companies which would qualify would be those that had no operations in the US, precluding them from providing a 'one stop shop' for European businesses with branches or operations in the US.

Secondly, rather than immediately accept the need to revisit the "neutral" approach of European regulation, **EU policy-makers could start by examining areas where its existing laws do not follow principles of better regulation – and where this could disadvantage EU firms vis-à-vis their global competitors**. As an example, consider technology neutrality. Technological neutrality can be seen as an application of the non-discrimination principle in matters relating to technology. It implies the law should not discriminate between technologies. In other words, functionally equivalent technologies should be treated in the same way and the same regulatory principles should apply to the same types of market actors regardless of the technology they use.[308] In practice, however, EU law has not always – and in some respects still does not – fully respect technology neutrality. This is especially true in light of the emergence of new digital services which have often avoided being regulated under existing frameworks, even when functionally similar services based on legacy technologies are regulated. This can risk imposing disproportionate regulatory burdens on European firms providing services based on pre-existing technologies, while imposing fewer burdens on global firms.

One prominent example is messaging. The EU's previous regulatory framework for telecommunications regulated "electronic communications services" (ECS), which were defined as including "the conveyance of signals on electronic communications networks". This meant that traditional voice telephony, SMS and the provision of internet access services were deemed to be regulated as ECS. However, services like internet-based message and calls were not regulated as ECS, since they sat "over the top" of an internet access service (which was itself an ECS). This created two tiers of regulation for services which were functionally the same, with more burdens on traditional telecommunications players (which were usually European) and fewer burdens on digital services firms (which were more often non-European). The resulting competitive distortions persisted until the Electronic Communications Code (EECC) removed the distinction.[309]

Similar concerns persist today and deserve attention. For example, European broadcasters commonly complain that the European regulatory environment imposes differential obligations on local broadcasters and online content providers which deliver services on demand – adopting the increasingly questionable assumption that local broadcasters are incumbents rather than underdogs. These include varying responsibilities regarding licensing, advertising, watershed rules, and local content requirements. Ensuring a 'level playing field' so that the same type of service is subject to the same rules – regardless of whether it is delivered as a broadcasting service or via the internet – might significantly help European firms without resorting to active discrimination.

These reforms do not require the EU to artificially tilt the playing field – instead they can address areas where EU law does not currently live up to the ideal of technology neutrality, and, as a result, imposes

[308] Z. Meyers, P. Larouche and D. Schnurr, *The AI Act and Technological Neutrality*, CERRE (forthcoming, 2025).
[309] The new definition of "electronic communications service" in the EECC was meant to encompass VoIP as well. In any event, by the time the EECC was adopted in 2019, the demise of traditional voice telephony meant the debate was moot.

disproportionate burdens on European companies and innovators. Even with such adjustments, it seems likely that in some areas the EU is unlikely to have successful firms either because it lacks comparative advantages or third countries are themselves tilting the playing field. This leads to the question of **whether and how regulation should provide artificial benefits to European companies**. There does not currently appear to be much political appetite for express discrimination. The EU's failure to agree a proposed cybersecurity scheme for cloud services, which would have imposed 'sovereign' requirements on its highest tier, illustrates this.[310] Similarly, the Commission has had to delay the publication of its proposed Cloud & AI Development Act proposal, which was intended to support European cloud and AI services, reportedly because the Commission has struggled to articulate a workable definition of 'European' solutions or to propose a politically palatable way to provide benefits to these solutions.

However, **discrimination is increasingly appearing in indirect ways in EU law and legislative proposals**. For example, in the framework for Financial Data Access (FiDA) proposal, law-makers are trying to exclude DMA gatekeepers from the regulated access to financial data to which financial services companies will be entitled.[311] Such indirect discrimination has some risk, especially when inappropriate proxies are used which might be ill-suited to achieve the EU's stated policy goals, or have unintended consequences. The exclusion of DMA gatekeepers in FiDA could be an example of poor regulatory design as the DMA does not preclude large tech firms from expanding into the provision of new types of services, such as financial services, in order to increase competition and innovation. If the concern is to boost European firms, then it is unclear why only a small number of firms are disadvantaged, and why they have been chosen for exclusion based primarily on the popularity of their different, non-financial services.

Another example of discrimination appearing in indirect ways is in European procurement law where there has been until now limited appetite for expressly discriminating against non-EU providers, but other criteria are being introduced to benefit EU firms. Despite Commission President von der Leyen referring to 'made in the EU' mandates[312], and Draghi pushing public procurement as a way to boost the European tech sector, breaching WTO laws seemed so far, a bridge too far for many EU member-states. Instead, the EU seems likely to rely on criteria like carbon emissions, sustainability and supply chain diversity – or require bidders to comply with European rules – which indirectly support the case for using European solutions. More assertive use of the EU's Foreign Subsidies Regulation in procurement practices – including its potential application to regulation which gives unfair advantages to local firms – could also help boost European firms**.** These options may have more short term economic benefits over an approach which more explicitly demands that public authorities use European solutions even when they do not offer the best value for money. In any case, **any external discrimination should only be applied after a thorough evaluation of its short- and long-term costs and benefits.**

[310] See A. Calcara, *European cloud computing policy: failing in Europe to succeed nationally?*, West European Politics, 2025.
[311] Proposal of the Commission of 28 June 2023 for a Regulation of the European Parliament and the Council on a framework for Financial Data Access, COM(2023) 360.
[312] https://y3r710.r.eu-west-1.awstrack.me/L0/https:%2F%2Fdmp.politico.eu%2F%3Femail=zach.meyers@cerre.eu%26destination=https:%2F%2Fec.europa.eu%2Fcommission%2Fpresscorner%2Fdetail%2Fov%2FSPEECH_25_2053/1/010201993c53438c-db409547-5879-4fa2-8627-4dc864665203-000000/nbpD3ZycokuKIpELiCS2lQWBEsI=443.

