Final Report for Meta Platforms Inc.

Recalibrating policy for digital platforms in the EU Digital Single Market

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Executive summary

Europe is falling behind on measures of prosperity and competitiveness, and the Digital Single Market, a key driver of these goals, has been hindered by growing regulatory complexity

Europe trails the US on key indicators of prosperity and growth, including productivity, access to capital and investment in R&D, resulting in a nominal GDP per capita of over USD80 000 in the US compared to USD40 000 in the EU in 2023.[1] European policy makers recognise the importance of digital technology as a driver of prosperity and economic growth. This is enshrined in the Digital Single Market (DSM) strategy, launched in 2015.[2] A successful DSM would boost long-term prosperity for Europeans, improve the competitiveness of European industry by enabling scale, and achieving 'open strategic autonomy' by cultivating the ability of the EU to source key resources and inputs as a means to grow and innovate.

Despite these ambitions, the DSM is not functioning as envisioned. Barriers to cross-border trade remain,[3] and fragmentation in the application of rules and their enforcement between member states limits the benefits that consumers and businesses can gain from the size of the European market. Fragmentation has also contributed to a scarcity of successful large-scale digital businesses in Europe, which hinders European innovation in the digital space. Although Europe creates many high-tech start-ups, few manage to scale up while remaining based in Europe, and many European start-ups consider starting their business in the US rather than Europe.[4] As a result, Europe is home to fewer 'unicorns'[5] than the US,[6] and the largest platforms operating in Europe are largely based outside Europe.[7]

[1] In 2023; see World Bank Group, *GDP per Capita (current US$).*

[2] European Commission (2015), *A Digital Single Market Strategy for Europe.*

[3] Of 74 barriers to cross-border trade reported by businesses in 2002, 45 (61%) were still reported as barriers in 2020; see European Commission (2022), *30 years of single market – taking stock and looking ahead.*

[4] A 2022 Stripe report found that 25% of ~200 interviewed European start-ups considered starting their business in the US rather than Europe; see Stripe (2022), *European tech voices.*

[5] Start-ups valued at over USD1 billion.

[6] According to PitchBook, the US was home to 714 as of 1 July 2024, compared to just 215 in Europe (including the UK); see PitchBook (2024), *Unicorn companies tracker.*

[7] Of the 19 companies with platforms designated under the DSA as of 28 June 2024, only Booking.com and Zalando are members of the European Tech Alliance (EUTA), which represents leading European tech firms; see European Commission (2024), *Supervision of the designated very large online platforms and search engines under the DSA* and European Tech Alliance*, Members.*

The success of businesses active in the digital space is an essential measure of the success of the DSM. These businesses are characterised by high research and development (R&D) spending, both in absolute terms and as a share of their revenue. The relative scarcity of successful digital businesses in Europe has led to a marked difference in R&D spending and intensity between the US and Europe,[8] which acts as a further driver of divergence in long-term competitiveness and prosperity.[9] To support the ambition of the DSM and Europe's broader innovation strategy, Europe first needs to find a better balance between regulation and innovation, to unlock and support more investment in R&D and innovation from the private sector. This is even more critical in areas of 'deep tech', including Artificial Intelligence (AI), where the US is attracting massive private investments an order of magnitude greater than in the EU in 2023, illustrating a growing gap between the two.[10]

Meanwhile, DSM-related policy has focused on ensuring the availability of world-class digital connectivity,[11] and constraining the perceived harms and risks associated with large digital platforms, gatekeepers, and very recently AI providers. These policies include the General Data Protection Regulation (GDPR), Digital Services Act (DSA), the Digital Markets Act (DMA), the AI Act, and other instruments.[12] These efforts are bearing fruit, but not all as intended. Connectivity has improved and the GDPR is seen as setting a gold standard in personal data protection, but at the same time the DSM has been ineffective at reducing fragmentation in the adoption and enforcement of rules. Smaller companies are particularly affected by the cost and complexity of regulation.[13] This takes much-needed resources away from innovation and growth, and risks harming Europe's long-term competitiveness in the context of rapidly evolving digital technology.

Digital platforms contribute to the DSM by delivering benefits for consumers, facilitating cross-border trade, and empowering businesses with innovative tools and technology building blocks

The vast majority of Europeans use the internet and digital platforms to interact and conduct a wide variety of activities online.[14]

Digital platforms facilitate online transactions at scale by connecting buyers and sellers,[15] and while platforms are commonly associated with advertising, businesses also use them to meet a wide variety of needs, including setting up web stores (e.g. Shopify), receiving payments (e.g. Stripe), and facilitating logistics and delivery (e.g. Fulfilment by Amazon). Individual platforms typically enable integration with other online tools and with one another, to easily onboard business customers.[16] Businesses also often have the option to use more than one provider for a particular need – this is referred to as 'multi-homing', which is a "powerful driver for contestability".[17,18]

[8] R&D equal to 3.8% of net sales for EU-based companies, compared to 8.1% for US-based companies in the World2500 dataset in European Commission (2023), *The 2023 EU Industrial R&D Investment Scoreboard.*

[9] European companies that invest the most in R&D belong in 'mid-tech' sectors such as automotive and manufacturing, which typically spend a lower proportion of their revenue on R&D than 'high-tech' digital platforms.

[10] Private investment in AI was EUR62.5 billion in the US and EUR5.5 billion in the EU, based on European Parliament (2024), *AI investment: EU and global indicators.*

[11] European Commission, *Europe's Digital Decade.*

[12] European Commission (2024), *Achievements of the von der Leyen Commission: Realising Europe's Digital Decade.*

[13] See Stripe (2022), *European tech voices*; as well as Union of entrepreneurs and employers (2023), *European tech companies face an overwhelming amount of rules.*

[14] Eurostat, *Individuals – Internet activities.*

[15] Harvard Business School Online, *Digital platforms: What they are and how they create value.*

[16] For example, Shopify provides integrations with a number of third-party tools, sales channels and payment gateways, to allow businesses more flexibility in their interactions with customers; see Shopify, *Integrations, Sales channels, Online payment gateways and payment provider integrations.*

[17] Centre on Regulation in Europe (2022), *Interoperability in digital markets.*

[18] While dominant firms may have incentives to limit multi-homing, in Europe, the Digital Markets Act has been introduced to help address situations where platforms that serve as 'gatekeepers' may attempt to behave in anti-competitive ways.

Digital platforms help enable the DSM and mitigate European fragmentation by creating spaces that transcend national borders and reduce barriers associated with geographical, linguistic and cultural differences. This is achieved through relatively standardised processes or tools that users interact with in similar ways across Europe.

On Meta's platforms for example, most advertisements (measured using 'ad impressions' to end users)[19] going across borders within Europe are going to countries that do not share a common language with the seller's country.[20] Platforms are also of particular benefit to smaller businesses, as shown in an eBay study that highlighted how 97% of all eBay-enabled small businesses in Europe were exporting, with those in the EU exporting to 20 different international destination markets on average.[21]

Through digital platforms, European businesses are able to operate online efficiently, by using tools that are globally competitive, regardless of whether these tools were developed in Europe or in other parts of the world. For example, EU advertisers that use Meta's advertising services are able to achieve average returns on ad spend (euros in sales achieved per euro invested in ads) that are comparable to that achieved by advertisers in the US. The value provided by platforms such as Meta is growing, with AI-powered ads generating around 25% better average returns on ad spend for EU advertisers.

Digital platforms (as well as content and applications providers) operating at global scale also tend to develop technology building blocks in the form of digital infrastructure (e.g. cloud services) and open-source software (e.g. libraries and tools for AI). These building blocks are made widely available across the world, and are at the heart of European digital transformation, with European digital start-ups and scale-ups using building blocks provided by global suppliers to grow their operations securely[22] and develop innovative solutions for their own customers.[23] Without these building blocks, they would need to rely on smaller-scale, less competitive tools, dedicate resources to building these tools themselves, or simply not be able to operate.[24]

Digital platforms provide a wide variety of tools that enable European businesses to operate and grow rapidly and cost-effectively. This stands in contrast to the extensive range of digital regulations that increase regulatory complexity and compliance costs for European businesses.

In order to foster the emergence of globally successful companies that cement Europe's future competitiveness, EU digital policy should evolve to reduce complexity and support innovation

As Europeans look to a near future filled with uncertainty and challenges, policy makers are calling for the single market to be strengthened, and also for large sums of new investment to boost the European economy. Europe already possesses some of the assets needed to deliver on these ambitions: high savings rates, a highly educated population and strong academic research institutions,[25] as well as an attractive

[19] An advertisement ('ad') impression is a metric used to measure the number of times an ad has been displayed to the users on, for example, Meta's platforms.

[20] In this analysis, a "common language" between two countries is defined as a language that is spoken by at least 5% of both populations as a first language, based on data from CIA World Factbook, *Languages*.

[21] As highlighted in eBay's 2022 Digital Density Report; see eBay (2022), *Digital Density in Europe*.

[22] For examples, see Google Cloud (2022), *How one e-commerce platform (PrestaShop) went from data mistrust to data confidence;* AWS, *Zendesk case study;* Sendcloud, *Security;* Trustpilot, *Security at Trustpilot*.

[23] For example, see Mirakl, *The most advanced technology and enterprise-grade security, Curated partners for your marketplace operations, Introducing AMI: How AI is embedded into Mirakl to help you transform your business, Mirakl introduces industry-first capability for suppliers to sell on marketplaces in one click.*

[24] Impact reports from Mirakl, Stripe, Shopify, eBay and others demonstrate how their customers build their digital transformation on top of the tools and platforms they provide.

[25] Policy makers acknowledge the need for further investment and support; see European Parliament (2019), *Europe – the Global Centre for Excellent Research* and European Commission (2022), *Communication on a European strategy for universities.*

environment for people to live and work. If it can "leverage the single market's potential in mobilising both private and public resources more effectively",[26] Europe will be better equipped to capitalise on opportunities to regain global competitiveness and leadership within the digital economy.

In practice, fulfilling these objectives requires making sure that regulation does not stand in the way of innovation and private investment, including by global platforms. This requires a shift from the approach of the last decade, and a recognition of the role that global digital platforms play in enabling the DSM and helping Europe realise its innovation ambitions.[27]

Digital regulation in the EU for the last decade has focused on constraining perceived risks, and this has led to a regulatory environment that is increasingly complex and costly, not only for large digital platforms operating at a global scale, but also for high-tech European digital businesses.[28] The risk of persisting with this approach is that it could widen Europe's ongoing investment gap compared to the US and increasingly China, which is already particularly visible in AI, and as a consequence, further hamper Europe's ambitions for technology leadership.

In future, policy and regulation can do more to support European innovation, growth and Europe's competitiveness, in two main ways. Firstly, policy makers should include a competitiveness test in impact assessments for any new regulation they propose. In addition, they should provide regulators with a framework that allows them to consider both fundamental rights and other policy objectives like innovation and competitiveness. Secondly, digital policies under the DSM should focus on recognising the importance of private-sector investments and enabling them further in areas where innovation can support Europe's global competitiveness, particularly in emerging areas of digital technology, including AI and other 'deep tech' sectors.[29]

To achieve the scale and pace of innovation required in digital 'deep tech', Europe needs to be strategic in how it directs innovation policy. The challenge will be to strike a perfect balance between the use of existing technology building blocks (provided by global providers), and fostering cutting-edge innovation and capabilities within Europe. This should encourage European companies to continue making use of technology building blocks from global providers, particularly when they relate to well-established technologies (e.g. cloud), while also empowering European companies in their pursuit of global leadership in more nascent fields (e.g. AI). European policy makers can also consider focusing efforts on value chain components where Europe is best positioned to develop comparative advantage.

Only by fostering a regulatory environment that allows innovation to flourish, and by equipping European companies with the best tools (including globally-competitive technology building blocks), can Europe achieve the innovation and growth needed to bolster its strategic autonomy and remain open to global markets. Building strategic autonomy on top of globally competitive, state-of-the-art technology will help unlock the massive new investment that policy makers are calling for, in areas where this investment can have a genuine impact. The next five years should be a period where European public policy works hand in hand with the private sector to solve big challenges, with digital technology as a core asset to build with, and not against.

[26] Letta (2024), *Much more than a Market.*

[27] The Strategic Agenda 2024–2029 published by the European Council lists priorities including "bolstering our competitiveness", "promoting an innovation- and business-friendly environment" and "advancing together"; see European Commission (2024), *EU strategic agenda 2024–2029.*

[28] Businesses under the European Tech Alliance (EUTA) umbrella reckon that 30% of their resources may be taken up by regulatory compliance; see European Tech Alliance (2023), *European tech companies face an overwhelming amount of rules.*

[29] 'Deep tech' sectors related to the DSM include AI, semiconductors, advanced and quantum computing, robotics and autonomous systems, and future communication technology; see European Commission, *The new European innovation agenda;* European Commission, *Target investment areas.*

1

Introduction

The European single market has long been viewed as an important driver of European progress, and openness to trade continues to be a cornerstone of the EU's development.[30] This has been challenged by the Covid-19 pandemic and Russia's ongoing invasion of Ukraine, resulting in a relative loss of performance and competitiveness compared to other large global economic players, in particular the US. As a result, the EU is under increased pressure to maintain and strengthen its economic security, by remaining globally competitive in a rapidly changing global trade landscape.

European policy makers recognise the importance of digital technology and the successful digitalisation of its economy and society as a driver of success. This is enshrined in the Digital Single Market (DSM) policy agenda. A successful DSM would boost long-term prosperity for Europeans, improve the competitiveness of European industry by enabling scale and achieving 'open strategic autonomy' by cultivating the ability of the EU to source key resources and inputs as a means to grow and innovate.

The first half of 2024 has seen a reinvigorated public discussion on the future of the single market and European competitiveness. A number of high-profile reports[31] are shaping the direction of EU policy action in the next five years, focusing on industrial policy, access to capital markets, reducing persistent fragmentation of European action, and emphasising the need for European companies to scale up.[32]

This study examines the role of digital platforms and building blocks in translating the policy vision of the DSM into reality, including by providing European businesses and consumers with tools, services and building blocks to support their digital transformation. The remainder of the study is structured as follows:

- **Section 2** provides an overview of the state of the DSM, and the role of fragmentation and a lack of integration due to the new digital regulations in undermining the success of the DSM agenda.

- **Section 3** discusses how digital platforms contribute to the DSM, providing benefits for consumers and businesses, contributing to cross-border trade, and offering technology building blocks that are enabling European businesses to innovate and scale.

- **Section 4** highlights how digital platforms (as discussed in Section 3), help to address some of the shortcomings of the DSM (identified in Section 2), and sketches a framework for European policy makers to consider for an innovation-driven and growth-oriented future.

[30] The EU has low tariffs and generally transparent rules and regulations; see European Commission, *EU position in world trade* and BusinessEurope (2024), *Reboot Europe*.

[31] See Letta (2024), *Much more than a Market*; a speech delivered by Draghi in April 2024 hinted at the likely contents of the eventual report; see Draghi (2024), *Radical Change – Is What Is Needed.*

[32] ProMarket (2024), *Are Letta, Macron and Draghi Marking the End of Neoliberalism in Europe?*

2

The Digital Single Market is not yet fulfilling its objectives, hampered by growing fragmentation and complexity

In this section, we first discuss the growing gap in Europe's prosperity and competitiveness compared to the US, which is often used as a benchmark in articles and reports that show Europe's relative lack of progress (**Section 2.1**). We then explore how a lack of economic integration between European member states (**Section 2.2**) contributes to diverging prospects between the EU and the US. Thereafter, we dive deeper into how the European DSM is not delivering the benefits envisioned by the EU, contributing to a lagging global position in terms of producing leading companies and investing in high-tech R&D, which is crucial for innovation, productivity and growth (**Section 2.3**). Finally, we explore how growth in the EU is hampered further by the introduction of new digital policies, which contribute to fragmentation in the implementation and enforcement of regulations (**Section 2.4**).

2.1 Europe is falling behind on measures of prosperity and competitiveness, leading to an accelerating divergence with the US

Several recent reports and articles that address Europe's economic performance have noted that Europe trails the US on several key indicators of prosperity and growth. As detailed in Figure 2.1 below, European per-capita GDP is significantly lower than in the US as of 2023.[33] Labour productivity growth in the EU, meanwhile, has been significantly slower than in the US over the past few decades (see Figure 2.2).[34]

Figure 2.1: Comparing the EU and US on GDP per capita, in current USD [Source: Analysys Mason based on data from the World Bank]

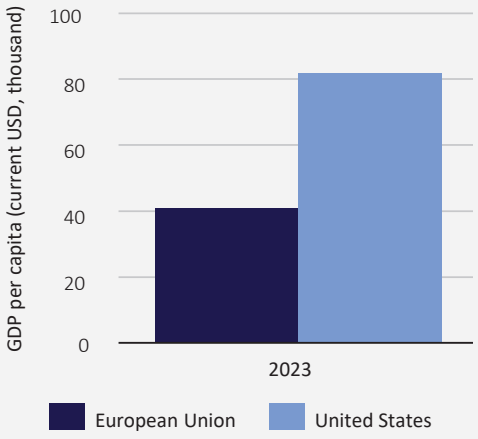
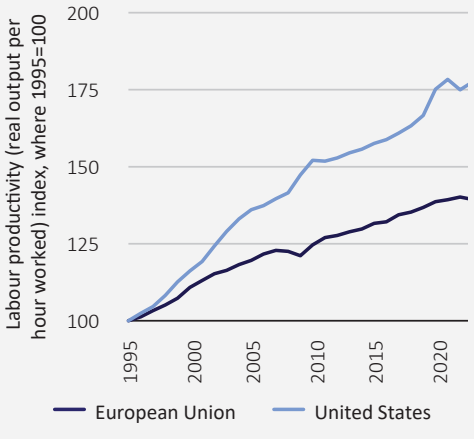


Figure 2.2: Comparing the EU and US on labour productivity between 1995 and 2023 [Source: Analysys Mason based on data from Eurostat and the Bureau of Labor Statistics]



[33] World Bank Group, *GDP per Capita (current US$)*.

[34] Index data from Eurostat (real labour productivity per hour worked, where 2015=100) and from the United States Bureau of Labor Statistics (measured through 'business sector labor productivity', calculated using an index of real output and an index of hours worked where 2017=100) have been rebased to 1995; see Eurostat, *Labour productivity and unit labour costs*, as well as United States Bureau of Labor Statistics, *Labor productivity and costs measures.*

In recent years, Europe has also seemed a less attractive destination for investment than the US, with a lower industrial investment rate,[35] as well as public companies that exhibit lower returns on investment capital and smaller average market capitalisations.[36]

These challenges are unlikely to be driven by a shortage of capital. European private savings are estimated at a total of over EUR33 trillion.[37] According to World Bank data, annual gross domestic savings in the EU amounted to 25% of GDP in 2022,[38] significantly higher than in the US over the same period (18% of GDP in 2022).[39] However, a significant part (EUR300 billion) of these European private savings is invested abroad each year, primarily in the US,[40] including in US high-tech companies.

The divergence in economic performance between Europe and the US is complex and can be ascribed to a variety of historical and geopolitical factors,[41] however, a major contributing factor that sets the EU apart from counterparts like the US is the persistent lack of economic integration between member states in the EU.

