ECIPE OCCASIONAL PAPER • 05/2022

Leadership in European Digital Policy:

Future Role and Direction for the D9+ Group

By **Fredrik Erixon,** *Director at ECIPE,* **Dr. Philipp Lamprecht,** *Director and Senior Economist at ECIPE,* **Professor Erik van der Marel,** *Chief Economist at ECIPE,* **Vanika Sharma** *and* **Elena Sisto,** *Research Economists at ECIPE*[1]

[1] ECIPE's work on Europe's digital economy receives funding from several firms with an interest in digital regulations, including Amazon, Bertelsmann, Ericsson, Google, Meta, Microsoft, Rakuten, SAP, and Siemens.

ECIPE | EUROPEAN CENTRE FOR INTERNATIONAL POLITICAL ECONOMY

EXECUTIVE SUMMARY

In this paper, we will discuss how Europe makes digital policy and how its digital economic performance can be improved. The focus is on the D9+ initiative. Launched in 2016 on the initiative of former Swedish trade minister, Ann Linde, nine countries with a particular interest in matters of the digital economy met to learn from each other and seek common ground on policy issues. On occasions, the D9+ Group has issued joint statements relating to regulatory initiatives in the EU. Since its founding, the group has expanded, and now also includes "guest countries", but it remains fundamentally an initiative of small and mid-sized open-oriented economies with a strong interest to exploit the economic power of digitalisation and new emerging technologies.

The D9+ initiative is important and this paper argues that its work should expand and focus on expanding the scale and scope of digital technological change in the European economy while addressing risks that an over-powering regulatory approach to digital policies in Europe reduces the benefits of the digital transformation. Importantly, the D9+ Group has a special interest to promote digital openness and avoid the agenda for technology sovereignty and strategic autonomy sliding into digital protectionism. Finding the right direction of policy is of fundamental importance for Europe's long-run economic growth, and the D9+ Group should take a leadership role.

There are five key arguments advanced in this paper:

First, *all countries in the EU stand to benefit from digital openness* – an approach that deepens the single market while keeping borders open for deep digital integration with other countries. Recent decades have already proven that the European economy thrives on close technological integration in its single market, leading to higher rates of productivity, better global competitiveness, and more prosperity. Furthermore, with markets being open to other partners in the world, the EU can benefit on the basis of many more customers and better access to frontier technology.

Second, *a restrictive regulatory environment will depress activity in the digital economy and reduce the positive effect of digitalisation on productivity and prosperity.* Good regulations help to expand economic activity and support entrepreneurship, the growth of young firms and fast rates of digital adoption – the use of digital technologies and services by businesses and households. On these scores, the EU can substantially improve its performance.

Third, *D9+ countries have a lot in common – digital and general economic characteristics that should prompt them to be far more ambitious in promoting Europe's digital competitiveness.* The group is based on small and mid-sized open-oriented economies that all think it is

crucial for Europe to run an open digital economy with large space for entrepreneurial experimentation and intensive integration with leading digital regions in the world.

Fourth, *D9+ countries should take on greater leadership for the development of digital regulations and the broader policy for an open digital economy in Europe.* In the last decade, the voice of small and mid-sized open-oriented economies in Brussels have been challenged by a changing global landscape and new policies have increasingly reflected the economic interests of larger European economies. Hence, D9+ countries have a key task in front of them: to be more proactive in developing new ideas for how European policy should evolve, advance the economic reforms that are necessary for deep digital integration, and ensure that the voice of digitally open economies is heard around the negotiation tables when policy is decided in Brussels.

Fifth, *the D9+ countries have a clear role in establishing better frameworks in the EU for sharing experiences and learning from each other.* EU countries have made different experiences in technological specialisation and they all have important knowledge to share – and lessons to learn. Some of the D9+ countries are consistently ranked very high in global league tables over technology, innovation and digital competitiveness and have economic and political experiences that are relevant for the general EU policy direction. Therefore, these countries have a special responsibility to carve out a new function in EU digital policy-making that provide for positive examples to be imitated.

D9+ countries should take a greater responsibility for the long-term development of digital regulations. It is important now to accommodate the 'portfolio' effect of digital regulation: the entry of new and burdensome digital regulations should be balanced by policy reforms that ease the conditions for digital business, just as high-risk investments in a financial portfolio should be balanced by purchasing low-risk assets. Each digital regulation adds to the total cost of developing and doing business in Europe, and with the current wave of burdensome regulation, it is urgent to balance Europe's regulatory portfolio. Therefore, policy leadership from the D9+ group of countries should consider the future path of digital regulations. There is a dearth of policy leadership on emergent technologies and what is needed to make them powerful in the European economy.

1. INTRODUCTION

The way Europe makes decision about its digital polices – its digital regulations and the policies that guide how the broad digital economy integrates with the rest of the world – has been changing fundamentally in the past decade.[2] With the arrival of new and prescriptive regulations of data management and digital business models, and a general ambition to advance "strategic autonomy"[3] and "technology sovereignty",[4] the tone in digital decision making has changed from one of liberalisation and progressive world-market openness to something seeking regulatory control and steering commercial outcomes. In the past years, the EU has advanced some significant regulations on data and the digital economy – including the General Data Protection Regulation (GDPR) and the Digital Markets Act, to name only two – and there are new regulatory actions planned to be adopted in the near future, for instance the AI Act and the Data Act. All these regulations have impacts not just on companies that rely heavily on data and data-powered business models but also change the terms for how individual member states can design their policies. With the EU in the driving seat on data and digital regulations, the capacity of member states to decide on their own policy strategy for how to benefit from big technological shifts has changed, and capitals in Europe are therefore now more active in areas like the supply of digital skills and advanced human capital than in digital regulations and commercial policy.

Any model of policy and market governance has advantages and disadvantages. The more central role for the EU in shaping Europe's policy for the digital economy can reduce intra-European frictions and transactions costs within Europe, and lead to new waves of cross-border economic integration in the EU. In practice, new digital policies can build on the real contributions that platforms and emergent technologies have made to the "singleness" of the single market – reducing the home market bias and making it easier to contract on and deliver goods and services across the continent.[5] Furthermore, a big internal market with few barriers and many customers can give new companies and business models in Europe a chance to grow and reach scale in the home market. Obviously, these advantages are already real for many companies and consumers in Europe.[6]

A disadvantage of a centralised regulatory approach is that Europe may not be the locus of new innovations and businesses, and that intra-European digital integration may cancel some of the benefits of integrating with other countries in the world. If new digital

[2] Unless otherwise stated, we are using Europe and the European Union interchangeably in this report.

[3] Frontier Economics, 2022, *Measuring the Impacts of the EU's Approach to Open Strategic Autonomy.*

[4] Matthias Bauer & Fredrik Erixon, 2020, *Europe's Quest for Technology: Opportunities and Pitfalls.* ECIPE Occasional Papers, no. 2/2020.

[5] Matthias Bauer, 2018, *Online Platforms, Economic Integration and Europe's Rent-seeking Society.* ECIPE Policy Brief, No. 9/2018; ECIPE & AT Kearney, 2021, *The Economic Cost of Restricting the Cross Border Flow of Data;* OECD, 2022, T*he Evolving Concept of Market Power in the Digital Economy: OECD Competition Policy Roundtable Background Note.*

[6] European Investment Bank, 2016, *Restoring EU Competitiveness: 2016 Updated Version.*

regulations have the effect of making it harder to engage with investors, innovation partners, technology suppliers, and customers outside of Europe, these regulations can exacerbate existing technology and innovation lags, and ultimately reduce European competitiveness and access to the best technology in the world. If other countries respond in kind, it will also reduce the chances of competitive European firms and technologies to win new customers abroad. Either way, Europe cannot build on its economic strengths.

Furthermore, if Europe-wide policy goes for a one-size-fits-all approach, there's the risk that spaces for technology and business experimentation are reduced and that countries in the EU will not learn from the experience of other European countries. The success of European integration is not just based on common rules set in Brussels but also how country after country have learned from successful examples of commercial and regulatory policy in other EU countries. In a way, the EU is a good example of the power of policy imitation.

In this paper, we will dive deeper into key issues for governance, policy direction and policy learning in Europe's digital economy and especially look to one example – the D9+ Group. Launched in 2016 on the initiative of former Swedish trade minister, Ann Linde, nine countries with a particular interest in matters of the digital economy met to learn from each other and seek common ground on policy issues.[7] On occasions, the D9+ Group has issued joint statements relating to regulatory initiatives in the EU.[8] Since its founding, the group has expanded, and now also includes "guest countries", but it remains fundamentally an initiative of small and mid-sized open-oriented economies with a strong interest to exploit the economic power of digitalisation and new emerging technologies.

The D9+ initiative is important and this paper will make the argument that its work should expand and focus exactly on the two points raised above: expanding the scale and scope of digital technological change in the European economy while addressing risks that an over-powering regulatory approach to digital policies in Europe reduces the benefits of the digital transformation. Importantly, the D9+ Group has a special interest to promote digital openness and avoid the agenda for technology sovereignty and strategic autonomy sliding into digital protectionism. Finding the right direction of policy is of fundamental importance for Europe's long-run economic growth, and the D9+ Group should take a leadership role.

[7] Boston Consulting Group, 2016, *Digitizing Europe: Why Northern European Frontunners must Drive Digitization of the EU Economy.*

[8] See for instance the non-paper on the Digital Services Act by the D9+ Group: https://www.gov.pl/web/digitalization/one-voice-of-d9-group-on-new-regulations-concerning-provision-of-digital-services-in-the-eu

There are five key arguments advanced in this paper.

First, *all countries in the EU stand to benefit from digital openness* – an approach that deepens the single market while keeping borders open for deep digital integration with other countries. In fact, this is of central importance for Europe's future competitiveness. Europe is a diverse region, but EU countries are collectively trailing global frontrunners in the digital economy and need to position themselves close to these economies – especially the US – to catch up faster. On the positive side, while there has been strong digital divergence in the EU in the past (e.g. big gaps between member states in their network readiness and digital trade), the differences have become smaller after decades of digital convergence – both in capacities (network readiness, digital human capital, and more) and in outcomes (e.g. the size of the domestic digital economy). There is also a key point of unity: while EU countries have comparative advantages in some areas of the digital economy, they trail in others and need to draw on the capacities of other countries to access the best digital technologies and services in the world.[9] No EU country is consistently at the frontier of all change in technology and the digital economy: they all could learn from others.

Second, *a restrictive regulatory environment will depress activity in the digital economy and reduce the positive effect of digitalisation on productivity and prosperity.* Notwithstanding big differences between EU countries, there are worrying gaps between the EU and other economies at the frontier of technology and digital change – for instance on metrics like equity investments in Artificial Intelligence (AI) – and the risk is that future developments will agglomerate to regions with better conditions for technological change than Europe.[10] Europe's share of the world economy is falling and, in the future, the region will become more dependent on knowledge, research, patents, technology and innovations that were developed outside of Europe. For European companies and consumers to have access to the best technology in the world, the EU will need to deepen its digital relations – just as other parts of the world should deepen their dependence on Europe. Therefore, a comprehensive digital strategy for Europe should accommodate the EU's ability to access frontier technologies and services in the future.

Third, *D9+ countries have a lot in common – digital and general economic characteristics that should prompt them to be far more ambitious in promoting Europe's digital competitiveness.* The group is based on small and mid-sized open-oriented economies that all think it is crucial for Europe to run an open digital economy with large space for entrepreneurial

[9] See chapter 2 for examples of different advantages of individual EU countries.

[10] Technological change can lead to economic divergence and has done so through history. Lagging countries can eventually catch up but the effects of early divergence in technology adoption rates can be persistent. See for instance Björn Brey, 2021, *The Long-run Gains from Early Adoption of Electricity.* ECARES Working Paper No. 23/2021, ULB.

experimentation and intensive integration with leading digital regions in the world. Generally, the policy culture in D9+ countries tend to favour open and competitive markets in Europe – and they support policies that are deepening the single market and connecting European markets with the world market. While there are differences between D9+ countries in many indicators of digital capabilities and digital-economy performance, they are economies that must specialise their digital economy more than large countries. The latter can use scale advantages for their approach to the digital economy but D9+ countries cannot because they are too small. All else equal, small economies will always have smaller "endowments" than large economies – for instance, smaller sizes of accumulated data to use for cloud business development, fewer digital patents, fewer large industrial companies who can invest in AI solutions, et cetera – and will have to compete by a higher digital intensity than digital scale. D9+ countries are resolutely in this category of countries.

Fourth, *D9+ countries should take on greater leadership for the development of digital regulations and the broader policy for an open digital economy in Europe.* In the last decade, the voice of small and mid-sized open-oriented economies in Brussels have been challenged by a changing global landscape and new policies have increasingly reflected the economic interests of larger European economies. This difference between big and small countries have been seen in several issues – from the design of the GDPR to initiatives to have a Europe-wide Digital Services Tax. This is not to say that the newly emerged policies in Europe are fundamentally alien to the economic interests and political preferences of D9+ countries: they are not. But Europe's choice of a regulatory model that is more restrictive than in other key economic regions (e.g. Japan, Singapore, the United Kingdom and the United States) have economic consequences, and they are likely to be felt more in D9+ countries than in other economies. Importantly, with one notable exception, all D9+ countries have a less restrictive digital regulatory environment than the EU. Hence, D9+ countries have a key task in front of them: to be more proactive in developing new ideas for how European policy should evolve, advance the economic reforms that are necessary for deep digital integration, and ensure that the voice of digitally open economies is heard around the negotiation tables when policy is decided in Brussels.

Fifth, *the D9+ countries have a clear role in establishing better frameworks in the EU for sharing experiences and learning from each other.* EU countries have made different experiences in technological specialisation and they all have important knowledge to share – and lessons to learn. Some of the D9+ countries are consistently ranked very high in global league tables over technology, innovation and digital competitiveness and have economic and political experiences that are relevant for the general EU policy direction.

Therefore, these countries have a special responsibility to carve out a new function in EU digital policy-making that provide for positive examples to be imitated.

This study is structured as follows. In chapter two, we will look closer at the general digital performance in the EU – both input factors like R&D and e-business capacities and output factors like digital trade and digital intensity in the economy. Marshalling many quantitative analyses and data observations, the result is that EU policies could do a far better job in supporting innovation, competition, and growth in the digital economy. Chapter three is more specific to the D9+ group and country-level performance. While some national characteristics will have been discussed in the previous chapter, this chapter will delineate key economic factors that make the D9+ a united group. In fact, it is more united than its member countries sometimes think. In chapter 4, we outline new agenda items for the D9+ initiative and how member governments could make it an even more important forum for Europe's digital policy making. The report ends with an Annex on the distributive effects of digital regulation, which show key data points for all D9+ countries and discuss their sensitivity to a restrictive regulatory environment for the digital economy.

2. DIGITAL PERFORMANCE IN THE EU: WHAT NEEDS TO BE IMPROVED?

With the entire world economy going through a period of strong technological shifts, the competitiveness of Europe's economy – in industry and service sectors alike – is and will be profoundly defined by its capacity to accommodate new technologies and foster innovation and structural transformation in sectors and individual businesses. This is good news because more and better use of technology gives Europe and the world a chance to vastly expand prosperity without exhausting natural resources or polluting the planet. On the back of a growing digital economy, European economies can raise their productivity – which is sorely needed after a long period of low productivity growth – and provide for better economic outcomes for households and younger generations that struggle to find good economic opportunity.

How is the EU positioned in the digital economy and the technological shifts that are powering a good part of its growth potential? In this chapter, we will take a closer look at key factors defining economic success in the modern and digital-intensive economy and, before going into the performance of the D9+ Group, what coming challenges that EU countries are facing in an increasingly competitive global digital economy.

EU countries are increasingly alike but trail other advanced digital economies

A first and positive point is that EU countries, like the world at large, are increasingly alike in their capacity to thrive in the digital economy. If we consider these capacities – or what in economics jargon is called "endowments" – we find strong patterns of convergence on key metrics such as the quality of Internet access, digital skills, and investments in science that a country can utilise to develop its digital economy. Obviously, the availability and speed of the Internet is a vital digital endowment for everyone – consumer-facing activities like retail and audio-visual services as well as for heavy industry that optimises production and services via digital networks. In Europe, according to the latest data (which is a few years old), almost nine in ten households have access to the Internet in their homes while 65% use mobile devices to access the Internet on the move. Similarly, nearly all EU firms have access to Internet broadband. Besides, the cost of faster Internet connections have gone down year-on-year[11].

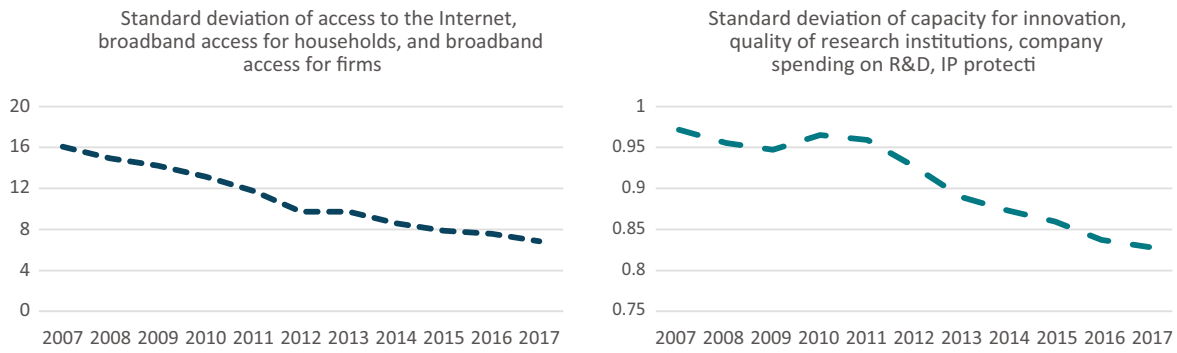
What is noticeable in this development is not just the relatively fast increase in the access and speed of the Internet, but the convergence across member states. Figure 1 (left) shows the average degree of convergence for Internet access and speed across EU member states,

[11] Data is based on Eurostat data: Statistics on the digital economy and society. Level of internet access; Individuals using mobile devices to access the internet on the move; Households with broadband access; Households covered by ultrafast broadband; Enterprises with broadband access; Monthly price of internet access.

using the standard deviation as a measure. The standard deviation measures the distance between each member states and the group average. The figure shows a clear downward trend, demonstrating that there is a degree of convergence across the EU in digital infrastructure. Even more important, as Internet access and speed are growing across all member states, this convergence is towards a higher level across the EU.

But digital endowments are not just built by investing in digital infrastructure or greater network capacity. Countries contribute to their digital endowments by ensuring their policy environment is conducive to innovation, spending on research and development or investing in digital skills so individuals can make full use of the digital technologies at hand. In relation to these digital endowments, Figure 1 (right) shows that there has also been convergence across the EU. The figure presents a declining trend of the average standard deviation of four variables measuring digital endowments: capacity for innovation, quality of scientific research institutions, company spending on R&D, and intellectual property protection[12].

FIGURE 1: CONVERGENCE ON DIGITAL ENDOWMENTS ACROSS THE EU



Source: Eurostat; own calculations.

While there has been convergence in the EU, Europe remains distant from the global frontier – the best performing countries – in scale, scope and the speed of growth in digital endowments. For instance, it is frequently observed that 5G roll out in Europe has been slower than in many other countries and that the EU is trailing leading economies on other issues related to investment in domestic digital capabilities. Europe is performing relatively well in some areas but is still far behind frontrunners in the development of, for instance, next-generation computing, emergent AI solutions, and business growth powered by AI.

[12] The increase in digital convergence showed by the downward trend of the standard deviations was confirmed by the Principal Component Analysis (PCA). PCA is a statistical method used to reduce the number of variables to a set of uncorrelated values which are called principal components. This statistical technique is widely used in the economic literature to measure economic convergence.

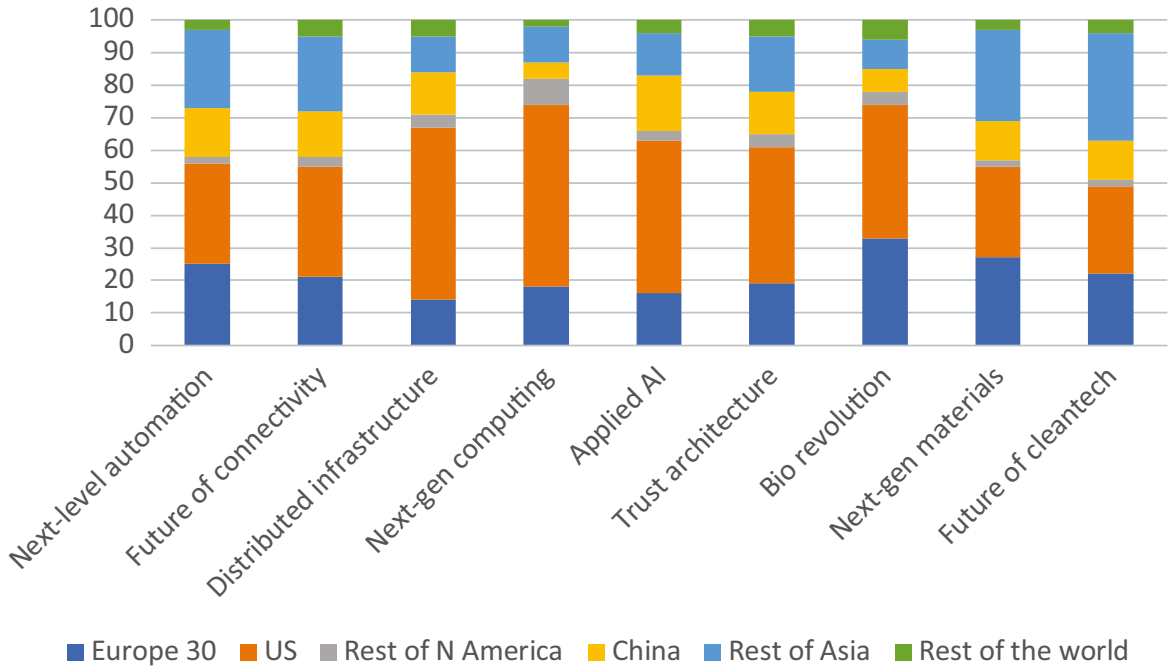
The gap between the EU and the US in patents in these transversal technologies has grown over recent years – not least driven by significantly lower R&D spending on emergent technologies in European firms. In digital or computing technologies, the ten biggest US companies spend four times as much on R&D as Europe's top ten companies – and, generally, R&D spending in European firms were 40 percent lower than in US firms between 2014 and 2019.[13] Equity investment in AI compounds these observations of a Europe that is lagging behind the leading economies. The EU only represents seven percent of all equity investments in AI – while the US and China stand for 40 percent each.[14]

Measuring patents for next-generation computing, distributed infrastructure, and AI applications (see Figure 2), the United States outperforms Europe by a ratio of 3:1. These sectors of transversal technologies also show the biggest gap between the EU and the US – compounding the smaller but significant differences between the two regions in other and related technologies, such as next-level automation, connectivity, and trust architecture. This gap may not be an issue for Europe if it remains open to deep integration with the United States and others in these technologies: European businesses and users can then access these technologies through trade, investment, and other business partnerships. However, this gap sits awkwardly with the more muscular notions of 'technological sovereignty', which put the emphasis on policies of import substitution or regulations, like the proposed AI Act, that run the risk of creating complex layers of AI rules and uncertainty about what is allowed and not allowed in Europe. In the history of world technological development, it has always been important for lagging countries to move closer to frontier economies: it increases their pace of catching-up with leaders. Europe will have to go in that direction too.