2.2.3. Risk based and proportionate

Another overarching question facing policy-makers is whether regulation in Europe is overly precautionary. That is, beyond excessive complexity, which is broadly agreed to be a problem, does Europe simply have regulatory standards which are too exacting, and therefore harm European companies?

Enrico Letta's report on the EU's single market recommended a two-step approach to fixing the bloc's regulation – with 'administrative' simplification being the first step, and a second step which involves a more 'political' negotiation about the objectives regulation seeks to achieve (including, presumably, the possibility of some deregulation).[313] At this stage the Commission has spoken very little about the second stage. Nevertheless, there are concerns that a more radical departure from the precautionary approach may be necessary.

On this question, the **extent to which EU regulation is precautionary can be overstated**, particularly in more recent digital regulation. The Digital Services Act's rules for very large online platforms and the AI Act's rules on AI deployment are good examples of 'responsible innovation'. [314] They do not dictate standards to be met – but instead require and expect firms to incorporate regulatory objectives (like the mitigation of systemic risks, in the case of the DSA) into the design of services from the start, relying more on overarching and flexible principles rather than strict legal requirements.

Even where EU regulations do take a stringent approach, this may not always impose a competitive disadvantage for the EU. Europe – given its relatively high wages and energy costs, and its limited labour flexibility – is not a low-cost production hub. For internationally tradeable goods and services, European firms cannot compete at the lower end of the market. This explains why so much of its export competitiveness lies in high-end, low-volume machines like aircraft, lithography machines, and high-end industrial equipment. In these sectors, the EU faces increasing competition from China, often supported by its own self-preferencing procurement practices and subsidies. In this context, high standards can help European firms because they avoid European products being undercut by cheaper, lower-quality substitutes in Europe. Of course, that may impose costs on European customers, who may then be required to buy higher-quality goods and services than they need, potentially making those customers less competitive than non-EU providers who can choose cheaper substitutes. However, if Europe can export its high regulatory standards (as it does with the Brussels Effect) then European customers will be somewhat protected from this competitive disadvantage – and this may equally help European products be more competitive in export markets.

However, these considerations do not justify blithely imposing high standards. Instead, they require a careful assessment of how markets will respond to these standards (such as whether foreign companies will meet them more easily than European firms) and whether the costs to European customers of paying higher prices justifies any benefit to European producers. This must be led by evidence, not just hypothesis.

Another reason for maintaining high regulatory standards is where they instil trust in technology. European consumers and business customers can be more risk-adverse than those in other countries.

[313] E. Letta, *Much More than a Market: Empowering the Single Market to deliver a sustainable future and prosperity for all EU citizens*, April 2024.
[314] T. Wheeler, *Techlash: Who Makes the Rules in the Digital Gilded Age?*, Brookings Institution Press, 2023.

This justification is often cited by the Commission as a reason for pressing ahead with tough regulation. However, again, this justification needs to be backed by evidence rather than assertion. Otherwise, the higher costs associated with high standards may impede technology take-up more than they improve it.

A bigger risk of strict regulatory requirements is that they are imposed in sectors where European companies are not present, on the basis that European legislators feel there is nothing for European firms to lose by imposing such requirements. The AI Act negotiations were a good example, where only the prospect of French AI firm Mistral becoming a European AI champion was enough to cause some legislators to rethink some of the more onerous proposals in the law. Mistral's political connections played a significant role in having its voice heard; most start-ups, by contrast, do not have such weight in law-making processes, or such start-ups may not exist yet. Imposing high standards in these contexts risk creating a self-fulfilling prophecy: standards are imposed because there is no European firm able to voice its objection, and the existence of onerous regulations makes it more difficult for European start-ups to emerge and scale. To tackle this problem, law-makers must think more dynamically about how markets might evolve, rather than only considering the loudest lobbying interests in front of them. Ironically, thinking dynamically may lead to the opposite of the current situation: with higher standards in sectors where European firms are strong, and looser regulatory standards where European firms are yet to emerge, to maximise their opportunity of doing so.

2.3. The process of making regulation

2.3.1. Better Regulation Principles

The **EU was previously renowned for the quality of its law-making, which was responsible for the famed 'Brussels effect'**, whereby law-makers in other parts of the world often looked to the EU for inspiration – or simply adopted EU laws. Anu Bradford has explained the reasons for the EU's powerful regulatory influence in the world: the EU's laws have often tackled problems which are globally understood to be of concern; the EU has often regulated in a way that reflects fundamental rights, reflecting values also held by many other jurisdictions; its laws have embraced the value of open markets, giving other countries strong incentives to align with EU standards to enable access to Europe's 450 million consumers; and its laws have often reflected good regulatory design – written in ways that can accommodate 27 different national legal systems and reflecting reasonable compromises between different national interests.[315]

However, the quality of the EU's law-making may have declined in recent years – with more laws being passed that lack a proper problem definition and are instead mostly performative, whose consequences have not been fully thought through by the EU legislature, and which do not always respect principles of better regulation. One the reasons for this is, in some cases, the failure to properly scrutinise laws when they are proposed by the Commission and adopted by the Parliament and the Council, and then when they are evaluated after some years of implementation.