2.2 A root cause is insufficient economic integration, caused by persistent barriers to trade, which the DSM seeks to address

In spite of the efforts of several generations of European policy makers to foster economic integration within Europe since the 1950s,[42] businesses in the EU continue to report barriers to cross-border trade within the EU. The Digital Single Market strategy,[43] launched just under a decade ago in 2015, aimed to foster economic integration and growth across Europe, with a specific focus on the importance of digital technology as an enabler. While the DSM can help to overcome barriers to integration and trade, its implementation has itself been marked by fragmentation, with the result that digital technology has not had its full economic impact on the EU.

2.2.1 European businesses continue to be hindered by persistent barriers to trade within the EU

Even though the European single market was officially established in 1993,[44] barriers to cross-border trade within the EU remain persistent. According to research from the European Commission,[45] of the 74 barriers to cross-border trade reported by businesses in 2002, 45 (61%) continued to be reported as barriers in 2020, despite a more digitally enhanced business environment (with most Europeans engaging in e-commerce).[46] These 74 barriers were sorted into eight categories, and only two categories[47] featured a situation where most of the barriers reported in 2002 were no longer reported as barriers in 2020. Meanwhile, barriers in certain categories, such as a lack of information, as well as culture and language, continue to be fully reported as issues in 2020 (see Figure 2.3).

[35] European Round Table for Industry, *Competitiveness and industry benchmarking report 2024.*

[36] McKinsey Global Institute (2024), *Accelerating Europe: Competitiveness for a new era.*

[37] Eurostat (2023), *Households – statistics on financial assets and liabilities.*

[38] World Bank Group, *Gross domestic savings (% of GDP) – European Union.*

[39] World Bank Group, *Gross domestic savings (% of GDP) – United States.*

[40] Le Monde (2024), *Enrico Letta: Europe's economy is falling behind, 'we can't wait any longer'.*

[41] For instance, compared to the US, Europe exhibits an ageing population, workers preferring to work fewer hours, energy-supply issues, and lower levels of fiscal spending; see Centre for European Reform (2023), *Why Europe should not worry about US out-performance.*

[42] European Union, *Founding agreements*.

[43] European Commission (2015), *A Digital Single Market Strategy for Europe.*

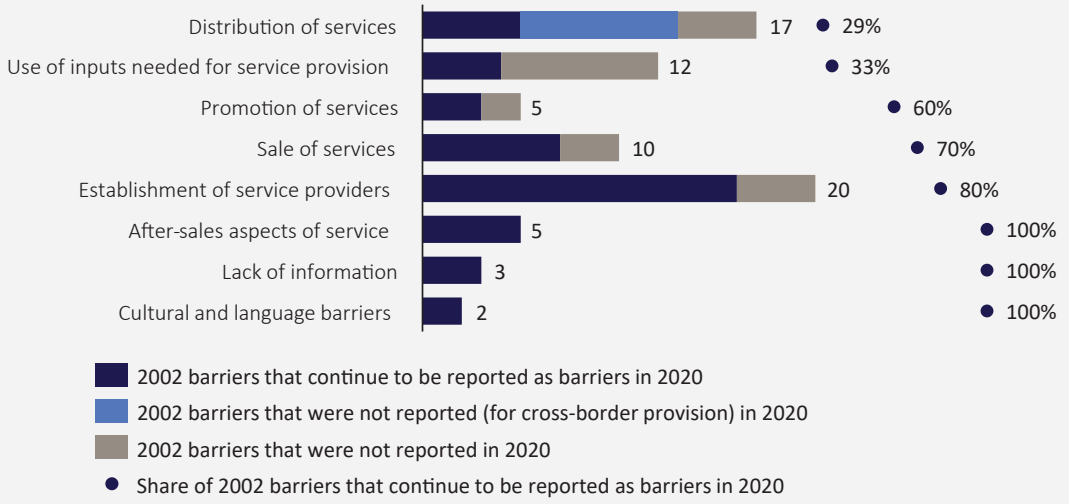
[44] The European single market guarantees the free movement of goods, services, people and capital in the EU; see Council of the European Union, *30th anniversary of the EU single market.*

[45] European Commission (2022), *30 years of single market – taking stock and looking ahead.*

[46] According to Eurostat, 75% of internet users bought or ordered goods or services online in the EU in 2023; see Eurostat (2024), *E-commerce statistics for individuals.*

[47] "Distribution of services" and "Use of inputs needed for service provision".

Figure 2.3: Number of reported barriers to cross-border trade within the EU, sorted into categories (2002–2020)
[Source: Analysys Mason based on European Commission, 2024]



There are several reasons behind the persistence of barriers to trade within the EU. A 2020 report by the European Commission identifies five such 'root causes',[48] with the first three all directly related to regulation:

- regulatory choices at EU level and national level
- transposition, implementation and enforcement of EU legislation
- administrative capacity and practices
- general business and consumer environment in member states
- other root causes such as differences in language or culture.

Greater cross-border trade in goods and services across the EU could bring about economic benefits, according to the European Economic and Social Committee (EESC), which stated on its website that overcoming remaining barriers to the trade of goods could generate between EUR228 billion and EUR372 billion of additional GDP per annum, while reducing barriers to trade of services by 80% could generate a further EUR457 billion per annum.[49]

As discussed further below, the DSM strategy, which was introduced in 2015, and which included improved cross-border digital trade as an objective, has not fully addressed the persistent challenges described above.

2.2.2 The DSM strategy aims at enabling cross-border trade and boosting economic growth, while DSM policy has focused on connectivity and constraining risks associated with platforms

The European Commission envisions the DSM as a key driver of European competitiveness and growth on the global stage, and the DSM strategy highlights three pillars:[50]

- providing better digital access for consumers and businesses to goods and services across Europe
- creating the right conditions for digital networks and services to flourish
- maximising the growth potential of the European Digital Economy.

[48] European Commission (2020), *Identifying and addressing barriers to the single market*.

[49] The EESC is the voice of organised civil society in Europe. It represents employers, workers and civil society organisations; see European Economic and Social Committee (2022), *Single market barriers mean a huge loss to the collective public good for Europe.*

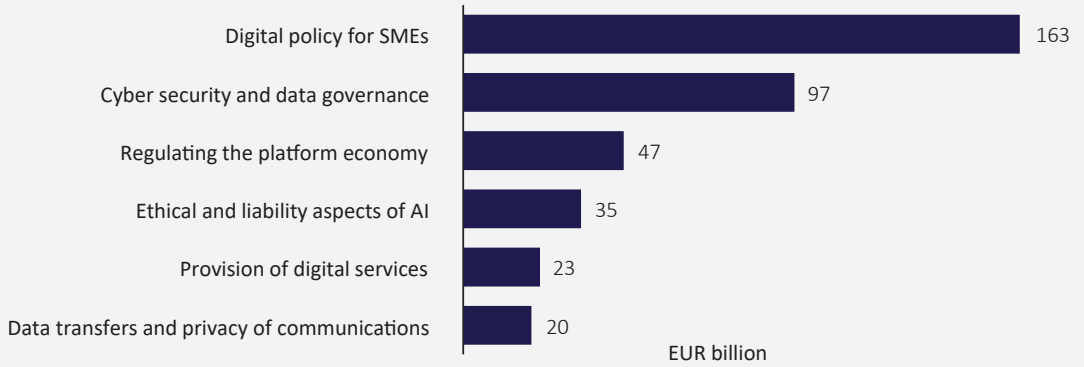
[50] European Commission (2015), *A Digital Single Market Strategy for Europe*.

The initial policy thrust was designed to create benefits primarily in connectivity and electronic communications (e.g. through the European Electronic Communications Code and funding for fibre and 5G roll-out). This is shown in a 2019 study conducted by Bruegel, which highlighted that measures related to electronic communications and services were estimated to generate EUR86.1 billion in annual benefits, accounting for almost 50% of the benefits across all DSM-related measures considered in the study.[51] Meanwhile, initiatives introduced targeting e-commerce, content and online platforms only accounted for EUR14.6 billion, or less than 10%, of the estimated annual benefits of all measures considered.

Other policy areas, especially those introduced since 2019, have focused on protecting fundamental rights and reducing perceived harms, including from the evident popularity of large digital platforms, through regulations such as the Digital Services Act (DSA), the Digital Markets Act (DMA) and the AI Act, among others. Several core measures in these regulations are asymmetric in nature: they are designed to place more regulatory scrutiny on larger platforms and search engines (in the case of the DSA) or platforms that act as a 'gatekeeper' in digital markets (in the case of the DMA).

One justification for this asymmetry is the potential for greater harm occurring on platforms operating at a very large scale.[52] However, analysis from the European Parliamentary Research Service[53] estimates the annual GDP impact of regulating the platform economy at EUR47 billion per annum,[54] which appears small in comparison to other policy areas (see Figure 2.4).

Figure 2.4: Estimated additional GDP per annum from digital transformation policy areas [Source: Analysys Mason based on European Parliamentary Research Service, 2023]



Meanwhile, most benefits are expected to come from digital policy targeted at small and medium-sized enterprises (SMEs) and cyber security and data governance, which are areas that large digital platforms already focus on extensively.[55]

[51] It should be noted that the report relied on ex-ante estimates, and noted that ex-post evaluations of measures would have been premature at the time of writing. See Marcus, J.S., et al. (2019), *Contribution to growth*: *The European Digital Single Market – Delivering economic benefits for citizens and businesses*.

[52] See European Commission, *Questions and answers on the Digital Services Act*; as well as the Council of the European Union, *What is illegal offline should be illegal online: Council agrees position on the Digital Services Act*.

[53] European Parliament (2023), *Mapping the cost of non-Europe report*.

[54] The study notes that the benefits of regulating the platform economy stem largely from benefits to workers in the 'gig economy'.

[55] Amazon Web Services, *Cloud data security solutions for small and medium businesses*; Google Blog (2023), *Continuing our support for a safer Europe*; Meta (2020), *New Report Shows Impact of Facebook Apps on the European Economy*.

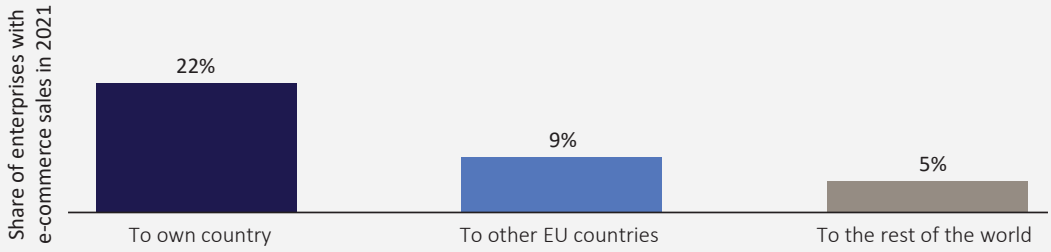
2.3 The European DSM is not delivering its stated ambitions to support cross-border trade and the emergence of large and innovative global digital players in Europe

The DSM has yet to achieve its stated objectives. Cross-border trade barriers remain, limiting the benefits that consumers and businesses can gain from the size of the European market. European digital businesses, which already find it difficult to scale across the EU based on historical barriers, are hindered further by growing regulatory complexity and fragmentation. These barriers are limiting Europe's ability to foster the emergence of large high-tech businesses, which are essential to innovation and long-term competitiveness, growth and prosperity.

2.3.1 Current levels of cross-border online trade between European member states does not reflect a fully integrated and successful DSM

We use e-commerce as an example of a leading digital service that would benefit from a successful DSM, allowing businesses to reach customers across all European member states easily. Current outcomes show e-commerce is still much more likely to be conducted within individual member states. Figure 2.5 below shows that European enterprises are more than twice as likely to sell online to domestic customers as compared to customers in other EU countries, and more than four times as likely to sell online to domestic customers compared to customers in the rest of the world.[56]

Figure 2.5: Share of enterprises with e-commerce sales in 2021, to different destination groups [Source: Digital Economy and Society statistics published by Eurostat, 2024]



Businesses in the EU have much ground to cover to achieve a cross-border reach of e-commerce similar to the reach that exists between US regions. An analysis of the cross-border reach of advertisements (ads) in the EU and the US on Meta's platforms (in Figure 2.6) shows that just 41% of ad impressions[57] from EU advertisers reach users that are outside the advertisers' own country.[58] In the US, a much larger proportion (75%) of ad impressions from advertisers is delivered outside of advertisers' own census region (by splitting the US into four census regions[59]),[60] which includes other census regions within the US and the rest of the world.

[56] Eurostat, *E-commerce sales of enterprises by size class of enterprise*.

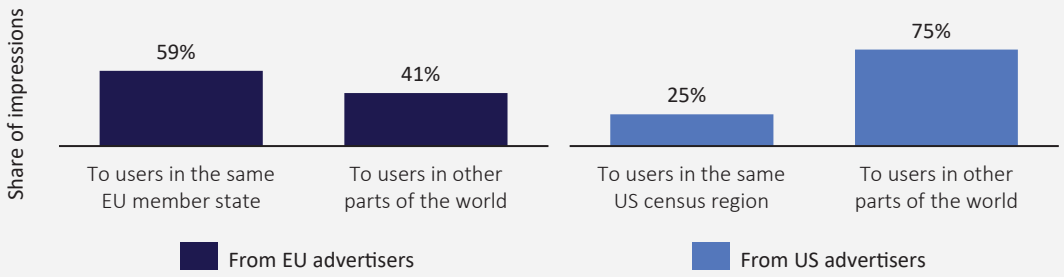
[57] An ad impression is a metric used to measure the number of times an ad has been displayed to the users on, for example, Meta's platforms.

[58] This analysis was conducted using a random sample of 10% of the active ad campaigns during three different dates in July 2024 – 1 July 2024, 15 July 2024 and 26 July 2024.

[59] Using a four-way split of US states into regions (Northeast, Midwest, South and West); see US Census Bureau, *Census Regions and Divisions of the United States*.

[60] This analysis was conducted using a random sample of 10% of the active ad campaigns during three different dates in July 2024 – 1 July 2024, 15 July 2024 and 26 July 2024.

Figure 2.6: Comparing cross-border distributions of impressions for advertisers based in the EU and in the US
[Source: Analysys Mason based on platform data from Meta, 2024]



Although ad impressions capture only one aspect of cross-border trade, they help to illustrate the extent of the challenges faced by businesses in Europe in selling across borders, particularly within the EU. This shows that businesses are not yet treating the European market as one true digital single market.

2.3.2 European digital businesses that seek rapid growth face challenges in achieving scale within the EU

Due to fragmentation, businesses that aim to expand within the EU often target specific member states instead of expanding across all member states (and the 450 million consumers between them) at the same time. This makes Europe a less attractive prospect (compared to more homogenous large markets such as the US or China) for businesses aiming to grow and achieve a large scale rapidly.

Europe creates many high-tech start-ups, but few manage to successfully scale up while remaining based in Europe. In fact, many choose to expand and even move to the US as they grow. An article published by Sifted in 2023 explores how 358 start-ups that were founded in Europe since 2005 had since moved headquarters to the US,[61] while a 2022 report published by Stripe that was based on interviews with 200 European start-ups found that 25% of respondents had considered starting their business in the US rather than Europe,[62] in part due to the perception that there are fewer regulatory hurdles in the US compared to Europe. Meanwhile, Index Ventures, a major European venture capital (VC) firm active in Europe and the US, found that the top reason for European start-ups expanding to the US was, by far, to access US customers.[63] These customers are part of a single large, dynamic market, with more limited variation in rules, compared with Europe where there are many small fragmented markets with many different sets of rules.

These factors contribute to a scarcity of successful large European businesses in the digital space. According to PitchBook,[64] the US was home to 714 'unicorns', or start-ups valued at over USD1 billion, in July 2024, compared to just 215 in Europe (including the UK). The largest online businesses operating in Europe were also largely outside Europe: out of 19 companies designated under the DSA as Very Large Online Platforms (VLOP) or Very Large Online Search Engines (VLOSE) or both,[65] only two, Booking.com and Zalando, are European businesses.[66]

[61] Sifted (2023), *Europe's highest-valued startups that made the move to America*.

[62] Stripe (2022), *European tech voices*.

[63] Index Ventures, *The founder's guide to US expansion*.

[64] As of 1 July 2024; see PitchBook (2024), *Unicorn companies tracker*.

[65] As of 28 June 2024; see European Commission (2024), *Supervision of the designated very large online platforms and search engines under the DSA*.

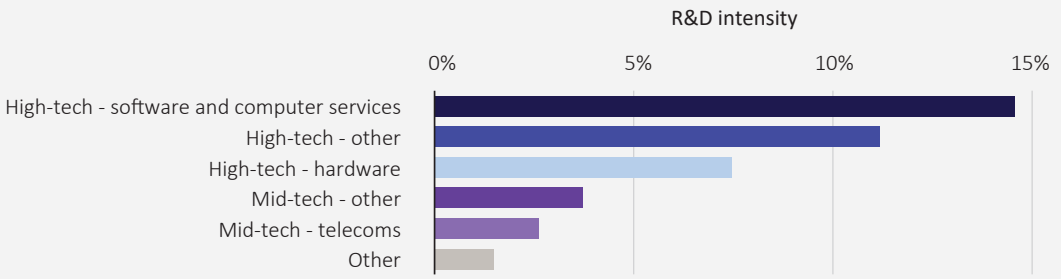
[66] Both are members of the European Tech Alliance (EUTA), which represents leading European tech companies.

2.3.3 The lack of large-scale European digital businesses contributes to the limited R&D spend seen in Europe, which is crucial for long-term competitiveness and prosperity

Successful high-tech companies matter for many reasons, including that they are by far the largest investors in research and development (R&D), which is an important enabler of innovation and long-term economic growth, and that companies in the EU do not invest as much as the US in high-tech R&D.

Among the top 2500 companies in the world by R&D spend in 2022,[67] companies in mid-tech sectors, which tend to be more mature,[68] spend on average of only 3.6% of their net sales on R&D, compared to 10.0% for more high-tech companies.[69] In the digital sector, high-tech industries, particularly companies in software and computer services,[70] are significantly more R&D intensive than mid-tech industries (including automotive, manufacturing, telecoms services) on a global basis, as shown in Figure 2.7 below.

Figure 2.7: R&D intensity for 2500 worldwide industries [Source: Analysys Mason based on data from the 2023 EU Industrial R&D Investment Scoreboard and European Policy Analysis group, 2024]



This list contains 367 companies based in the EU, mostly in mid-tech sectors, with the top five R&D spenders in Europe being automotive and parts companies (e.g. Volkswagen, Mercedez-Benz, Robert Bosch, BMW and Stellantis); meanwhile, of the 827 US companies in the list, this balance is reversed, with firms in high-tech sectors in the top five, in particular semiconductors, devices and software (e.g. Alphabet, Meta, Microsoft, Apple and Intel). As shown in Figure 2.8 below, mid-tech companies account for the largest share of net sales for the 367 EU companies in the dataset, while high-tech companies account for the largest share of net sales for the 827 US companies. As a result, European companies on the list are significantly less R&D intensive on average than their US counterparts (see Figure 2.9).[71]

[67] European Commission (2023), *The 2023 EU Industrial R&D Investment Scoreboard*.

[68] In the digital sector, fixed and mobile telecoms operators are examples of mid-tech companies that include mature incumbents that do not tend to spend much on R&D. It is worth noting that in the telecoms supply chain, more spend on R&D is undertaken by vendors such as Nokia (R&D intensity of 18.1% in 2022), and Ericsson (R&D intensity of 17.4% in 2022), However, within the World2500 dataset in European Commission (2023), *The 2023 EU Industrial R&D Investment Scoreboard*, these vendors are classified as 'technology hardware and equipment' companies, which the European Policy Analysis Group classifies as 'high-tech' in European Policy Analysis Group (2024), *European innovation policy: How to escape the middle technology trap*.