[13] McKinsey Global Institute, 2022, *Securing Europe's Competitiveness: Addressing its Technology Gap*.

[14] European Investment Bank Innovation Financing Advisory, 2021, *Artificial Intelligence, Blockchain and the Future of Europe: How Disruptive Technologies Create Opportunities for a Green and Digital Economy.*

FIGURE 2: PATENTS IN TRANSVERSAL TECHNOLOGIES



Source: McKinsey Global Institute and Bertelsmann Stiftung.

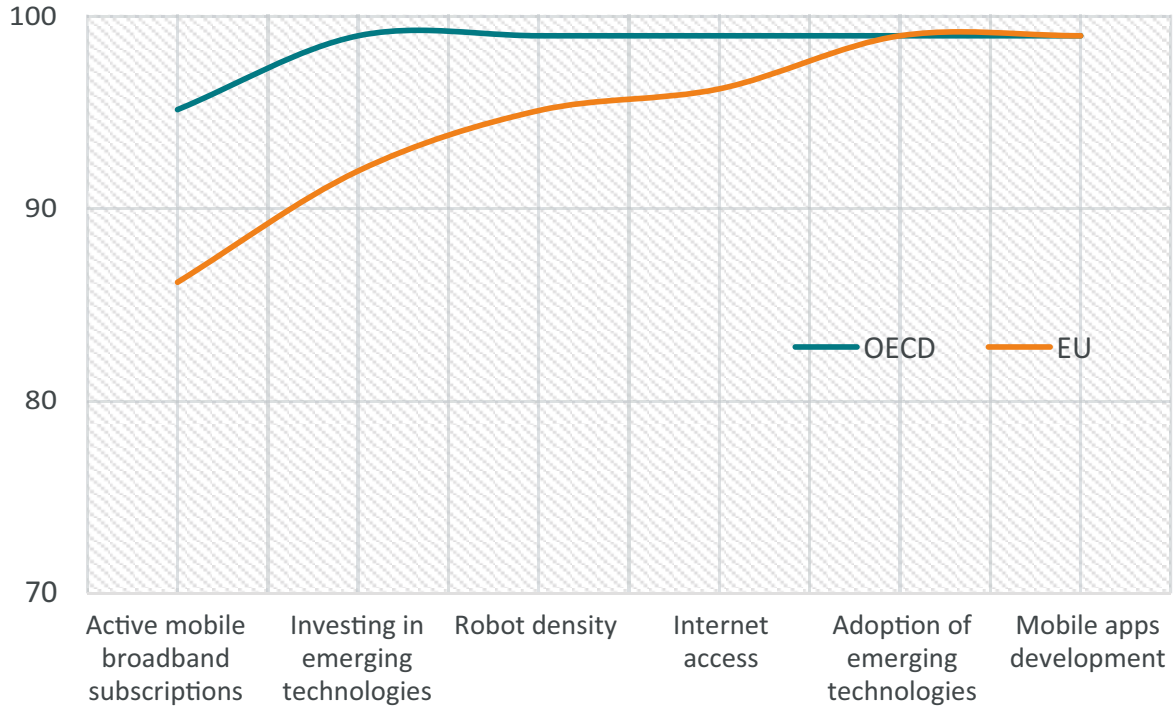
Europe's distance to the frontier is about more than AI. In Figures 3 and 4, we present a frontier analysis of selected indicators of technology (input) and innovation (output) performance. In these figures, the EU and the OECD as groups are benchmarked against the best-performing country for each indicator, and the figures reveal that on many indicators the EU is trailing the OECD group – let alone the best-performing country. The EU ranks high on some indicators, but the distance to the frontier is substantial on others. Again, there is a gap between the EU and others in factors related to both capital and labour markets – for instance, the volume of investment in technology and advanced skills and research. Shortages in human capital are increasingly holding back performance in the digital economy. Germany alone has a skills gap in data specialists that amounts to almost 100 000 vacant jobs, and as more investment takes places elsewhere, there is a substantial risk that qualified labour moves from Europe.[15] OECD data also points in this direction: there is a net outflow of STEM research human capital.[16] Sweden, for instance, had twice as many computer engineers leaving the country than coming to it in 2019.[17] While these observations of human capital flows are not surprising – the movement of capital and labour follows a pattern of agglomeration – they are profoundly important for future digital performance in Europe: the more Europe seeks to separate itself from global technology frontrunners, the more Europe-educated labour will move to the frontrunning countries.

[15] BITKOM, 2022, *IT-Fachkräftelücke wird größer: 96.000 offene Jobs.*

[16] Laurence Boon et. al., 2022, *How can Europe Catch Up on its Digital Backlog?* OECD, ECOSCOPE.

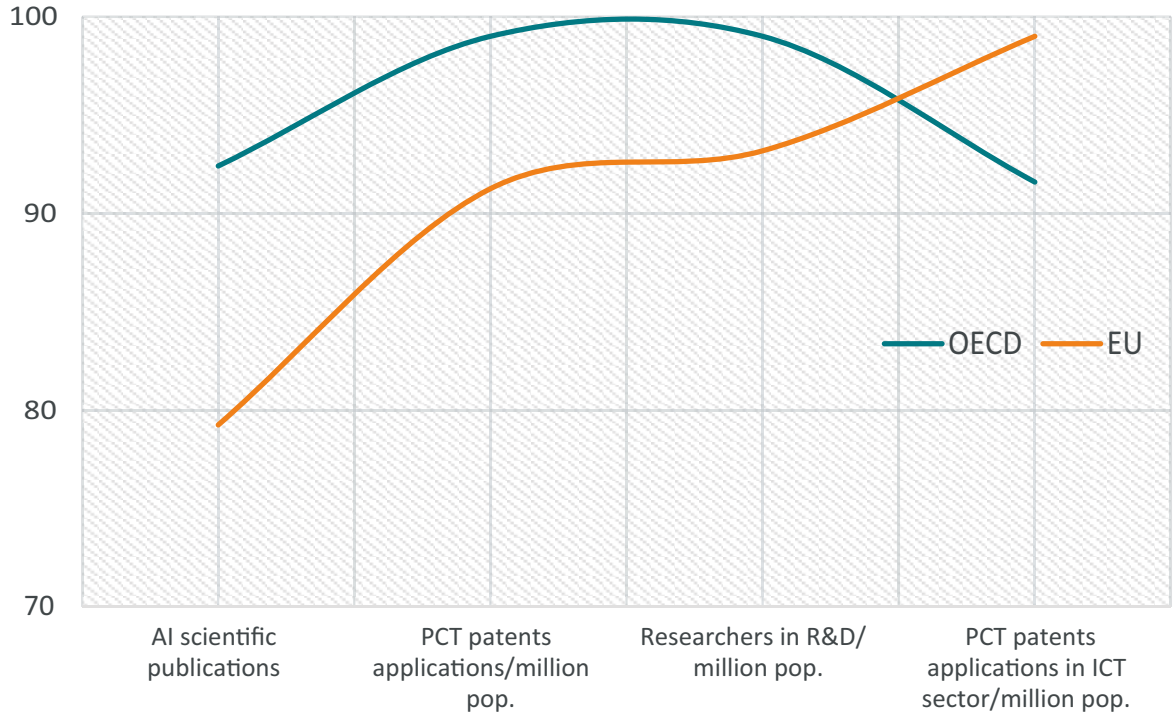
[17] Stefan Fölster et al., "Invandrade ingenjörer stängs ute från arbetsmarknaden", *Göteborgs-Posten,* 12 October 2021.

FIGURE 3: FRONTIER ANALYSIS: TECHNOLOGY



Source: NRI 2022, WEF, WDI, MSTI; own calculations. Note: The frontier analysis benchmarks the OECD group and the EU group against the top-performing country for each indicator.

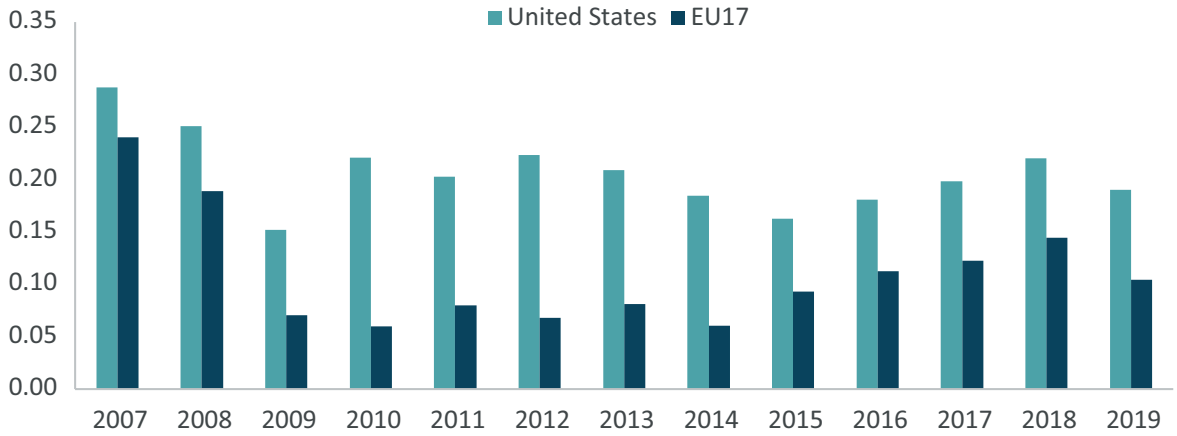
FIGURE 4: FRONTIER ANALYSIS: INNOVATION



Source: NRI 2022, WEF, WDI, MSTI; own calculations. Note: The frontier analysis benchmarks the OECD group and the EU group against the top-performing country for each indicator.

Let us look closer at indicators of output performance – best measured by indicators of so-called digital intensities. While digital endowments show the resources that countries have invested in growing their digital economies, digital intensities represent the amount of economic output that is being created out of these investments – basically, how economies use the endowments. In Figure 5, we assess digital intensities by the contribution of ICT services[18] to the growth in the goods and services produced in an economy (in technical terms, this is described as the value-added growth). We also compare the EU with the US. The contribution of ICT to value-added growth fell after the Great Recession and has been relatively low ever since. Even though the US and the EU-17 follow a similar trend, the contribution of ICT to value-added growth in the US economy has been higher in every year of the series. The accumulated effect of the US consistently having strong value-added contributions is strong and is an important explanation to why technology and innovation have given a stronger boost to productivity in the US than in the EU.[19]

FIGURE 5: CONTRIBUTION OF ICT SERVICES TO VALUE-ADDED GROWTH (PERCENTAGE POINTS)



Note: The contribution to VA includes tangible ICT capital and intangible assets (computer and software databases), which were lumped together in the previous EU KLEMS releases. EU 17 includes Austria, Belgium, Bulgaria, Czechia, Germany, Estonia, Finland, France, Hungary, Italy, Lithuania, Latvia, Netherlands, Portugal, Spain, and Sweden (Missing data for EU countries in 2019 except Austria, Czechia, Germany, Finland, France, Italy, and the Netherlands).
Source: EUKLEMS & INTANProd - Release 2021

Obviously, raising the digital intensity in the economy is a key challenge for the EU. While there are variations between EU member states, and also between the D9+ Group and the rest of the EU membership (see also Figure 8 later in this paper), it remains the case that all EU countries are underperforming given the size of the digital endowments they have built up over time. What many EU countries also have in common is that the

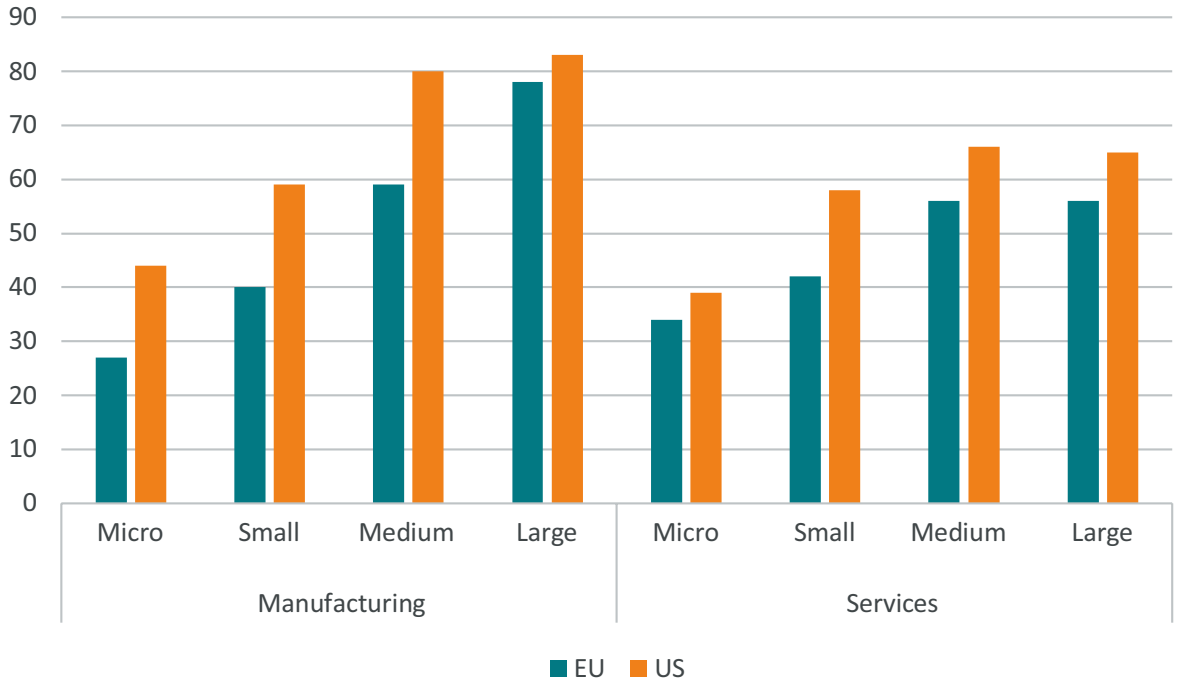
[18] The EU KLEMS database contains a measure of the contribution of ICT services to value-added growth. This database has been funded by the European Commission and contains measures of economic growth, productivity, employment, capital formation and technological change. The documentation and data can be accessed here http://euklems.net/index.html

[19] ECB, 2021, *Key Factors Behind Productivity Trends in EU Countries.* ECB Strategy Review.

underperformance is concentrated to one sector and one type of firm: the services sector and Small and Medium-sized Enterprises (SMEs).[20] This is not unique to Europe: technology and productivity growth in SMEs and the services sector are underperforming in many other countries too. Still, the EU has a bigger challenge than other countries.

Figure 6, using data from the European Investment Bank, compares the digital intensities of different firms in the EU with similar firms in the US – a measure of digital adoption. Large firms in Europe's manufacturing sector are close to the digital adoption rates of their US peers, but the differences between the two regions are significant for especially small and medium-sized companies – in both manufacturing and services.

FIGURE 6: DIGITAL ADOPTION BY FIRM SIZE IN THE EU AND THE US (%)



Source: EIB Investment Survey

These firm-size differences have a knock-on effect on the overall performance of the economy. It is well established in academic research that the underperformance of smaller firms and the services sector reduces productivity and growth.[21] Moreover, since the European economy is much more dependent on SMEs (99.8 percent of all non-financial firms in Europe are micro, small, and medium-sized) than, for instance, the US economy, low adoption rates

[20] ECB, 2021, *Key Factors Behind Productivity Trends in EU Countries.* ECB Strategy Review.

[21] See for instance Debora Revoltella et. al., 2020, *Adoption of Digital Technologies by Firms in Europe and the US.* Centre for Economic Policy Research, VoxEU.

in the SME sector weigh more heavily on the regional economic performance.[22] The lower rates of young and small firm growth have also held back European performance over time – in the whole economy and the digital economy specifically.

While Europe has been catching up on the number of unicorns and platforms that have been developed in the region, it remains the case that the EU is far behind the US and other frontrunner economies. In 2021, Europe had 132 companies valued at more than 1 billion USD – and even if the growth of unicorns was faster in the EU than in the US, the number of unicorns in America is still four times higher than in Europe.[23] Moreover, looking at decacorns – young companies valued at more than 10 billion USD – Europe had 34 such firms while America stood 134 in 2021.[24]

There is no single explanation to Europe's underperformance. Obviously, Europe's digital economy did not have the same number of first-wave digital firms as in the US and therefore struggles with a comparative shortage of industry and technology 'ecologies' that are important for spurring new business growth.[25] Furthermore, business growth financing and the risk appetite in capital markets are also a factor that holds Europe back. While Europe does not have less savings to use for investments than the US, it is notable that only marginal parts of Europe's pension savings have been channelled into venture capital and private equity – parts of the capital market that are crucially important for business growth finance.[26] In the US, venture capital investments measured as share of GDP is ten times larger than in the EU.[27]

Regulation is also an important factor. It is well established in economic research that restrictive business regulations reduce firm growth and business formation generally. Such regulations also pressure down investment and, ultimately, depress economic growth. Europe's performance on business regulation is, as we will later document in Chapter 3, generally good – but there are significant variations between EU countries. Some countries have fewer regulations and a smaller regulatory burden than other countries, and it is no surprise that countries with a smaller regulatory burden also have a higher performance in the digital economy.

---

[22] European Investment Bank, 2021, *Artificial Intelligence, Blockchain and the Future of Europe: How Disruptive Technologies Create Opportunities for a Green and Digital Economy.* Mario Draghi, 2017, *Moving to the Frontier: Promoting the Diffusion of Innovation.* European Central Bank; Gherhes, C., Vorley, T. et al., 2022, Mapping SME Productivity Research: A Systematic Review of Empirical Evidence and Future Research Agenda. Small Business Economics, 58 (3)

[23] i5 Invest, 2022, *The European Unicorn and Soonicorn Map 2022.*

[24] Orla Browne, *The Rise of the European Decacorns,* Dealroom, July 2021

[25] See for instance McKinsey Global Institute, 2022, *Securing Europe's Competitiveness: Addressing its Technology Gap; European Investment Bank, 2021, Artificial Intelligence, Blockchain and the Future of Europe: How Disruptive Technologies Create Opportunities for a Green and Digital Economy.*

[26] European Investment Bank, 2021, *Artificial Intelligence, Blockchain and the Future of Europe: How Disruptive Technologies Create Opportunities for a Green and Digital Economy.*

[27] Niklas Elert et. al., 2019, *The Entrepreneurial Society: A Reform Strategy fort he European Union.* Springer.

Regulations that are specific to data and the digital economy also have economic impacts. If we take the GDPR as an example, it is a regulation that prompted a sharp increase in administration and compliance costs for business. Forbes reported that US Fortune 500 companies alone had spent 7.8 billion USD to prepare for the start of GDPR in 2018, and there is wide agreement that the implementation costs for business were widely bigger than what regulators had initially estimated.[28] Obviously, companies that are more exposed to privacy regulations were more affected than others. One estimate suggests that exposed companies experienced a drop in sales of 2.2 percent and in profits of 8.1 percent as a result of the implementation of the GDPR. Clearly, the effects were stronger on small businesses. Small IT firms experienced a 12.1 percent drop in profits while large IT firms had their profits reduced by 4.6 percent. Notably, very large platforms like Google and Meta were not affected at all: they have rather taken bigger market shares because of the GDPR.[29]

Academic research also points to broader economic effects. The GDPR had a negative impact on investment in firms and their valuation, and exacerbated the 'ecology' problem in Europe that was previously discussed.[30] As the GDPR reduced especially venture investments in Europe, it will take a longer time for the region to build up clusters and technological ecologies that will help to drive business growth and new innovation. Moreover, it also seems clear that it reduced technology variety in Europe and the rate of entry of new technology – with ripple effects on consumers and the consumer surplus value of new technology.

The app market is a case in point. Using 4.1 million apps available in Google Play Store between 2016 and 2019, a group of economists found significant effects of the GDPR on the European app market. First, GDPR sharply reduced the number of available apps in Europe. With the entry of the regulation, about one third of all the available apps exited Google Play Store and the rate of new app entry fell by 47 percent. Second, the apps that left the EU market or did not enter it were a mix of apps that ultimately proved to be successful (accumulated app installations, four quarters after launch, were higher than 100 000) and apps that were not successful. Third, apps continued the pre-GDPR trend of becoming less intrusive. Fourth, the average use of old vintage apps rose – pointing again to how the GDPR reinforced existing market share and the power of incumbents. Lastly, the economic effects were substantial: the falling rates of new app entry equal a drop of one-third of the consumer surplus value of apps and a 30 percent drop in average use and revenue.[31]

These are stark figures. However, they are not surprising. Academic research has shown time and again that technology and business-model specific regulations tend to have a strong effect

[28] Oliver Smith, 2018, "The GDPR Racket: Who's Making Money From This $9bn Business Shakedown". *Forbes.*

[29] Chinchih Chen, Carl Benedikt Frey, and Giorgio Presidente, 2022, *Privacy Regulation and Firm Performance: Estimating the GDPR Effect Globally.* The Oxford Martin Working Paper Series on Technological and Economic Change No. 2022:1.

[30] Jian Jia et. al., 2018, *The Short-run Effects of GDPR on Technology Venture Investment.* NBER Working Paper No. 25248.

[31] Rebecca Janssen et. al., 2022, *GDPR and the Lost Generation of Innovate Apps.* NBER Working Paper No. 30028.

on various measures of economic output and performance. These effects are even stronger when the regulations influence new technology and new market entry. The GDPR is only one digital regulation that the EU has introduced, and it is highly likely that the Digital Markets Act and the AI Act will have similar effects, unless they are significantly changed. These economic costs may be a price worth paying to achieve non-economic objectives, like privacy in the case of the GDPR. But it is rarely acknowledged by policymakers that these new digital regulations come with a significant cost. If they were observed, regulation could be improved. In fact, the design of regulations like the GDPR can be changed to avoid excessive costs while protecting the non-economic regulatory intention. Moreover, policymakers could take other policy initiatives to compensate for the negative economic consequences of a regulation. Like in all other policies, there is a portfolio effect in digital regulations: economic disadvantages created in one area of regulations could be balanced by regulatory benefits in another area of regulations to avoid depressing market activity. So far, the EU has not prioritised achieving such a balance.