To address this, the **principles and guidelines of Better Regulation should be more consistently and rigorously applied**. As the Commission itself explains, "Better regulation is about creating legislation

[315] A. Bradford, *The Brussels Effect*, Oxford University Press, 2019.

that achieves its objectives while being targeted, effective, easy to comply with, and imposing the least burden possible."[316]

Ex ante and ex post evaluation

To achieve this, **Commission ex ante impact assessments examine the problems to be addressed, the objectives to be achieved, the trade-offs involved, the available policy options, and their potential impacts.** One of the primary benefits of impact assessments is their ability to identify the causal links between: (1) the rules and the incentives they create, (2) the behaviour of firms, competitors, consumers, or citizens, and (3) the resulting benefits to users. [317] To prepare better regulation, these key causal relationships should be clearly articulated in the ex ante impact assessment, which requires explicitly outlining the 'transmission mechanisms' through which rules are expected to generate a chain of effects, each dependent on the preceding one. Lawmakers should avoid assuming causal links and should clearly distinguish between genuine cause-and-effect relationships and mere correlations.

Another significant benefit of impact assessments is their ability to highlight trade-offs associated with different policy options, which may be: (i) economic—for example, between regulation, competition, and innovation; (ii) non-economic—for example, between different fundamental rights; or (iii) institutional—for example, between EU-level and national-level intervention or enforcement.[318] Here again, to prepare better regulation, these key causal relationships should be clearly articulated in the ex ante impact assessment and not left for the implementation as it is too often the case currently.

To assess causal relationships and policy trade-offs, **impact assessments must identify the relevant indicators and then collect the data necessary to measure them**. These measurements should rely on the best available data, particularly from independent, high-quality academic studies, and may be supplemented by additional research conducted for EU institutions. When precise quantification is not feasible—as is often the case for forward-looking impact assessments—specific numerical estimates should be avoided, as they can be misleading; instead, approximate orders of magnitude should be used.

Moreover, for ex ante impact assessments to provide genuine added value in the adoption of new legislation, it is essential to establish **mechanisms ensuring that they are systematically considered and updated throughout *all stages* of the legislative process**. This is particularly important given potential discrepancies between the impact assessment conducted by the Commission at the time of a proposal's publication and the final text of the legislative act. [319] At the same time, more evidence-based impact assessments can lead to stronger proposals that are better able to withstand political negotiation and remain true to their original objectives. This approach aligns with the Interinstitutional

[316] 2021 Better Regulation Guidelines, p.1.
[317] M. Bassini, M. Maggiolino and A. de Streel, *Better Regulation and Evaluation for the EU Digital Rulebook*, CERRE Report, January 2025.
[318] The different effects of those trade-offs may also unfold in a different time frame. For example, positive short-term price effects may have longer term costs in terms of innovation, or more complex consumer choice may have more long-term benefits in terms of innovation.
[319] Also, Draghi Report, Part B, p.324.

Agreement of 2016 on Better Law-Making,[320] which foresees that the impact of any substantial amendment to a Commission proposal introduced by the European Parliament or the Council should be assessed by the institution introducing the amendment, potentially with support from the Commission.

Then when the law has been adopted and is implemented**,** *ex ante* impact assessment should be **complemented by *ex post* evaluation, embedded in the policy cycle to inform the appropriate adaptation of regulatory (or alternative) approaches**. This is because the traditional 'regulate-and-forget' mindset must give way to a dynamic 'adapt-and-learn' approach as recommended by the OECD**.**[321] *Ex post* evaluations should test the assumptions on which the impact assessments were based, and if some assumptions turn out to be incorrect, the laws need to be adapted. Moreover, each new evaluation should be built on the previous evaluations, taking into account newly available market data, and correcting mistakes from past evaluations. Finally, each evaluation should lead to concrete recommendations for law-makers to follow up upon.

Robustness and independence

To be effective, both ex ante and ex post assessments must ensure robustness and independence. The Regulatory Scrutiny Board (RSB), established within the Commission in 2015, has emerged as a credible body, at times issuing negative opinions on the quality of the Commission's impact assessments and evaluations, even on politically important proposals. The RSB issued two negative opinions on the impact assessment for the Corporate Sustainability Due Diligence Directive (CSDDD), for example. The RSB exerts some degree of political accountability over the Commission as decisions to entirely override its opinions have been rare (with the CSDDD a notable exception). However, the RSB faces substantial challenges due to its heavy workload amid the pace of recent EU law-making. It currently lacks the resources to scrutinise more than a small fraction of the Commission's ex post assessments. Moreover, the Board's independence may also be constrained over time, as it relies on the Commission for its secretariat, and several members are appointed from within the Commission and return to it after their tenure. These factors risk limiting the RSB's capacity to provide a fully critical and independent perspective, particularly when such criticism may be politically inconvenient.

Moreover, we recommend that **draft impact assessments and evaluation reports prepared by Commission staff be subject to public consultation prior to review by the RSB**. This would allow stakeholders, who often have access to better information and data than Commission staff, to provide input on the identified causal relationships and policy trade-offs, as well as on the selection and use of indicators and data. Stakeholders could also propose alternative indicators or sources of data. Based on the consultation's outcomes, Commission services should revise their draft reports and provide a separate explanation of how stakeholder feedback was taken into account. With this information, the RSB would be better positioned to conduct thorough quality control of the causal analyses, trade-off assessments, and data usage in impact assessments and evaluations.