[69] Classification of industries into high-tech, mid-tech and 'other' adopted from European Policy Analysis Group (2024), *European innovation policy: How to escape the middle technology trap*; 'hardware' includes 'technology hardware and equipment' as well as 'electronic and electrical equipment', while 'telecommunications' includes 'fixed line telecommunications' and 'mobile telecommunications'.

[70] In the sample, the top 10 US companies by R&D spend contains five companies that can be considered high-tech companies in the digital space, including Alphabet, Meta, Microsoft, Apple and Intel; in the top 10 EU companies by R&D spend, the only company that fits the description of 'high-tech' in the digital space is SAP.

[71] Based on 2022 data for EU- and US-based companies in the World2500 dataset in European Commission (2023), *The 2023 EU Industrial R&D Investment Scoreboard*.

Figure 2.8: Split of net sales for US and EU companies in the sample data, by tech sector [Source: Analysys Mason based on 2023 EU Industrial R&D Investment Scoreboard and European Policy Analysis group,[72] 2024]

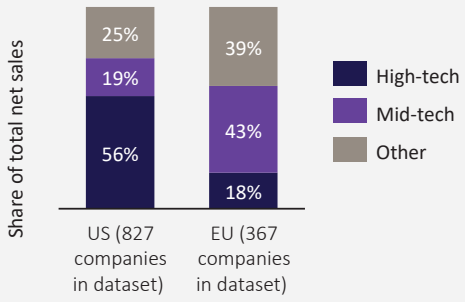
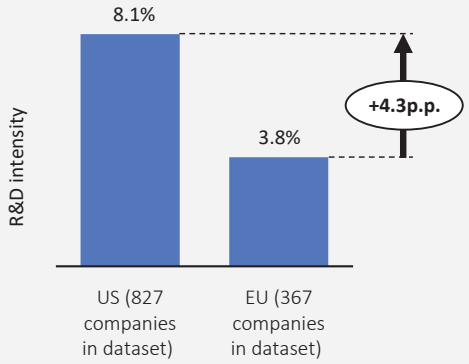


Figure 2.9: R&D intensity for US and EU companies in the sample data [Source: Analysys Mason based on 2023 EU Industrial R&D Investment Scoreboard and European Policy Analysis group,[72] 2024]



R&D spending is important to long-term competitiveness and prosperity. Alongside measures to improve education and support entrepreneurship and innovation,[73] innovation is viewed as a key driver of productivity and economic growth.[74] According to a 2024 report by the European Policy Analysis Group,[75] a "radical restructuring"[76] in the EU innovation ecosystem and public funding could help the EU to escape this "middle-technology trap".[77] That said, Europe's R&D issues cannot be solved through public funding alone. According to the same report, government-funded R&D in the EU accounts for a similar share of GDP as in the US, at around 0.7%. However, R&D spending by the business sector in the EU accounts for just 1.2% of GDP, compared to 2.3% in the US.

It is therefore important for high-tech European businesses in the private sector, including digital businesses, to drive more R&D spend in Europe. To do so, European digital businesses will need to be in a position to grow and expand more easily across the EU. At present, high-tech European digital businesses with ambitions to expand across all 27 member states deal with persistent forms of fragmentation such as different languages,[78] as well as growing fragmentation due to the introduction of new digital regulations.

2.4 Fragmentation, complexity and cost of regulation are compounding the difficulties European digital businesses face in growing to a globally-relevant scale

In the last five to ten years, European policy makers have introduced regulations focused on constraining perceived harms from online platforms, including the GDPR, the DMA, the DSA and the AI Act, which are still being implemented and tested through regulatory and judicial processes.[79]

[72] Classification of industries into high-tech, mid-tech, and 'other' adopted from European Policy Analysis Group (2024), *EU Innovation Policy: How to Escape the Middle Technology Trap.*

[73] European Central Bank, *How does innovation lead to growth?*

[74] Countries that ranked highly on innovation in 2013 exhibited high GDP per capita in 2022, as well as high labour productivity; see FTI Delta (2024), *Getting national innovation right*.

[75] Including researchers from Bocconi University and the Toulouse School of Economics; see European Policy Analysis Group (2024), *EU Innovation Policy: How to Escape the Middle Technology Trap*.

[76] This could include changes to the governance structure of the European Innovation Council, and an increased emphasis on directing R&D funding toward projects with more disruptive potential; see European Policy Analysis Group (2024), *EU Innovation Policy : How to Escape the Middle Technology Trap*.

[77] In the European Policy Analysis Group report, specialising in mid-tech industries is characterised as being problematic, due to the limited potential that these industries have for sustained growth.

[78] As of the time of writing, there are 24 official languages in the EU; see European Union, *Languages*

[79] According to law firm CMS in its GDPR Enforcement Tracker Report as of 1 March 2024, a total of 2086 fines had been recorded to date, amounting to EUR4.48 billion; see CMS (2024); *GDPR Enforcement Tracker Report Numbers and Figures*.

These regulations have been introduced with the goal to improve the lives of Europeans, but have also introduced unintended consequences in the form of additional complexity and cost for businesses. For example, the GDPR helps to ensure that all businesses active in Europe meet certain standards of data protection. It has had some success in exporting European norms abroad, with governments outside the EU choosing to enhance their data protection regimes to achieve adequacy with European standards.[80] However, it has also led to increased compliance costs for businesses, including notably SMEs.[81]

Growing complexity and costs make it more difficult for businesses across sectors to engage in cross-border trade, and also negatively impact progress on DSM objectives that relate to the development of successful digital businesses and a flourishing digital economy.

2.4.1 New digital regulations are extensive and complex, resulting in fragmented and overlapping adoption of rules across jurisdictions within the EU with which businesses have to comply

Fragmentation in the adoption of rules refers to differences and overlaps in how rules are transposed and implemented by different jurisdictions across the EU. This can occur at three levels:

- **Between national-level rules** – Where member states retain the prerogative of setting their own rules, businesses operating across multiple member states must comply with all of those individually. For example, a recent paper mentions VAT as an example: while there is a unified VAT collection system (VAT OSS) that enables businesses to file and pay VAT returns through a single EU country,[82] European businesses are required to register and comply with disparate national VAT requirements in every member state where they store inventory.[83] Other areas where member states have set their own rules include product markets regulations and environmental standards.[84]

- **Between national- and EU-level rules** – Other rules are harmonised in law at EU level, but implementation and enforcement can vary materially between member states. Examples include the 2019 DSM Copyright Directive, where the transposition into national law has been inconsistent amongst member states, as well as the Audiovisual Media Services Directive (AVMSD), in the context of which some member states have imposed new and additional regulatory requirements in addition to common minimum standards.[85]

- **Between EU-level rules** – At the EU level, there are potential overlaps between different pieces of legislation. For instance, a 2022 study[86] found that in certain situations, the DMA may contradict other EU rules, including the GDPR and P2B Regulation.[87] Overlaps between legislation could introduce complexity for businesses. An analysis by law firm Pinsent Masons cites how the overlap of DSA requirements with that of DAC7 (a tax directive) could be "especially burdensome for smaller operators", if inconsistencies arise between different frameworks and co-ordination is ineffective.[88] Meanwhile, another law firm, DLA Piper, highlights overlaps between data protection principles in the GDPR and principles and requirements in the AI Act, and suggests that a good understanding of both is needed to manage compliance costs.[89]

[80] European Commission, *Adequacy decisions*.

[81] CEPR (2022), *The GDPR effect: How data privacy regulation shaped firm performance globally*.

[82] Bradford (2024), *The False Choice Between Digital Regulation and Innovation*.

[83] Although businesses already store inventory in multiple countries for logistical efficiency, these diverse VAT requirements add a significant compliance burden.

[84] European Centre for International Political Economy (2022), *European strategic autonomy – What role for Europe's fragmented single market?*

[85] See Bradford (2024).

[86] Bania (2022), *Fitting the Digital Markets Act in the existing legal framework: the myth of the "without prejudice" clause*.

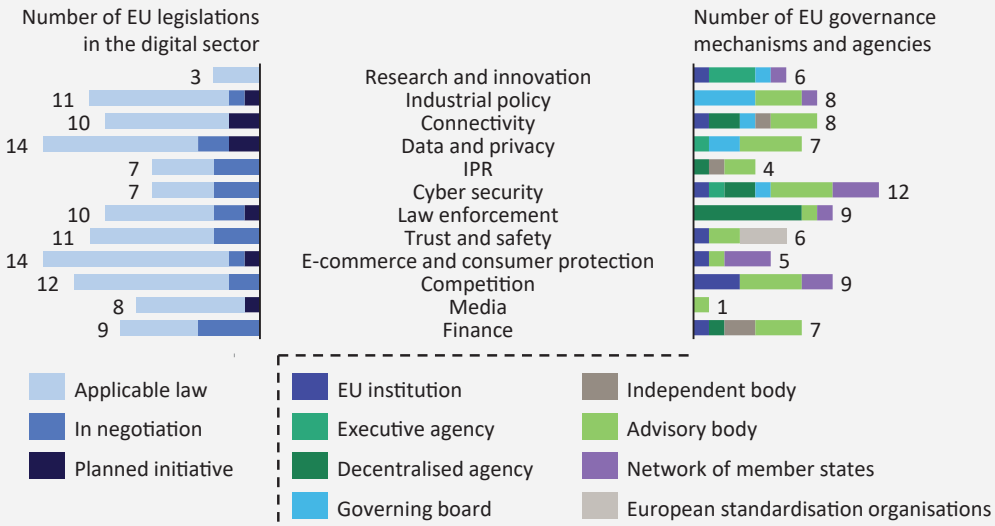
[87] Another study identified overlaps between three EU legislations that relate to illegal and harmful digital content – the AVMSD, the Terrorist Content Regulation (TERREG), and the DSA; see CERRE (2022), *Overlaps – Services and Harms in Scope: A Comparison Between Recent Initiatives Targeting Digital Services*.

[88] Pinsent Masons (2024), *KYC: the EU Digital Services Act adds to platforms' DAC7 duties*.

[89] See DLA Piper (2024), *Europe: The EU AI Act's relationship with data protection law: key takeaways*.

A dataset from Bruegel as of June 2024 shows that even before considering national rules, there is already a long list of EU legislations relevant to the digital sector,[90] with multiple legislations addressing each topic, as shown on the left half of Figure 2.10. Meanwhile, the right half of the figure highlights the extensive range of governance mechanisms and agencies at the EU level that are involved in these policy areas, which risks creating more fragmentation through the enforcement of regulation, in addition to fragmentation from the adoption (i.e. implementation) of regulation.

Figure 2.10: EU legislation for the digital sector and EU-level bodies that contribute to implementation and enforcement, as of 6 June 2024 [Source: Analysys Mason based on Bruegel, 2024]



Below, we consider how overlaps in regulatory enforcement at EU level, but also within and across member states, magnifies this complexity.

2.4.2 Fragmentation and overlaps also apply to regulatory enforcement, both within member states, and across different jurisdictions, which creates additional uncertainty for businesses

In addition to fragmentation and overlaps in the adoption of rules, recent digital regulations also exhibit **persistent fragmentation in enforcement.** Within each member state, there are typically several authorities that deal with digital issues (see Figure 2.11 below for a sample within three countries).

[90] Bruegel (2024), *A dataset on EU legislation for the digital world.*

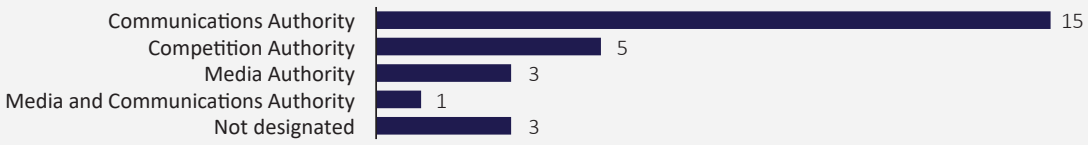
Figure 2.11: Examples of regulatory authorities involved in the regulation of digital platforms in Ireland, France and the Netherlands [Source: Analysys Mason based on various sources, 2024][91]

Ireland[92]	France[93]	Netherlands[94]
• CCPC (competition and consumer protection) • ComReg (communications regulator) • CnaM (regulator of broadcast and online media)- Digital Services Coordinator for the DSA • DPC (data protection commission)- Data Protection Authority for the GDPR	• Autorité de la Concurrence (competition authority) • ARCEP (telecoms regulator) • ARCOM (regulatory authority for audiovisual and digital communication) - Digital Services Coordinator for the DSA • CSA (audio-visual council) • CNIL (computers and individual freedoms agency)- Data Protection Authority for the GDPR • DDD (defender of rights)	• ACM (competition authority)- Digital Services Coordinator for the DSA • AFM (financial regulator) • AP (data protection authority)- Data Protection Authority for the GDPR • CvdM (media authority)

This can lead to **fragmentation in enforcement within jurisdictions,** resulting from different national authorities interpreting rules or responsibilities in potentially contradictory or overlapping ways. Some countries such as the Netherlands have recognised these issues, and the government set up a Digital Regulation Cooperation Platform (SDT) to better coordinate the efforts of different authorities that address digital issues in the same country.[95]

The DSA stipulates that each member state must designate a Digital Service Coordinator (DSC) to apply, monitor and enforce the DSA. In theory, this helps create a single point of contact within a given member state, but as Figure 2.12 below shows, these are very different types of organisations with which service providers operating across member states may need to engage.

Figure 2.12: Number of countries with assigned DSCs by relevant authority [Source: Analysys Mason based on European Commission, 2024]



[91] European Commission, *Digital Services Coordinators* and European Data Protection Board, *Our members.*

[92] American Chamber of Commerce Ireland (2023), *Ireland - Regulating for Europe's Digital Future.*

[93] National Institute for Research in Digital Science and Technology (2021), *The regulation of digital platforms: French government takes the lead.*

[94] Netherlands Authority for Consumers & Markets, *The Digital Regulation Cooperation Platform (SDT).*

[95] The UK, though not in the EU, has launched a similar initiative, *the Digital Regulation Cooperation Forum*.

This shows **persistent fragmentation in enforcement across multiple jurisdictions**, for a single legal instrument. In the context of the DMA, legislators tried to go further by designating the EC as "the sole authority empowered to enforce this Regulation".[96] However, the DMA also includes provisions that allow support from national competition authorities (NCAs).[97] A recently published study details how tensions between the European Commission's role as the sole enforcer of the DMA, and developments taking place at national level, could potentially undermine effective enforcement of the DMA,[98] with 21 member states having adopted or proposed relatively heterogeneous measures in terms of the provisions that national authorities are empowered to deal with.

High levels of regulatory fragmentation make it difficult for businesses to comply with requirements from all relevant authorities, within and across member states, and could also create complexity and cost that could hinder innovation and growth, as discussed further below.

2.4.3 Recent digital regulations include features aimed at reducing regulatory fragmentation and costs for smaller platforms and businesses, but these appear to have been ineffective so far

Problems associated with regulatory fragmentation are not new, and three of the five root causes (introduced in Section 2.2.1) behind persisting barriers to the single market,[99] as identified by the European Commission, are related to fragmentation.[100] The urgency of addressing these issues of fragmentation much more effectively is clear in Letta's recent *Much more than a Market* report,[101] and is translated into proposals to simplify regulations, enhance proposal design and rule adoption. It will be important for these proposals to be more effective than past efforts to improve harmonisation, such as using EU Regulations as opposed to Directives. As illustrated below in the context of the GDPR, Regulations that are meant to be harmonised still do not address fragmentation issues fully.

Case study: Fragmentation in the adoption and enforcement of the GDPR

The GDPR is an example of an EC Regulation that aimed to replace existing fragmented rules with a single set of EU-wide rules for businesses. The law itself is harmonised across the EU, but national data protection authorities are tasked with enforcing it in their own country.

This has led to continued fragmentation between member states, due to some member states adding additional requirements (e.g. the inclusion of issues related to video surveillance systems in Spain), increasing the extent of requirements (e.g. stricter supervision of data processing in Hungary), varying reporting requirements (e.g. anonymised versus public),[102] and some member states being more active than others in issuing fines.[103]

As a result, a proposal was made in 2023 to introduce additional procedural rules for enforcing the GDPR,[104] but there continue to be concerns on whether these rules would result in more harmonised enforcement in cross-border cases.[105]

[96] European Parliament (2022), *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 (DMA).*

[97] In Articles 37, 38 and 39; for examples of national-level developments in some member states, see Wolters Kluwer (2023), *The NCAs Piggyback on to the European Commission: Hungary and The Netherlands Trigger the Race for Monitoring National DMA Compliance.*

[98] Martinez (2024), *The Decentralisation of the DMA's System of Enforcement*.

[99] European Commission (2020), *Identifying and addressing barriers to the single market*.

[100] These include "regulatory choices at the EU level and national level", "transposition, implementation and enforcement of EU legislation", and "administrative capacity and practices".

[101] Letta (2024), *Much more than a Market*.

[102] Union of entrepreneurs and employers (2023), *The digital single market and its future in the context of development opportunities for the Polish SME sector*.

[103] Heine (2021), *3 Years Later: An Analysis of GDPR enforcement*.

[104] European Commission (2023), *Proposal for a Regulation laying down additional procedural rules relating to the enforcement of Regulation (EU) 2016/679*.

[105] European Parliament (2024), *An analysis of the newly proposed rules to strengthen GDPR enforcement in cross-border cases*.

In spite of efforts to harmonise legal instruments under the DSM across the EU, there are early indications that **these regulations are in fact creating material costs and risks for European businesses**:

- For this study, we conducted a small number of interviews with public policy professionals working for digital platforms operating in Europe.[106] Interviewees noted that **regulatory pressure is becoming so burdensome that it puts further pressure on innovation levels in Europe**, with European scale-ups having to dedicate limited amounts of available capital to making products and services compliant.

- More broadly, the EU Tech Alliance (EUTA), a trade association representing 30 established European technology companies, found that "**up to 30% of EU tech company resources can be taken up by compliance** instead of focusing on the company's growth and innovation".[107]

- These findings are corroborated by stakeholders such as the Union of Entrepreneurs and Employers in Poland,[108] which suggests that **although measures may be targeted at larger platforms, they can also generate material levels of compliance cost and complexity for smaller players, which can constrain their pace of growth**, particularly across more EU member states.

- Meanwhile, a 2022 study conducted by Stripe found that **53% of interviewed European start-ups reported "time spent adhering to compliance processes" as the greatest threat to their business**.[109]

The growing regulatory burden experienced by digital platforms and start-ups makes it more difficult for Europe to achieve its digital ambitions, as digital platforms play an important role in translating the vision of a DSM into reality. In the next section of the report, we explore how digital platforms enable Europeans and European businesses to conduct activities online and realise a variety of benefits in the process. We also consider how European digital platforms are benefiting from building blocks developed by digital platforms operating at a global scale.

[106] We conducted a small number of interviews with digital platforms operating in Europe, to understand how their services and tools help to enable businesses to sell across borders in the EU, and to understand more about persistent challenges that they face in the Digital Single Market.

[107] European Tech Alliance (2023), *European tech companies face an overwhelming amount of rules*.

[108] Union of entrepreneurs and employers (2023), *The digital single market and its future in the context of development opportunities for the Polish SME sector*.

[109] Stripe (2022), *European tech voices*.