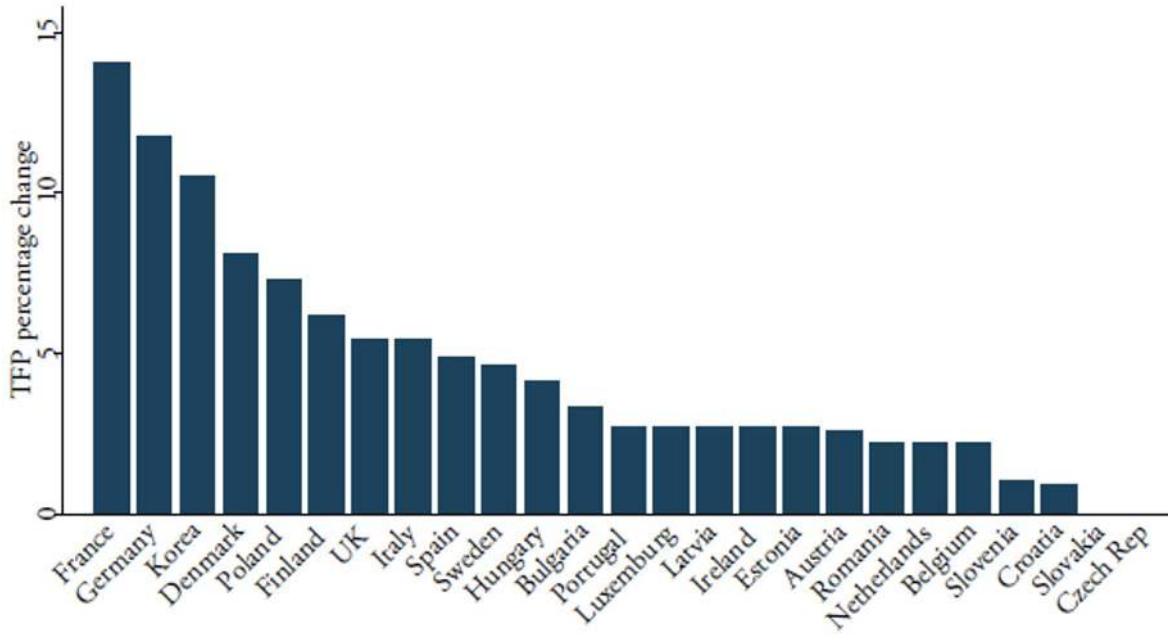
All EU countries would benefit from more digital openness

Fortunately, there are good reasons to be optimistic about Europe's economic prospects. As we have seen, the economic performance of the EU is trailing behind the United States and other global leaders, and the shift in the economy from manufacturing to services and emerging technologies have proven especially difficult for Europe. But the gap between Europe and the global leaders at the frontier of digital growth and innovation can be closed, and it is obvious to most observers what is required for competitiveness to go up, for productivity to grow, and the economy to expand at a faster clip. Europe should cut the barriers that still make services and technology markets to be organised along national lines and that lead to strong home-market biases in most member states – a classic single market agenda. Moreover, policies at the EU level should better target reforms that promotes more entrepreneurship and competition, leading to more adaptable markets and greater ease for new technology to flow within sectors as well as between sectors.

There are clear linkages between regulatory restrictiveness and economic performance. Various restrictions on data and digital business models, and administrative costs for complying with digital regulations, tend to reduce the downstream uptake of digital technologies and negatively affects business-sector productivity growth. Similarly, regulations that prevent certain types of companies, like digital platforms, to compete or freely access sectors will eventually drive up user costs for accessing the services and the technologies that they provide.

Several studies show that reducing various restrictions would boost the productivity of firms in all economies, and logically, more so in highly restricted economies than in the less restricted ones. This is also the result of our own calculations, using the DTRI index that includes several dozens of different policies on market openness in digitally intense sectors – including data-specific regulations like data-storage measures, fiscal policies like taxes and tariffs on digital services and goods, and cross-border regulations like data-localisation rules (see Figure 7).[32] On average, Total Factor Productivity[33] would go up by 4.5 percent in a sample of the 64 countries used in the DTRI, if data policy restrictions were lifted. The effect for many EU countries would be bigger. In France and Germany, two of the most digitally restricted countries in the EU, Total Factor Productivity would go up by more than ten percent – which would be an enormous boost to the economy. Importantly, all EU economies would stand to benefit by reducing the economic effects of restrictions in data policies.

FIGURE 7: TOTAL FACTOR PRODUCTIVITY GROWTH BY LIFTING DATA POLICIES RESTRICTIONS



Source: Digital Trade Restrictiveness Index; own calculations.

[32] More information about the DTRI is available here: https://dti.eui.eu/

[33] Total factor productivity represents a subset of overall productivity. It includes everything that cannot be explained by changes in labour and capital productivity and therefore is close to innovation and technological change.

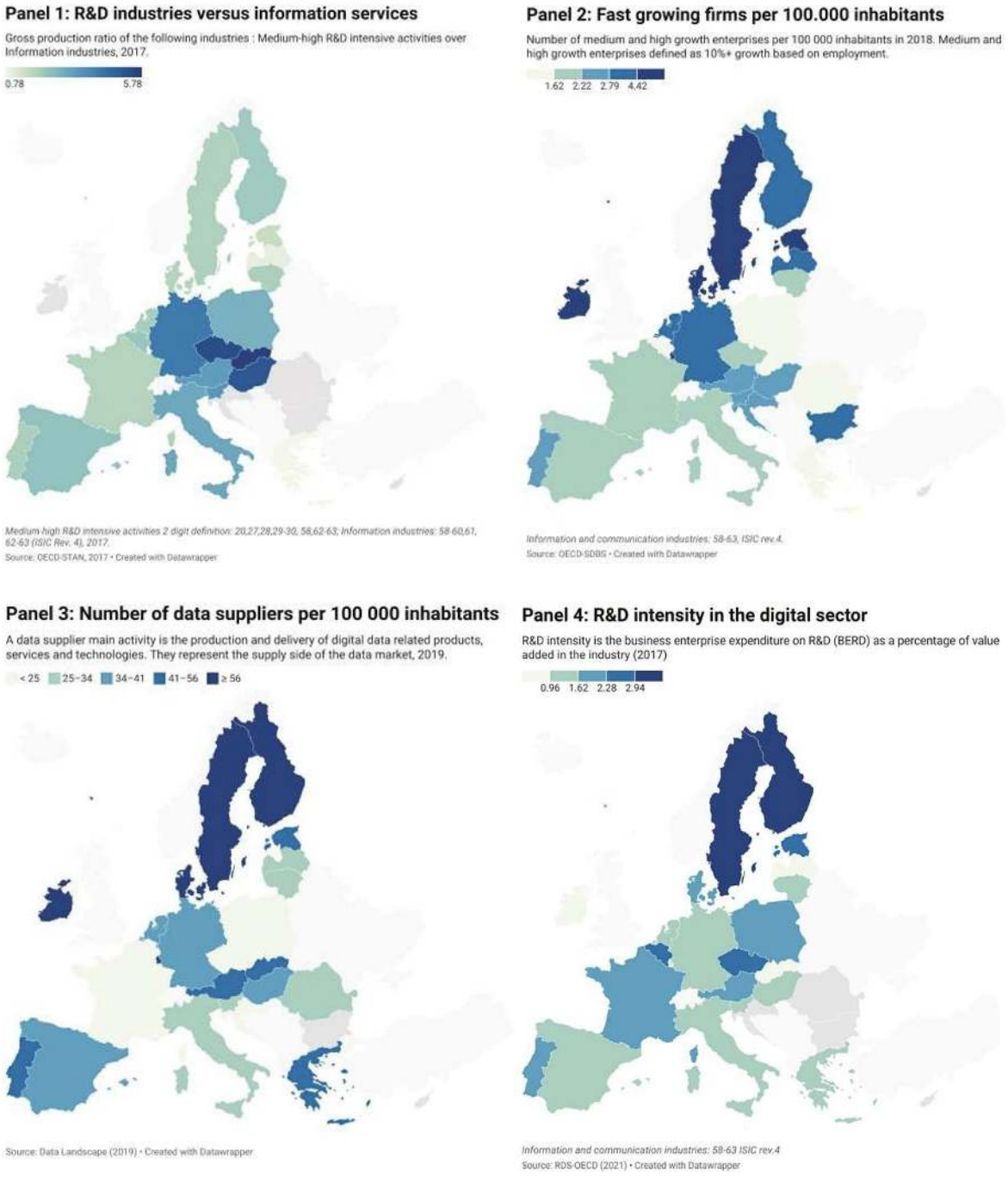
Europe remains united in diversity in industry structures and endowments

There are other similarities and differences that matter for economic performance. For instance, European countries differ markedly in their industry structures and the factor endowments that power the digital economy. Figure 8 illustrates this point by selecting some of the most important economic factors behind the shape of digital output in various countries. The first panel depicts to what extent countries are oriented towards producing high and medium R&D manufacturing compared to digital services. It shows, for instance, that Germany and Italy – together with some Eastern European countries such as the Czech Republic, Slovakia, and Hungary – score high in industrial R&D and low in digital services R&D. In other words, the relative sizes of these two sectors suggest that these countries have fewer production-oriented interests in digital services. Other countries – such as the Nordics, Ireland, and Portugal – have an R&D industry structure that is much more catered towards digital information services.

Similarly, firm characteristics differ substantially between countries. Many young high-growth firms are active in the digital economy and new regulations would therefore especially affect them. They also tend to be sensitive to restrictive versions of regulation as they lack resources to work with them – let alone understanding them. The second panel in Figure 8 shows that the economies of Sweden, the Baltics, Ireland, and the Netherlands – together with countries in Central and Eastern Europe (CEE) – have a higher share of firms that are fast growing (based on their employment expansion in recent years). Sweden, for example, tops the ranking as it has 5.2 high-growth firms per 100.000 inhabitants.

Strong differences within Europe also appear in analyses of data endowments. Panel 3 in Figure 8 shows the difference between countries in the EU – and, again, there is a clear geographic pattern. The strong producers of data-related services and technologies, or "data suppliers", are Denmark, Sweden, Finland, and Ireland. The R&D levels used in digital services, as shown in the final panel of Figure 8, directly relate to future growth prospects. The panel shows how much the digital service sector spends on R&D as a share of value added. Again, Nordic countries top the rankings.

FIGURE 8: EUROPEAN COUNTRIES DIFFER IN INDUSTRY STRUCTURES AND ENDOWMENTS



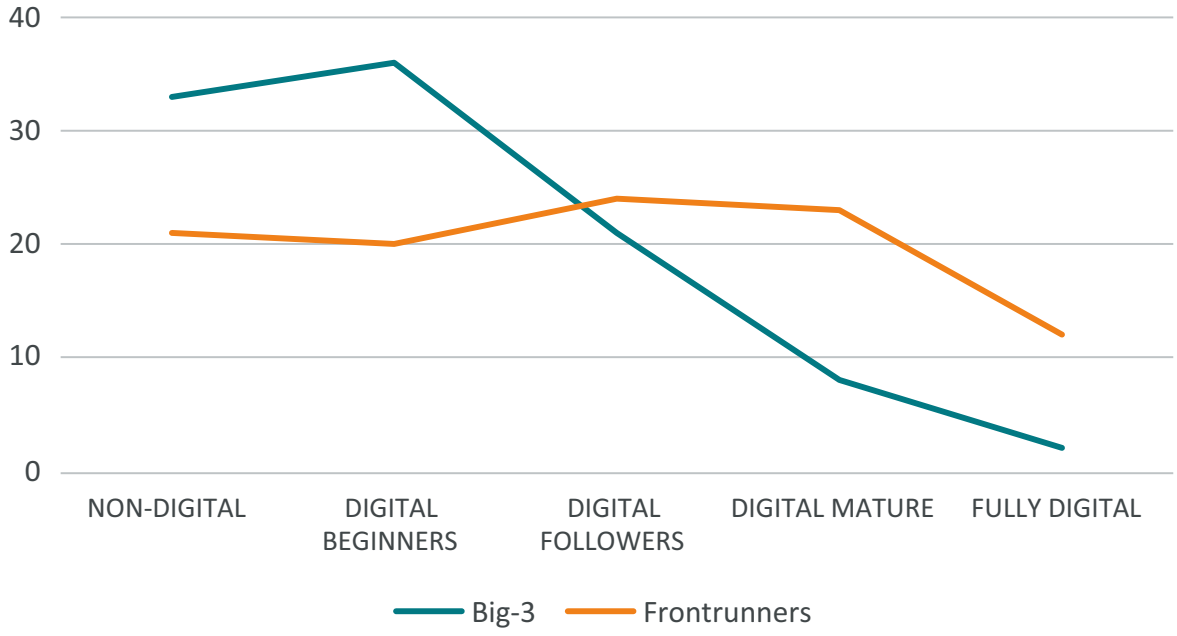
These metrics merit greater attention. If businesses are slower than consumers to adopt new technologies and develop greater digital intensity, it suggests that many of the key challenges are less about digital endowments and more about barriers to the utilization of new technologies.[34] We delve deeper into these factors below, but it is important to press a bit more on the issue of firm performance: there is in most countries big differences between

[34] Erik van der Marel et al, 2017, *Boosting Trade in Services in the Digitalisation Era.* Bertelsmann Stiftung.

firms in their digital performance and capacity to exploit opportunities from digitalisation, but the gaps between firms are substantially bigger in some countries.[35]

Figure 9 looks at average scores of different firm types in the European Commission's Digital Economy Scoreboard during the 2010s – knowing there is a lag in adoption and that companies improve over time. The figure works with two country groups – the EU's Big-3 members (Germany, France and Italy) and seven small economies that are digital frontrunners. If we only look at the large economies, we find notable differences at firm level between them and smaller economies. Some countries, like Italy, have a very high percentage of companies that lag in digital maturity but other large economies are still far behind the frontrunners. These variations between firms are crucially important for digital economic performance: a major reason why digital intensities in the Nordic economies are so much higher than in the Southern European economies is because firm types with the lower digital intensities (non-digital, digital beginners, and digital follower) have still digitalised a lot. In the aggregate, this variation has an effect on economic performance. There are four countries in the EU that have better digital adoption rates than the US at firm level: Denmark, Finland, the Netherlands, and the Czech Republic.[36] Notably, they are also more digitally open than the EU as a whole – and they are also members of the D9+ group of countries.

FIGURE 9: PERCENTAGE OF FIRMS ACCORDING TO THEIR TECHNOLOGY ADOPTION



Source: Digital Entrepreneurship Scoreboard 2015-2020.

[35] European Investment Bank, 2020, *Digital Technologies and Firm Performance: Evidence from Europe.*

[36] European Investment Bank, 2021, *Who is Prepared for the New Digital Age? Evidence from the EIB Investment Survey.*

While the adoption of e-commerce can increase trade and productivity, the full benefits of digitalisation will only come when digital services are fully embraced by all industries. The data shows that this is not the case in Europe and that many European firms have failed to adopt the digital tools at their disposal. Therefore, there is a disconnect between how consumers use digital opportunities and how EU firms make use of digital technologies and services in their business models – and this difference is very big for the Big-3 economies. For instance, the distance to the global frontier in digital adoption rates in Germany is not about consumer but business adoption rates.[37] The problem with digital diffusion across firms affects the general contribution of digitalisation to economic prosperity. First, it stops the creation of new technology as the diffusion of technology and new digital services enables new applications and inventions in sectors (e.g. transportation and health) which were not the originators of the technology in the first place. However, they can adapt and create new goods, services, and applications by using what have been developed in other sectors. Second, it underlines that investments in digital endowments are not enough for the digital economy to grow at a fast rate. This is a key point: a country's performance in the digital economy cannot be boosted just by adding additional digital endowments. There also must be a regulatory and business environment that helps companies to experiment with and develop new business models and operations – and that puts more pressure of change and competition on the business community.

[37] For a deeper analysis, see Erik van der Marel et al, 2017, *Boosting Trade in Services in the Digitalisation Era.* Bertelsmann Stiftung.

3. THE ROLE OF THE D9+ INITIATIVE – EUROPEAN POLICY LEADERSHIP FOR DIGITAL OPENNESS

In this chapter, we will take a closer look at general digital economic performance of countries – and how different countries compare with each other. The previous chapter has already outlined a few similarities and differences that delineate different groups in the EU and how they have performed in the digital economy. The maps in Figure 8 (in Chapter 2) have already given a strong indication of three groups or type of countries in the EU's digital economy – digital frontrunners in Europe's northern regions, large economies in continental Europe, and catch-up countries (usually in Central and Eastern Europe) that are fast advancing their digital capacities. These three groups are crucial for understanding the D9+ initiative – and why it is important for policy leadership in Europe.

The analysis has also shown that restrictive policy environments have impacts on many important intermediary indicators of digital economic performance – such as young firm growth, R&D expenditures, human capital formation, and more. Moreover, these restrictions also effect market behaviour and, as in the case of GDPR and new entry of apps, depress market activity. Similar findings have been made for other data or digital policies: they reduce activities such as investment and trade in digital technologies and services, and their contributions to productivity and economic growth. On both these scores – the impact on key intermediaries and depressed market activity – there are substantial differences between EU economies in how they respond to new regulation and, indeed, why some countries are particularly vociferous in calling for higher regulatory burdens on companies in digital sectors. These features of Europe's digital policy will also be covered in this analysis and in the Annex, where indicators of digital intensities and the digital regulatory burden are presented for each D9+ country.

The conclusion is: the D9+ group of countries is united in its need for digital openness and policies that allow small and open economies to specialize and use their comparative advantages. These countries should now deepen their cooperation to make their voices heard more resolutely in the EU.

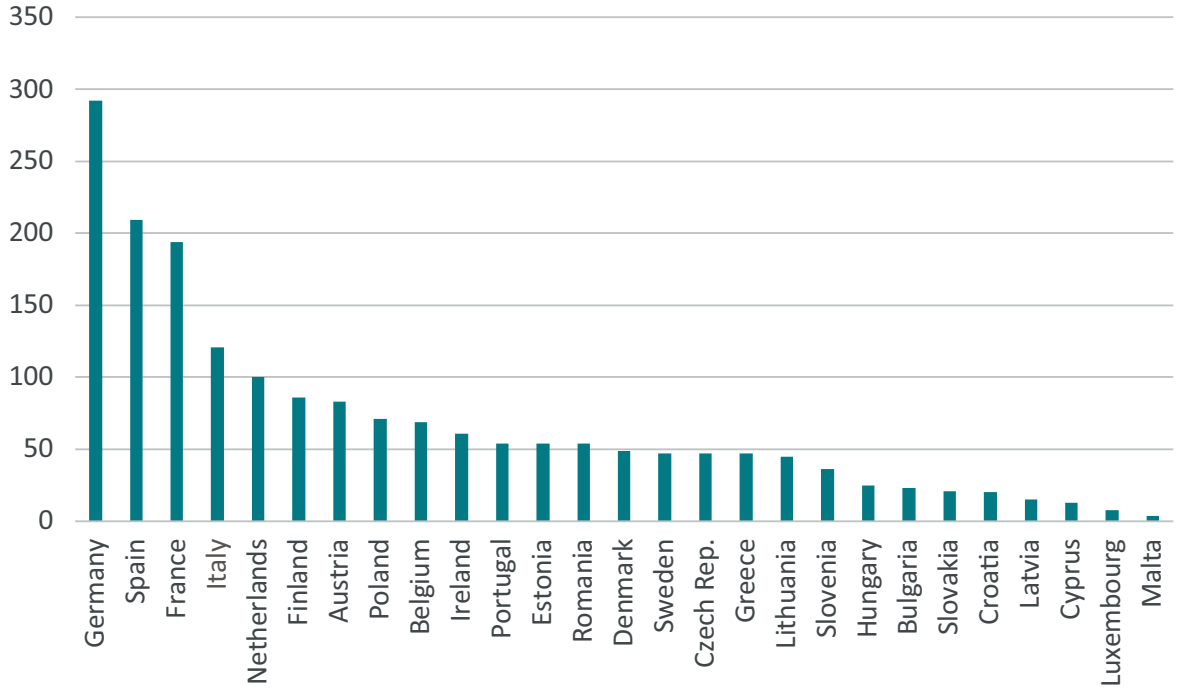
Variations in digital endowments, intensities, and policy: D9+ countries and the EU

A key feature of the countries that are part of the D9+ group is that they are small and mid-sized economies that have pursued an economic strategy based on using digital intensities rather than digital scale advantages. As a result, they have become more dependent on digital openness and the ability to integrate markets for data, data services, digital technologies and more with other countries. Equally important is that the D9+

group is much less restrictive in its digital regulation policies. This chapter will expand on these key features of the D9+.

Let us start by exploring further what strategies based on digital intensities versus digital scale advantages mean in practice. Figure 10 presents the number of advanced technology centres in EU countries – clusters, ecologies, or other forms of concentration of knowledge technologies and firms that help to spur firm growth. One result stands out: big economies like Germany, Spain, France, and Italy have more advanced technology centres than other countries. This is the scale effect: these countries have more people and bigger economies than other EU countries and will therefore always have better scale advantages than smaller countries like Portugal, Denmark, and Luxembourg. The same holds for more data-specific endowments: Germany has by far the most data suppliers in Europe, and France spends far more in digital R&D than Sweden and Finland – even if the two Nordic economies use their data supply and digital R&D far more intensively than Germany and France (as shown in Figure 8, Chapter 2).

FIGURE 10: ADVANCED TECHNOLOGY CENTRES IN EU COUNTRIES

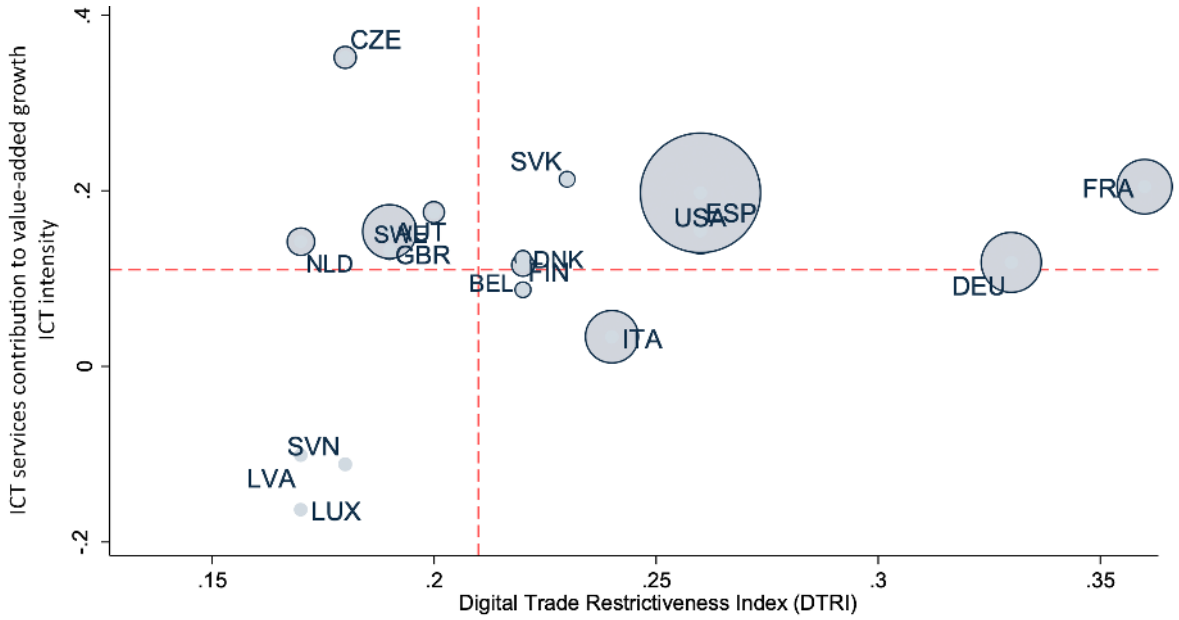


Source: European Commission, 2021, Advanced Technologies for Industry.