[320] Interinstitutional Agreement of 13 April 2016 on Better Law Making, points 15-17. The mission letter of Dombrovskis states that he should 'lead the negotiations on a renewed inter institutional agreement on simplification and better law making. This should ensure that teach institution assesses the impact and cost of its proposals and amendments in the same way with a simple and clear methodology.'

[321] OECD, *Recommendation of the Council for Agile Regulatory Governance to Harness Innovation*, OECD/LEGAL/0464.

2.3.2. Regulatory experimentation and scaling-up national success

Another way to improve EU regulatory making would be to scale-up national regulatory success.[322] Despite concern about the EU's overall inability to adequately support innovation and a globally competitive digital sector, there are in fact many pockets of success – showing that, with the right policy decisions and frameworks, Europe can support innovation while holding true to its values and without requiring fundamental reforms. Rather than just fret about the EU's many failures, therefore, policy-makers would be wise to look at examples of how member-states have been able to achieve success. Nordic countries, for example, have performed disproportionately well at fostering both large technologically sophisticated hardware manufacturers like Nokia and Ericsson, while also birthing many highly innovative digital platforms like Spotify. Rather than look solely to the US for inspiration, EU policy-makers could consider how to ensure that excellent innovation-friendly policies in one member-state are identified, explained, and can be disseminated to other member-states.

The Commission, for example, could put **greater focus on 'praising' good performers and/or 'naming and shaming' countries which have not performed well**. This would, however, require the Commission to be robust and act independently from its negotiations with member-states to pass new laws. Such a function may be better performed by an independent body or at least a part of the Commission insulated from political pressure.

Beyond these 'soft' persuasive measures, **the Commission is already playing a stronger role in helping to identify where countries have an innovation defect and giving them strong incentives to own these problems and address them**. For example, the EU's Recovery and Resilience Facility (RRF) – the pot of money allocated to stimulate the EU economy after Covid – provides an example of how the Commission could provide funds to member-states tied to specific projects or regulatory reforms. However, while the RRF was structured in a way that allowed member-states to set their own idiosyncratic objectives, the Commission has rightly proposed a more structured performance-related set of incentives to encourage member-states to make growth-enhancing reforms in the next budget.

While the single market is important, the EU should also recognise the value in some areas of enabling a diversity of regulatory approaches. The 'country of origin' principle – by which firms can have their products or services authorised in one member-state, and then other member-states are bound to accept those products or services through a system of mutual recognition – means that different member-states are allowed the freedom to adopt different approaches to authorising goods or services. This can encourage experimentation between member-states to adopt innovation-friendly and proportionate ways to implement regulation. Since the most successful of these will attract more firms to seek approvals in that member-state, the approach can encourage competition and may often be better than the Commission imposing a top-down 'one size fits all' approach.

Finally, the **EU may, for some policies, need to move away from consensus from all the member-states and seek more 'coalitions of the willing'**. In areas where this achieves success, other countries will join the coalition; where the experiment is a failure, the coalition can dissolve. The need for unity

[322] A good example of regulatory success scale up is the regulation of fibre deployment in the EU. France and Spain developed the best regulatory approach by relying on symmetric regulation of the passive infrastructures and then this success was scaled up over the whole EU.

has made it impossible to effectively implement the Draghi recommendations: positive measures to implement the Draghi Report were watered down in an effort to pre-empt blocks by member-states. One example proposed in the "European Way" papers is the idea of a Sovereignty Compact: a protocol which would enter into force once two-thirds of member-states, representing at least 70 % of the EU population and GDP, ratify it.[323] Once in force, certain budgetary decisions would be reliant on Qualified Majority Voting and get access to new resources like the Competitiveness Fund.

2.4. Regulatory implementation

Regaining EU competitiveness in an increasingly digital and globalised economy requires not only robust legal frameworks but also effective implementation and enforcement of those laws. The rapid evolution of digital technologies and markets presents unique challenges that traditional regulatory approaches may struggle to address.[324] To meet these challenges, regulators should draw on the insights of scholarship in **responsive and participatory regulation, which emphasises the strategic use of external actors to enhance compliance and oversight**. [325] In this model, the regulator functions as an orchestrator of a broader compliance ecosystem, leveraging multiple stakeholders to ensure that laws are not only well-designed but effectively applied. [326] This approach involves coordinated action across three key actors:

- *Regulated Firms:* Firms themselves are central to effective enforcement. Regulators should adopt an "enforcement pyramid" approach, beginning with persuasion and guidance and escalating to sanctions only when necessary. This strategy encourages companies to develop strong internal compliance systems, establish dedicated compliance functions, and implement robust reporting mechanisms. By fostering a culture of co-regulation and accountability, firms become active partners in achieving regulatory objectives.
- *The Market:* Competitors, business users, and end-users can serve as valuable monitors of market behavior. Regulators should empower these actors to report violations and contribute insights that inform the design of effective regulatory remedies. This market-based engagement increases the detection of non-compliance, promotes fair competition, and ensures that regulatory interventions are grounded in real-world market dynamics.
- *The Broader Community:* Civil society organisations, public interest groups, and independent auditors play a critical role in reinforcing oversight and accountability. Their involvement can provide transparency, amplify public trust, and bring additional expertise to complex regulatory challenges. Engaging these actors helps to ensure that regulatory frameworks serve the public interest and are responsive to societal needs.