3

Digital platforms are contributing positively to the DSM, working with consumers and businesses across the EU

This section discusses the role of digital 'platforms'[110] offered by technology companies in enabling the DSM. The core proposition of a 'platform' is to provide compelling services to consumers, and allow businesses to interact with these consumers on the platform itself to support their own commercial objectives.

The introduction of EU regulations such as the DSA and DMA over the past few years has focused not only on protecting fundamental rights, but also on ensuring fair competition in order to allow innovative European companies to emerge. Yet, this focus has overlooked the positive impact that large technology companies operating at global scale are having on enabling European businesses and creating opportunities for them to access the DSM.

These platforms are working to make the DSM a reality despite its current limitations, by transforming how Europeans conduct a wide range of day-to-day activities (**Section 3.1**), facilitating cross-border trade and enabling business success (**Section 3.2**), and providing technology building blocks, including in emerging technologies such as AI, to enable businesses, including European digital platforms, to build, innovate, and grow more easily (**Section 3.3**).

3.1 Digital platforms transform how Europeans live and work by delivering numerous benefits for European consumers

The internet and the digital platforms that have developed with it have transformed how people communicate, shop, consume content, and more. In this sub-section, we consider how Europeans have been impacted by these developments, firstly as individuals using digital platforms to conduct a wide range of activities, and then more specifically as consumers that derive a variety of benefits from the use of digital platforms.

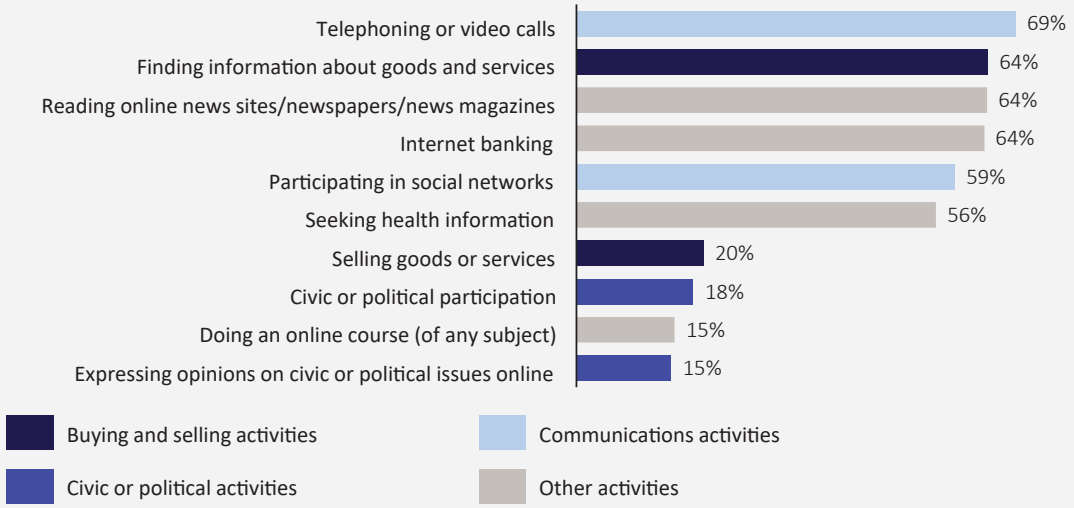
3.1.1 Digital platforms are used extensively across the EU, and are having transformative societal and economic effects

Digital platforms have transformed global and European society. By using these digital platforms, Europeans are able to communicate, obtain information, and also engage in a wide range of day-to-day activities online, as shown in Figure 3.1. This aligns with one of the three pillars in the Digital Single Market strategy focused on "better access to digital goods and services".[111]

[110] The Platform to Business Regulation applies to providers of 'online intermediation services' and 'online search engines'; see European Parliament (2019), *Regulation (EU) 2019/1150 of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services;* the Digital Single Market strategy includes search engines, social media, e-commerce platforms, app stores and price comparison websites as examples of online platforms; see European Commission (2015), *A Digital Single Market Strategy for Europe.*

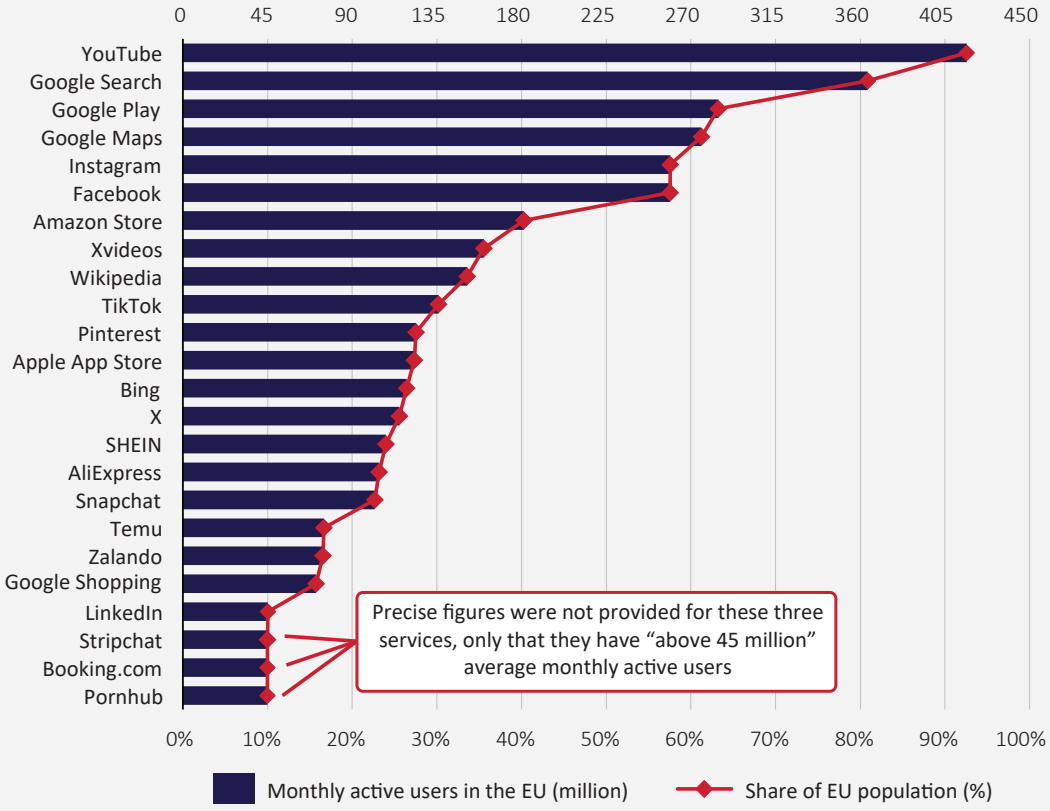
[111] European Commission (2015), *A Digital Single Market Strategy for Europe.*

Figure 3.1: Percentage of individuals in the EU27 who used the internet for various activities in 2023
[Source: Analysys Mason based on statistics published by Eurostat,[112] 2024]



Digital platforms that are global in scope tend to operate across the EU already. Figure 3.2 below indicates how widely some platforms are used across the EU, and is based on reported monthly active user information that has been used by the European Commission to designate VLOPs and VLOSEs under the DSA.[113]

Figure 3.2: Average monthly active users for services designated under the DSA [Source: Analysys Mason based on a summary published by the European Commission as of 28 June 2024]



[112] Eurostat, *Individuals – Internet activities*.

[113] European Commission (2024), *Supervision of the designated very large online platforms and search engines under the DSA*.

Digital platforms based in Europe have also launched a variety of online marketplaces, focusing on e-commerce (e.g. Allegro, Bol, CDiscount), fashion (e.g. Zalando, Vinted), travel and tourism (e.g. Booking.com, Trivago), mobility and logistics (e.g. Bolt, Delivery Hero, Freenow), as well as jobs and other classifieds (e.g. AppJobber, XING, Adevinta).

These online marketplaces provide access not only to new services, but also to new markets, which allow Europeans to discover new economic opportunities. For instance, Vinted, an online marketplace focused on clothing and accessories, makes it easier for individuals to sell their second-hand items or purchase used items at a lower cost than in traditional stores. Meanwhile, online marketplaces in travel and tourism, and in mobility and delivery, make it easier for individuals to turn their properties and vehicles into assets that are used to provide services.

This is sometimes referred to as the 'collaborative economy', and several studies on this topic were published by the European Commission in 2018,[114] including one that found that the size of the collaborative economy was EUR26.5 billion in 2016.[115] A 2020 report published by the Centre for European Policy Studies, meanwhile, recommended that collaborative economy workers "receive increased social protection", while noting that "gatekeepers do not dominate the collaborative economy" due to a competitive environment with low entry barriers and where "both workers and consumers enjoy choice".[116]

3.1.2 Consumers that use digital platforms have access to greater choice for a range of services, as well as a wide variety of free digital goods and services

Cross-border online trade supports one of the three pillars of the DSM and creates benefits for consumers, as described in a JRC Technical Report published by the European Commission as early as 2013:[117]

- Lower distance-related trade costs facilitated by online trade increases online competition and reduces online prices, likely then contributing to reductions in prices of products sold offline.
- Reduced trade costs promote greater product variety due to the expanded geographical coverage of both suppliers and consumers, positively impacting consumer welfare.
- Online trade reduces transaction/information costs for consumers due to the relative ease of different stages in the transaction compared to offline trade (e.g. assembling product reviews).

By using digital platforms, consumers experience greater choice as they gain exposure to businesses in a wide range of industries. For example, on Meta's platforms, EU users receive ads from a large range of advertisers that can be classified into 23 broad industry verticals[118] (which can be further classified into approximately 170 distinct industry sub-verticals). As digital advertising services can be personalised, the ads ultimately seen by each user on Meta's platforms are more likely to be curated to their interests, helping them to discover desired products within the wide range of verticals shown above, which contributes to consumer satisfaction.

[114] European Commission, *Collaborative economy studies.*

[115] Publications Office of the European Union (2018), *Study to monitor the economic development of the collaborative economy at sector level in the 28 EU member states.*

[116] Centre for European Policy Studies (2020), *Europe's collaborative economy.*

[117] European Commission (2013); *What does Economic Research tell us about Cross-border e-Commerce in the EU Digital Single Market?*

[118] Businesses are classified into 23 verticals based on Meta's internal definitions, which includes e-commerce, consumer packaged goods, retail, entertainment and media, travel, technology, professional services, automotive, healthcare, pharmaceuticals and biotech, gaming, education, B2B, advertising and marketing, publishing, banking and credit cards, restaurants, telecom, energy, national resources and utilities, non-profit, insurance, government, organisations and associations, and agriculture.

Digital platforms also contribute to consumer welfare by providing access to free digital goods. A 2019 study that measured how much people were willing to pay to use Facebook estimated a total consumer welfare gain of USD16 billion on average per annum between 2004 and 2017 for consumers in the US.[119] This study was also cited in a 2020 paper from two of the authors that penned the previous study, and that found that Facebook generated a median consumer surplus of USD500 per person in both the US and in Europe.[120] Meanwhile, a 2021 macroeconomic analysis calibrated to the US market found that free digital goods (such as Google Maps and YouTube) are underprovided given the significant consumer welfare gains associated with such goods.[121] Finally, a 2023 study of 13 countries (including 7 EU/EEA members and the UK) found that ten prominent digital goods generated over USD2.5 trillion in consumer welfare per annum (~6% of the aggregated GDP).[122]

3.2 Digital platforms facilitate cross-border trade across the EU and contribute to business success through tools that improve efficiency and scale

Digital platforms are essential enablers of the DSM, through the services they provide for businesses of all sizes to engage in cross-border trade at scale. The tools provided by digital platforms help businesses operate online more efficiently, thus improving profitability and returns on online investments, while also generating wider economic benefits.

3.2.1 Digital platforms mitigate some of the persistent barriers to cross-border trade across the EU

The tools provided by digital platforms contribute to increased trade by lowering costs (e.g. search, replication, transportation and verification costs)[123] as a result of the economies of scale and scope and the network effects inherent to digital platforms.[124] Of particular relevance to Europe's issues with fragmentation is that platforms create spaces that transcend national borders and reduce barriers associated with geographical, linguistic and cultural differences. This is achieved through relatively standardised processes or tools that users interact with in similar ways.[125]

For instance, businesses selling online need a way to receive payments swiftly and securely, and those aiming to sell to multiple countries need to be able to collect payments in multiple currencies, and at reasonable cost. Stripe, a company based in the US and Ireland, processed over USD1 trillion in payments globally in 2023 (around 1% of all final consumption transactions). Some challenges in cross-border payments, and how Stripe addresses these, is described further in the case study below.

[119] Brynjolfsson et al. (2019), *GDP-B: Accounting for the value of new and free goods in a digital economy.*

[120] Brynjolfsson and Collis (2020), *How Should We Measure the Digital Economy?*

[121] Greenwood et al. (2021), *'You Will:' A macroeconomic analysis of digital advertising.*

[122] The ten digital goods are Google Search, Meeting Friends, YouTube, Google Maps, WhatsApp, Amazon Shopping, TikTok, Instagram, Twitter, Snapchat. The 13 countries examined are the US, Canada, Mexico, Germany, the UK, Ireland, France, Belgium, Norway, Spain, Romania, Japan and Korea. Note: representative samples of approximately 40 000 people were used in the choice experiments; see Brynjolfsson et al. (2023), *The Digital Welfare of Nations: New Measures of Welfare Gains and Inequality.*

[123] Goldfarb and Tucker (2017), *Digital Economics.*

[124] Many platforms are 'two-sided' and bring together businesses and consumers. Network effects can occur within one side of the market (e.g. a social network becomes more useful to individuals if their friends are on it) or across sides (e.g. the same social network is more valuable to advertisers the more individuals are connected to it); see European Parliament (2021), *Online platforms: Economic and societal effects.*

[125] Each process or tool likely has customisation options which cater to different types of users, but generally tend to serve users in different countries in similar ways.

Case study: Differences in consumer preferences for payments is a barrier to cross-border trade, and Stripe provides standardised tools to help facilitate cross-border transactions[126]

A 2022 study conducted by Stripe ('The state of European checkouts') documents some of the challenges of facilitating cross-border payments in Europe, including the fact that preferred local payment methods differ across countries. Of all customers surveyed, 95% said it was important for a website to provide common payment methods in their country, and 86% claimed that they would abandon their cart if preferred payment options were unavailable.

Stripe supports businesses aiming to sell in multiple countries by allowing businesses to charge customers in multiple currencies, and offering tools for fraud detection and dispute resolution to foster trust and mitigate risk. According to a 2023 Stripe report on digital trade,[127] "more availability of technology and tools" was the most cited reason for businesses finding it easier to expand internationally in recent years.

Small businesses, in particular, benefit from the tools provided by digital platforms to sell across borders. For example, eBay enables interactions between buyers and sellers across borders, using product listings to help map buyers and sellers, and seller verification and ratings tools to build trust in cross-border commerce.[128] These features help to facilitate cross-border trade, but do not address all barriers to selling in other countries, particularly with regard to compliance. These benefits, and limitations, are described further in the case study below.

Case study: eBay helps facilitate significant levels of cross-border trade for small businesses, and provides advice and support on compliance matters which hinder cross-border trade

eBay's proposition is of particular benefit to small businesses. According to eBay's Digital Density report,[129] 97% of small businesses enabled by eBay in Europe were exporting to an average of 20 international destinations. The report also compared sub-national regions on two different measures, one based on GDP per capita, and another based on per-capita selling activity on eBay, to show that eBay was not only helping small businesses to succeed, but also helping small businesses located in less economically developed areas to gain more opportunities.

While digital platforms can facilitate cross-border trade, they can only offer advice/assistance on other matters, such as those relating to compliance. For example, eBay explains in its Cross-Border Trade Handbook[130] that sellers are responsible for paying all taxes associated with use of the platform in line with applicable laws and details tax laws for sellers shipping goods to different destinations. eBay also describes how business sellers can comply with Extender Producer Responsibility (EPR)[131] regulations in several European countries and contribute to waste management in these markets.

Businesses on Meta's platforms find potential customers in markets outside their own geographic boundaries. Using statistics provided by Meta, Figure 3.3 shows a few examples.[132] About 64% of EU-based business pages on Instagram and 37% of EU-based business pages on Facebook are followed by users from countries other than the businesses' own country, while 41% of ad impressions by EU advertisers reach users that are outside the advertisers' own country.

[126] Stripe (2022), *The state of European checkouts* and Stripe (2024), *Stripe 2023 annual letter.*

[127] Stripe (2023), *How digital trade is reshaping the global economy.*

[128] The large distance between consumers and the businesses they buy from in cross-border e-commerce creates trust issues. Digital platforms help to address these issues, for instance through the use of ratings and verification processes. Specialist platforms (such as Trustpilot) also help to perform this specific function, but many e-commerce platforms working across borders include ratings and verifications processes as part of their normal operations.

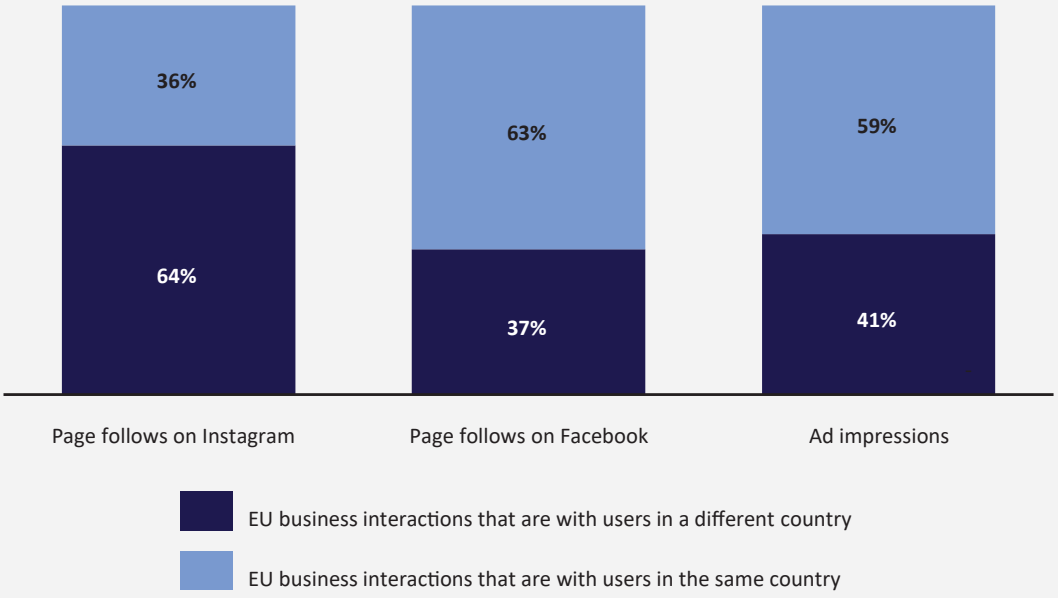
[129] eBay (2022), *Digital Density in Europe.*

[130] eBay, *Cross-Border Trade (CBT) Handbook.*

[131] eBay, *Extended Producer Responsibility.*

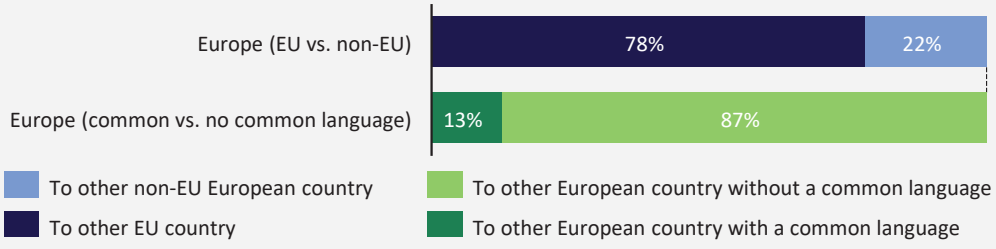
[132] All of these examples are constructed using a random 10% of the active advertising campaigns (and a 10% sample of business pages/ profiles on Facebook and Instagram) on 1 July 2024, 15 July 2024 and 26 July 2024.