By contrast, Figure 11 looks first at digital intensities (using data for ICT services intensity as proxy) and shows that it is smaller economies – not the big economies – that have the greatest intensity of these services in their economies. We have chosen these digital services because they are still services that big economies usually have higher intensities in; even a big economy like the US ranks pretty high in ICT services intensity. The

figure also shows something else: large economies have higher digital policy restrictions than smaller economies. In this sample, based on the DTRI index used previously in the report, the EU countries with the highest digital policy restrictions are France, Germany, Spain, and Italy.

FIGURE 11: DIGITAL INTENSITIES AND DIGITAL POLICY RESTRICTIONS



Source: The DTRI; EU KLEMS; own calculations.

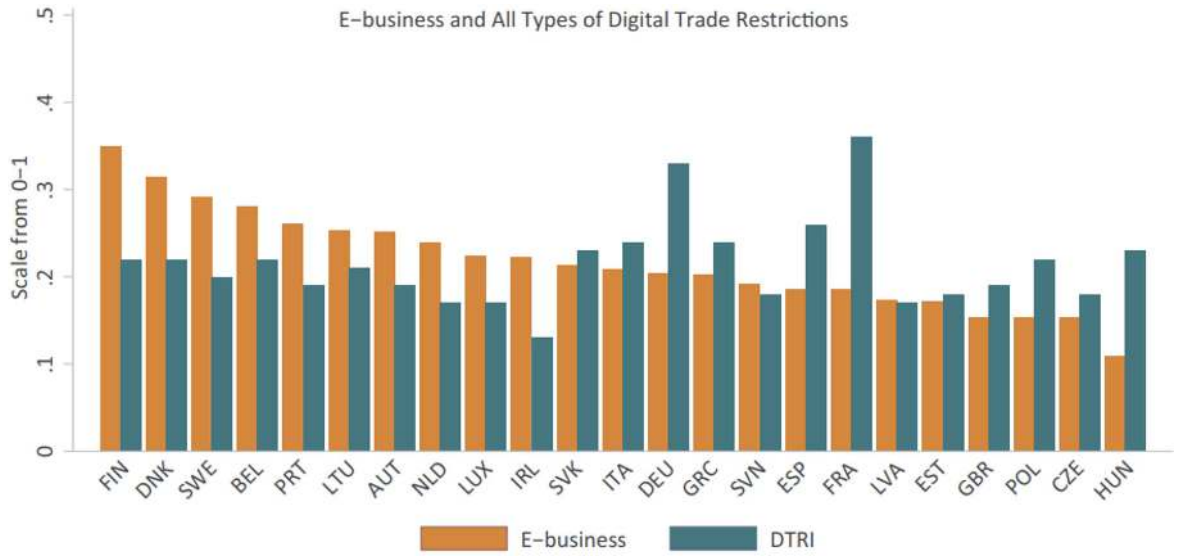
We can explore this relationship in a deeper way by considering the correlation between digital openness and digital adoption rates – another indicator of intensities. As previously observed in the paper, digital adoption rates differ across countries in the EU, and the differences in digital and technology restrictions between countries appear to be highly correlated with the variation in adoption. Digital technologies include Customer Relationship Management (CRM) software, AI, and cloud computing – which are all component parts in the e-business indicator in Figure 12. As can be seen in this figure, there is variation in digital adoption rates but EU countries also differ in how much they are still restricted in digital trade and technologies. Indeed, there is an intimate relationship between the two: the higher the digital restrictions, the lower the adoption rates.[38]

It is notable that both digital adoption and openness tend to be the strongest in small countries like the Nordics, Belgium, and Portugal. On the other hand, large economies like Italy, Germany and France have lower adoption rates and far higher restrictions in digital integration with other countries. Restrictions in these countries are also higher

[38] The same pattern holds globally and for various indicators of digital intensities, for instance digital trade. See Martina Ferracane et. al., 2018, *Do Data Policy Restrictions Inhibit Trade in Services?* ECIPE DTE Working Paper 02.

than in smaller catch-up economies – often Central and Eastern European countries – that for understandable reasons have lower adoption rates than mature and large European economies. As these economies catch up in economic development and prosperity, they will also close the gap in digital adoption to their richer peers.

FIGURE 12: DIGITAL TECHNOLOGY ADOPTION BY FIRMS (E-BUSINESS) AND THE DIGITAL TRADE RESTRICTIVENESS INDEX (DTRI)



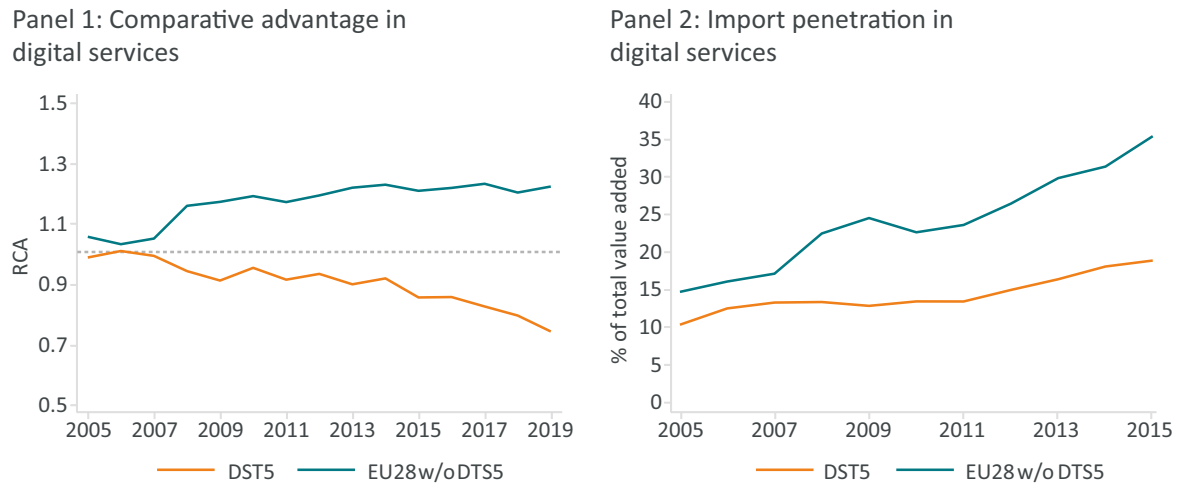
Source: Eurostat, OECD, ECIPE; authors' own calculations. Note: See Annex C in van der Marel et al. (2020) for further details. E-business denotes the percentage usage of digital technologies by firms in each services sector. For the e-business indicator, the sector of business services is chosen.

Countries with higher digital policy restrictions and lower digital adoption rates also tend to be more favourable to EU regulations that err on the side restrictiveness. While that relation may not hold in each individual country case, it is notable that countries like France, Germany, and Italy have been among the strongest supporters of EU policies that add substantial regulatory burdens on the digital economy. The GDPR, the Digital Markets Act and the Digital Service Act are cases in point. Since all these regulations were accepted by all EU countries in the end, it is difficult to evidence this point quantitatively. However, the relationship can be observed on the issue of the Digital Services Tax (DST), a controversial initiative in the EU that was blocked by some countries. In the end, some EU countries adopted the DST – and it is interesting to explore why these countries did it, and not others.

In Europe (including non-EU countries), five countries have introduced a special tax on digital services: Austria, France, Italy, Spain, and the United Kingdom. Apart from Austria, they are all large economies and, as previous figures have shown, score high on digital policy

restrictions. Panel one in Figure 13 shows that the comparative advantage in digital service in the DST countries has fallen over time: they have a substantial comparative disadvantage in digital services. For the EU-28, including all DST countries, the development has been the opposite: its comparative advantage has grown over time. Panel two looks at import penetration of digital services. While the rate of import penetration has grown in DST countries, it is substantially lower than in the EU-28. These results are revealing. DST countries are not just bigger economies that have higher digital policy restrictions, they also have much lower competitiveness and import penetration in digital services, suggesting that their digital services sector is depressed. Their support for a Digital Service Tax may thus be influenced by their comparatively low digital intensities.

FIGURE 13: WHICH COUNTRY HAS INTRODUCED A DIGITAL SERVICES TAX? EVIDENCE FROM COMPARATIVE ADVANTAGE AND IMPORT PENETRATION ANALYSES[39]



Source: WTO-OECD BaTiS; OECD TiVA; own calculations

Note: Comparative advantage is measured as revealed comparative advantage vis-à-vis the rest of the world. Import penetration is measured as share in total domestic value added.

"D9+ United" – high digital intensities and openness

These points are important for understanding why the D9+ countries have formed a joint initiative. Obviously, the D9+ group is not unified on all metrics of the digital economy: it would be surprising if they were, considering that some economies are among the world's richest economies while others became independent and freed from Soviet-style economic policies as recent as the 1990s. However, the group is substantially united in areas of high digital intensities and a favourable view on policy openness.

[39] Erik van der Marel and Peer Schulze, 2021, *Taxing Digital Services: Compensating for the Loss of Competitiveness.* ECIPE Policy Brief No. 11/2021.

A full analysis of all the metrics and data points that have been marshalled in this paper shows that there are three distinct groups of countries – set out in Table 1. We are calling the first country group "the North" because the members of that group – e.g. Denmark, Finland, Sweden, Ireland, and the Netherlands – are all geographically positioned in the northern part of Europe. They are small and open economies, often at the "frontier" of digital technology – meaning that their digital performance is on par with the best-ranked innovation economies in the world. Their digital human capital is high, and they often rank at the top in global comparisons of network readiness and innovation capability. That is also why they are sometimes referred to as "digital frontrunners".[40] Their digital economies are often highly dynamic, and their firms are intense users of new digital services and online platforms. Importantly, they rely on comparatively high rates of firm growth and their intensity of data suppliers is very high by European standards. They are also important producers of new technologies with high digital intensities in old and big companies, and with a strong performance in new firm growth. While these northern economies have their comparative advantages in somewhat different sub-sectors in the digital economy, they all trade more than other country groups in digital-intense sectors.

The second group are CEE countries – e.g. Estonia, the Czech Republic and Poland. They are also comparatively small and open economies, and they rely on economic integration with other economies for the supply of data and digital services. They may not be significant producers of new digital technologies, but they are increasingly offering digital ancillary services to companies in other EU countries. In other words, they are increasingly outsourcing hubs for digitally intensive services – and some of them have an industry sector that is moving fast towards emerging digital technologies. These economies have gone through a period of substantial structural economic change – in the decades that followed on their independence and the collapse of communism – and therefore have a firm profile that is uncommon. Due to high levels of firm exits in their transition phase, they have comparatively few old and incumbent firms and a comparatively high share of new firms. Some also feature unicorns. These firms are also growing faster compared to firm growth in continental Europe. However, firm growth is not on par with the North.

Finally, the third category is called the EU6 and is made up of continental economies – e.g. France, Germany, and Italy. They are mostly large economies by European standards. Hence, they have stronger scale advantages than the other two groups. Their industry structure is based considerably more on manufacturing than digital services. Their digital intensities are higher than in the CEE but significantly lower than in the North. Furthermore, their firm growth is also weaker than in the North. While France

[40] See also a similar country groups delineation in Boston Consulting Group, 2016, *Digitizing Europe: Why Northern European Frontrunners must Drive Digitization of the EU Economy.*

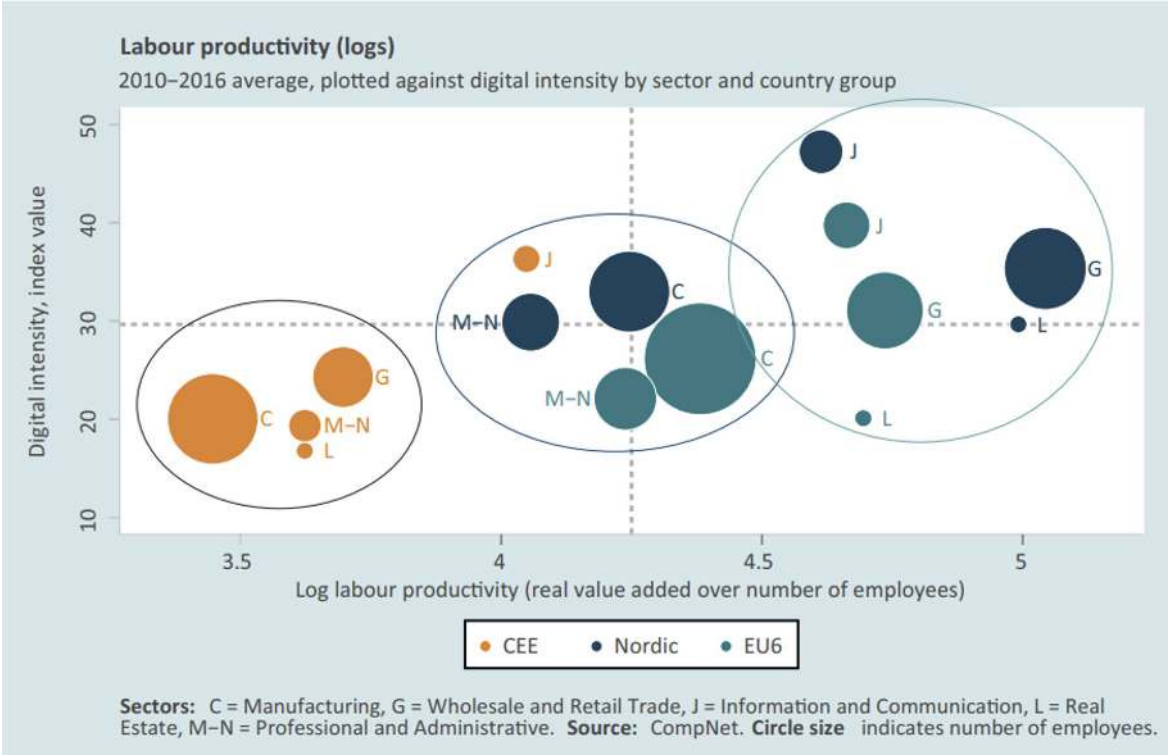
and Germany have an absolute advantage in data because of their size, their data supply per capita trails behind the North. Moreover, even if France and Germany have more unicorns than other EU countries, their unicorn intensity (unicorns per capita) is much lower compared to countries in the other two groups.

TABLE 1: COUNTRY GROUPS IN THE EU'S DIGITAL ECONOMY

The North	The CEE	The EU6
- Small and open economies, dependent on cross-border exchange in digital technology and services; - Low digital restrictiveness overall; - At the digital "frontier" – with high levels of networks readiness and digital human capital; - High levels of new digital entrepreneurship: young and fast-growing firms and platforms; - High unicorn and app-intensity on the production side; - Relative strength in data supply and R&D value-added in digital sectors.	- Small and open economies, dependent on cross-border exchange in digital technology and services; - Higher digital restrictiveness than in the North and the EU6; - Distant from the digital "frontier"; - Few incumbent companies and many small firms – but not small-firm growth comparable to the North; - Digital users rather than digital producers, with companies offering digital ancillary services to other firms in the EU (e.g. back office digital outsourcing).	- Typically larger economies with stronger scale advantages; - Comparatively strong in manufacturing and R&D- intensive manufacturing; weaker in digital services sectors; - More restrictive digital policy environment than in the North; - Incumbency advantages for old firms and weak firm growth, with comparatively few start-ups and unicorns; - Lower comparative levels of value added in digital sectors than in the North – more equal to the CEE.

The three groupings also emerge distinctly if we look closer at productivity performance. Figure 14 illustrates the relationship between *firm-use* of digital technology and *firm-level* productivity. It shows that there is a close connection between the two variables: the usage of digital technologies by firms is positively associated with productivity. Digital technologies are defined by the e-business indicator, the same indicator as in Figure 12 (including performance indicators on CRM software, cloud computing, big data, online platforms, and more). We have used the ECB CompNet database for computing the variable for aggregate firm-level productivity for each sector available. While the CEE group is obviously a group that is different from the other two groups, Figure 14 also shows that the North has consistently higher digital intensities than the other groups in most sectors, and that the North and EU6 top the productivity ranking in an equal number of sectors.

FIGURE 14: LABOUR PRODUCTIVITY AND FIRM USE OF DIGITAL TECHNOLOGIES



Source: CompNet; Eurostat; own calculations. Labour productivity is defined as real value added over the number of employees. Following the specifications in CompNet, we only consider those companies with at least 20 employees. Digital intensity was produced using the e-business indicator.

The D9+ group of countries builds on countries from two of the groups in Table 1: digital frontrunners in Europe's North and catch-up economies in the CEE region. While there are differences between them – as can be seen in Table 1 and the country reports in the Annex – they are mostly defined by different levels of economic development. Hence, it is not surprising that CEE countries in the D9+ Group has neither the digital endowments nor the digital intensities as countries in "the north". However, the process of convergence is fast, and it is notable that the industry structures and economic profiles of the CEE countries are also becoming more similar to those in the highest-performing countries – not least supported by fast growth in the services sector.

Importantly, the first uniting element of the D9+ group is their reliance on market openness for developing their digital economy. Digitalisation has the potential to support growth in many different sectors and the growing digital economy will make positive contributions to the productivity of non-ICT sectors as well. This is especially true for the services sector. However, it is sometimes argued that countries with smaller digital endowments (e.g. data sources and digital infrastructure like broadband and mobile networks) do not stand to

profit as much from digitisation as countries with bigger endowments. That is a profound misconception. Endowments are only one side of the equation. What is key for economic success in the digital economy is not just the total amount of digital endowments, but how the endowments are employed in the economy. Or to put it in different terms: how countries are building up and using their comparative advantages.

Composed of small and mid-sized export-oriented economies that do not have size advantages like large economies, all D9+ countries must focus on their comparative advantages for economic success. To improve their digital economic performance, they must rely on using their digital capabilities more intensively. Furthermore, they have to use exports and imports to do so. D9+ countries do not have large and liquid domestic markets that could pay for productive digital performance in all sectors and niches. In economic jargon: they must specialise more than other economies.

Most of the D9+ members have already advanced their digital specialisation and developed a pattern of integration with the world market, and they continue to use that access to build their digital economy performance. For instance, Finland is increasingly exploring the gains from its intensive use of cloud computing services while Ireland's specialisation is far more in AI technologies. Therefore, these economies already have a domestic constituency for digital openness that is stronger than in most other EU countries, and thus they tend to favour policies of openness and the avoidance of regulations that substantially raises the cost of integrating with the world and within the EU. They have a strong interest in the output resulting from the use of their digital capabilities and they can benefit substantially from a policy that is targeting digital market openness.

Hence, reaping the rewards in the digital economy is based on an exchange that exploits the comparative advantages of countries and, here, most of the D9+ member countries are performing well. Most D9+ countries have a significant digital trade sector and the share of its total trade that is based on digital services is usually higher than in the EU at large.[41] Those D9+ countries who do not have a sizeable digital trade sector still rely on cross-border exchange for their value added. D9+ members with a smaller trade sector – such as the Czech Republic, Poland, Portugal, and Spain – are well established in international value chains and they create significant output from their digital endowments. They have an interest in an open and supporting regulatory environment because their future benefits from digitalisation is crucially dependent on deepened digital specialisation and access to digital technologies, services, and endowments in frontier economies. Moreover, the integration of D9+ countries such as the Czech Republic, Poland, Spain, and Portugal

[41] See country reports in the Annex. Obviously, more industry oriented economies in the CEE (e.g. Poland) does not have a high share of digital services trade, but they are growing this sector at a fast rate – leading to convergence with other D9+ countries.

into international value chains has further contributed to the policy openness of their economies. Their economies show a significant degree of openness which is comparable to that of digital frontrunners (see Annex).

Thus, the shared interest of D9+ countries in improved regulatory conditions for the digital economy is first based on openness to digital trade and economic integration. In that way, the ability of member countries to prosper in the digital value chain depends on the countries they trade with and their proximity to digital frontier economies. Hence, it becomes clear that they can profit from a faster pace of digital economy growth by tying themselves closer to other frontier economies.

Second, and related, the D9+ countries are united in their preference for domestic regulations in the digital economy that are less restrictive. All D9+ countries (but one) have lower levels of regulatory restrictions on the digital economy, meaning that they impose less regulatory costs and fewer burdens on businesses that work with digital business models and use digital intensive business operations. To the extent that D9+ countries have high levels of regulatory restrictions, it is usually in the broader telecom sector – reducing the scope of market experimentation and competition in network infrastructure and services. Importantly, this preference for a more liberal approach to digital regulations is closely associated with their smaller economic size. As noted in the case of the Digital Services Tax, D9+ countries have developed a stronger comparative advantage in digital services and the import penetration of the same services is far higher. For them, this openness works in both directions – both exports and imports – and it is crucial that policies do not break with their proximity to digital frontier economies in the world.

The future task for all D9+ countries thus lies in both generating more output from their accumulated digital capital, through climbing the value chains of the digital economy, and expanding their digital endowments. To do so, they need better market conditions for the digital economy and more investment in digital capacities and skills. Better market conditions will enable them to exploit their comparative advantage in the sectors in which they are specialised. Indeed, better conditions are necessary for the efficient use of these countries' accumulated digital capital, which in turn also incentivises more investments.

4. AN AGENDA FOR THE D9+ AND ITS MEMBERS

The previous chapters have shown that, while there is a fast process of digital convergence in the EU, there are notable differences in the capacities of countries to expand their digital economies. While all EU countries are united in their diversity, the D9+ countries share basic economic characteristics (they are small or mid-sized open economies), a preference for digital openness, and a regulatory environment that is less restrictive. Arguably, these are solid economic foundations for deepening D9+ cooperation and for designing a D9+ agenda that is broader than at present.

Past D9 and D9+ meetings seem to have been useful, according to officials from member countries, but it is also clear that several countries have struggled to come up with a clear motif why they should prioritise the D9+. There have been efforts to unite countries on different regulatory developments in the EU, but governments in the D9+ group have sometimes taken different positions on new regulatory proposals and differed in how important or urgent they have considered new regulations to be. While reflections and discussions on current regulatory files in the EU are useful and lead to better knowledge, a group like the D9+ should find a motivation for their existence that is deeper and goes beyond providing updates and general commentary on specific proposals on digital regulations.

An example is the case of "technological sovereignty" – the efforts in Europe to wean itself off the dependence on technologies and companies from other parts of the world. All D9+ countries are positive to efforts to build up better digital capacities and human capital, allowing firms and users in Europe to understand, access and use new technologies regardless of their origin in the world. They also support more EU policies on cybersecurity and a deepening of the single market, which would improve the conditions for building up digital competitiveness in Europe and especially boost young and fast-growing digital firms.