By adopting a participatory and multi-stakeholder approach, the EU can create a regulatory ecosystem that is both resilient and adaptive. This not only strengthens compliance and enforcement but also

[323] K. Zenner et al, *The European Way: A blueprint for reclaiming our digital* future, 27 May 2025.
[324] G. Nicoletti, C. Vitale and C. Abate, *Competition, regulation, and growth in a digitized world: Dealing with emerging competition issues in digital markets*, OECD Working Paper, 14 March 2023.
[325] I. Ayres and J Braithwaite, *Responsive Regulation: Transcending the Deregulation Debate*, Oxford University Press, 1992.
[326] As already suggested fifteen years ago by T. O'Reilly, "Government as a Platform" in Lathrop and Ruma (eds) *Open Government: Collaboration, Transparency, and Participation in Practice*, O'Reilly Media, 2010, 11–40.

positions the Union to maintain and enhance its competitiveness in a rapidly evolving global digital economy.

In addition to fostering compliance, regulators can actively support innovation through mechanisms such as regulatory sandboxes.[327] These controlled environments allow firms to experiment with new services and business models while mitigating potential risks to consumers and the market. By providing a structured space for testing and iterative feedback, sandboxes encourage learning, refinement, and responsible innovation. This approach aligns closely with the principles of **adaptive governance**, a framework that emphasises flexibility, experimentation, and continuous improvement. While these principles have long guided regulatory thinking, recent advances in digital technologies and data analytics make adaptive governance significantly more feasible, enabling regulators to respond dynamically to emerging risks and opportunities in real time.

Regulators could further strengthen their capabilities by harnessing **big data and artificial intelligence (AI)**. Experience from the financial sector demonstrates the potential of SupTech (supervisory technology), where AI-driven tools and large-scale data analytics have transformed regulatory practices. These technologies enhance data collection, reporting, and management, providing regulators with more timely and accurate information. [328] Beyond administrative efficiency, AI and big data enable advanced analytics for market surveillance, early detection of misconduct, and prudent risk supervision.[329] By leveraging these capabilities, regulators can anticipate emerging challenges, respond proactively to market developments, and ensure more effective enforcement—ultimately creating a smarter, more agile regulatory ecosystem that keeps pace with rapidly evolving digital markets.

[327] A. Attrey, M. Lesher and C. Lomax, *The role of sandboxes in promoting flexibility and innovation in the digital age*, OECD Going Digital Toolkit Note, 2019.

[328] For an overview of the SupTech used by financial supervisors, see the database of the Cambridge SupTech Law at the Cambridge Judge Business School: https://ccaf.io/suptechlab/ as well as the Bank of International Settlement (BIS) Innovation Hub: https://www.bis.org/about/bisih/topics/suptech_regtech.htm. Next to regulators, the antitrust authorities are also exploring the use of big data and AI to improve their operations.

[329] S. di Castri, Hohl S., Kulenkampff A. and J. Prenio, The suptech generations, *Financial Stability Institute Insights* 19 (2019). More ambitiously, SupTech could be employed to simulate market evolution using agent-based computational modeling**,** providing regulators with a forward-looking tool to anticipate systemic risks and dynamic market behaviors: W. Brian Arthur, Foundations of Complexity Economics, *Nature Review: Physics* 3 (2021) 136-145.

3. Better Institutions for Competitiveness

Having outlined potential reforms to EU regulation, this section turns to a deeper challenge: even when reforms are widely recognised as beneficial for Europe's innovation and competitiveness—and have been on the agenda for decades—EU institutions, both at the EU and national levels, often struggle to deliver them. This section examines the limitations of the EU's current institutional arrangements and explores both short-term and more aspirational approaches to enhance the bloc's capacity and incentives to foster innovation. To realise the objectives highlighted in past competitiveness reports, Europe must address these institutional and governance challenges. We propose three main lines of reform to tackle current weaknesses: (1) substantially improve coordination among regulations and regulators; (2) address conflicts of interest arising from the Commission's multiple roles; and (3) strengthen key EU institutions, particularly the Court of Justice and the European Court of Auditors.

3.1. More policy and institutional coordination

3.1.1. Policy coordination

As we have observed in a companion issue paper,[330] an important barrier to growth-enhancing policies is the lack of coordination between different policies – leading to the absence of a clear overarching strategy, and the frequent inability for the EU institutions to weigh trade-offs between competing policy goals and articulate how these trade-offs have been managed. **The EU's ability to coherently manage these trade-offs and deliver growth could be improved with less dispersion of policy tools within different EU institutions, and between the EU institutions and national governments.**

For example, when it comes to industrial policy, the Commission's role has tended to focus on limiting the use of state aid, while some member-states have consistently pushed for greater flexibility on the use of subsidy. The European Competitiveness Fund is a proposal to expand the scope and discretion which the European Commission has over industrial policy funds, and which could help deliver more coherence.[331] The **Commission could amend the Competitiveness Fund proposal to allow for better safeguards and an institutional structure** which could ensure more long-term consistency, for example by making commitments to support projects and priorities over periods longer than a single Commission.

3.1.2. Institutional coordination

Next to coordination at the policy level, coordination among regulators is also essential for enforcement predictability and coherence. **While the enforcement regimes in the digital rulebook were developed largely independently from each other, there is now a pressing need to streamline them with greater regulatory coordination and cooperation to ensure consistency**.[332] Regulatory coordination is necessary on two levels: first, within the same legal instrument across member-states (for example, coordination among the 27 national telecommunications regulators), and second, across

[330] Z. Meyers, *Can EU reconcile digital sovereignty and economic competitiveness*, CERRE, 2025.
[331] https://commission.europa.eu/publications/european-competitiveness-fund_en.
[332] G. Monti and A. de Streel, *Improving institutional design to better supervise digital platforms*, CERRE Report, 2022.

different legal instruments (for example, coordination between telecommunications regulators and data protection agencies).