Figure 3.3: Distribution of EU-based business interactions that are with users in the same versus different country than advertisers [Source: Analysys Mason based on platform data from Meta, 2024]



EU advertisers on Meta's platforms reach audiences in other European destinations, both within and outside the EU, and regardless of whether audiences are located in a country that shares a common language[133] with the country where the advertiser is based. Figure 3.4 below[134] shows the geographic and language distribution of the ad impressions by EU advertisers that are delivered to European countries other than the advertiser's own country. Among those, about 78% of ad impressions are delivered to other EU countries and 22% are delivered to non-EU European countries.[135] Figure 3.4 also shows that about 87% of EU advertisers' ad impressions to other non-domestic European countries go to countries that do not share a common language with the advertisers' own country, which suggests that advertising on Meta's platforms reaches beyond the boundaries of language.

Figure 3.4: Geographical distribution of ad impressions from EU advertisers that reach users in Europe [Source: Analysys Mason based on platform data from Meta, 2024]



[133] In this analysis, a "common language" between two countries is defined as a language that is spoken by at least 5% of both populations as a primary or secondary language, based on data from CIA World Facebook, *Languages*.

[134] This analysis was constructed using a random 10% of the active advertising campaigns on 1 July 2024, 15 July 2024 and 26 July 2024.

[135] For this analysis, "Europe" is defined as the 46 countries that are part of the Council of Europe, see Council of Europe, *46 Member States.*

AI developments are also leading to advances in translation, which, in Europe, can help to better address language-related fragmentation and further boost cross-border trade. Real-time translation tools have been shown to generate significant productivity improvements.[136] Similarly, open-source translation models developed within Meta's No Language Left Behind programme[137] achieved a 44% improvement in translation quality compared to the next-best system.[138] This is another example of how digital platforms can help businesses to overcome barriers to cross-border trade within the EU. More broadly, AI has the potential to drive automation at speed and scale, helping the EU address challenges with productivity and ageing populations.[139]

3.2.2 Digital platforms create opportunities for European businesses to operate online efficiently and profitably at scale, which helps to unlock wider economic benefits

Businesses selling online need to be discovered by as wide a customer base as possible, at the lowest cost, and European businesses benefit from having access to globally-competitive tools.

From the advertisers' perspective, personalised ads improve the targeting of their ads to the user groups that are more interested in the product and services that are offered. A study by Meta in 2022 shows that personalised advertising can often lead to repeat purchases,[140] which in such cases indicates customer satisfaction with the advertised product. The same study also documents that advertisers have 37% higher cost per incremental customer when they are unable to use off-platform data in the personalisation feature of ads delivery.

In 2022, researchers at UC Berkeley ran a study[141] that calculated the returns on ad spending for US advertisers on Meta's platforms. Using the same methodology, internal calculations by Meta show that for each euro spent on Meta's platform in 2022, European advertisers earn EUR3.37 in revenue.[142] Since then, the advertising tools provided by Meta have led to larger gains for European businesses. In 2024, Meta replicated the 2022 study by UC Berkeley and discovered that the average returns on ad spend for European advertisers has reached EUR3.79 per euro spent in 2024; this is 12% higher than the average returns in 2022 and on a par with the increased average return of USD3.71 per USD spent for US advertisers over the same period. Based on this study, advertisers in Europe currently earn approximately EUR107 billion in revenue annually from ads on Meta's platforms. Crucially, the study also finds that AI tools used in advertising are driving additional improvements. When European advertisers who did not previously use AI tools turned on the AI-driven automatic targeting features, they experienced an average 25% increase in the returns on their ad spend – with their average returns going up from EUR3.58 to EUR4.47 for every EUR1 spent on Meta ads (see Figure 3.5).[143]

[136] Benefits include time savings, improved service offerings and quality to end customers, ease of use and accessibility, trust and confidence in the system security and quality of results, and improved employee morale. Forrester (2024), *The Total Economic Impact™ Of DeepL* found that return on investment in real-time translation tools for a 'representative' firm could reach 345%.

[137] Meta, *No Language Left Behind.*

[138] The model is made freely available for non-commercial use and covers 200 languages, including languages that are endangered; see NLLB Team (2024), *Scaling neural machine translation to 200 languages* and Nature (2024), *Meta's AI system is a boost to endangered languages – as long as humans aren't forgotten.*

[139] In the context of the relatively recent emergence and rapid progress of generative AI in particular, there are a variety of views on the productivity impact these technologies will have. Brynjolfsson and Li (2024), *The Economics of Generative AI | NBER* found significant improvements in productivity for labour-intensive customer service tasks, although Acemoglu (2024), *The Simple Macroeconomics of AI* argues that these effects are unlikely to be generally visible in a broad section of the economy, muting the overall impact of generative AI. Despite these variations in views at this early stage, technologies that can lead to automation and a reduced dependence on labour in sectors that are labour intensive and subject to shortages of workers are likely to be beneficial overall.

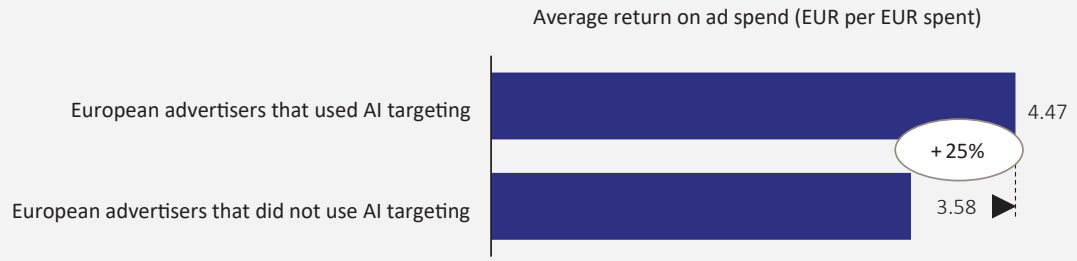
[140] Based on data from six months after experiments on ad traffic were run; see Wernerfelt et al. (2022), *Estimating the Value of Offsite Data to Advertisers on Meta.*

[141] Tadelis et al. (2023), *Learning, sophistication, and the returns to advertising: Implications for differences in firm performance.*

[142] See Meta Research, *Meta proudly supports the people and economy of the United States and around the world.*

[143] This calculation follows the methodology in the Tadelis et al. (2023) paper published by the National Bureau of Economic Research.

Figure 3.5: Comparison of average return on ad spend for European advertisers when using AI-driven targeting to when using non-AI-driven targeting in 2024 [Source: Analysys Mason based on platform data from Meta, 2024]



Beyond using online tools to advertise to customers, businesses looking to sell online also benefit from the use of platforms to initiate sales. Businesses looking to set up a web shop and facilitate transactions two decades ago might have needed to build websites from scratch using in-house expertise.

Many digital platforms simplify this process for businesses. Shopify is one example of an e-commerce platform which enables businesses to launch, manage and market their own online stores and provide services ranging from website creation to check-out. Its impact on European businesses is described in further detail in the case study below.

Case study: Shopify helps many businesses in Europe and around the world to develop their online commerce presence

Shopify allows businesses to operate their own branded e-commerce site, and offers an aggregation platform that acts as a shop window, e-commerce portal, and offers order tracking functions (the 'Shop' app). Shopify provides integrations with a number of sales channels and tools that allow businesses to interact with customers through social media, email and chatbots.

An economic impact report released by Shopify and Deloitte in 2021 showed that in 2020, sales generated by European Shopify merchants to customers outside of the European continent increased significantly over a short period, from USD980 million in 2018 to over USD2844 million in 2020 (including the start of the Covid-19 pandemic).[144]

Finally, products sold online also need to be physically delivered to customers, which is referred to as fulfilment. Amazon is a leading facilitator of e-commerce globally, acting as a retailer and marketplace for third-party sellers. Amazon has developed a whole ecosystem to serve those sellers, including fulfilment services using its own storage and delivery facilities. This infrastructure can be used for sales made on Amazon's own platform, but also for sales made on non-Amazon platforms. Services such as these help businesses to engage in e-commerce, which has a measurable impact on the EU economy, as described in the case study below.

[144] Deloitte (2021), *Global Economic Impact Study of Shopify.*

Case study: Amazon's fulfilment centres, along with its broader operations, enable trade and employment across the EU

Amazon provides fulfilment offerings that allow businesses to make use of Amazon's global fulfilment centre network.[145] Fulfilment by Amazon (FBA) allows businesses to outsource the process of storing, packing and shipping products, as well as handling customer support and returns for sales conducted through Amazon channels. Meanwhile, Amazon's Multi-Channel Fulfilment (MCF) provides a similar service, for sales that are conducted through non-Amazon channels.

Amazon's fulfilment centres do not only support businesses looking to sell online, but also deliver benefits to local economies. An analysis conducted by Frontier Economics suggests that Amazon's fulfilment centres in Europe employ an average of 1500 people, while also supporting an additional 250 local jobs outside of the fulfilment centres.[146] More broadly, Amazon's EU operations supported over EUR9.8 billion in intra-EU sales by European SMEs in 2022, enabled by the company investing over EUR150 billion in the EU between 2010 and 2022.

Each digital platform typically enables integration with complementary platforms to easily onboard business customers. Most platforms use non-restrictive contract terms, meaning businesses can use more than one provider ('multi-home') for a particular need.[147] As many of these services are software-based, marginal costs are typically low, resulting in high levels of multi-homing, which, according to a CERRE report,[148] is a "powerful driver for contestability".[149] This is important to bear in mind in the context of the recent increase in digital regulation in Europe, the focus of which includes "more fair and open markets", and a strong focus on contestability.[150]

3.3 Global digital platforms contribute to the broader European digital economy through significant investment in open and widely available technology building blocks

A prosperous European digital economy is not only one where individuals conduct activities online, and where businesses use digital platforms to engage in efficient online and cross-border trade, but also one that features European digital businesses actively innovating and contributing to the digital ecosystem in a way that boosts Europe's economic prospects.

In this section, we discuss how the technology **building blocks** developed by technology companies operating at a global scale have been made more widely available, and are now being used by European businesses, particularly European digital platforms, to drive their own innovation and growth by building on top of these building blocks.

[145] Amazon, *What is Fulfillment by Amazon (FBA)?, Why Amazon Multi-Channel Fulfillment?*

[146] Amazon (2023), *Amazon EU Impact Report 2023.*

[147] Both Shopify and Amazon offer payments solutions, while also being integrated with payments solutions provided by other companies; see Shopify (2024), *Payment Providers and Online Payment Gateways* and Amazon Pay; *Getting started for merchants.*

[148] Centre on Regulation in Europe (2022), *Interoperability in digital markets.*

[149] While dominant firms may have incentives to limit multi-homing, in Europe, the Digital Markets Act has been introduced to help address situations where platforms that serve as 'gatekeepers' may attempt to behave in anti-competitive ways.

[150] See for example European Commission (2023), *Questions and Answers: Digital Markets Act: Ensuring fair and open digital markets.*

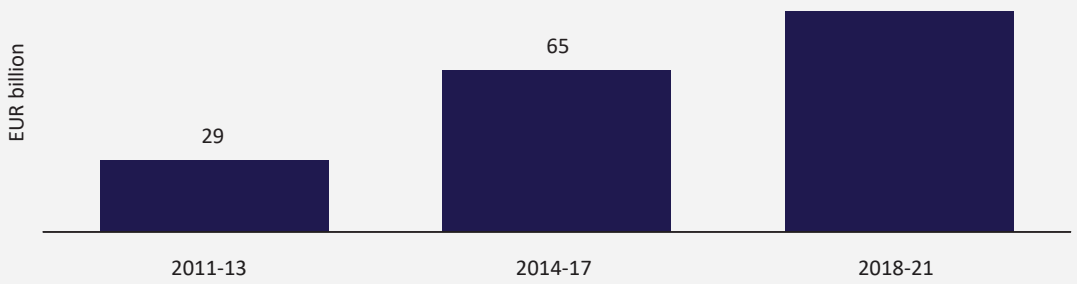
3.3.1 Global digital platforms are investing in capital-intensive infrastructure and innovative software accessible by all EU businesses

Large technology companies (including digital platforms, content and other applications providers) have developed a range of technology **building blocks** that they have made available to other businesses building digital services and products. These building blocks fall into two broad categories: **digital infrastructure** (including data centres, cloud, servers and networking) and **software** (including fundamental developments in computer science, algorithms, software tools and libraries).

Technology companies operating at a global scale invest significant amounts in digital infrastructure building blocks, including in Europe

Between 2011 and 2021, we estimate that large technology companies invested a total of EUR183 billion in European data centres, long-distance networks and content delivery infrastructure (Figure 3.6).[151]

Figure 3.6: Investments made by technology companies in digital infrastructure [Source: Analysys Mason,[152] 2022]



These infrastructure investments support these companies' own services, including search, advertising and streaming, but a significant proportion of those investments are related to public cloud services. In Europe, five global cloud providers have deployed 97 cloud availability zones in Europe (74 in the EU) as of May 2024,[153] as shown in Figure 3.7 below. Each of these availability zones typically contains one or more data centres that are separated physically from other zones, enabling extremely high scale, availability and resilience.[154]

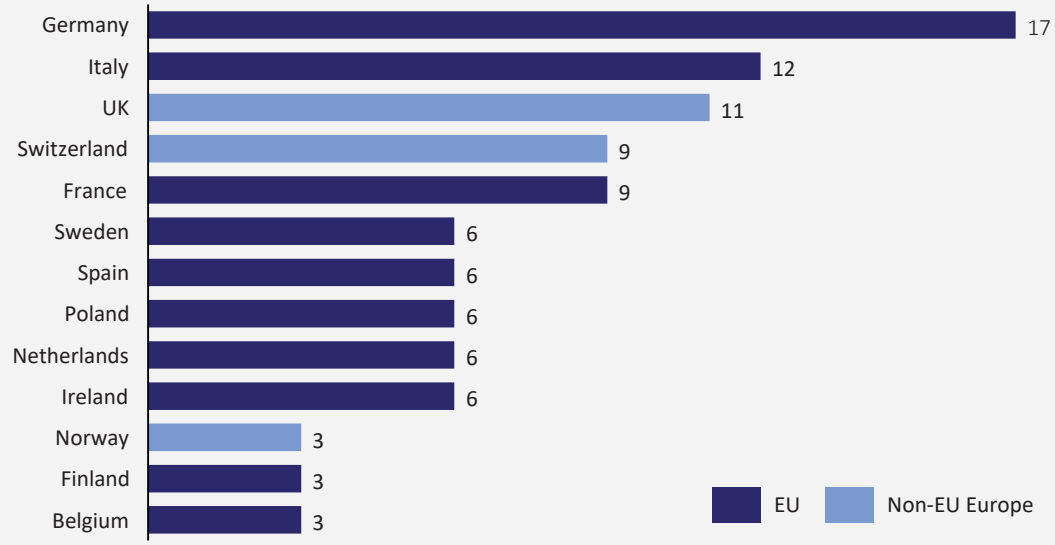
[151] Investment in digital infrastructure increases reliability and quality of experience for end users. More broadly, many studies have shown how these investments drive overall internet penetration and usage and, as a result, generate macroeconomic benefits through digitalisation. These include increased GDP, job creation and environmental benefits, as well as improved societal outcomes (e.g. education, health, access to remote work) from the consumption of online services.

[152] Analysys Mason (2022), *The impact of tech companies' network investment on the economics of broadband ISPs.*

[153] Information collected in May 2024, from Alibaba Cloud, *Alibaba Cloud's global infrastructure;* AWS, *Regions and availability zones;* Google Cloud, *Cloud locations;* Microsoft, *Azure geographies;* Tencent Cloud, *Regions and availability zones.*

[154] Dgtl Infra; *Cloud regions and availability zones explained.*

Figure 3.7: Total number of cloud availability zones deployed by Alibaba, Amazon, Google, Microsoft and Tencent in European countries [Source: Analysys Mason based on cloud provider websites, 2024]



This infrastructure has been built over nearly two decades. The scale of global cloud providers was initially underpinned by their own IT needs, as they operate large platform services themselves, but demand for cloud services from other customers is now driving a significant part of their investments (e.g. Google operated Google Search and YouTube, and in addition offers public cloud services).[155]

Although the global cloud providers considered above are based in either the US or China, they have made significant investments across the world, including in Europe. Cloud providers based in Europe, meanwhile, operate at a much smaller scale: OVHCloud has ten regions, most of them with a single availability zone, across four European countries, along with four availability zones in North America.[156] In comparison, Amazon Web Services (AWS), a US-based global provider, has 8 regions, with 3 availability zones each, across 8 European countries (including the UK).[157] Amazon also has nearly 30 availability zones in North America, with more under construction across both continents. The infrastructure already deployed by global cloud providers is not easy to replicate, and previous efforts to build a European federated data-centre platform, Gaia-X, appear to have stalled, in part because of the availability of Europe-focused infrastructure and products on US hyperscale platforms.[158]

Innovations made by large technology companies in the design of data-centre systems and components has also led to benefits for the wider industry. The Open Compute Project (OCP) was founded within Facebook (now Meta) in 2009, and since 2011, has focused on making innovative data-centre designs more widely available.[159] In 2014, Meta announced that it saved USD1.2 billion using Open Compute designs for its data centres and servers over the previous three years,[160] and a subsequent Omdia report estimated that global spend on OCP-recognised equipment exceeded USD18 billion in 2021, with that figure expected to double by 2026.[161] The economies of scale realised through the project have benefitted all users of OCP equipment, including but not limited to Meta.

[155] Analysys Mason (2018), *Infrastructure investment by online service providers.*

[156] OVHCloud, *Regions*

[157] AWS, *Regions and availability zones*

[158] Data Center Dynamics (2024), *Gaia-X: Has Europe's grand digital infrastructure project hit the buffers?*

[159] Open Compute Project, *About.*

[160] Data Center Knowledge (2014), *Facebook: Open Compute has saved us USD1.2 billion.*

[161] Omdia (2022), *OCP Impact Study 2022.*

Although infrastructure building blocks such as cloud are largely supplied by providers based outside Europe, they are made widely available across Europe, and European businesses can benefit from using these building blocks for their own needs. The same can be said of software building blocks, considered below.

Large innovative technology companies have also developed software building blocks, including in AI, which are widely available and used by other businesses to drive innovation

The principles of open, collaborative technological development exhibited in infrastructure-related initiatives such as OCP are also reflected in open-source **software**, which allows developers to use, access and modify code in a collaborative and interoperable way, lowering cost and enabling innovation. The European Commission defines free and open-source software as "[combining] copyright and a licence to grant users the freedom to run the software, to study and modify it, and share the code and modifications with others".[162]

Open-source software solutions have the potential to generate significant economic impact. A 2021 European Commission study estimated that companies in the EU invested EUR1 billion in developing open-source software code in 2018, which generated economic impact of between EUR65 billion and EUR95 billion.[163] A more recent study published by Oxera in 2023 explored how open foundation models (in the context of generative AI) unlocks benefits including an ecosystem of collaboration, reduced costs, democratisation of AI, enhanced competition, interoperability and compatibility, security and data privacy, and transformative effects.[164] While the study includes a compilation of estimated benefits associated with AI or generative AI from third-party sources, it notes the large degree of uncertainty surrounding the absolute level of benefits likely to arise, due to the current stage of AI development.