However, they are cautious when it comes to using policies to directly cut market openness to digital frontrunners outside of Europe. A version of technological sovereignty that is based on protectionism or a high degree of policy defensiveness is alien to D9+ countries, and there are many economic reasons behind that attitude. Policies based on such concepts would be especially troubling for small and mid-sized economies that need to digitally specialise and intensify their economy more than larger economies. Policies that make Europe more inward-looking will immediately affect the abilities of D9+ countries to exploit their comparative advantages and to benefit on the back of greater specialisation.

Hence, D9+ countries are often critical of new digital regulations in the EU that come with the effect or the rhetoric of making Europe less dependent on digital technologies, business models and firms from other parts of the world – most often the United States. But they

have not worked together to provide another version of technological sovereignty that better reflect their economic conditions, and that would make D9+ countries more proactive on the EU scene. Consequently, their voice is not heard as much as it could be and it is easy for other countries and for European institutions to neglect D9+ countries.

What could be a realistic agenda for the D9+ - aiming to raise the profile of small and mid-sized economies in the EU policy making process and establish new policies that are based on the shared economic interest of the D9+ group? The aim of this chapter is to help D9+ countries to outline basic principles and policy recommendations that could serve as the core of new policy advocacy from the D9+ group and its individual members. The chapter provides new impulses for D9+ countries in how they could structure their work and make it more significant – substantively and politically, in their own countries as well as in Brussels. We propose six key features of a D9+ initiative that is raising its ambitions.

Recommendation 1: Develop policies that make the EU more attractive for digital innovation and investment

The first recommendation is for the D9+ group to focus on EU policies that will help to make Europe more attractive for businesses, investors and innovators that want to develop new digital technologies, innovations, goods, and services. This is important for D9+ countries as well as for the EU at large. The EU is trailing global frontrunners on many scores of digital economic performance and it is urgent for Europe to improve. Technological shifts lead to patterns of economic agglomeration – economic resources moving to the regions with the highest activity – and the risk for Europe is that its distance to the technological frontier will grow.

Improving the digital regulatory environment is important for making Europe more attractive. Europe's landscape of digital regulation is increasingly complex and difficult to navigate, especially for outside economic operators and for young and fast-growing firms – a cohort that is very important for boosting productivity growth. Regulations like the GDPR have had significant effects on business costs and investment in European firms: market activity has generally been reduced by it. New regulations like the Digital Markets Act, the Digital Services Act, the AI Act, and the Data Act have not yet taken effect, but they will add to the high regulatory burden in Europe and make it harder to innovate and develop new technologies in Europe.

Compounding these effects is the general tone in much of the EU's attitude to digital policy. Some leaders talk about advancing 'technological sovereignty' and 'strategic autonomy', and flavour these concepts with policies and ideas that are defensive against competition and that lead to new restrictions on companies who are trying to raise their competitiveness.

These concepts often preface initiatives such as building a European cloud that separates the region from the US, taxing digital services and adding new data management costs. For many, it is believed that such policies will only hurt companies from other parts of the world and that the benefits will come from more harmonisation in Europe and bigger markets shares for EU firms. Economic reality often points in the opposite direction: new digital regulatory burdens have made it more difficult for EU firms to grow.

The D9+ countries must ponder how new policies should be designed. They do not necessarily need to relitigate old battles of digital regulation. What is important now is that the D9+ accommodate the 'portfolio' effect of digital regulation: the entry of new and burdensome digital regulations should be balanced by policy reforms that ease the conditions for digital business, just as high-risk investments in a financial portfolio should be balanced by purchasing low-risk assets. Each digital regulation adds to the total cost of developing and doing business in Europe, and with the current wave of burdensome regulation, it is urgent to balance Europe's regulatory portfolio.

Policy leadership from the D9+ group of countries should consider the future path of digital regulations. There is a dearth of policy leadership on emergent technologies and what is needed to make them powerful in the European economy. While the European network discussion is focused on 5G, frontier firms are advancing 6G and the structure of a decentralised Internet. Europe still discusses policies on cloud computing, but technology development is moving fast to next-generation computing. It is right for Europe to explore ways to expand industrial AI but new AI applications are already about to change education, health and how users interact with the Internet.

Recommendation 2: Take leadership on digital economic openness – within the EU and with global frontier economies

Furthermore, there is an equally urgent need to consider new policies for how European firms and economies interact with frontier economies in the world, especially the United States and OECD partners. The EU starts from a relatively good position of economic openness. However, its digital trade policy is mostly occupied by issues of e-commerce and its policy for giving adequacy status to other countries has been cumbersome. Furthermore, many of its internal digital regulations have clear cross-border consequences – making it harder to organise data supply and value chains that draw on data and economic operators in many jurisdictions. Cloud services and AI, for instance, are sectors that are influenced by these regulations. The value chain for AI applications includes many different nodes and functions: data collection and maintenance, computing services and data centres, code development and deployment, engineers and other skilled labour, interaction with

hardware (e.g. robots), and more. It is important for innovation and competition that all these functions can operate across borders, but new regulations either make that harder (e.g. the AI Act) or crosses out certain types of data suppliers from the value chain (e.g. the Data Act).

There are non-digital regulations that are also important to consider. Standards are one example. With Europe's new Standardisation Strategy, there is greater emphasis on European control over standards and the integration of technical standards into the EU regulatory framework. Echoing the broader attitude to 'technological sovereignty', Europe's new thinking on standards have consequences for global industries to work out technical standards that accommodate new technology and that builds on most stakeholder views.

The concept of strategic autonomy overlays many policies that affect Europe's digital openness. It is right that Europe builds up market resilience and improves it autonomous capacity to understand, access and develop new technology – and that the geopolitics of technology is understood. However, resilience and autonomous capabilities are not advanced by driving up the cost for business and for integrating with economies that are close partners. Europe's strength in the digital economy will improve by making it far more attractive to invest, innovate and develop new technologies in Europe, and such an approach is critically dependent on close interaction with global frontier economies.

The D9+ group of countries relies heavily on digital trade and other forms of digital cross-border interaction. Its strong economic interest should prompt the group to take leadership on policies to improve Europe's digital openness. This includes making more use of the Transatlantic Trade and Technology Council and deepen collaboration in technology and business-model regulations. It is a positive sign that America and Europe seem to be able to agree on a new accord for the cross-border portability of personal data, but there are many other issues where the two partners diverge.

Recommendation 3: Increase the ambitions with the D9+ and build institutions around it

A third recommendation is to give the D9+ initiative a better structure and raise its political importance. The risk for any initiative like the D9+ is that it runs out of energy. D9+ meetings should be important for senior politicians as well as for key government officials. There is established interest from the business community, with the formation of B9 groups who meet on the side line of the official meetings and help to craft agenda points for high-level officials to discuss. It is important that business continues to put time and resources into the D9+ initiative.

It is notable that D9+ governments still find the initiative appealing and, after a wave of new digital policy regulations in the EU, more important than ever to raise their voice about the EU's general digital policy direction. During its EU Presidency, the Czech government and its business community have also provided some new energy for D9+-type of countries to start to engage in new and constructive ways with key EU policies – for instance, the role of the single market for boosting digital growth. Notably, it has made some significant efforts to shift the tone in the discussion about the EU's digital direction – away from an inward-looking version of technological sovereignty to "open strategic resilience". Moreover, it has raised the significance of Transatlantic cooperation in digital policies – not least in light of current geopolitical shifts and the war in Ukraine – and made efforts to boost digital policy and standards cooperation in the Trade and Technology Council.

Building on these efforts, the way to make the D9+ relevant for governments is to increase the level of ambition and connect more closely with long-term policy developments. The Czech effort to bridge broader geopolitical developments in the world with the EU agenda is instructive: initiatives and leadership become important when they connect with real issues on the ground. This can be expanded and include more strategic issues for the EU's long-term performance. The EU needs to revive policies that are based on innovation, openness, and competitiveness (recommendations 1 and 2), and it needs to take that agenda into more specific areas – like new policies on AI. The EU is in the process of developing a new AI Act – and it raises several questions about the right degree of regulation (how restrictive should it be?) and how unilateral regulations in Europe can integrate with regulatory developments elsewhere. These are issues for the D9+ group to develop. In reacting to specific proposals they should raise the broader and long-term issues: are new proposals in the long-term interest of their and Europe's economic and geopolitical interests?

To fulfil the roles mentioned above, concrete actions are needed to further improve the way in which the D9+ works. One way of doing so would be to increase the level of seniority in meetings and have meetings that require the presence of ministers – occasionally also the heads of governments.

Another key element is to establish a particular protocol for the D9+ meetings and activities of the group. In order to raise the importance of the group's work and particular items to be discussed, there is a need for a clear and common agenda that commands attention. An agenda would also make sure that certain standard items are always going be taken into consideration by the group, and that there is continuation over time. A long-term work programme could be established that would ensure that each meeting is a component parts of a concrete ambition – and not just single events with random connections to past meetings.

High-level D9+ meetings could also be prepared by conclusion documents, drafted in advance, that build political importance into the agenda. Occasionally, this is already part of current practice – but it could expand. The D9+ could also explore different options for how industry can support their work and it should establish clearer links between the capital-based processes and the negotiation table in Brussels.

Finally, D9+ meetings should be planned and established long in advance and there should be clarity on which countries are going to chair the meetings in a rotating chairmanship among D9+ countries. For example, the D9+ member countries hosting meetings in the group in 2025 should already be aware of this today. This is also directly related to the group's ability to fulfil the roles mentioned above, as countries are not only going to be aware that they are responsible for meetings well in advance and can better prepare, but as this also enables them to use meetings as an opportunity to set the agenda and propose initiatives of importance to them.

Recommendation 4: Establishing a permanent Secretariat for the D9+ Group with the capacity to evaluate the group's policy and performance, and to propose ways to improve EU performance

A critical effort to increase the ambition and significance of the D9+ would be to establish a permanent Secretariat that is tasked to prepare meetings and to evaluate policies and performances. Such a Secretariat would not need to be a large body and could take the form of an advisory group or a "wise person" group, and it would be mandated to prepare discerning evaluations of policy developments at the EU level and how they connect with desired economic and strategic outcomes. The Secretariat would support the work of D9+ member governments by providing them with a tool to get a much better understanding of what EU digital policies actually mean for them.

Policy evaluation also serves a broader purpose. Currently, many European Commission impact assessments often fall short of providing a comprehensive analysis of all levels of impacts that digital policies can have for EU member states. This has also been noted at D9+ meetings and pointed out by several member governments to the Commission. There is a clear need for additional supporting analysis on impacts and spill-over effects of digital policy on the economy, industrial sectors, start-ups, and entrepreneurs. Good policy evaluations would allow the group to combine their resources and avoid looking at issue areas solely from the viewpoint of one country. In addition, it would allow for a parallel evaluation of policies by adding another level to the policy evaluation provided by the EU.

Recommendation 5: Take initiatives to address digital challenges that are common to the EU

It is important for the entire EU that greater policy leadership for the region's digital future is developed. There are profound challenges – economic, social, environmental, and strategic – that immediately connects with the digital economy, and how digital regulations support or hinder a positive development. Some example are skills and human capital in AI, and how EU policies can establish more certainty and openness about AI that would help labour market and firms to adapt. There are obvious challenges about making Europe's SME sector more digital and capable to prosper in a world of ever more competition based on technological skills and adaptability. Moreover, Europe has a strong policy in the fields of data and privacy, and needs to maintain that attitude while making it easier to integrate with democratic market economies that share the spirit and substance of European policies, even if they are not designed exactly as in Europe. Obviously, this is important for geopolitical developments and for securing Europe's access to frontier technologies and digital services in the future.

Again, the point is not to relitigate old policies but to help focus the D9+ and the EU at policies that have long been neglected in the EU. One specific example is the direction of AI policies and performance in Europe, which runs the risk of preventing the current and future innovation from positively impacting on European SMEs and customers. The D9+ countries have one thing in common on AI policies: they lack the scale of data, human capital, and industries to enable strong and positive development across the board. They need specialisation – but for that development to work out well, it is necessary to have deep integration partnerships with other EU and world economies. In contrast to many large economies, for instance, they need a deeper single market that could assist that specialisation and provide trust that their access in the future will happen on fair market-economy terms.

Many key topics also require taking into account areas that are not strictly on digital policies but are important for them, such as tax issues. Currently, it is often the European Commission that takes initiative on forward looking issues. The D9+ group should seize the opportunity of complementing the analysis of the European Commission in these areas and thus taking a more prominent role at the steering wheel of EU digital policy. For example, most – if not all – D9+ countries have a different view than many other EU member states about the terms for international data flows. Currently, the Data Act proposes new policies that would create new de facto restrictions for some non-EU service providers on the storage and transfer of non-personal data outside of the EU. It is a a big issue for many small economies that lack the scale factors to build up domestic cloud capacities in a commercially sound way or that do not want to rely on providers in the EU that are not globally competitive. And it prompts the question: how should the EU build

in the long-term interests of partnering with key frontier digital economies in the world and ensure that European firms can thrive on their services.

At a high level, the D9+ could also take the lead in encouraging the next European Commission to the importance of single market reforms and embracing a pro-trade approach. For Europe to close the technology gap and make the EU a global leader for sustainable growth and innovation, deeper markets and more integration are needed. In addition, international cooperation on digital policy and standard setting is particularly critical. The D9+ could take new intiatives to ensure that the EU keeps the European Standardization System (ESS) open, inclusive, and consensus-based while seeking alignment with international standards. The D9+ could also play a key role for a strong and unified transatlantic approach to preserve security, stable economic development and protection of freedom and democratic values.

Recommendation 6: Promoting the D9+ group's role of an effective learning mechanism

A first important recommendation is to make the D9+ group a stronger and more effective "learning mechanism" that can showcase what works (and what does not) for its members and for other countries in the EU. A "learning mechanism" may come across as abstract and ambiguous but goes to the heart of successful policy making: imitation of policies in countries that have performed well. It used to be a big part of the work provided by the EU and other bodies like the OECD, but the significance of it has waned over the years.

All countries have learned something from their experience of building up a digital economy that is useful for others to know. In the first place, countries have used different tools and regulations to build stronger digital endowments, and they have differed in how they regulate various aspects of the digital economy. It is obvious that these differences have impacted on the outcomes, but what are the exact lessons learned? Why did network infrastructure investments in some countries lead to significant and positive economic results in some countries – but not so much in others? What have countries learned from growing their expenditures in digital skills and human capital – what new economic performances come from general digital upskilling? Should such programmes be "firm-close" or divorced from firms? Should they receive greater political priority than expanding expenditures on STEM research at universities? These are only a few issues, but they have significance for the economy and there are great varieties between D9+ and EU countries.

Equally important are the interplay between more specific digital regulations, productivity, and economic growth. It is obvious that countries have developed different levels and profiles of specialisation in the digital economy, but on what basis did that happen? It is clear that economic factors like an economy's industry structure have played a significant

role, but domestic regulation have likely been a strong influential factor as well. What did countries learn from choosing different regulations?

These are not just academic discussion points. It is of key importance to have such a learning mechanism in the EU and that learning experiences in digital policies get translated into other countries through policy imitation. Importantly, this could help to break the somewhat monolithic approach in the EU to the digital economy, which often tends to be based on an "industry-first" attitude which downplays the services sector and the role of SMEs. Compared with other regions in the world, almost all EU countries have a great task ahead of them in boosting digitalisation in services and the SME sector. More learning experiences could help enrich the European policy discussion and help it to focus on the big questions. The D9+ have a huge potential of facilitating this important benefit, and for providing new impulses to EU digital policy by fulfilling this role more effectively. In particular, there is a strong potential for the activity of the D9+ to focus on learning mechanisms that shape positive outcomes and experiences for other countries by transmitting lessons learned. Overall, this recommendation lays a clear focus on finding a way within the D9+ to make the group a more prominent and more effective platform that also becomes more relevant for the business community.

ANNEX – THE EFFECTS OF DIGITAL REGULATIONS ON D9+ COUNTRIES

Mapping the economic effects of regulation on different types of economies

There are different ways to map the effects that various digital regulations have on the economy. In the impact assessment of the DMA, for instance, the Commission argues that the increase in market contestability and the reduction of various big-platform advantages (e.g. network effects) will generate positive dynamic gains. In the Commission's economic analysis of the AI regulation, the argument is that the adoption of AI will increase as a consequence of the regulation (e.g. by creating more trust in AI applications), and therefore the gains will outweigh any costs. These propositions may be true. At the least, they are using some basic assumptions that undeniably are correct: market contestability is important for long-run economic development and trust in technology helps to increase adoption rates.

However, just like many other analyses of regulation, the macro-oriented approach can be a bit too abstract and distant from the firm, market, and regulatory factors that determine the distributive consequences of a regulation. The impact assessment that accompanies the DSA is a case in point.[42] It finds that better harmonization will increase digital trade and that the competitiveness of business users will go up, leading to a positive macroeconomic effect in the region of 0.3-0.4 percent of GDP in the EU. It also takes account of costs, but only the direct compliance costs – in fact, it finds no indirect cost to unfold because of the DSA.[43] Such an approach is inadequate. While some harmonization gains are likely, it is equally likely that the increasing cost of operating and using platform services will have an impact on users. Every time there are new regulatory restrictions introduced, there will be costs on the affected operators that will have an impact downstream. If this impact slows down the diffusion or adoption of new innovative technologies, the economic consequences can be substantial, and they would be different across countries and sectors. Since the DSA comes with a big catalogue of new regulatory restrictions, a full impact assessment should take account of their impact.

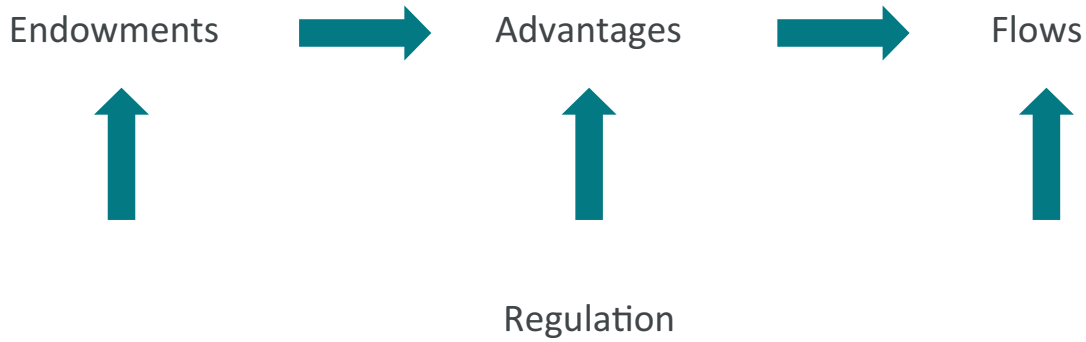
One way to approach the distributive effect of the DSA – and, of course, other regulations like the DMA and the AI Act – is to map which different *endowments, advantages,* and *flows* would be impacted. The attentive reader will already have noticed that it is these three parts that we have covered previously in this paper: the "modern" and specific endowments that influence the shape of a country's digital economy; what different advantages and specialisations that emerge from these endowments; and what "flows" or "streams" that are

[42] European Commission, 2020, Staff Working Document Impact Assessment Accompanying the Proposal for a Regulation of the European Parliament and of the Council on a Single Market For Digital Services (Digital Services Act) and amending Directive 2000/31/EC. SWD (2020), 348 final, Part I and II.

[43] Ibid, Annex 3, Table 2.

created in the economy (e.g. movements in firm composition, investments in innovation, and trade) because of these advantages. Figure A1 sets out the model for how to think about understanding the effects of regulations on specific countries or groups of countries with different endowments, advantages, and economics flows. Figure A2 maps some of the more specific effects.

FIGURE A1: MODEL FOR UNDERSTANDING THE DISTRIBUTIONAL EFFECTS OF REGULATION

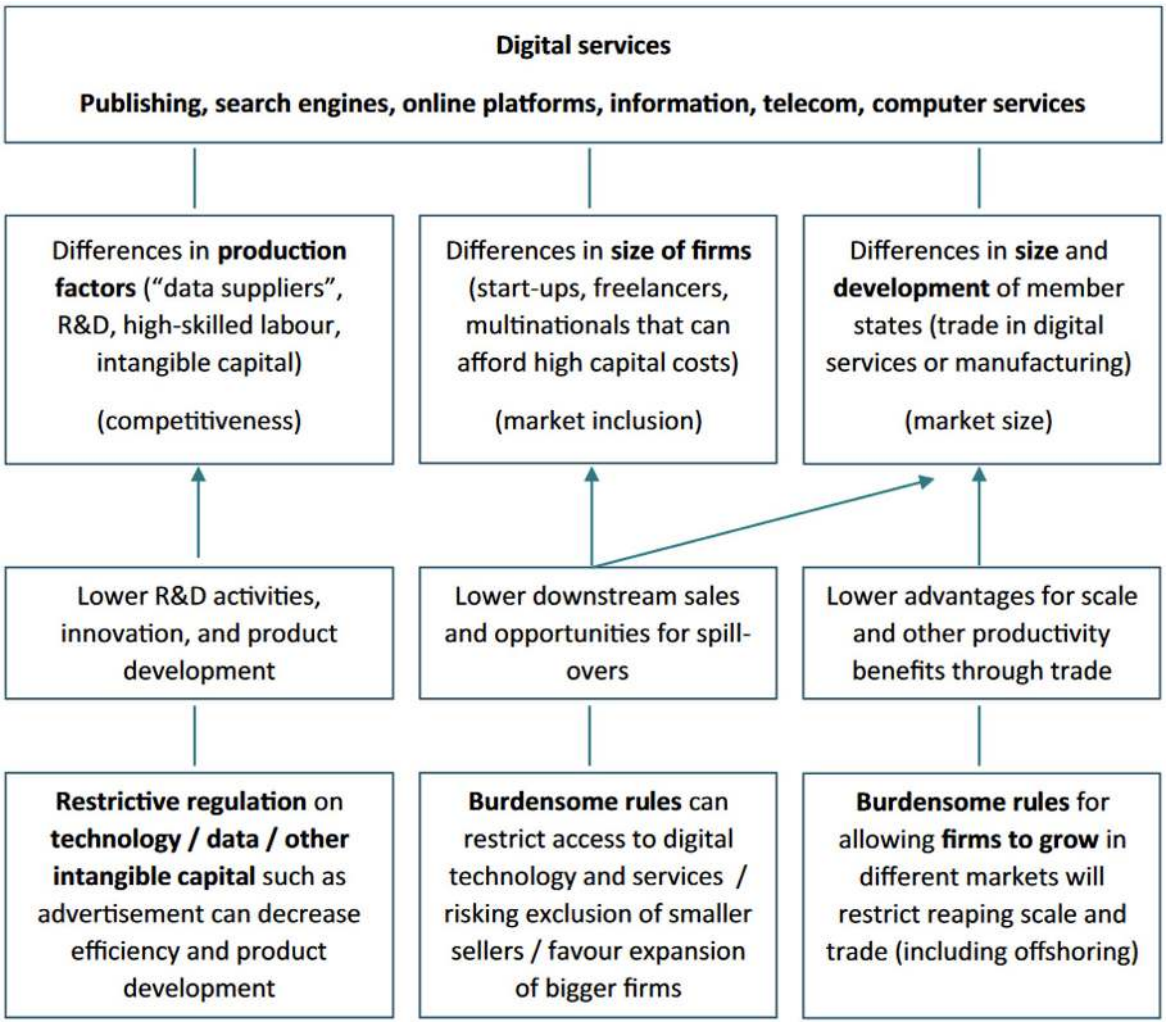


In cases when the new regulation restricts the use of *endowments,* the effects tend to be strong. Then, firms or countries will not be able to exploit their endowments – in our case, data, data-supply structures, R&D resources, and intangible assets (such as organizational capital using software), source codes, and more. Obviously, the effect is more significant in countries with comparatively strong endowments in these intangible factors.