The first type of coordination is organised through the many EU networks of national regulators which have been established by EU law, such as the Body of European Regulators for Electronic Communications (BEREC) or the Consumer Protection Cooperation (CPC) Network. However, these networks have different institutional structures and dynamics, and may not yet ensure optimal coordination within the network.[333]

The second type of coordination is underdeveloped, both at the national and, even more so, at the EU level:

- At the national level, some networks of regulators overseeing the digital value chain have begun to emerge, for example in France, Germany, Ireland[334] or the Netherlands.[335] These networks contribute to a shared understanding of digital ecosystems and foster consistent policy approaches and decisions among different regulators; and
- At the EU level, the DMA High-Level Group, which consists of five regulatory networks (BEREC, ECN, CPC, EMBS, and EDPB), is the emerging platform for cooperation.[336] However, the functioning of this high-level group is impeded by a lack of transparency and stakeholder involvement.[337] More fundamentally, the scope of this high-level group is limited because, on the one hand, it only deals with policy issues at the general level and cannot handle specific regulatory cases and, on the other hand, it only addresses the DMA and not the other laws in the digital rulebook.

Ideally, a systemic structure should be established that, on one hand, enables and incentivises cross-country and cross-regulatory regime coordination, and on the other hand, ensures hierarchical relationships that allow for the rapid adoption of final decisions in the best interest of the EU, rather than merely serving the interests of individual member-states. **One possibility would be the establishment of a European System of Digital Regulators, with a two-tier structure**: (i) an EU tier: the creation of a new EU body, the *European Digital Agency (EDA)*; and (ii) a national tier: the *National Digital Regulators*, which could naturally evolve from the telecommunications regulators established under the EECC and the digital services coordinators set up under the DSA. A possible source of inspiration for this new system could be the Single Supervisory Mechanism (SSM), under which significant banks in the Eurozone are supervised by the European Central Bank (ECB) in close cooperation with national financial supervisors through the establishment of Joint Supervision Teams.[338]

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[333] P. Alexiadis, T. Shortall, A. Guerrero and N. Nikolinakos, Coherence vs Fragmentation - Institutional Challenges to EU Digital Market Regulation, *Business Law International* 24(3), 2023, 233-286.
[334] https://www.comreg.ie/about/other-regulators/.
[335] https://www.acm.nl/en/about-acm/cooperation/national-cooperation/digital-regulation-cooperation-platform-sdt
[336] https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=3904. Previously, the Digital Clearing House, an informal cooperation platforms established at the instigation of the European Data Protection Supervisors, also aims to achieve this cross country and cross regime coordination: https://www.edps.europa.eu/data-protection/our-work/subjects/big-data-digital-clearinghouse_en.
[337] A. de Streel, R. Feasey and G. Monti, DMA@1: Looking Back and Ahead, CERRE report, March 2025.
[338] Council Regulation 1024/2013 conferring specific tasks on the European Central Bank concerning policies relating to the prudential supervision of credit institutions OJ [2013] L287/63. The SSM illustrates the advantages of centralisation which

At the EU level, the establishment of an EU digital regulator has been proposed in the Letta Report of 2024 and was already recommended in the Bangemann Report back in 1994.[339] The optimum **scope of enforcement powers for the new EDA should be determined by weighing the costs and benefits of EU enforcement**. One option would be that the EDA would take over the direct enforcement powers currently exercised by the Commission under all the laws of the digital rulebook (such as the DMA and DSA), as well as the enforcement powers of the various regulatory networks established under the EU digital rulebook against pan-EU operators. This option could be effectively complemented by the establishment of a '28th' fully harmonised legal regime that smaller firms could choose to adopt.[340]

At the member-state level, the reformed **national digital regulators would retain important roles**. On the one hand, the heads of national regulators would participate in key aspects of decision-making carried out by the EDA. On the other hand, national regulators would monitor compliance of the EDA decisions by regulated firms in their respective member-states, handle complaints, and resolve disputes. National regulators could also keep direct enforcement powers for smaller firms.

3.2. Breaking up the European Commission

As previously noted, the role of the European Commission has evolved considerably over time, reflecting both the deepening of European integration and the growing complexity of the global political economy. Today, the Commission operates in multiple, interrelated capacities:

- *Primary initiator of EU legislation*: The Commission holds the (quasi-exclusive) power to propose legislation to both the European Parliament and the Council, shaping the EU's legislative agenda and policy priorities.
- *De facto government of the EU*: Beyond its legislative role, the Commission increasingly functions as the EU's executive authority, navigating a geopolitical landscape where strategic deals and international partnerships often take precedence over formal rules.
- *Orchestrator of industrial and innovation policy:* The Commission plays a central role in the development and implementation of the EU's emerging industrial strategy. This involves coordinating a multifaceted policy ecosystem, including legal frameworks, technical standards, funding instruments, and engagement with both public actors—particularly member states—and private sector stakeholders.
- *Enforcer of single market rules:* Through its enforcement powers, the Commission ensures the integrity of the internal market and can initiate infringement proceedings against member states that fail to comply with EU law, safeguarding the uniform application of EU regulation.

ensure a level playing field across the Eurozone as well as a holistic and effective regulatory assessment. It also illustrates the many challenges of centralisation. As the system is still in transition, national differences remain in supervision culture that should be eroded as joint supervisory teams continue to work together. Moreover, sufficient transparency of SSM operation should be ensured to preserve the accountability of the system of supervision.