Many prominent examples of open-source software and tools, including ones related to AI, have been developed by large technology companies and are now widely available (see Figure 3.8).

Figure 3.8: Examples of software and tools developed by global technology companies based on open models
[Source: Analysys Mason, 2024]

Category	Provider	Solution	Description
Operating systems	Google	Android[165]	Open-source operating system for mobile devices, with a repository of information (codebase) and customisable source code
	Meta	Horizon OS[166]	Open computing platform for the metaverse, making it easier for developers to build mixed-reality apps
Software library for machine learning	Google	TensorFlow[167]	Open-source platform facilitating creation of machine-learning models, supporting users through intuitive APIs and interactive code samples
	Meta	PyTorch[168]	Easy-to-use open-source machine-learning framework supporting Python and C++, also supporting mobile deployments
Large language models (LLMs)	Meta	Llama[169]	Open platform featuring AI models, tools and resources for developers (including an LLM for generating code), enabling them to build, experiment and scale AI
	Google	Gemma[170]	Lightweight open models offered to developers and researchers, as well as tools to help optimise performance

[162] European Commission (2020), *Open source software strategy 2020–2023.*

[163] European Commission (2021), *Study about the impact of open source software and hardware on technological independence, competitiveness and innovation in the EU economy.*

[164] Oxera (2023), *The economic opportunities of open foundation models for Europe.*

[165] Android, *Android Open Source Project.*

[166] Meta (2024), *Introducing Our Open Mixed Reality Ecosystem.*

[167] TensorFlow, *Introduction to TensorFlow.*

[168] PyTorch, *Pytorch Foundation.*

[169] Meta, *Discover the possibilities with Meta Llama.*

[170] Google, *Gemma open models.*

Some of these building blocks are also being developed in a way that is intended to foster openness and facilitate integration. Meta, for instance, created an advisory group in May 2024, including the CEOs of Shopify and Stripe, to advise on its AI efforts.[171] This is in line with Meta's ambition to build and enable open-source AI, including through Llama, as a common resource that can be adopted, customised and deployed at will by nearly all developers in the world.[172]

Newer technologies are expected to see increased uptake in coming years. This is facilitated in part by digital platforms that are developing ways to make AI solutions more accessible to businesses more widely; solutions include offering open-source AI models, either freely (e.g. Meta's Llama 3) or as a service (e.g. Amazon Bedrock on AWS). Major cloud providers[173] have started to introduce AI-powered solutions, as well as a combination of free-to-access and paid-for training resources to help individuals and businesses develop competency in using AI and to drive broader adoption.

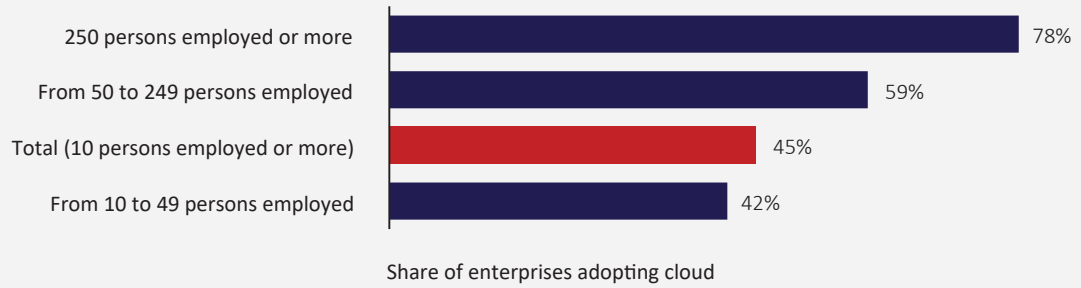
3.3.2 Technology building blocks are widely used across Europe by start-ups, scale-ups and established businesses as part of their digital transformation

European businesses and platforms use multiple **digital infrastructure** and **software** building blocks to support their innovation and growth, in turn enabling economic activity across Europe. In this section, we use the examples of **cloud services** (in the **digital infrastructure** category) and **AI** (in the **software** category) to explore recent developments.

Across Europe, cloud services are used extensively, especially in the digital space, and AI, while still emerging, is already supporting digital transformation for established European businesses

At present, **cloud services** are already used by many businesses across the EU,[174] particularly by larger businesses (Figure 3.9), as well as businesses in the information and communications sector (Figure 3.10), while cloud adoption in more traditional business sectors is also climbing at a rapid pace, representing wider digital transformation.

Figure 3.9: Share of enterprises in the EU that have adopted cloud services as of 2023, split by size
[Source: Analysys Mason based on Eurostat, 2024]



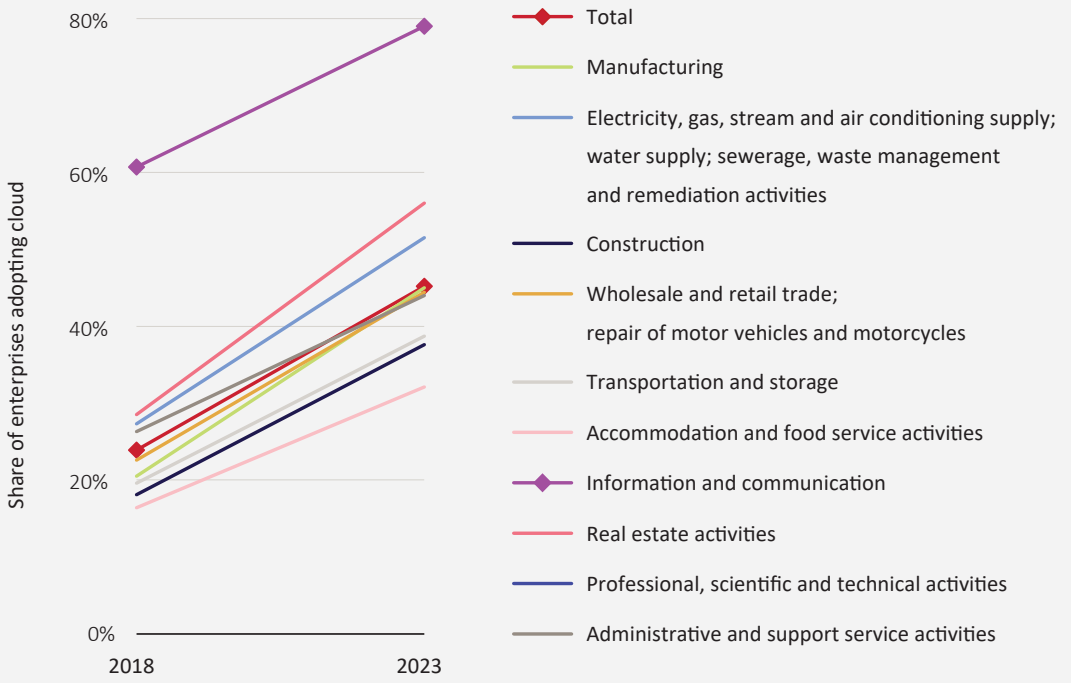
[171] Bloomberg (2024), *Meta's Zuckerberg Creates Council to Advise on AI Products.*

[172] Meta (2024), *Open Source AI Is the Path Forward*

[173] AWS, *AI Tools and Services – Artificial Intelligence Products, Machine Learning Service - Amazon SageMaker, Generative AI Use Cases and Resources;* Microsoft, *Copilot for Microsoft 365, Azure AI Platform;* Google (2024), *Our AI Journey, The Gemini ecosystem represents Google's most capable AI*

[174] Eurostat, *Cloud computing - statistics on the use by enterprises.*

Figure 3.10: Share of enterprises in the EU that adopt cloud services in 2018 and 2023, split by industry
[Source: Analysys Mason based on statistics published by Eurostat, 2024]



Cloud services are an essential part of how businesses across the EU, including digital start-ups and scale-ups, gain access to state-of-the-art computing without major upfront investment.[175] A 2022 study commissioned by AWS highlights significant benefits including flexibility and cost savings, innovation and agility, as well as data security and privacy.[176] The study also estimated that a 10 percentage point increase in cloud adoption by small businesses across the EU would increase the European economy by 0.6%.

European companies have **also started to incorporate AI** technologies to improve their products and services. AI is being deployed in the areas of product and service development, marketing and sales, and customer service.[177] The German-headquartered software giant SAP, which offers business-to-business (B2B) software solutions, provides clear examples of how AI can improve a whole range of offerings. This includes simplifying predictive analytics in enterprise resource planning and management, automating procurement processes, optimising staffing and personalising marketing.[178] At the same time, Siemens, a provider of industrial manufacturing technology, has evolved its product portfolio to incorporate AI-enhanced solutions, as detailed in the case study below.

[175] With cloud, start-ups are able to pay as they grow, and focus on innovation without needing significant upfront investment; see Forbes (2024), *From startups to giants: The role of the cloud in business growth.*

[176] Public First (2022), *Unlocking Europe's digital potential: How cloud computing can support the EU's Digital Decade.*

[177] Wall Street Journal (2023), *How did companies use generative AI in 2023? Here's a look at five early adopters.*
Economist (2024), *How businesses are actually using generative AI.*
Wesley Baker (2023), *EU Companies Are Shaping the AI Landscape.*
eWeek (2024), *15 Generative AI Enterprise Use Cases.*

[178] SAP, *Software products for best-run businesses; and* Siemens, *Artificial Intelligence.*

Case study: Siemens

Siemens is a multinational industrial technology manufacturing company, with a recent focus on industrial digitalisation and smart infrastructure. It has incorporated AI into its internal manufacturing processes and its product portfolio through:

- Smart software (e.g. AI assistance for data analysis or coding)
- Design space exploration (e.g. simulating design impact on manufacturing processes)
- AI-enabled operations (e.g. predictive maintenance, service optimisation, advanced robotics)
- Vertical AI solutions (industry and use-case-specific solutions, e.g. reduction in electronics false-calls, leak detection in water networks, smart harbour crane control)
- Partner AI offerings (e.g. digital twin with Nvidia and SkillReal)
- The Siemens AI laboratory also offers a platform for testing AI use cases.

A recent addition to Siemens' product offerings is its Industrial Copilot, an AI-powered assistant developed in collaboration with Microsoft. The Copilot is designed to enhance human–machine collaboration by helping users generate, debug and optimise automation code, using automation and process simulation data from Siemen's open business platform (Siemens Xcelerator) and enhancing it with Microsoft Azure's OpenAI, all while customers maintain control over their data.

Cloud and **AI** are just two examples of building blocks (within the two categories of digital infrastructure and software, respectively) that are being used by businesses in Europe. Notably, these building blocks are also of particular importance to European digital businesses, which tend to use several different types of building blocks, from a variety of providers, as inputs for the development, innovation, and growth of their own offerings.

European businesses, and European digital platforms in particular, tend to use multiple building blocks simultaneously to drive their own innovation and improve their offerings

Businesses often use multiple technology building blocks at the same time. These technology building blocks are used by a wide range of businesses, but notably by innovative high-tech digital platforms that are key to future European competitiveness. One such example is Mirakl, a European digital platform that enables businesses, including large established brands in both the business-to-consumer (B2C) and B2B segments, to launch their own online marketplaces, and onboard a wide variety of sellers and partners onto those marketplaces quickly.

Case study: Mirakl

Mirakl works with many traditional retailers (e.g. Decathlon, Carrefour),[179] and large businesses with complex procurement needs (e.g. Toyota, Airbus),[180] to enable them to sell online and monetise their existing customers more effectively. Mirakl also provides solutions to allow sellers to sell across multiple marketplaces easily, which further supports the growth of marketplaces, and the facilitation of customer discovery for sellers adopting these solutions.

The company's 2023 seller report[181] highlights higher growth in the marketplace and dropship[182] business (38% growth between 2021 and 2022) compared to general e-commerce (6% growth between 2021 and 2022), and a large share of sellers on its platforms (62%) intending to expand their presence across more marketplaces in the future. Mirakl also reported that over half (53%) of the merchants selling on its marketplace and dropship platform are brands, which suggests that services such as those offered by Mirakl may be viewed by established businesses as an effective way to compete in an increasingly digital world.

Readily available building blocks have contributed to Mirakl's growth by allowing the company to benefit from world-leading solutions, while facilitating integration with a wide range of tools to enable easier onboarding of potential users. Mirakl uses building blocks from several different providers, including those developed by global companies.

These building blocks are not mutually exclusive, and Mirakl uses solutions from multiple providers for each of these functions. By building on top of these building blocks to create unique marketplace-focused solutions, Mirakl has itself developed into an important enabler for businesses looking to launch their own marketplaces, as well as the third-party sellers and consumers that then use those marketplaces.

Figure 3.11 below illustrates these dynamics, and shows how Mirakl uses cloud and security building blocks from global providers to develop innovative technology solutions for its customers, while also using AI building blocks from global providers, along with its own proprietary AI technology, to power a variety of innovative use cases on its platform, which ultimately benefits Mirakl's customers.

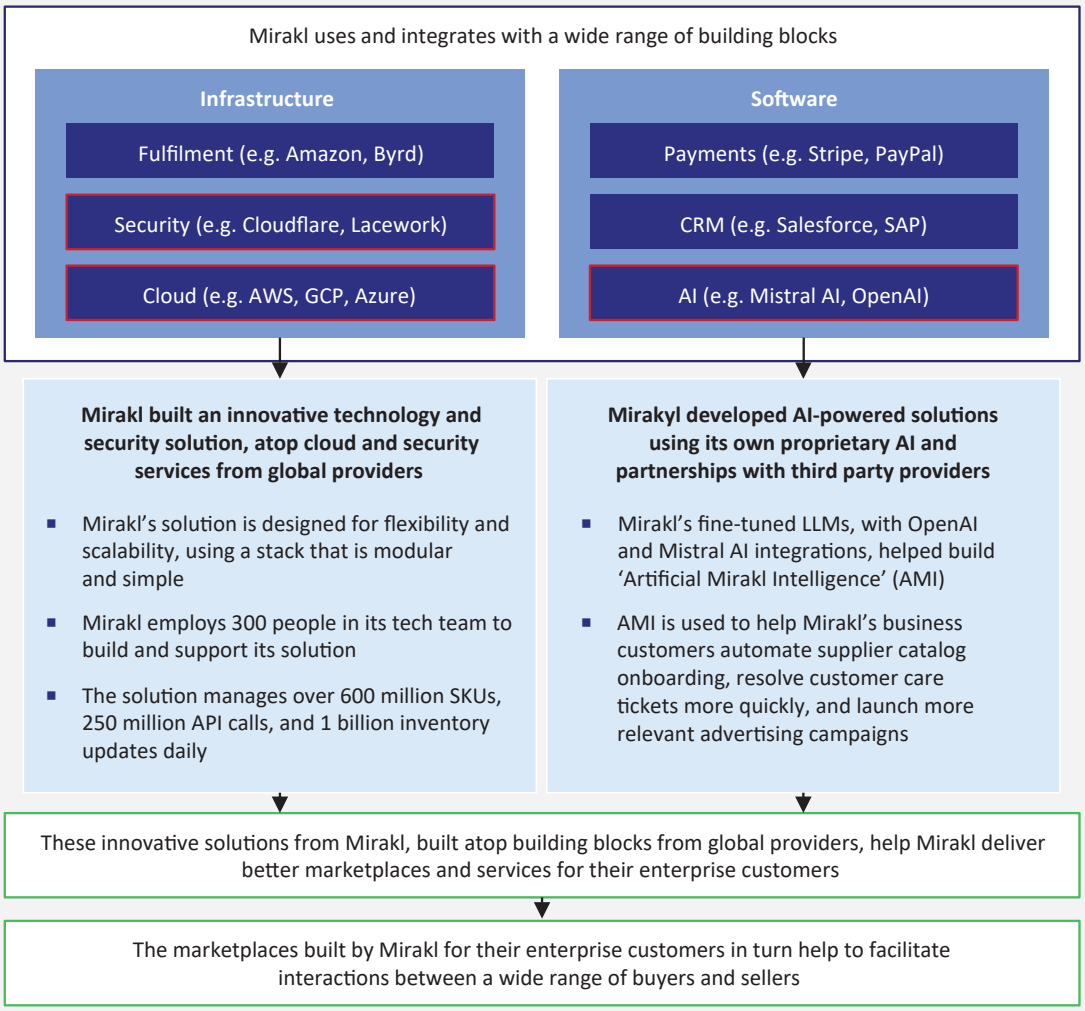
[179] Mirakl, *Retail customers.*

[180] Mirakl, *B2B customers.*

[181] Mirakl (2023), *The 2023 Seller Report by Mirakl.*

[182] 'Dropship' is a fulfilment strategy that involves the producers of goods (such as brands) shipping products directly to end customers and bypassing retailers that facilitate the sales transaction without ever receiving the physical shipment before it reaches the end customer; see Mirakl, *Dropship, marketplace or both: Which assortment strategy is right for your business.*

Figure 3.11: Examples of building blocks, including from global companies, used by or integrated with Mirakl, that help develop innovative solutions [Source: Analysys Mason based on websites,[183] 2024]



Mirakl's innovations, built atop building blocks, have the potential to drive significant downstream impact. Decathlon, a sporting goods retailer, has launched Mirakl-powered marketplaces across Europe,[184] which allow third-party sellers to list their products for sale, alongside those from Decathlon, and this allows buyers to choose from more products and providers as a result.[185]

Digital platforms deliver benefits for Europeans, and contribute to cross-border trade and business success, while also providing technology building blocks that support innovation. As such, it is crucial for policy makers to recognise these dynamics and the important role that digital platforms can continue to play in enabling future European innovation and growth, and to ensure that regulatory constraints do not unnecessarily undermine these benefits.

[183] Mirakl, *The most advanced technology and enterprise-grade security, Curated partners for your marketplace operations, Introducing AMI: How AI is embedded into Mirakl to help you transform your business, Mirakl introduces industry-first capability for suppliers to sell on marketplaces in one click.*

[184] Mirakl (2021), *Decathlon Accelerates Marketplace Strategy with Launch in Italy and UK;* Decathalon, *What is the Decathalon Marketplace?*

[185] The Decathalon marketplace allows sellers to use Mirakl as a standalone tool, but also supports APIs and other third-party integrations (Shopify, Prestashop, etc.). Sellers on the Decathlon EU marketplace are required to be a registered company in the EU, to be VAT registered in the EU, and to hold stock in the EU.

4

European digital policy should support innovation and ensure regulation contributes positively to Europe's future digital success

The role that global digital platforms play in supporting European businesses through technology building blocks is essential to realising Europe's innovation ambitions. The Strategic Agenda 2024–2029 published by the European Council lists priorities including "bolstering our competitiveness", "promoting an innovation- and business-friendly environment" and "advancing together".[186] These priorities suggest a willingness to work with the private sector, rather than against it. In the context of digital policy making, this would imply a shift in focus from introducing new digital regulations, to boosting research and innovation, and using industrial policy to reinvigorate European growth, which we examine in this section.

We first articulate how the DSM and associated policy and regulation can evolve to support these ambitions, by better supporting private investment to enable the next big innovations to emerge (Section 4.1).

To achieve the scale and pace of innovation required in digital 'deep tech', Europe needs to be strategic in how it directs innovation policy and support. We propose an approach to consider the impact of policy on innovation, applied to the generative AI value chain as an example (Section 4.2).