Regulations can also impact directly on specific *advantages.* As we have seen, some European countries have comparative advantages in digital services and digital-intensive sectors while other countries have comparative advantages in R&D-intensive manufacturing. Some firms and countries have size advantages that drive the economies of scale in digital industries and sectors; others have size disadvantages and specialized their economies in other sectoral niches accordingly.

Finally, regulations can also impact directly on *flows* in the economy. For instance, a regulation can affect the portability of data between countries or trade in services that are digitally intensive – both measures that usually affect countries that are more dependent on flows as exporter or importer. Regulations can also restrict the relative balance between firms that are old or young, or big or small. Regulations that make it harder for young and small firms to grow, for instance, tend to increase the value of the size advantage for large firms. The economy then gets tailored to improving efficiency and chasing such gains, which typically happens in large companies. However, it also inhibits innovations coming from young and small firms, which often are important contributors to an industry's productivity growth.

FIGURE A2: MAPPING THE EFFECTS OF REGULATIONS



Source: ECIPE.

The effects of restrictive digital regulations are often that they reduce the ability to exploit a country's existing endowments (e.g. data and digital human capital). Take a country like Germany. German consumers have high digital skills and are close to the international frontier of digital use: they adopt technologies when they are introduced. However, German firms are distant from the international frontier of digital use, and there is a big gap between digital endowments and intensities.[44] This means that any digital restriction will inhibit the ability of firms to grow with the expansion of these endowments: a restriction of the factor of production such as data will define the growth of new and digital firms. Such restrictions could therefore become a restriction on firm growth even if they primarily target endowments.

[44] Bertelsmann/ECIPE, 2019, "Are Services Sick? How Going Digital Can Cure Services Performance", *Bertelsmann Stiftung.*

It may be possible for some companies to import from other countries the type of assets that would make up the for the affected endowments. For instance, buying data from a firm in another country or through labour (human capital) mobility. It is far more common, however, that business users import goods and services with these endowments embodied. When that is the case, downstream services can still operate and even flourish despite the restrictions that inhibit the exploitation of domestic endowment factors. But the domestic endowments stay restricted and cannot contribute as much to economic development as when their potential is exploited. The result is that some sectors and firms will be saddled with poorly performing technology. Some companies will move abroad to get better regulatory conditions for growth.

Hence, there are risks of market *exclusion effects* – something that has been visible in several regulations affecting the portability of data and trade in digital-intensive services. Market exclusion happens when access to digital technologies and services gets restricted. Some firms and users will then be excluded from the market because they cannot produce competitively anymore. For instance, the cancellation of the data privacy shield between the EU and the US have widened the efficiency gap between small and big firms because it is mostly small firms that made use of this scheme. That also became visible in the difficulties to trade for small firms after the repeal of the privacy shield. Likewise, the introduction of the GDPR affected the balance between large and small firms – leading to some market exclusion effects for firms and countries. The result reinforced size advantages. This effect was amplified by a reduction in investment in digital start-ups that came on the heels of the GDPR. While the long-term aggregate effects of these regulatory changes were unknown at the time, they had the effect of changing the relative importance of some advantages and disadvantages.[45]

The effects of restrictive regulations are therefore likely to be felt more strongly by smaller firms and smaller countries with few or no scale advantages. Small countries generally tend to have smaller absolute advantages – for instance, the volume of data and economic competencies – and usually must rely more on other factors than scale to compete. To be competitive, and to move closer to the digital frontier, they usually invest more in R&D, intangible assets, and other digital endowment factors leading to higher digital intensities. If they are relatively endowment poor, they become more reliant on importing key digital technologies and services. Moreover, they typically have more space for young and fast-growing firms in their economies.

[45] Bitkom (2019) "Annual Survey: Bitkom Draws Mixed Conclusion Regarding GDPR Implementation"; Cory, N., D. Castro, and E. Dick (2020) "Schrems II': What Invalidating the EU-U.S. Privacy Shield Means for Transatlantic Trade and Innovation", ITIF; Kearney & ECIPE (2020) "The Economic Costs of Restricting the Cross-Border Flow of Data", Kearney/ECIPE White Paper.

Importantly, the general point is that digital regulations tend to affect firms, sectors, and countries differently depending on their size and digital intensities. This effect is strong when we are studying the introduction of new and innovative technologies into the economy – a subject that is somewhat different from studying the effects of regulation in saturated markets and on mature economic behaviours.

There is still a substantial challenge ahead of all European economies to *diffuse* existing digital technologies and services in the economy. In other words, all countries need to improve the adoption and the use of digital technologies and services in many sectors and firms. Unfortunately, time is of essence as the competitiveness of firms that are developed early in a technological shift tend to be persistent over time. While laggard countries could be catching-up in the future, and benefit substantially from doing so, differences in economic performance are still likely to persist because frontrunners and early adopters develop more quickly the human capital, and the firm assets and know-how associated with new technology.[46] And these assets – human capital and firm structures – tend to have lasting impacts on the technology-induced economic performance of a country or a region. Hence, restrictions on the flows of digital technologies and services in the economy are crucially important.

Let us now look a bit closer at the country groups that we laid in the beginning of this chapter and connect them with the effects of regulations. To advance the analysis of how these regulations will impact different economies, we will sort them along the three types of technologies: transactional technologies (online platforms), informational technologies (cloud, big data, AI), and operational technologies (robotics and 3D). Table 1 provides an overview of these types of technologies and the importance to different economies (the country groups) of restrictive regulations – regulations that restrict the use of endowments, advantages, and flows. The table also evaluates which of the three country groups that are likely to be more affected by restrictive regulations given their current endowments, advantages, flows, and policy structures. The rank in each category is based on the data presented in this paper.

[46] Bjorn Brey, 2021, "The Long-run Gains from the Early Adoption of Electricity", ECARES working paper 2021-23.

TABLE A1: TYPES OF TECHNOLOGY AND THE EFFECTS OF RESTRICTIVE REGULATION

	Transactional (online platforms)	Informational (cloud, big data, AI)	Operational (robotics, 3D, IoT)
Exploiting endowments	1. North 2. CEE 3. EU6	1. North 2. EU6 3. CEE	1. EU6 2. North 3. CEE
Exploiting advantages	1. North 2. CEE 3. EU6	1. North 2. CEE 3. EU6	1. EU6 2. North 3. CEE
Flows: trade intensities and small-firm inclusion	1. CEE 2. North 3. EU6	1. North 2. CEE 3. EU6	1.EU6 2. North 3. CEE
Current policy design: conform to endowment and advantages?	1. North 2. CEE 3. EU6	1. North 2. EU6 3. CEE	1. EU6 2. North 3. CEE

Source: The categories are drawn from Mary Hallward-Driemeier et. al., 2020, Europe 4.0: Addressing the Digital Dilemma, World Bank.

Naturally, all country groups will be affected by regulations that restrict certain aspects of a technology – the economic value of the endowment, for instance, or the exploitation of a comparative advantage in digital services or industrial AI. We assess in Table A1 how each country group is impacted along two different dimensions: the general competitiveness of the digital services and industry, and how smaller firms can potentially grow further given that many countries (such as in the North and the CEE) have smaller markets.

Transactional and online platforms have substantially increased the *competitiveness of existing industries* in all country groups, but especially in the North and EU6. They are great users of digital technologies nowadays, and some countries are also at the forefront of creating them. For instance, firms in the North are much more active users of B2C websites and apps through which they sell online. And the general observation is that the intensity of transactional and online platforms is higher in the North than in the EU6 (and, of course, the CEE). In other words, given the digital intensity in endowments and advantages, restrictive regulations on these two types of technologies will have a larger impact on output in the North than in the EU6 and the CEE groups. This policy is reinforced by the current structure of policy: policies in the North are more focused on allowing the comparative advantages in digital intensity to impact on the economy.

On the other hand, the growth and usage of online platforms also improve firm performance in CEE countries, and the effect comes to a large extent through the different flows – for instance, through trade and small-firm growth. While the proportion of firms in the CEE

region using transactional and online platforms is the lowest in Europe, these technologies provide CEE firms with a vehicle to reach customers and partners, thereby helping the region to improve market inclusion by allowing their smaller firms to grow. Many CEE countries have strong market dynamics with many young firms that are still relatively small but are growing. Their policy is partly designed to exploit that advantage – but only partly: the CEE group would benefit substantially from reforms that reduce the restrictiveness of regulations that concern access to digital technologies and services. A greater use of transactional platforms is directly connected to the CEE group's ability to raise firm productivity. Restrictions may therefore cut access to these platforms or slow-down their diffusion which will have a stronger effect in the CEE group. While flow intensity is also important for the North, it is less important for EU6.

There is a similar pattern if we look at informational technologies. On the production side of the economy, innovative technologies such as cloud, big data, and AI are first and foremost impacting the large cloud providers in EU6 countries and the digital intense services firms and sectors in the North. While the North has endowments and advantages defined by intensity, the EU6 has smaller (but good) intensities but stronger size endowments and advantages. Consequently, restrictive regulations are more likely to have a stronger production and competitiveness impact on the North than on the EU6 since the latter group can fall back on its economic scale. This pattern is also visible in current policy differences between the North and the EU6: policy in the North is more tailored for digital intensity and policy in the EU6 aims more at supporting size advantages.

Obviously, the CEE group also profits from a more competitive market for innovative technologies, but in a different way. These markets help reducing coordination costs for firms using these technologies – for instance, in their participation in fragmented supply chains. Moreover, as cloud and ML / AI technologies are often embedded in computer software services, and other IT services, scaling up these technologies in Europe could help a CEE country like Romania, for instance, which has developed itself as an ICT hub in recent years.

Lastly, operational technologies such as IoT and 3D that automate industrial production are mainly of concern to the larger EU6 countries. Germany, as a strong industrial powerhouse with many large manufacturing firms, stands out. Another notable country is Italy, which is a big robotics producer and a country with some scale advantages. Italy is also a big user of IoT technologies on a per capita basis and is in line with the EU average on the adoption of 3D printing. On a per unit firm basis, Sweden, the Netherlands, and Denmark are also big users of these technologies because they have an industry structure

that caters towards operational technologies. Operational technologies are capital intensive and usually is more common in firms and economies with size advantages.

For the CEE group, the picture is also mixed. Some CEE countries have the lowest use of operational technologies (e.g. Lithuania and Poland), but others are above the EU average. Slovenia, Slovakia, and the Czech Republic come out well in the comparison – partly because they have significant volumes of industrial outsourcing. In CEE countries with low adoption (and creation) of operational technology, there is a clear risk they will trail other countries even more. As many of these technologies favour big firms and have the purpose of saving labour costs, these technologies can sometimes be in direct competition with the current cost advantages of CEE countries.

Digital services and industries share several features that makes them a strong contributor to productivity and economic specialization. For starters, digital sectors make it easier to offshore business activities and creative efficient structures of supply. That helps countries to tap into services like Business Processing Outsourcing (BPO), which are performed with advanced software tools and the Internet. Often, a lot of cross-border trade in business services builds on this type of outsourcing activities. Through trade, it allows countries to better use endowments and exploit cost and comparative advantages, and thus to advance their growth potential. Moreover, because trade costs are low for services traded over the Internet (often through online platforms), cross-border integration in digital technologies and services also enable smaller players to participate in outsourced trade.

Second, compared to many other services and industries, digital sectors also include a great deal of R&D activities. These innovative activities are often performed with other intangible capital that firms have built up over the years. Data is an obvious and important example of this intangible capital. However, we also know that one intangible asset underperforms when not combined with another intangible assets, such as innovative property, market research, and scientific R&D. Indeed, seminal research clearly shows that different types of intangible capital are complimentary and, when they are combined, have clear so-called "spill-over" effects. The effective use of one intangible capital stimulates the productive use of another, and the combined use generate greater economic benefits for firms.[47]

This observation is important in light of some regulatory trends (for instance, in the Digital Markets Act) that aim for a control over how different endowments like data should be combined, or – rather – not combined. Intangible capital or digital endowments should be combined with other assets and endowments, and that usually happens through market cooperation. Regulations that have the effect of locking assets into a firm, sector or country

[47] Jonathan Haskel and Stian Westlake, 2018, *Capitalism without Capital: The Rise of the Intangible Economy,* Princeton University Press.

prevent smooth market cooperation between different assets and endowments, and give a premium to those with the capacity to host all relevant assets "in house" – especially large firms and large countries. Take the basic tenet of the proposed AI regulation, which seeks to define the degree of regulatory restriction based on the ethical risks associated with a certain type of AI development. It combines a categorization of risk with a categorization of market access for certain types of applied AI technologies. This may be the right approach to regulating AI, but there will be indirect costs following on the heels of the regulation. Such an approach to regulation tends to discourage offshoring and favour corporate solutions that make assets indivisible. There is then a direct benefit of keeping all assets in the same company and the same country to avoid regulatory risks associated with offshored or fragmented assets.

An example of this is digital intermediate services – a big part of the digital services market. Providers of digital services are great "sellers" of their intermediate inputs to other downstream sectors. For instance, cloud services are used by many companies as an intermediary input, and when the digital assets of a cloud provider are combined with, say, the intangible R&D assets of a car manufacturer, the net result is greater than the inputs. There is a rich academic literature suggesting that services inputs, free from restrictive regulations, generate greater productivity and trade benefits for downstream users, in particularly industry sectors. For instance, in OECD countries as well as less developed countries, a more restrictive policy environment in services has a negative knock-on effect in economy-wide activities. More recently, studies have found that this also matters for regulations of online platform technologies and data, showing that restrictive regulations are also negatively associated with business performance in using industries and services.[48]

A final economic aspect of the digital sector that is important is that it helps firms to scale up. Data as well as digital technologies and services need scale to become useful, and this is a feature that digital services share with the manufacturing sector. Market size is therefore an important ingredient for higher productivity. Traditionally, the need for producers to stay close to consumers in many services, and the fragmentation this entails, has often prevented the pursuit of higher productivity gains. Thanks to digital technologies, this "proximity burden" has gradually been removed by new ways to promote storability, modifiability, and transferability in many digitally-intense services – just like in the manufacturing sector. Increasingly, this happens to digital-enabled business services too. Scale is also an important factor for the ability of firms to combine accumulated capital with technologies, such as in the creation of cloud and data centres. These activities are very expensive.

[48] Martina Ferracane et. al., 2020, "Do Data Policy Restrictions Impact the Productivity Performance of Firms and Industries?", *Review of International Economics,* Vol. 28:3; Martina Ferracane and Erik van der Marel, 2020, "Patterns of Trade Restrictiveness in Online Platforms: A First Look", *The World Economy,* Vol. 43:11. Martina Ferracane and Erik van der Marel, 2021, "Do Data Flows Restrictions Inhibit Trade in Services?", *Review of World Economics,* Vol. 157:4.

These observations concern the firm and market mechanics of digital endowments, advantages, and flows. They make an important context for understanding how new digital regulations can interfere with natural and technology-driven market and firm changes, and have strong impacts on economic outcomes. These outcomes are indirect and less associated with the direct costs of a regulation already identified by the European Commission. The DSA is a case in point.

As noted previously, there are several parts in this regulation that will create new administration and compliance costs for online platforms. However, the DSA is most likely to prompt indirect costs as well. For instance, it is likely to reduce the incentives to outsource business activities to third parties. Consider the DSA provisions that create "know-your-customer"-type of rules for platforms, which will make it far more likely that platforms will separate business services connected to users of platforms, and that user firms will contract with platforms. Another example: the DSA requires platforms to maintain the traceability of traders, and that process will likely make data services less divisible. Companies will be less incentivised to outsource and offshore such services. Moreover, such a regulation raises the cost for hosting transactions on a platform, and small traders that do not generate much income for a platform are likely to feel the pressure. Probably, some platforms will reduce the ability of small traders to transact on the platform, leading to market exclusion effects and improving the size advantage of big firms.

The broader issue is the general access to online platforms for businesses and how that brings advantages and disadvantages between firms, sectors, and countries. If big platforms are cautious and exclude those for which the costs are too high, it would especially disadvantage small and young firms. Hence, countries with a high proportion of small and young firms would be more damaged than countries with big and old firms. These disadvantages would affect CEE countries the most – and not just because of their high share of small and young firms. Some of the CEE countries also have a disproportionate share of digital services that gain from activities mediated through transactional platforms.

Furthermore, other elements of the DSA will also have the effect of raising the transaction cost for using platform services. Adding various forms of regulatory burdens – like requiring independent audits of systemic platform risks and transparency on online advertising – and threatening with very high penalties in the event of non-compliance do not just lead to a direct cost. If there is a raise in VAT or import tariffs, the real cost does not come from the increased bill or import duty but the changes in market behaviour they generate. The same conclusion holds for regulations: they can increase the administrative cost, but the real question is what behavioural change and resource reallocation they prompt by firms?

The big economic risk with the DSA, and the DMA, is not the administrative burden. It is the market access and the services that will no longer be available or affordable which should take up our attention. Higher transaction costs from digital regulations, for instance, have the effect of raising the cost of intermediate services, which influences intermediate sales downstream. Such costs affect every user, but they especially have an impact on downstream industries that benefit from competitive services.

Similar questions should be asked about the DMA: how will resources be reallocated, and how will market behaviour change, because of the regulation? Again, the Commission's impact assessment finds dynamic gains of the DMA, but – incredibly – no dynamic costs, only direct compliance costs. But the challenging provisions in the DMA relate predominantly to digital endowments and the restrictions of them – specifically, how firms can build up and use intangible capital. These restrictions will almost certainly prompt economic costs, and these costs will motivate resource reallocation between big and small firms and countries.

As discussed above, there are strong complementarities between different types of intangible capital. The ability of a firm to build up data, for instance, will impact its capacity to spur innovation in the wider R&D ecosystem – in areas such as AI, app development, cloud computing, and more. This is the key point in the Commission's new thinking about industrial policy. If one type of capital or assets in a sector is inadequate, it will affect the quality of other capital and assets. Hence the need to consider the entire *industrial ecology:* how different capital and assets are developed and combined with each other. For instance, the Commission says that for Europe to be competitive in electric vehicles, there is a value to have access to research and competitive output in vehicle batteries. Similarly, to be at the frontier of developing green steel, a firm or a country need access to competitive hydrogen. The same holds for digital services: to be competitive in downstream digital services, companies and countries need competitive platforms.

However, the DMA builds on the assumption that endowment or asset combination should be prevented, if they are pursued by gatekeeping platforms. A core part of the DMA has the explicit intention of making it harder for firms to combine different sets of data, and the obvious result is that gate-keeping firms will have to reduce the usefulness and competitiveness of the services they deliver or otherwise would deliver in the future. Other provisions have the same effect of influencing how companies build up data as an intangible capital, even though the language is softer and the actual content remains to be further specified. Evidently, these parts of the DMA are most inhibiting for the big data supplying countries – countries with endowments and that have built comparative advantages based on these endowments – offering innovations on the back of transactional

and information technologies. Countries like Sweden, with relatively strong endowments and home to data generated by gate-keeping platforms, will obviously be affected.

Moreover, several parts of the DMA aim at other innovation features of digital firms such as advertising and search engine development. Several articles of the DMA come close to trespassing on the intellectual property of gatekeepers. These obligations could reduce the endowment value of the propriety information of digital firms, thereby reducing the incentive to develop other services with new innovations. The general issue is that these articles can force the disclosure of algorithms, trade secrets, and other intellectual property directly connected to endowments and that are combined with other intangibles and used to create digital services. These restrictions would in particularly hurt the countries that show very high-level R&D activities such as Belgium, the Netherlands, Denmark, and France.

Endowments and advantages may also be affected by the DMA when it comes to scale. A more structural constraint that the DMA prescribes is the definition of gatekeepers. In Article 3, the DMA clearly sets out under what conditions digital firms are designated as gatekeepers. Regardless of the exact threshold for designation, the article aims to regulate the aspect of scale that the big digital firms enjoy. This could influence market and resource reallocation. Scale is an essential feature for the big online platforms, but also for other digital firms that are building up capacity for technology and innovation. And even though the relationship between firm size and productivity benefits is somewhat weaker in services compared to manufacturing, this link is nonetheless the strongest for ICT services. Digital technologies have reduced the need for the physical proximity in these services, allowing firms to offshore tasks as they scale up – something that some CEE countries are already profiting from.

As a result, the threshold that defines the designation of gatekeepers could provide an incentive for digital firms to self-impose a limitation on scale to avoid burdensome regulatory obligations. And this is not just about the DMA; the DSA also comes with stronger regulatory obligations for so-called "very large platforms". Such a self-limiting effect is particularly likely if the quantitative threshold is too strict, narrowly defined, or subject to changes. Interestingly, on that latter point the DMA empowers the European Commission to adjust the quantitative metrics for designating gatekeepers. Moreover, the DMA also allows the Commission to identify gatekeepers by qualitative means, after a market investigation takes place. Such an approach could create uncertainly in the market and could potentially lead fast-growing platforms to conclude that they prefer the status quo and to avoid changing the business strategy even if new opportunities are presented. After all, a designation can imply losing the opportunity to keep trade secrets, which would have a knock-on effect on endowments and advantages.

The core message of this analysis, and in chapter 2 and 3 of the paper, is that digital regulations come with costs that extend widely beyond the direct costs that the Commission has taken stock of in their impact assessments. These costs will be distributed differently across firms, sectors, and countries – depending on their modern digital endowments, the costs and benefits that emerged from these advantages, and the flows generated from them. It is highly likely that these distributive effects will be substantial. Moreover, they are likely to be exacerbated once current policy structures, and how new digital regulations relate to existing policies, are factored in.

Obviously, current industry structures will be a main determinant of how the gains and costs of the new digital regulations will be distributed across countries. Importantly, size will matter for the distribution of the effects. Young, small, and fast-growing firms will be more exposed than large incumbents. Likewise, countries with size advantages will fare better than countries with size disadvantages. Countries that have developed comparative advantages in digital intensities and digital niches may find that current and new regulation will prompt an asset reallocation towards countries that are big and have big firms. Countries that produce and export digital services disproportionate to their size are likely to feel the strongest effect of restrictive regulations. Often, these are smaller countries that do not control the full value digital chain but rely on fragmented and offshored productions structures. They rely on endowments to be made divisible to build their own competitive advantages. However, the regulations covered in this study will likely have the effect of making the value chain more indivisible. Likewise, countries that are outsourcing hubs will be affected by such a direction in the market.