[339] Bangemann group, Recommendations of the high-level group on the information society to the Corfu European Council, p.17.

[340] This 28th regime will be proposed by the Commission for start-ups to simplify applicable rules and reduce the cost of failure, including any relevant aspects of corporate law, insolvency, labour and tax law: Communication from the Commission of 29 January 2025, A Competitiveness Compass for the EU, COM(2025)30.

- *Regulator:* The Commission is assuming an increasingly prominent regulatory role, particularly in the digital economy and in supervising large technology firms, overseeing the implementation of key legislation such as the Digital Markets Act (DMA) and selected provisions of the Digital Services Act (DSA) and AI Act.
- *Evaluator and reformer of EU policy:* The Commission monitors and assesses the effects of EU legislation, regularly reporting findings to the European Parliament and the Council. Based on these evaluations, it may propose reforms to improve the effectiveness, efficiency, and responsiveness of EU policies.

Taken together, these roles position the Commission not only as a central actor in EU governance but also as a dynamic institution that bridges legislative initiative, regulatory oversight, industrial strategy, and strategic policymaking in an increasingly complex global context.

However, each of these roles demands a distinct set of capabilities, and the Commission's expanding portfolio of responsibilities requires it to cultivate and integrate all these competencies internally. To perform effectively, the Commission should **enhance its strategic planning and foresight capacities**, ensuring it can anticipate emerging policy challenges and respond proactively rather than reactively.[341]

Equally important is the **re-internalisation of critical technical expertise**. While external consultants can provide valuable support, overreliance on them carries risks: consultants are often selected on a repeated basis which affect their independence and they may excel in project delivery rather than in providing the deep, context-specific policy insights necessary for informed decision-making. By building robust in-house expertise, the Commission can strengthen its capacity for independent analysis, improve the quality of its policy advice, and safeguard the coherence and effectiveness of EU governance. In response to the rapid evolution of digital technologies, the Commission should in particular enhance its expertise by recruiting additional engineers and data scientists.

The expansion of the Commission's roles has also generated internal tensions—and, in certain cases, potential conflicts of interest—between its diverse functions. While such tensions are not entirely new, they have been magnified by the growing complexity of the Commission's mandate and the increasingly interconnected and competitive global environment.

The first key tension arises **between the Commission's role as the initiator of EU legislation (and sometimes enforcing them) and its function as the enforcer of single market rules against member states**. As noted already, when the Commission proposes legislation requiring Council approval, it may be hesitant to initiate infringement proceedings that could alienate member states whose support is essential for the passage of new laws. This dynamic can create a structural disincentive to rigorously enforce single market rules, potentially undermining the uniform application of EU law and weakening the Commission's credibility as an impartial regulator.

A second tension emerges between the **Commission's role in proposing legislation and its role in evaluating the effectiveness of existing laws**. In effect, the Commission is often tasked with assessing its own work, which may create an inherent reluctance to acknowledge or emphasise policy shortcomings. For instance, in its evaluations of the General Data Protection Regulation (GDPR) published in 2020 and 2024, the Commission tended to downplay some of the regulation's adverse

[341] Ref Forseight Report.

effects on innovation, particularly for small and medium-sized technology firms. [342] These challenges have been well documented in the academic literature and highlighted in the Draghi Report, yet they received limited attention in the Commission's official assessments. This self-evaluative dynamic raises questions about the objectivity of the Commission's monitoring processes and underscores the need for independent oversight mechanisms to ensure a balanced and evidence-based appraisal of EU legislation.

A third tension arises between the Commission's role as a **geopolitical actor and its function as a regulator**. Academic literature consistently highlights that regulatory predictability and effectiveness is maximised when regulators are independent—not only from the firms they oversee but also from political influence.[343] While EU law mandates and safeguards this dual independence for national regulatory authorities,[344] it does not provide the same protections when the European Commission performs regulatory functions. According to the EU Treaties, the Commission is independent from national governments, but not from the European Parliament. [345] This raises long-standing concerns about its impartiality in regulatory matters. The historical debate over the independence of DG Competition and proposals to establish a separate EU antitrust agency may resurface with renewed urgency,[346] particularly as the Commission assumes greater responsibility for enforcing the digital rulebook while simultaneously becoming more geopolitically active. In recent years, the explicit integration of industrial policy objectives across a broad array of policy areas has arguably reinforced the perception that the Commission may prioritise strategic or geopolitical considerations over regulatory effectiveness. This growing overlap between political ambition and regulatory authority risks undermining confidence in the Commission's neutrality when it acts as a rule enforcer. Furthermore, it may encourage foreign powers to seek to 'negotiate' with the EU about how the Union applies its digital rulebook, by encouraging a perception that implementation and enforcement are politicised functions.