4.1 EU digital policy should avoid trade-offs between innovation and economic success on the one hand, and the protection of users on the other hand without clear evidence

The direction of digital policy in the EU for the last five to ten years has been towards constraining perceived risks, notably those associated with the scale of global digital platforms, at times without a clear assessment of the validity and impact of these risks.[187] This has led to a regulatory environment that is increasingly complex, costly and causing frictions (Section 4.1.1).

Policy makers can take action to ensure regulation is justified and proportionate, and reduce the fragmentation in the adoption and enforcement of European regulations by European authorities and member states. This would avoid artificial trade-offs and reduce complexity, costs and risks for digital businesses in Europe (Section 4.1.2).

More broadly, digital policies under the DSM should focus on recognising the importance of private-sector investments and enabling them further in areas where innovation can support Europe's global competitiveness, in particular in emerging areas of digital technology (Section 4.1.3).

4.1.1 Recent EU digital policy action is not fully aligned with its strategic goals

The Strategic Agenda 2024–2029 brings to the fore several strategic objectives associated with innovation in future technology, including related to regulation. In particular, it highlights the promotion of an environment conducive to innovation and business, an "ambitious reduction" in bureaucratic and regulatory burdens, as well as a more integrated single market, notably for energy, finance and telecoms, as core objectives.

[186] European Commission (2024), *EU strategic agenda 2024–2029*.

[187] See for example Centre for European Reform (2024), *Better regulation in Europe: An action plan for the next Commission*.

This suggests that European policy makers have started to recognise the challenge of a 'regulation-first' approach, and the need for a new way forward: one that focuses less on introducing new regulations, and more on encouraging innovation and investment to reinvigorate European growth.

The challenge in fulfilling this vision is significant. As a result of public policy efforts over the last decade, European digital regulation is broad, complex and fragmented. As discussed in Section 2.4, about 90 different EU legal and regulatory instruments apply to the digital sector, in addition to another 30 or so that are either planned or are being negotiated. Some of these instruments are being adopted and enforced in different ways by different authorities, leading to fragmentation at the national and EU levels. This contributes to complexity, risks and cost for businesses, making effective co-operation between regulatory authorities both within and between member states a key priority, including for organisations representing European digital businesses like the EUTA.[188]

The economic impact of Europe's digital policies is a trade-off between significant compliance, monitoring and enforcement costs that are known and unavoidable, and the benefits of reduced or mitigated risks,[189,190] which can only be quantified as 'avoided costs'. In practice, the impact of these regulations is already evident in increased complexity and risk on digital platforms and businesses in Europe, and the fragmentation in their implementation and enforcement.

Compliance costs are significant. The EUTA mentioned that a significant share of the resources available to European tech companies was taken up by compliance instead of being dedicated to innovation and growth.[191] This was supported by several interviews conducted with European platforms for this study. In addition to these direct costs, several interviewees also suggested that asymmetric regulations such as the DSA may cause significant complexity for smaller platforms, who are regulated in each member state where they operate, rather than directly by the EC. This could cause more costs and complexity for smaller businesses regulated by different national DSCs, each potentially with different interpretations of rules and approaches to enforcement. Furthermore, if businesses are required to comply with more obligations as they grow, particularly across national borders within the EU, this would act as a barrier to growth and a disincentive to grow first in the EU.[192]

The results are those discussed at the start of this paper: limited economic integration in digital sectors and relatively low levels of online cross-border trade; difficulties and disincentives for European digital businesses to scale and expand across Europe; and persistent challenges for innovative businesses to succeed on a global scale (see Section 2.3).

[188] European Tech Alliance (2024), *EUTA meets Dutch officials in the Hague, EUTA meets Spanish officials in Madrid.*

[189] For instance, on the Digital Markets Act, the preferred option (Option 2) in the initial impact assessment highlighted both costs (including annual compliance costs of EUR21.15 to 28.2 million for gatekeepers, and annual administrative costs of EUR16.7 million for the Commission and EUR6 million for national authorities), as well as benefits resulting from lower competitive asymmetries (such as a EUR13 billion increase in consumer surplus and increased economic growth of between EUR12 billion and EUR23 billion); see European Commission, (2020), *Impact assessment of the Digital Markets Act*; European Parliament (2021), *Initial appraisal of a European Commission impact assessment on the Digital Markets Act.*

[190] The initial impact assessment on the DSA argues that while the legislation would incur costs and administrative burdens, it would reduce legal fragmentation and lead to increases in cross-border digital trade of between 1.0% and 1.8%, and increases in GDP of between 0.3% and 0.6%, depending on the specific package considered; see European Parliament (2021), *Initial appraisal of a European Commission impact assessment on the Digital Services Act*.

[191] As discussed in Section 2.4.

[192] We note this was actually anticipated in the *DSA impact assessment*, which states that "direct costs are proportionate to the size and reach of a service provider".

4.1.2 Policy makers can take action to reduce the complexity and fragmentation that is slowing down Europe's digital ambitions and creating uncertainty for businesses operating in Europe

A true digital single market should enable businesses and consumers to leverage the benefits of digital infrastructure and services across the EU as a single market of 450 million people, with common rules and limited frictions. This requires simplification as a starting point, reducing the complexity and fragmentation of rules that make it difficult to operate across the EU as a true single market.

Reducing the fragmentation and complexity of digital regulations, at EU level and in member states (see Section 2.4), would free up a share of the significant resources available to European start-ups and scale-ups currently tied up in regulatory compliance and risk. This would also improve incentives for European businesses to scale within the EU first, instead of expanding or moving to the US (see Section 2.3). Finally, it would provide a more legible and less uncertain context in which innovative businesses can invest with less regulatory risk.

Complexity and fragmentation, and the costs that they imply for European businesses, stem from political choices, and a tension between member states' sovereignty and European effectiveness.[193] The nature of fragmentation can change as a result of new policies (e.g. regulations ensure consistency in the letter of the law compared to directives, but can still rely on national-level adoption and enforcement), but continue to pose challenges due to the ongoing tension between decisions taken at the EU level and by national authorities.

What solutions can EU policy makers consider in this context?

- **Assess the impact of recently introduced legislation and regulation in digital markets, including on European competitiveness, before any new laws and regulations are added**.[194] This would allow member states and businesses subject to these regulations to implement them carefully and more effectively.[195] This first approach is essential to ensuring digital platforms and businesses do not face additional barriers to operating in the EU, which risks discouraging innovation and growth in critical digital technology.

- **Focus on reducing fragmentation in implementation and enforcement at member state level**. Policy makers should consider and assess the viability of new approaches that could reduce the regulatory burden for platforms and businesses through simplification in the implementation of rules. Initiatives to foster better co-ordination between EU and national enforcement authorities, and streamline enforcement within individual member states, would reduce the regulatory burden for platforms and businesses.

[193] The GDPR is an example of an EC Regulation that aimed to replace existing fragmented rules with a single set of EU-wide rules for businesses, but has continued to exhibit fragmentation due to some member states adding additional components, increasing the extent of requirements, and varying reporting requirements; see Union of entrepreneurs and employers (2023), *The digital single market and its future in the context of development opportunities for the Polish SME sector*.

Some member states are more active than others in issuing fines; see Heine (2021), *3 Years Later: An Analysis of GDPR enforcement*.

A proposal was made in 2023 to introduce additional procedural rules for enforcing the GDPR, but there continue to be concerns about whether these rules would result in more harmonised enforcement in cross-border cases; see European Parliament (2024), *An analysis of the newly proposed rules to strengthen GDPR enforcement in cross-border cases*.

[194] The Innovation Club is a working group bringing together government departments in Estonia, Germany, Latvia and Lithuania. It calls for reducing the regulatory burden, consistent interpretation and implementation of existing data protection frameworks, and better ex-ante and ex-post reviews of the effectiveness of regulation; Innovation Cub (2024), *Make it simple: Our blueprint for a more innovative Europe*.

[195] Marcus, J.S. and Rossi, M.A. (2024), *Strengthening EU digital competitiveness*.

- **Work closely with digital platforms to identify and prioritise areas where fragmentation and regulatory complexity or uncertainty constrain the goals of the DSM, including innovation**. More co-operation between policy makers and digital platforms can explore challenges faced by businesses, and create solutions that can overcome these challenges at scale and could facilitate increased levels of cross-border trade.

These approaches would reduce complexity and cost, provide stability so that platforms and businesses can adapt to the current set of regulations and invest with more certainty, and would reduce some of the regulatory barriers to expanding across Europe. This, in turn, could help free up private investment in innovation that would support the next stage of the DSM.

4.1.3 Digital policies under the DSM should focus on enabling private-sector investments in areas where innovation can support Europe's global competitiveness

Effective regulation should strike a balance between mitigating proven risks and enabling innovation, by carefully assessing the impact of their decisions on innovation and competitiveness

Beyond fragmentation and complexity, European digital regulation increasingly focuses on risks and harms, giving regulators at EU and national level wide-ranging powers to intervene in digital markets. However, evidence regarding the impact of regulation often adopts a narrow focus that does not consider broader effects on the economy,[196] which results in a risk of over-regulation without clear benefits.

As an example, the AI Act seeks to pre-empt possible risks, rather than respond to clearly evidenced risks, while also aiming to provide certainty to market participants to incentivise investment in development and deployment of AI. Regulators in charge of AI therefore need to ensure they strike the right balance between mitigating risks (including in the context of fundamental rights), and enabling the benefits of AI to be realised. The AI Act, which already includes a "Fundamental Rights Impact Assessment" (FRIA) for high-risk AI systems,[197] could also benefit from a similar "Competitiveness Impact Assessment" that seeks to consider the potential economic benefit of the AI system, as this would contribute to a more holistic analysis. Effective regulation of AI would help other regulators (including, for example, data protection authorities) to also find the right balance in their area.

The ability of regulators to intervene 'ex ante' to prevent, rather than remedy harms should not lead to an overly cautious approach without clear evidence of risks. A more holistic assessment that incorporates both fundamental rights and competitiveness would be consistent with European principles, and could contribute to finding the right balance between protecting consumers, providing certainty to innovators and investors, and encouraging digital businesses to scale across Europe.

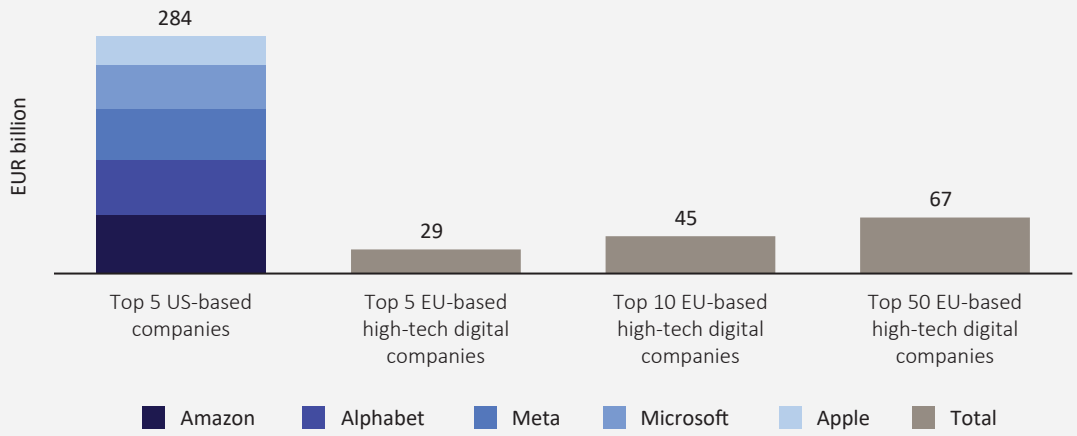
[196] Centre for European Reform (2024), *Better regulation in Europe: An action plan for the next commission*.

[197] EU Artificial Intelligence Act, *Article 27.*

Large-scale private investment is critical to funding innovation at scale in the digital space

The extent of private investment required in the digital space is illustrated by the scale of capital and R&D expenditure of the largest technology companies in the world. The EU digital sector has been investing much less, as shown in Figure 4.1. This gap is likely to grow, given the large investment commitments made by global platforms in recent months, although Europe benefits from these investments as well, both by being able to use the proceeds of these investments (e.g. new data centres), and also by being a destination for part of these investments.[198]

Figure 4.1: Comparing spend on R&D and capex for five US-based tech companies, with that of top EU-based 'high-tech' digital companies[199] (ranked by R&D spend), in 2022 [Source: Analysys Mason based on 2023 EU Industrial R&D Investment Scoreboard[200] and Amazon financial reporting[201], 2024]



Private investment responds to financial incentives, and public policy has the ability to have a positive or negative effect on incentives

Private investment responds to financial incentives, balancing financial returns with risks. The public sector plays an important role in ensuring that the risks associated with regulation and policy are contained, and in seeding and 'crowding in' (i.e. unlocking) investment through public support.

In the context of digital innovation, start-ups and scale-ups play a critical role, financed by VC firms. Private equity, infrastructure funds and traditional commercial banks are all active in financing more mature digital infrastructure and services. Historically, VC investment in European technology firms has been much lower than in the US, despite large excess private savings (see Section 2.1). This translates into a smaller volume of VC funding in Europe compared to the US, as shown in Figure 4.2.

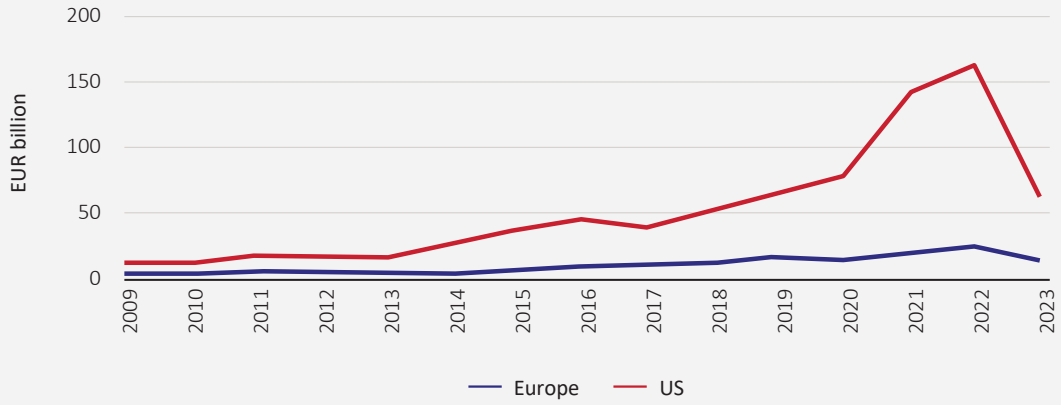
[198] About Amazon (2024), *Choose France Summit: Amazon announces plan to invest more than €1.2 billion into its French operations* and Reuters (2024), *Amazon Web Services plans $8.4 billion cloud investment in Germany;* Microsoft (2024), *Microsoft announces the largest investment to date in France to accelerate the adoption of AI, skilling and innovation* and CIO (2024), *Microsoft invests €3.2 billion in AI and the cloud in Germany*.

[199] Classification of industries into high-tech, mid-tech and 'other' adopted from European Policy Analysis Group (2024), *European innovation policy: How to escape the middle technology trap*; companies included are the top 50 companies based in the EU by R&D spend, and that fall into the 'software and computer services', 'technology hardware and equipment', and 'electronic and electrical equipment' categories in the World2500 dataset in European Commission (2023), *The 2023 EU Industrial R&D Investment Scoreboard*; The top five EU-based companies by R&D spend in these three categories are SAP, Siemens, Nokia, Ericsson and ASML Holding, while the next five are NXP Semiconductors, Infineon Technologies, Schneider, STMicroelectronics and Spotify.

[200] Based on 2022 data for Alphabet, Meta, Microsoft and Apple in the World2500 dataset in European Commission (2023), *The 2023 EU Industrial R&D Investment Scoreboard*.

[201] According to the Amazon annual report, "technology and content" costs include "payroll and related expenses for employees involved in the research and development of new and existing products and services, development, design, and maintenance of our stores, curation and display of products and services made available in our online stores, and infrastructure costs. Infrastructure costs include servers, networking equipment, and data center related depreciation and amortization, rent, utilities, and other expenses necessary to support AWS and other Amazon businesses."; reported spend of USD73 billion on "Technology and content" in 2022 was converted to EUR at a rate of USD1.05 per EUR; see Amazon, *2022 Annual Report*.

Figure 4.2: Comparing VC investment in Europe and the US [Source: Analysys Mason based on data compiled by Statista,[202] 2024]



In Europe, public funding is intended to support fundamental research and risky early-stage start-ups, and reduce risks for private investors, enabling them to invest more readily. Current efforts include programmes such as Horizon Europe,[203] the Recovery & Resilience Facility,[204] and the Chips Act, as well as member state innovation support programmes.[205] As noted by the EC in the context of the Chips Act, the effectiveness of these public investments will be dependent on being "broadly matched by long-term private investment".[206]

Letta's *Much more than a Market* report provides several recommendations on how to direct more capital to European businesses to invest and innovate, particularly for small and medium businesses, and in risky 'deep tech' sectors.[207] These recommendations should unlock private capital, and help direct it to these priority sectors, but it is important to acknowledge that this requires the risk-return profile of these investments to be more profitable (in aggregate within a portfolio of assets) than alternative investments, including in no-risk assets such as government bonds or dividend stocks.[208] In this context, a recent article showed that the returns that the seven largest US tech companies[209] have delivered to their investors have been much larger than their counterparts in the EU, on a much larger amount of capital invested.[210]

The challenge for policy makers therefore remains how to create an environment for European businesses active in the digital space to invest, innovate and ultimately grow profitably in Europe, as a stepping stone to the rest of the world.

[202] Data on European VC Investment (in EUR billion) originally from Invest Europe. (May 2024). Investing in Europe: Private Equity activity 2023. In Statista: https://www.statista.com/statistics/433418/total-funds-venture-capital-in-selected-european-countries/.; while data on US VC Investment (in USD billion) originally from NVCA. (April 2024). National Venture Capital Association Yearbook 2024. In Statista: https://www.statista.com/statistics/280260/venture-capital-fund-raising-by-holding-companies-in-the-usa/, and subsequently converted to EUR billion based on historical exchange rate information from the World Bank, Official exchange rate (LCU per US$, period average).

[203] European Commission, *Horizon Europe*.

[204] European Commission (2024), *Recovery and Resilience Facility*.

[205] See for example *France 2030*.

[206] European Commission (2024), *European Chips Act*.

[207] See section on the "Savings and Investments Union" in Letta (2024), *Much more than a Market*.

[208] It should be noted that technology stocks typically have low dividend yields relative to stocks in other sectors such as real estate, utilities or energy; see Morningstar (2024), *Tech stock dividends are changing income investing*.

[209] US companies include Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia and Tesla. EU companies include ASML, Capgemini, Dassault Systèmes, Hexagon, Infineon, SAP and STMicroelectronics. The market capitalisation of the US firms was roughly 20 times that of the European companies, annual revenue over the past 12 months was roughly 13 times that of the European companies, and average annual revenue growth was 27% for the US companies over the past ten years, significantly higher than the 10% annual growth for the European companies over that same period.

[210] Based on data from Koyfin; see Euronews (2023), *Why can't European tech firms compete with their US counterparts*.