In the country groups we have studied, the North and CEE countries are likely to face higher costs and be more affected by the economic reallocation that digital regulations prompt. They are smaller economies with few size advantages, and they also have higher shares of young and growing firms. Their pattern of specialisation in the digital economy as well as the entire economy build on these important factors.

The EU6 group will also be affected, but in a different way. Given their economic and firm structures – and the relative size advantages they enjoy in the European economy – they are likely to see some benefits from the economic reallocation. The more that regulation forces endowments to be centralised and indivisible, the more economic opportunity will be created for large economies and large firms. There will also be costs for countries like France and Germany, but these costs are likely to be different from the costs that the North and the CEE groups will carry.

ANNEX – COUNTRY REPORTS

1. Belgium

Belgium shows a high level of R&D in the digital sector, and a higher percentage of firms using digital technologies than the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 25 thousand people worked in the apps sector and in 2019, 31% of businesses used e-commerce to sell their products, which is above the EU average. This specialisation results in higher digital intensities – and digital advantages that lead to a strong flow of resources. Trade in digital services represents 5% of Belgium total trade. On a per capita basis digital services trade is above the EU average.

TABLE 1.1: DIGITAL INDUSTRY STRUCTURE

	Belgium	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	2.3	2.6
Number of fast-growing firms per 100,000 people (2018)	1.3	3
Number of data suppliers per 100,000 people (2019)	23	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	5.3%	3.2%

FIGURE 1.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

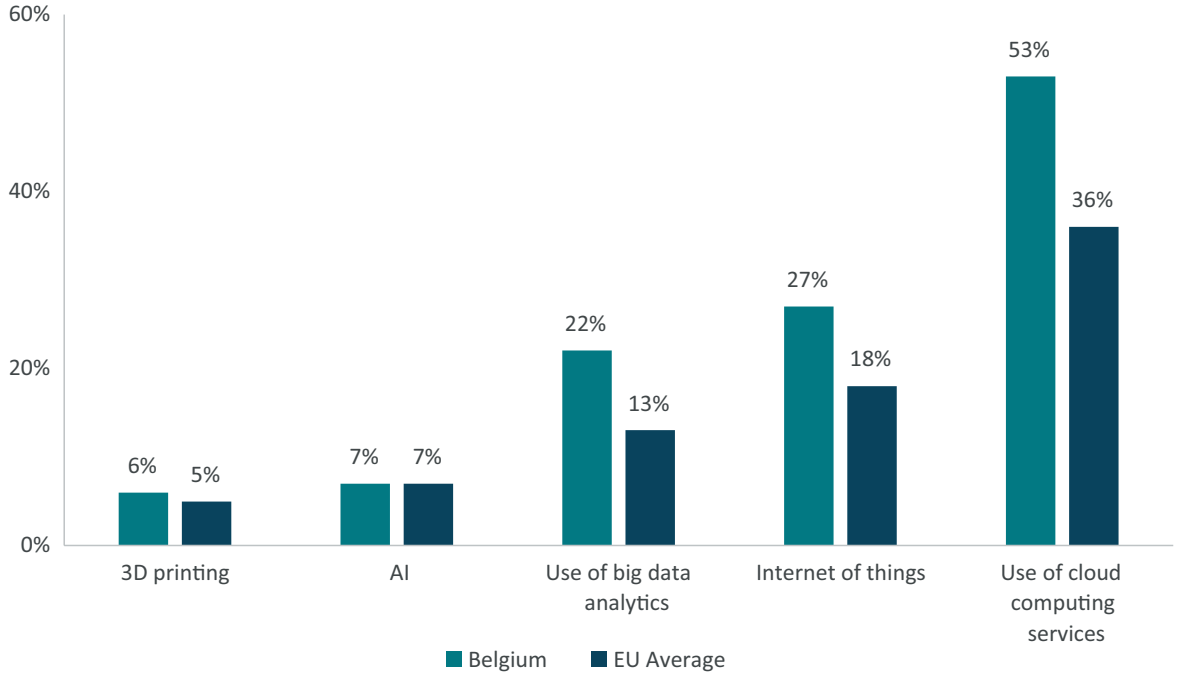


FIGURE 1.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

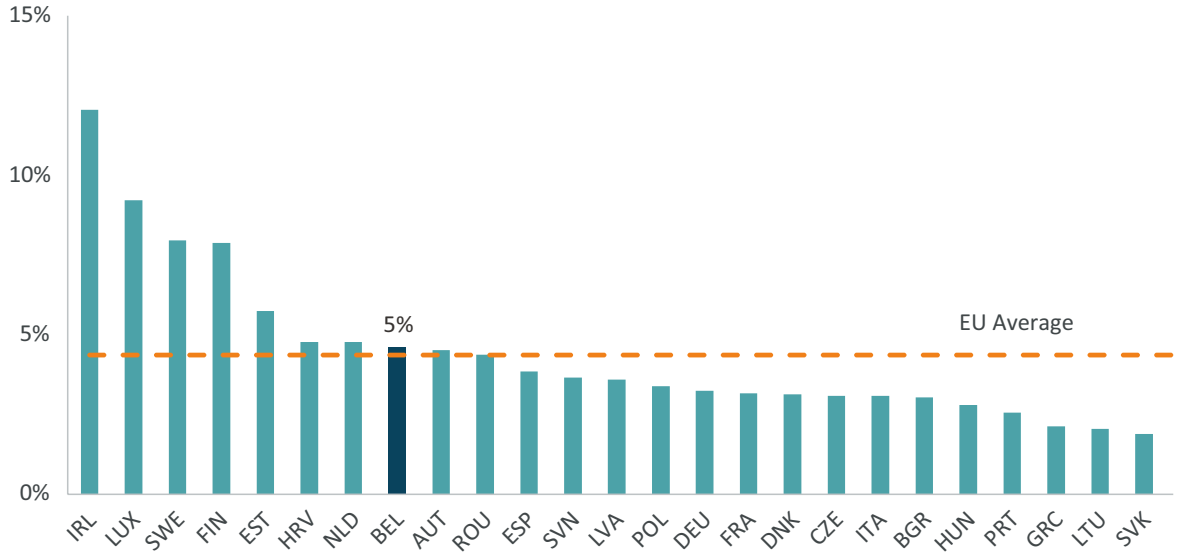
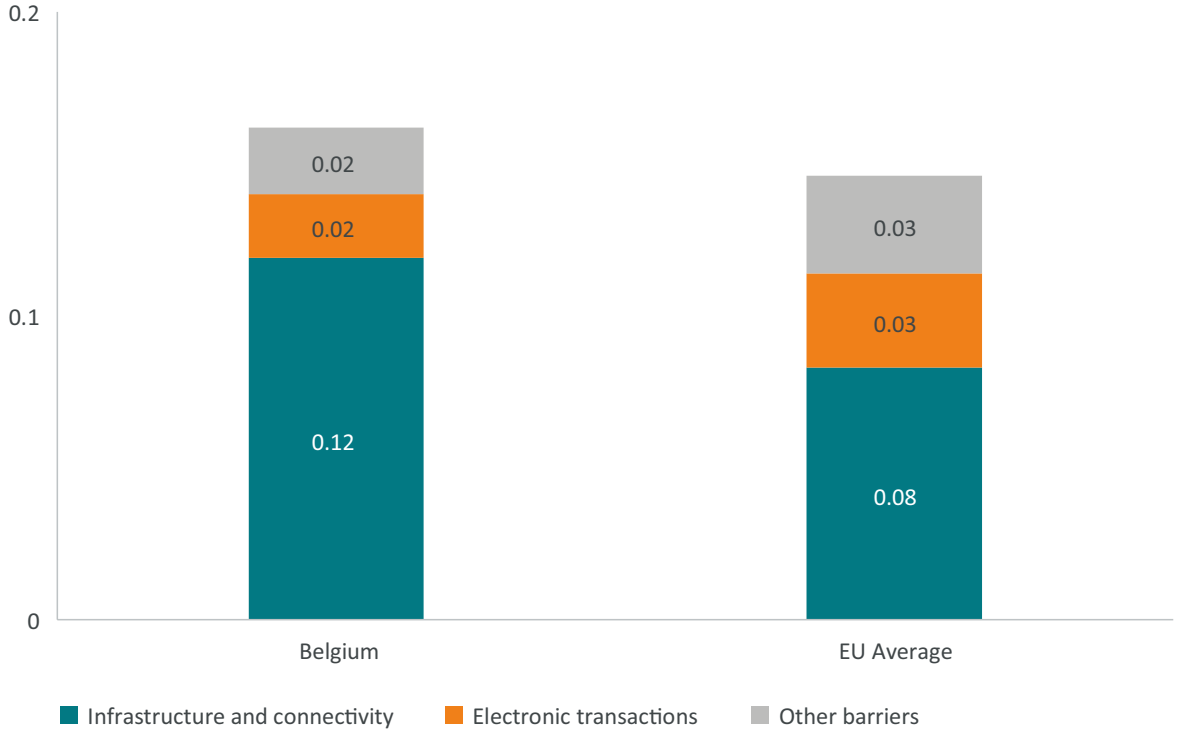


FIGURE 1.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



2. *Czech Republic*

The Czech Republic shows a high level of R&D in the digital sector, and the percentage of firms using digital technologies is similar to the EU average. Notably, the Czech Republic ranks first in the EU as users of the Internet-of-Things. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 39 thousand people worked in the apps sector and in 2019, 30% of businesses used e-commerce to sell their products, which is above the EU average. This specialisation results in a flow of resources towards digitally intensive sectors. Trade in digital services represents 3% of Czech Republic's total trade. Czech Republic's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Czech economy suffers from some of these restrictions, particularly in infrastructure and connectivity, but less so than in the EU average. Given its digital intensities and specialized pattern in the digital sector, the Czech Republic has been disproportionally affected by the indirect costs emerging from restrictive digital regulations. However, these effects are moderated by asset concentration to larger firms and participation in international digital supply chains (especially in IoT).

TABLE 2.1: DIGITAL INDUSTRY STRUCTURE

	Czech Republic	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	5.4	2.6
Number of fast-growing firms per 100,000 people (2018)	2.2	3
Number of data suppliers per 100,000 people (2019)	21	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	4.2%	3.2%

FIGURE 2.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

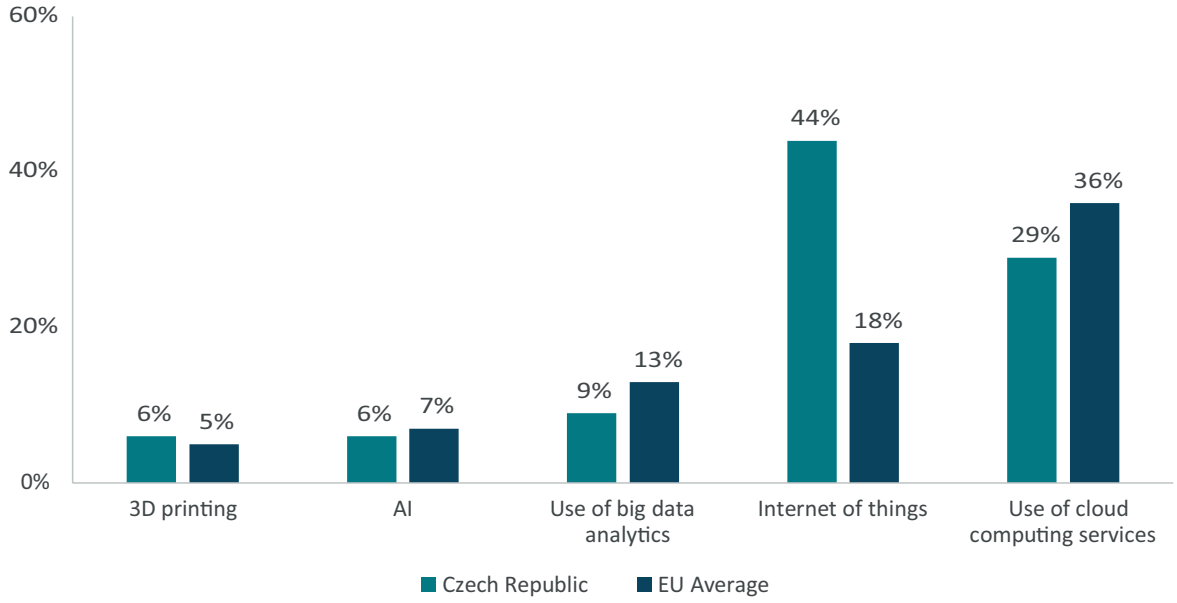


FIGURE 2.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

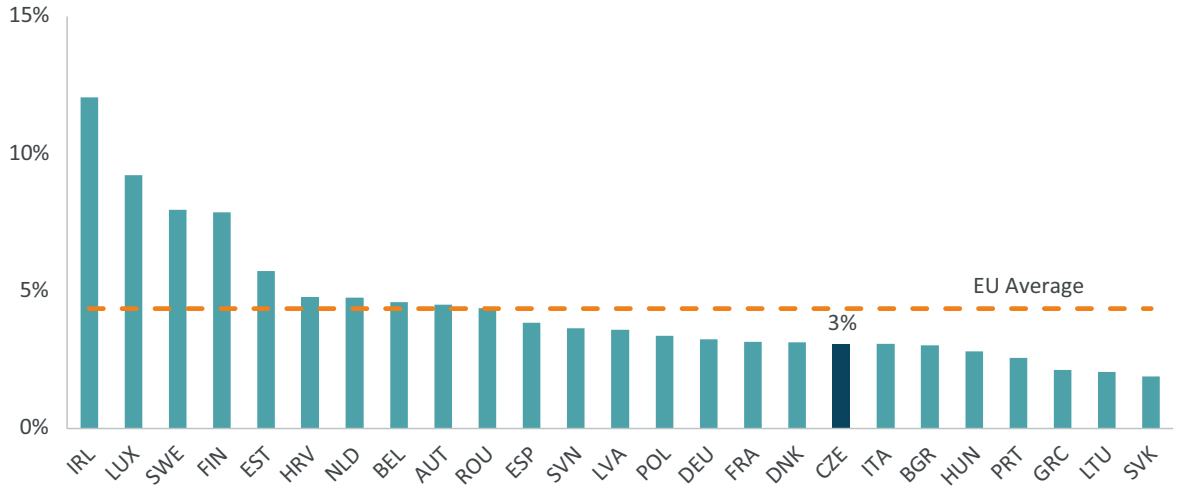
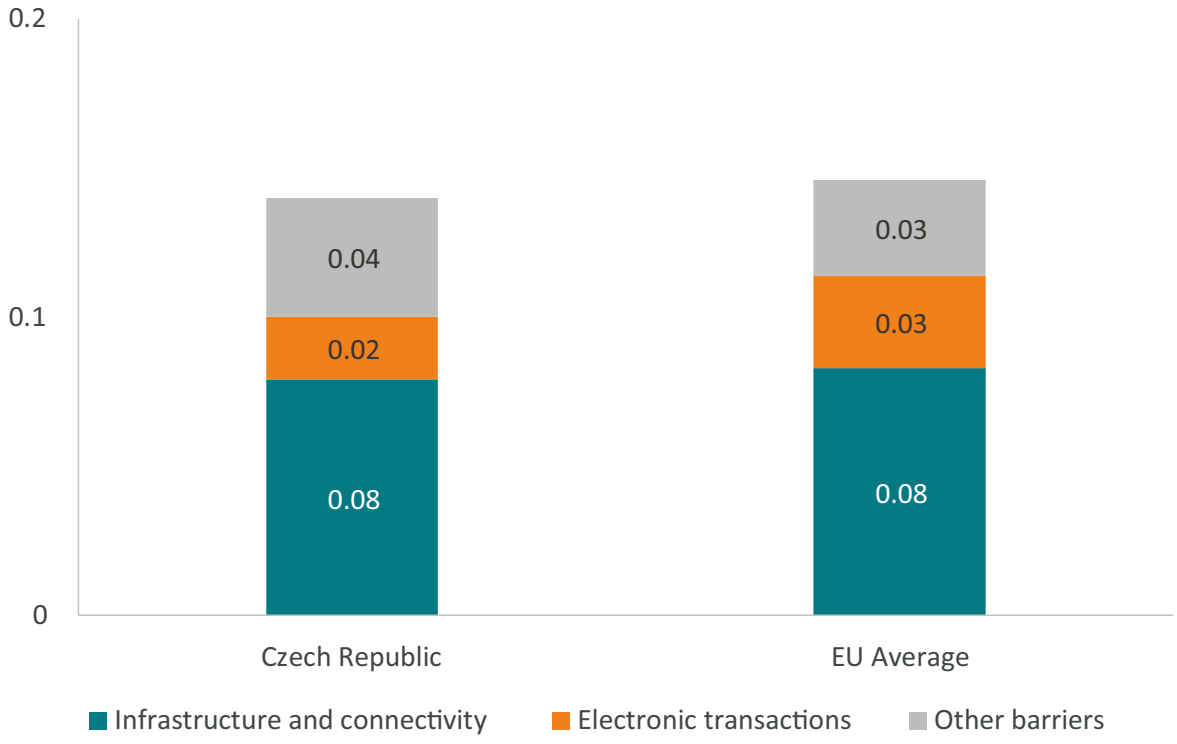


FIGURE 2.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



3. Denmark

Denmark shows a similar level of R&D in the digital sector to the EU average, while the percentage of firms using digital technologies is above the EU average. Denmark is among the top EU countries using cloud computing services and the number of data suppliers is above the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 46 thousand people worked in the apps sector and in 2019, 34% of businesses used e-commerce to sell their products, which is above the EU average. This specialisation results in a flow of resources to digitally intensive sectors. Trade in digital services represents 3% of Denmark total trade. Denmark's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Danish economy suffers from some of these restrictions, particularly in electronic transactions, but less than the EU average. Denmark is likely to have been disproportionally affected by the indirect costs of new digital regulations – and especially so its vibrant ecology of young and fast-growing firms, and its disproportionally big data sector.

TABLE 3.1: DIGITAL INDUSTRY STRUCTURE

	Denmark	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	1.9	2.6
Number of fast-growing firms per 100,000 people (2018)	4.8	3
Number of data suppliers per 100,000 people (2019)	71	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	3.5%	3.2%

FIGURE 3.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

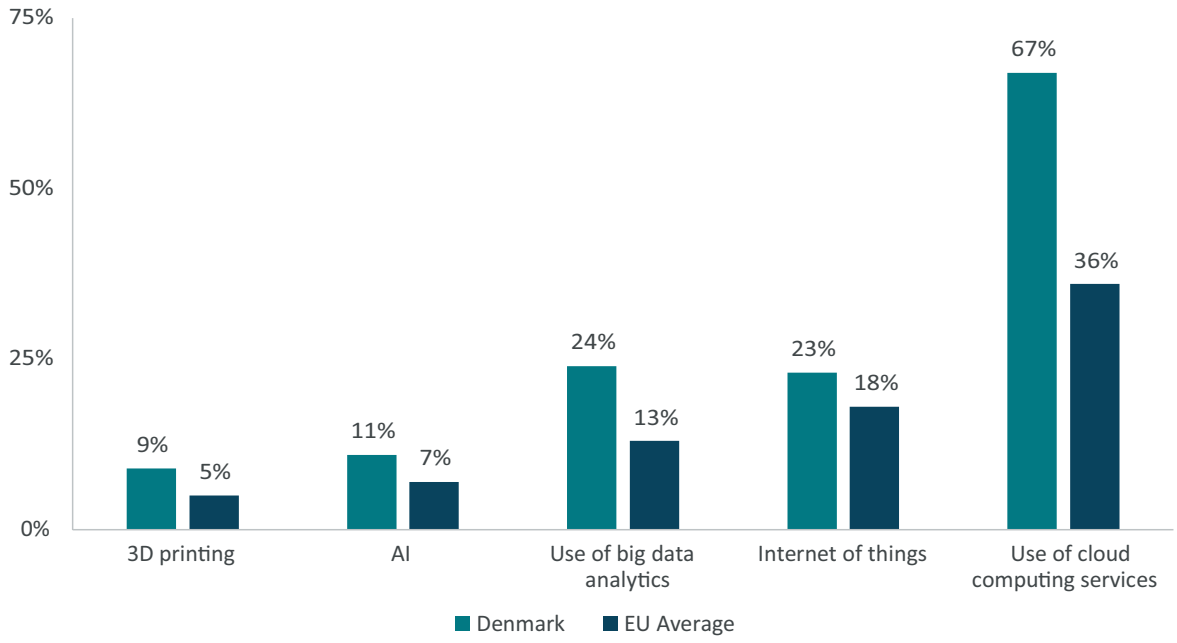


FIGURE 3.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

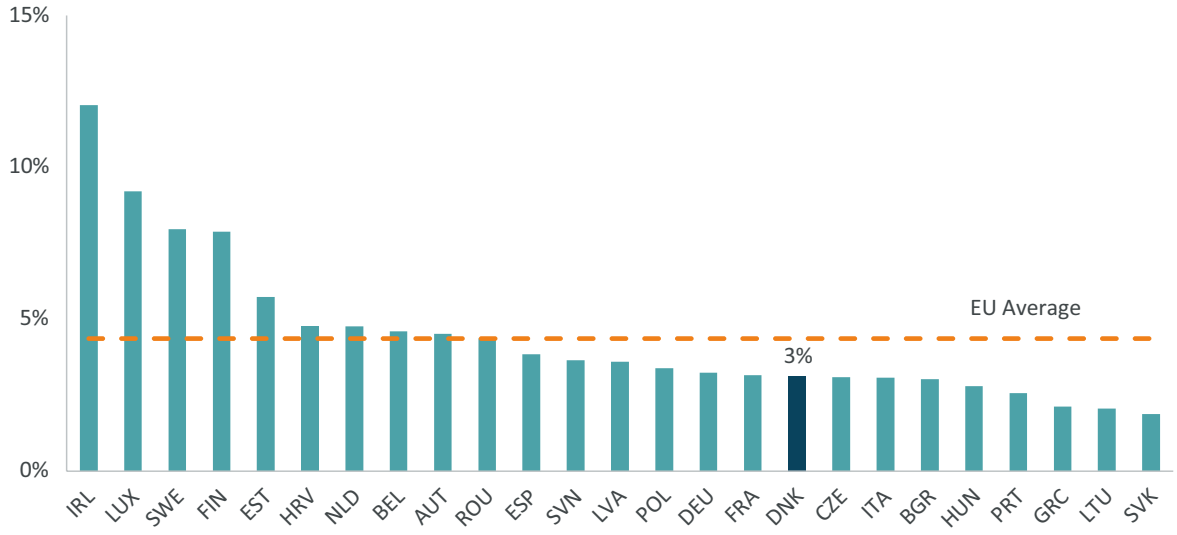
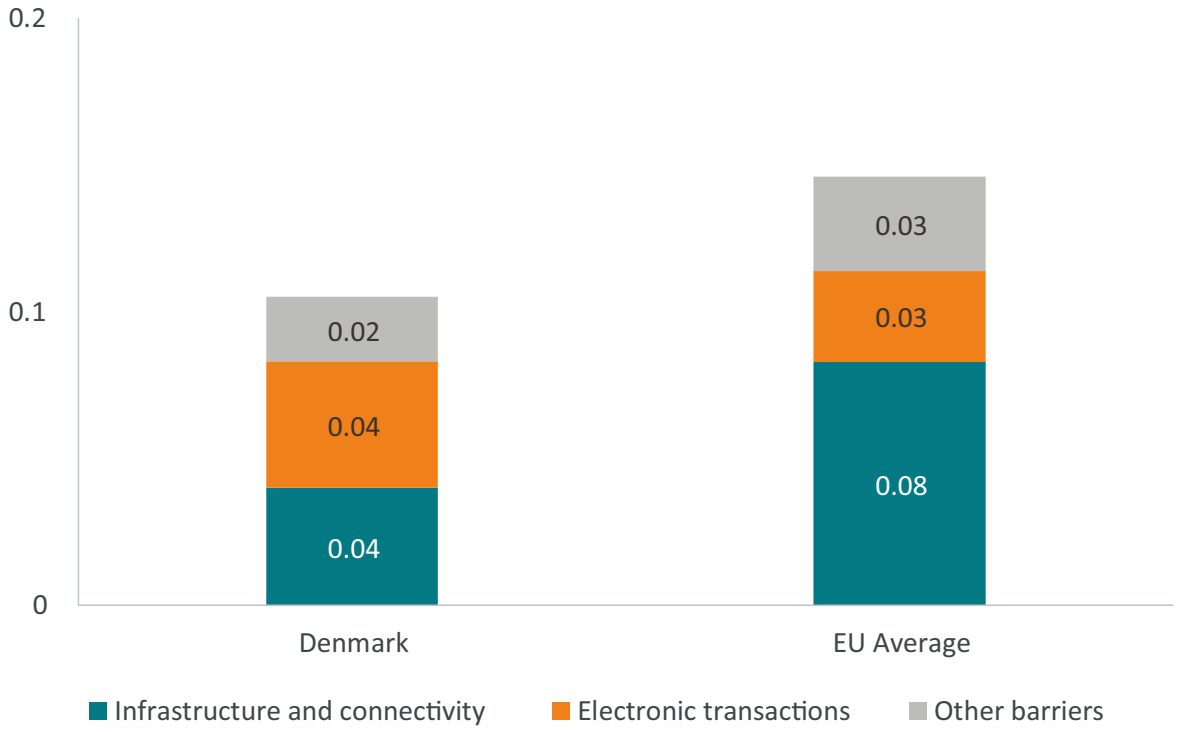


FIGURE 3.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



4. Estonia

Estonia shows a high level of R&D in the digital sector, while the percentage of firms using digital technologies is similar to the EU average. Estonia is among the top EU countries using cloud computing services and the number of data suppliers is exactly the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 21% of businesses used e-commerce to sell their products, which is similar to the EU average. This specialisation results in a flow of resources. Trade in digital services represents 6% of Estonia total trade, while on a per capita basis digital services trade is above the EU average. Estonia's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Estonian economy suffers from some of these restrictions, particularly on infrastructure and connectivity, but less than the EU average. The distributional effects of new regulations in Estonia will be stronger than in the EU due to size disadvantages and a strong specialization in digital trade.