To mitigate these tensions—which in some cases amount to genuine conflicts of interest—the Commission's various roles could be more clearly delineated. One approach would be to introduce greater internal separation by establishing independent teams within the Commission, each dedicated to a specific function. A more transformative option would involve structurally reorganising the Commission itself, dividing it into distinct entities aligned with its core functions: a geopolitical executive (government), a regulatory authority, and an internal market agency responsible for ensuring member-state compliance with single market rules. Such functional or structural separation could strengthen regulatory independence, enhance accountability, and reduce the risk that political considerations unduly influence enforcement or policy decisions—particularly as the Commission's mandate expands into increasingly complex and politically sensitive domains. At the same time, this approach carries potential costs: reorganisation could be time-consuming and may lead to a

[342] M. Bassini, M. Maggiolino and A. de Streel, *Better Regulation and Evaluation for the EU Digital Rulebook*, CERRE Report, January 2025.
[343] Baldwin R., Cave M., and M. Lodge (2012), *Understanding Regulation: Theory, Strategy, and Practice*, 2nd ed., Oxford University Press; C. Decker, *Modern Economic Regulation: An Introduction to Theory and Practice*, 2nd ed (Cambridge University Press, 2023).
[344] See, eg, European Electronic Communications Code, Directive (EU) 2018/1972, art 8.
[345] Article 17 TEU. Incidentally, the previous Justice Commissioner Reynders has acknowledged the potential for a lack of independence of the Commission when he noted that: *"… based on Article 8 of the Charter, the enforcer of data protection rules must be ensured by an independent authority. Therefore, the Commission could not have enforcing powers as it has in the DMA as DSA":* Speech on "The Future of Data Protection: Effective enforcement in the Digital World", 16 June 2022.
[346] C-D. Ehlermann, 'Reflections on a European Cartel Office', *Common Market Law Review* 32(2), 1995, 471-486.

temporary or even permanent loss of synergies between different policy instruments, potentially diminishing the Commission's overall policy coherence and agility.

3.3. Strengthening EU Courts

Finally, to enhance regulatory design and implementation at both the national and EU levels, the role of independent EU oversight bodies should be significantly strengthened.

First, the Court of Justice of the European Union (CJEU) must handle interpretative questions from national courts more efficiently to ensure the timely, uniform, and coherent application of EU law across member states. Inconsistent interpretations can undermine the single market, create legal uncertainty, and reduce the credibility of EU governance. The recent reform allowing some preliminary ruling questions to be answered by the General Court represents a positive step,[347] but it may prove insufficient over the medium to long term, particularly as the EU's regulatory reach and legislative output continue to expand. One potential solution would be the **establishment of regional EU courts, modelled on federal district courts, to manage caseloads more effectively, accelerate decision-making, and provide more localised expertise on complex regulatory matters**.[348] Such a structure could also reduce bottlenecks in highly technical areas, such as competition law, digital regulation, where timely decisions are critical to both compliance and enforcement.

Second, the **European Court of Auditors (ECA) could play a more prominent role in assessing the effectiveness of EU laws and policies**. As an independent EU institution,[349] the ECA is arguably better positioned than the Commission to conduct objective, credible evaluations—particularly in light of the structural tensions that arise when the Commission evaluates legislation it has itself proposed. Empowering the ECA to conduct more regular, systematic assessments of legislative and regulatory outcomes would provide a stronger evidence base for policy reform, identify unintended consequences, and support more transparent and accountable decision-making.[350] In addition, the ECA could collaborate with other independent research institutions, national audit offices, and academic bodies to enhance the analytical rigor of its evaluations, ensuring that reforms are grounded in empirical evidence rather than political expediency.

Strengthening these independent oversight mechanisms would not only improve the quality and credibility of EU law and policy but also reinforce public trust in EU institutions. By ensuring that enforcement, evaluation, and interpretation are conducted impartially and efficiently, the EU can

[347] Regulation 2024/2019 of the European Parliament and of the Council of 11 April 2024 amending Protocol No 3 on the Statute of the Court of Justice of the European Union.

[348] A similar but more ambitious proposal has been made by L. Garicano, B. Holmström and N. Petit in their Constitution for Innovation. They recommend the creation of Specialised Commercial Courts with exclusive jurisdiction over internal market violations by Member States. Any business facing discriminatory or non-discriminatory trade barriers could bring proceedings directly under English-language procedures. Decisions would be handed down within 180 days. The Specialised Commercial Courts would issue European Union-wide injunctions, award damages for lost profits, and their rulings would bind all Member States: https://www.siliconcontinent.com/p/the-constitution-of-innovation.

[349] TFEU art 285.

[350] The ECA already carries sometimes out performance audits for specific EU policies besides its main role of auditing EU finances: European Court of Auditors Methodological Guide 2023, pp. 18-24. For instance, the Court recently adopted an interesting (and critical) report on the EU Artificial intelligence ambition: https://www.eca.europa.eu/en/publications/SR-2024-08.

better manage its complex regulatory environment, anticipate challenges, and respond proactively to emerging policy needs.

About CERRE

Providing high quality studies and dissemination activities, the Centre on Regulation in Europe (CERRE) is a not-for-profit think tank. It promotes robust and consistent regulation in Europe's network, digital industry, and service sectors. CERRE's members are regulatory authorities and companies operating in these sectors, as well as universities.

CERRE's added value is based on:

- its original, multidisciplinary and cross-sector approach covering a variety of markets, e.g., energy, mobility, sustainability, tech, media, telecom, etc.;
- the widely acknowledged academic credentials and policy experience of its research team and associated staff members;
- its scientific independence and impartiality; and
- the direct relevance and timeliness of its contributions to the policy and regulatory development process impacting network industry players and the markets for their goods and services.

CERRE's activities include contributions to the development of norms, standards, and policy recommendations related to the regulation of service providers, to the specification of market rules and to improvements in the management of infrastructure in a changing political, economic, technological, and social environment. CERRE's work also aims to clarify the respective roles of market operators, governments, and regulatory authorities, as well as contribute to the enhancement of those organisations' expertise in addressing regulatory issues of relevance to their activities.

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