4.2 Europe's digital policy should support innovation to foster the emergence of global leaders able to cement Europe's future competitiveness

Emerging digital technology that has the potential of becoming transformational is one of several 'deep tech' sectors that Europe's innovation policy is designed to support, including through the 2022 New European Innovation Agenda (NEIA) and the European Investment Committee (EIC), as well as member state initiatives. 'Deep tech' sectors directly related to the DSM include AI, virtual worlds, advanced and quantum computing, semiconductors, and future communication technology.

Europe already possesses some of the assets needed to deliver on these ambitions: high savings rates, a highly educated population and strong academic research institutions,[211] and an attractive environment for people to live and work. If it can "leverage the Single Market's potential in mobilising both private and public resources more effectively",[212] Europe has an opportunity to regain global competitiveness and leadership in some areas of the digital economy.

In doing so, policy makers should ensure they recognise the role of existing foundations, including the building blocks provided by global digital platforms. There is a tension and a challenge between developing innovation and capabilities that are globally competitive in Europe, and the use of these global building blocks (Section 4.2.1). We propose a framework that links policy direction, including in the context of the NEIA, with the current state of play for Europe and the potential for European businesses to develop a leading position globally in emerging digital technology, which we apply to the emerging generative AI value chain as an illustration of how Europe's future position can build on decades of innovation and investment by digital players (Section 4.2.2).

4.2.1 Europe's innovation strategy in future digital technology should build on existing foundations to achieve the required scale and pace of innovation, rather than replicate them

Innovation policy and public support should focus on sectors where Europe can become globally competitive to build momentum compared to other regions

Through the NEIA flagships and the EIC work programme, Europe's digital innovation policy focuses on AI, virtual worlds, advanced and quantum computing, semiconductors and the next waves of communication technology. The policy recognises the importance of enabling smaller firms to play a role in innovation, in sectors that are still at early stages of development globally, and to scale up, including through access to funding. The ambition of the NEIA is for Europe "to be the place where the best talent work hand in hand with the best companies and where 'deep tech' innovation thrives and creates breakthrough innovative solutions across the continent that are deployed widely by innovation-friendly customers".[213]

This ambition focuses on the **process** of innovation. The specific **outcomes** of innovation and what they mean for the EU's competitiveness and place in the global economy are critical to the success of these innovation policies. These outcomes should be central to policy decisions that have an impact on innovation, including in particular across the DSM policy agenda.[214]

[211] Policy makers acknowledge the need for further investment and support; see European Parliament (2019) *Europe – the Global Centre for Excellent Research* and European Commission (2022), *Communication on a European strategy for universities*.

[212] Letta (2024), *Much more than a Market.*

[213] European Commission (2022), *The New European Innovation Agenda*.

[214] The Innovator (2024), *Interview Of The Week: Andre Loesekrug-Pietri, JEDI*.

The vision of a successful DSM would culminate in Europe being competitive at a global level in digital technology, driven by European digital businesses being successful and world-class. In order to achieve these goals and broader 'open strategic autonomy' (the ability of Europe to grow and prosper while securing its means of production),[215] Europe's current 'challenger' position in the digital sector needs to be recognised.

Europe starts from a challenger position in digital and should recognise the importance of remaining open to using globally competitive technology as a foundation for its own success

Europe is home to few successful large companies in digital sectors, leading to a significant gap in investment and R&D compared to the US. This gap has been evident for some years, but drawing level with US companies in existing technology sectors and assets is unlikely to be a desirable or even viable proposition. It would take enormous resources and time to simply stand still and, based on the availability of existing building blocks, it is not necessary to unlock European innovation in 'deep tech' sectors.

Taking the example of cloud infrastructure and services, AWS, Google and Microsoft are investing over USD80 billion annually in capex, and over USD350 billion between 2019 and 2023.[216] These services and infrastructures are available to European businesses and consumers. Although global platforms are often presented as 'non-European', they are deploying physical infrastructure in Europe, employ European staff all over the world[217] and thousands of people in Europe, and are regulated in Europe.[218] These investments in European infrastructure, people and skills, coupled with contributions to standards and open-source tools, contribute to Europe's potential success in future digital technology, and should be encouraged.

Europe's openness to technology from the rest of the world has allowed it to benefit from the services and building blocks described in Section 3, which are available today at much lower costs than it would take to replicate them. This openness is an asset that European innovation policy can build upon, rather than replicate, and it should be compatible with European sovereignty and ambition

- In the short term: by implementing and enforcing existing digital regulations consistently to all firms operating in the EU and allowing European businesses to access the services offered by these firms, and by alleviating regulatory complexity and fragmentation (as discussed in Section 4.1).

- In the medium term: by enabling European digital businesses to scale up by improving access to resources (capital, talent, technology inputs) and markets in the EU and outside it, including through digital trade agreements, for example.[219]

- In the longer term: through European digital businesses supplying future technology building blocks themselves, including by ensuring that technology that can be used in the EU can also be developed here (we discuss this in the context of AI in Section 4.2.2).

[215] Spanish Presidency of the Council of the European Union (2023), *Open strategic autonomy for a competitive and resilient EU.*

[216] Based on capital expenditure (capex) reported by Google and Microsoft. For AWS, this includes net addition to property and equipment for this segment only, which is likely to underestimate cloud-related capex.

[217] Notably, the founders of France-based Mistral AI are former employees of Meta and Google DeepMind, and one of the founders of Germany-based Aleph Alpha has worked for Apple.

[218] Amazon hired over 220 000 permanent employees in Europe as of 2024, while Google hired 5500 employees directly, with an additional 4000 contract and temporary workers in Ireland alone as of 2023; see Amazon (2024), *Amazon named a top employer 2024 in Europe*, The Irish Times (2023), *Google confirms it will cut 240 jobs from Irish business*.

[219] European Commission, *Digital trade agreements* (accessed July 2024).

This progressive process would allow European businesses to innovate and compete at the cutting edge of technology, without needing to replicate mature technology and infrastructure, but with the option and ability to do so when it makes economic sense.[220]

Conversely, if European digital businesses are able to grow and succeed with the use of global building blocks, they retain the option to progressively build their own foundational infrastructure, a process that is greatly facilitated by the prevalence of open standards and open-source software in digital sectors. In the long term, a successful DSM would be one that allows new foundational technology building blocks to emerge out of Europe, and be used across the world. This would position Europe and European businesses for success in emerging technologies, rather than risk limiting them to copying what is already being done by others.

4.2.2 The emerging generative AI value chain provides an immediate opportunity to develop and refine this approach

The EU has an opportunity to play a leading role in AI, one of the 'deep tech' sectors targeted by European innovation policy

Further to recent advances in generative AI models, AI as a whole has generated significant private investment, amounting to USD189 billion in 2023.[221] While a significant portion of this investment was made by existing companies, AI start-ups raised nearly USD50 billion in 2023,[222] a trend that has accelerated in early 2024, driven in part by investment by global technology companies.[223]

European companies are already contributing to the development of the global AI value chain, in terms of semiconductor manufacturing and the development and training of foundation models. They are also providing platforms and tools to allow businesses to adopt new AI technologies more easily.[224] Collaborations between large global platforms and European businesses are also contributing to the open-source AI ecosystem. Meta, Hugging Face and Scaleway, for example, announced an AI accelerator programme to help European start-ups integrate open foundational models into their products.[225]

Partnerships such as these are important in not only enabling European businesses to use new digital technologies, but also in helping European digital businesses that are providing these cutting-edge solutions to expand, in pursuit of digital leadership on a global stage. More broadly, European businesses active in the AI space are recognising the benefits of building on top of existing building blocks, at pace and at scale.

[220] This approach of being open to global supply chains and investing progressively mirrors to some extent the history of semiconductor manufacturing, which moved to a model where chip design and manufacturing separated nearly two decades ago, and of European telecoms, where regulation has sought to engineer progressive facilities-based competition by mandating access to existing infrastructure for new entrants to build scale first. See Cave (2006), *Encouraging infrastructure competition via the ladder of investment*.

[221] Gilbert and Tobin (2024), *The State of AI globally: investment, business use and labour*.

[222] Crunchbase (2024), *Artificial Buildup: AI Startups Were Hot In 2023, But This Year May Be Slightly Different*.

[223] This includes Microsoft investing USD10 billion in OpenAI, and Amazon's and Google's investments in Anthropic at USD4 billion and USD2 billion respectively. Crunchbase (2023), *The Biggest Of The Big: AI Startups Raised Huge — These Were The Largest Deals Of 2023*; Silicon ANGLE (2023), *PitchBook: Tech giants invested more in generative AI startups than VCs this year*.

[224] Some of the European businesses active in the AI value chain include ASML, STMicroelectronics, Infineon and NXP Semiconductors (semiconductors), Mistal AI and Aleph Alpha (foundation models), and DeepL and T-Systems (platforms and tools).

[225] Meta (2024), *Meta, Hugging Face, and Scaleway announce a new AI accelerator programme for European startups*.

European policy should support this path of innovation, by carefully targeting and calibrating interventions

European businesses active in AI require access to **capital, skills and experienced engineers, compute infrastructure, open-source models**, and **tools** to help develop, deploy and use these models, as discussed above. Figure 4.3 below provides a snapshot of the current state of play for these businesses for each of these requirements.

With fast-moving innovation underway at a global level, the EU needs to carefully consider the trade-offs associated with early regulation (e.g. through the AI Act),[226] or risk missing the opportunity to play a central role in developing and rolling out cutting-edge technology solutions built on AI. One particular risk relates to digital platforms (both large and small) deciding to slow down the launch of new services in the EU because of regulatory uncertainty.[227] This would be detrimental to the ability of European businesses to access resources in Europe and innovate on top of AI building blocks.

These examples highlight the importance of leveraging existing inputs, rather than simply constraining them. They also show the breadth of policy considerations that affect innovation, and the potential that a true 'single market' for capital, people and services could bring.

Figure 4.3: Illustrative example of innovation-focused review of the inputs required for generative AI [Source: Analysys Mason, 2024]

Access to capital: ***Unlock further private capital and improve the effectiveness of public funding, including through partnerships***	European companies that are looking to enter the generative AI value chain will need to be able to access capital in order to **fund their innovation, operation and growth**. Both private and public investment have roles to play in funding AI developments. According to the Stanford AI Index Report 2024, private investment in AI in Europe (EU plus UK) reached USD11 billion in 2023, including USD0.74 billion in generative AI.[228] This is comparable to investments in China (USD7.76 billion in AI, including USD0.65 billion in generative AI), but much lower than those in the US (USD67.2 billion in AI, including USD22.5 billion in generative AI). In terms of public funding, both the Horizon Europe and Digital Europe programmes aim to invest EUR1 billion per annum in AI, while it was also reported that the Recovery and Resilience Facility had invested EUR4.4 billion into AI by September 2023.[229]

[226] At this point most observers remain unsure as to whether the AI Act will improve regulatory certainty and drive AI innovation in the EU, or on the contrary act as a deterrent, as explained in Bruegel (2024), *The European Union AI Act: premature or precocious regulation?*; see also the perspective of Brian Williamson (Communication Chambers, 2024), *Aligning regulation and AI*.

Specific concerns have focused on the use of personal data for training, and on aspects related to copyright. This is summarised in Taylor Wessing (2024), *AI, the Artificial Intelligence Act & Copyright*.

[227] Foreign Policy (2024), *Europe is in danger of regulating its tech market out of existence*.

[228] Stanford University (2024), *AI Index Report 2024.*

[229] European Commission, *Coordinated plan on artificial intelligence*.

Figure 4.3: Illustrative example of innovation-focused review of the inputs required for generative AI [Source: Analysys Mason, 2024]

	To foster more investment in Europe, the EC hopes to mobilise investments from the private sector and member states to reach an annual run rate of EUR20 billion until 2030.[230] Public–private partnerships are playing a role; for example DeployAI (announced in March 2024) is backed by EUR28 million in funding from the European Commission, and involves 28 partners (including public and private organisations) from 13 European countries all collaborating to make AI solutions more accessible to SMEs across Europe.[231] Public resources need to be used more effectively: it was reported in May 2024 that delays in starting Horizon Europe, as well as a lack of co-ordination on overlapping projects, had led to underspending of EUR600 million against a EUR2 billion target for AI-related R&D spending from 2021 to 2022.[232] The European Court of Auditors (ECA) had also noted that in Horizon 2020 (the programme that preceded Horizon Europe), spending on AI projects had resulted in fewer patent applications per EUR10 million invested than the average for the entire Horizon 2020 programme, and below the originally set targets.[233]
Skills and talent: ***Improve the attractiveness of Europe to AI talent, recognising the opportunity that experts trained in large global platforms offer***	The question of AI skills and talent has been studied at length over the last five years. To develop, integrate and deploy AI features and products, European businesses need to attract, train and retain qualified employees, focused on research, engineering and building products. In 2020, a Bruegel review[234] found that the EU fared poorly compared to the US, China and even the UK, on both undergraduate and postgraduate computer science degrees. It also found that the EU was relatively unattractive to 'talent' trained outside the EU, and did not retain its own PhD graduates in this field, who chose to work outside the EU. This is likely due to a combination of cluster effects (established AI research teams attracting top talent) and pay differentials. This is consistent with European statistics showing EU businesses struggle to fill ICT-related vacancies.[235]

[230] European Commission, *European approach to artificial intelligence*.

[231] EIT Digital (2024), *DeployAI brings the AI on demand platform to the market starting today*.

[232] Science|Business (2024), *EU missed artificial intelligence targets due to Horizon Europe delay, auditors find*.

[233] European Court of Auditors (2024), *EU Artificial intelligence ambition: Stronger governance and increased, more focused investment essential going forward*.

[234] Bruegel (2020), *Europe has an artificial-intelligence skills shortage*.

[235] Eurostat (2023), *EU companies face difficulties in hiring ICT experts - Eurostat*.

Figure 4.3: Illustrative example of innovation-focused review of the inputs required for generative AI [Source: Analysys Mason, 2024]

	Recent analysis suggests that alumni from global platforms are instrumental in the creation of European AI start-ups, including for high-profile start-ups such as Mistral AI. This leverages both European universities who are training significant (albeit still insufficient) numbers of experts, and the presence of these large platforms in Europe. Experts who acquired expertise within larger platforms are critical to developing new European businesses in this space.[236] This is an area where public policy should play an important role. One of the NEIA flagships focuses on attracting and retaining talent, with an ambition to train 1 million 'deep tech' talents by 2025 (with much still to be done as of early 2024).[237] Other aspects such as the treatment of stock options and the mobility of talent within Europe are clear areas for improvement.
Tools and models: ***Use existing tools and remove barriers to the development of competing models by European businesses***	The emergence of open-source[238] **tools and models** is providing more opportunities for companies to enter the AI value chain, by using and offering AI building blocks. Open-source tools include software libraries, development platforms, and open AI foundation models such as Meta's Llama 3 and Mistral AI's open-weight models.[239] These are all widely available and help support innovation by a large number of third parties.[240] There is still considerable debate on the potential risks of open-weight AI models, but their benefits are more clearly understood.[241] In the context of EU innovation, in this area there is also considerable uncertainty on the costs and efforts required to develop and train AI models. Today's large models reportedly cost in the region of USD100 million to train, while Mistral AI reportedly only spent around a quarter of this so far to build its products.[242] The ability to access and use models from a variety of providers, and the wide availability of the science and research behind them,[243] provides several avenues for innovation, working on or with AI models.

[236] Sifted (2024). *Google and DeepMind alumni lead GenAI startup creation in Europe.*

[237] See European Commission (2024), *New European Innovation Agenda on the move*.

[238] See for example the successful European AI platform, Hugging Face (*Hugging Face – The AI community building the future*) and examples of open-source tools such as PyTorch, developed by Meta engineers (see Alex Moltzau (2020), *PyTorch Governance and History*).

[239] See Meta Platform's open-source AI efforts (*Resources – AI at Meta*).

[240] The open-source library Scikit-learn, from French start-up Probabl, is reportedly supporting over a million software projects: (The Innovator (2024), *Can Europe Compete On AI? For Some The Answer Is Probabl*).

[241] See Stanford University (2024), *On the Societal Impact of Open Foundation Models* and NTIA (2024), *Dual Use Foundation Artificial Intelligence Models with Widely Available Model Weights*.

[242] Financial Times (2024), *Mistral secures €600mn funding as valuation soars to almost €6bn*; Dario Amodei, CEO of Anthropic, cited by Tom's Hardware (*link*)

[243] A foundational paper for the current generative AI developments is a paper describing 'transformers', which was authored by Google engineers and published for all to use. See Wired (2024), *8 Google Employees Invented Modern AI. Here's the Inside Story.*

Figure 4.3: Illustrative example of innovation-focused review of the inputs required for generative AI [Source: Analysys Mason, 2024]

Compute infrastructure: ***Use existing building blocks and build if and when economically justified further to commercial success***	In the context of AI, these tools require significant **compute power**, and in particular expensive graphics processing units (GPUs), to be used effectively. Large GPU clusters are being deployed on a significant scale by global platforms, including cloud providers who make them available to their customers for developing, training and deploying AI models. The European Commission is actively trying to improve its support in this space for research. In July 2024, it announced a revision of the framework that governs the use of EU-funded high-performance computers, so that they could be used as "AI factories", primarily focused on early-stage innovation.[244] The benefits of commercial technology building blocks are clear in the context of deploying and using models: cloud providers[245] are offering this compute capacity at scale, on a model that allows their customers to only pay for the capacity they need rather than invest heavily upfront in a data centre and a large number of GPUs. As European companies active in AI grow larger and more successful, they will have an opportunity to invest in their own infrastructure if and when it makes economic sense to do so.

[244] European Commission (2024), *AI Factories*.

[245] Including specialised GPU cluster providers, see for example TechCrunch (2024), *CoreWeave's $1.1B raise shows the market for alternative clouds is booming*.

5

Conclusion

This positive early sign of Europe's ability to build cutting-edge AI technology reflects a broader dynamic. Europe retains very attractive assets: plentiful private savings, a skilled workforce, strong institutions of higher education and research, political stability, and world-class infrastructure in leading cities and regions. As a result, every large digital business in the world is present in Europe in one way or another. Creating a policy and regulatory environment that keeps these assets in Europe will be a fundamental success factor for the high-tech industrial policy that many are calling for.

In a favourable policy context, technology building blocks would be key to Europe's technology and economic sovereignty, and to delivering a more complete DSM

The innovations, investments and tools created and made available broadly by European and global digital platforms are currently constrained by the complexity and fragmentation of the EU's digital regulations. **The EU's future economic success, and the prosperity of its citizens, will be built on innovation and cutting-edge technology, not on norms, regulation and the technology of the last 20 years**.

Being attractive to global business matters, for Europe and for Europeans. Significant investment is made by those global businesses in fundamental science, technology, processes and products that are available in Europe, with economies of scale and network effects working not just in favour of digital platforms, but also of their customers, including millions of European consumers and businesses.

Digital platforms, both European and global, will continue to play a major role in making an improved DSM a reality across the entire EU, but **policy and regulation must enable these platforms to expand this role where it contributes to European competitiveness and innovation**. This implies working on alleviating the many constraints (due to fragmentation in norms and much increased regulation) on digital platforms.

As Europeans look to a near future filled with uncertainty and challenges, Europe needs to avail itself of talent, goodwill and resources, wherever it may come from. Building strategic autonomy on top of globally competitive, state-of-the-art technology will help the massive new investment that policy makers are calling for to go further, in areas where they can have a genuine impact. The next five years should be a period where European public policy works hand in hand with the private sector to solve big challenges, with digital technology as a core asset to build with, and not against.

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