TABLE 4.1: DIGITAL INDUSTRY STRUCTURE

	Estonia	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	1.6	2.6
Number of fast-growing firms per 100,000 people (2018)	4.6	3
Number of data suppliers per 100,000 people (2019)	42	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	4.2%	3%

FIGURE 4.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

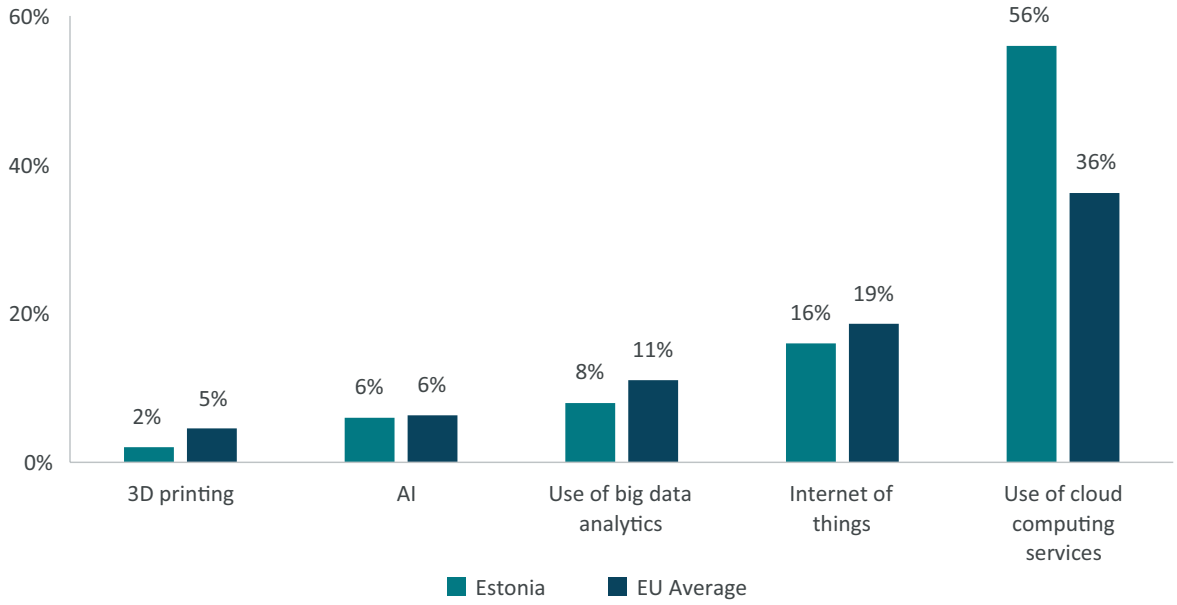


FIGURE 4.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

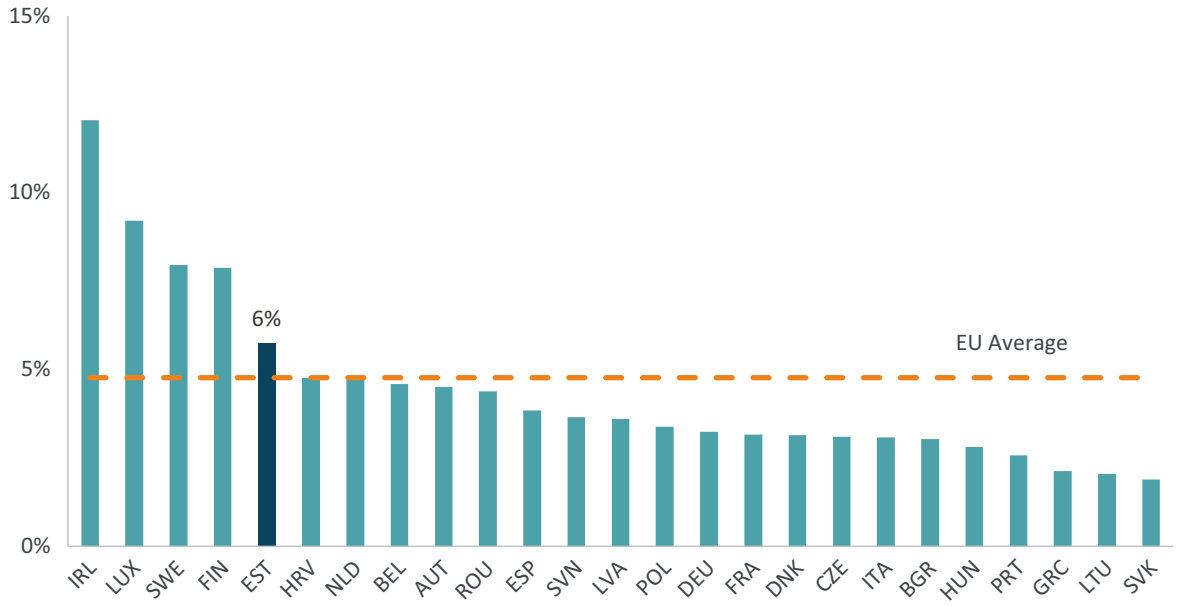
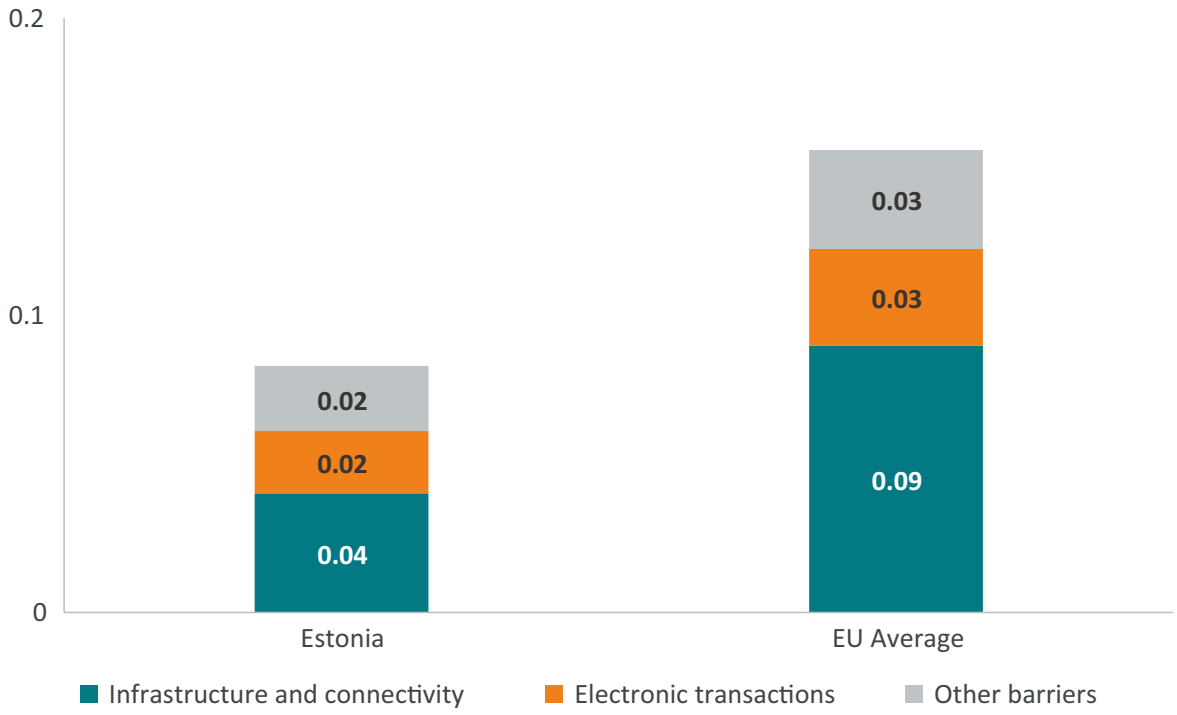


FIGURE 4.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



5. *Finland*

Finland shows a high level of R&D in the digital sector, and the percentage of firms using digital technologies is consistently above the EU average. Finland ranks first for having the most cloud computing services in the EU and the number of data suppliers is considerably above the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 54 thousand people worked in the apps sector and in 2019, 29% of businesses used e-commerce to sell their products, which is well above the EU average. This specialisation results in a flow of resources to digital sectors. Trade in digital services represents 8% of Finland total trade. On a per capita basis, digital services trade is well above the EU average, making digital specialisation in Finland even stronger. Finland's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Finnish economy suffers from some of these restrictions, but less so than the EU average.

TABLE 5.1: DIGITAL INDUSTRY STRUCTURE

	Finland	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	2.2	2.6
Number of fast-growing firms per 100,000 people (2018)	4.3	3
Number of data suppliers per 100,000 people (2019)	57	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	6%	3.2%

FIGURE 5.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

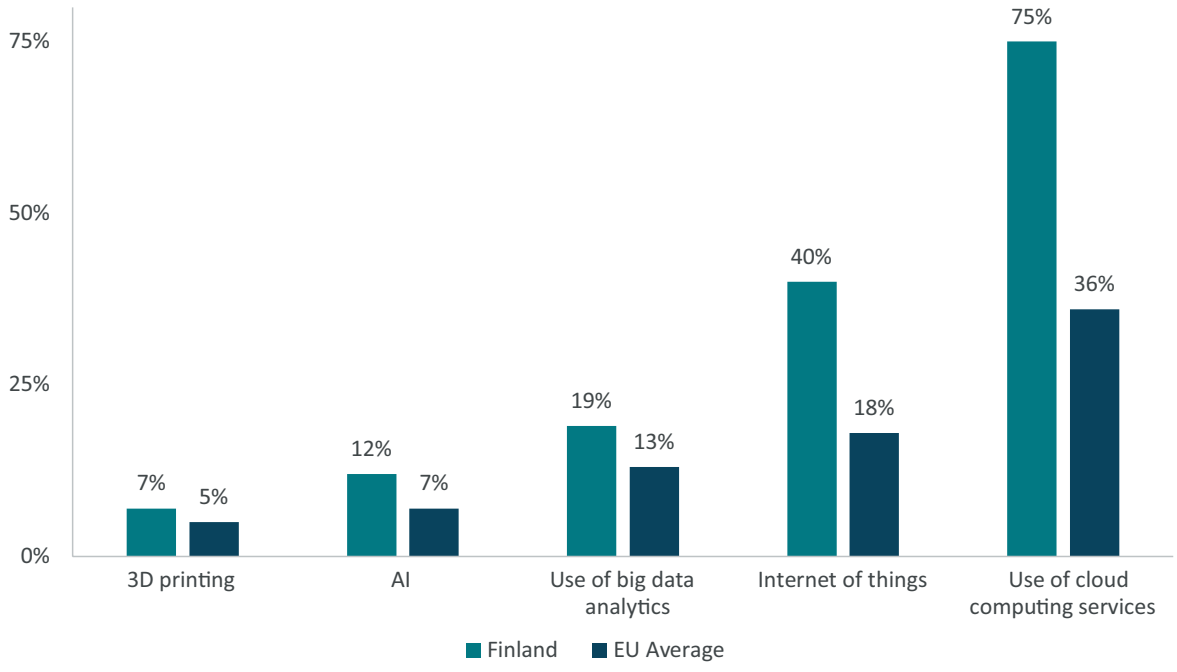
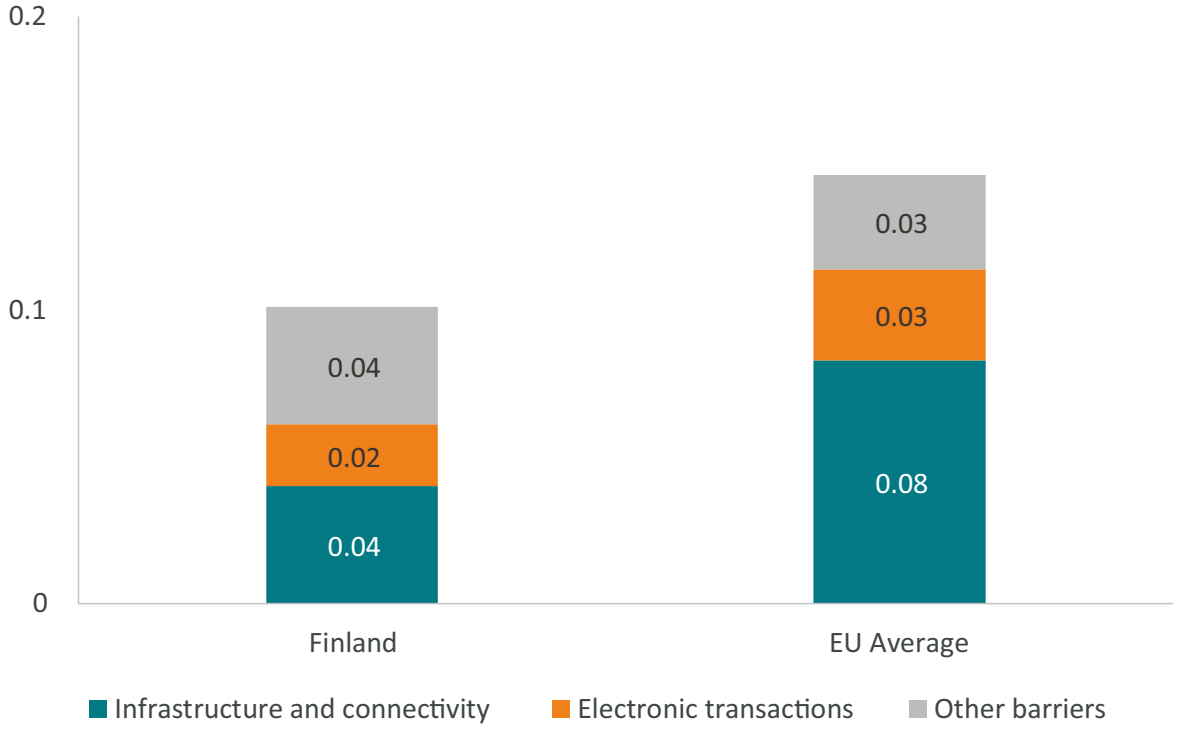


FIGURE 5.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

FIGURE 5.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



6. *Ireland*

Ireland shows a similar level of R&D in the digital sector to the EU average, while the percentage of firms using digital technologies is above EU average. Ireland is the frontrunner of the EU in the use of AI and the number of data suppliers are significantly above the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 15 thousand people worked in the apps sector and in 2019, 39% of businesses used e-commerce to sell their products, which was twice the EU average. This specialisation results in a flow of resources to digital sectors. Trade in digital services represents 12% of Ireland total trade. On a per capita basis, digital services trade is the largest across the EU. Ireland's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions.

TABLE 6.1: DIGITAL INDUSTRY STRUCTURE

	Ireland	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	1	2.6
Number of fast-growing firms per 100,000 people (2018)	5.4	3
Number of data suppliers per 100,000 people (2019)	77	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	2.4%	3.2%

FIGURE 6.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2017, EUROSTAT, SCALE 0-100%)

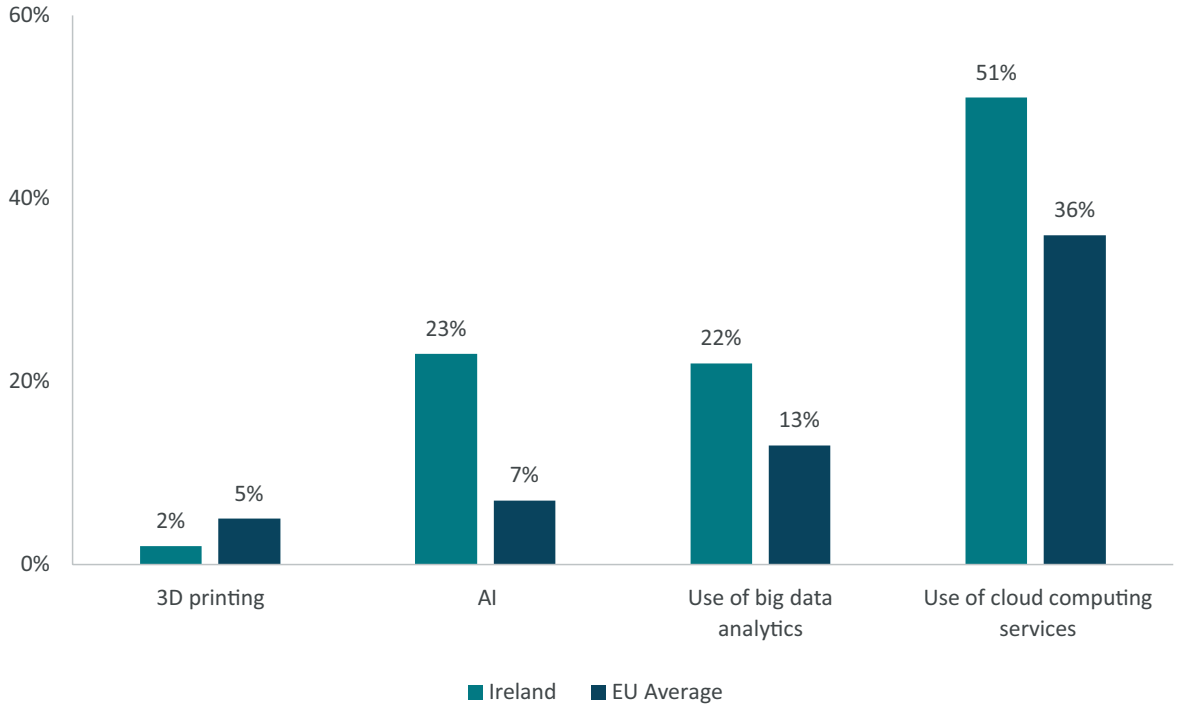


FIGURE 6.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

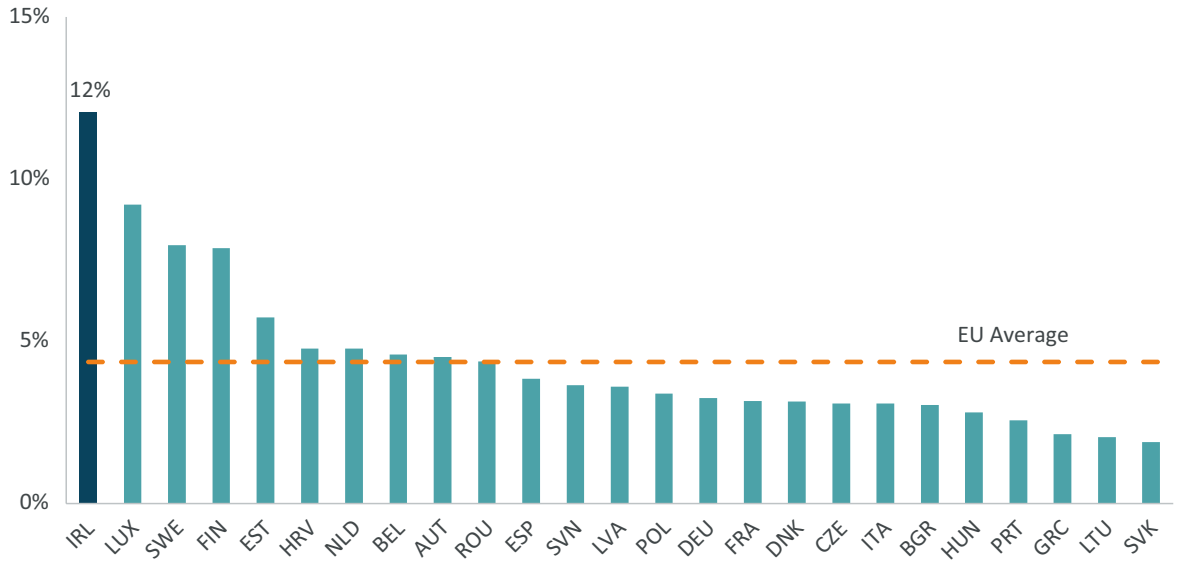
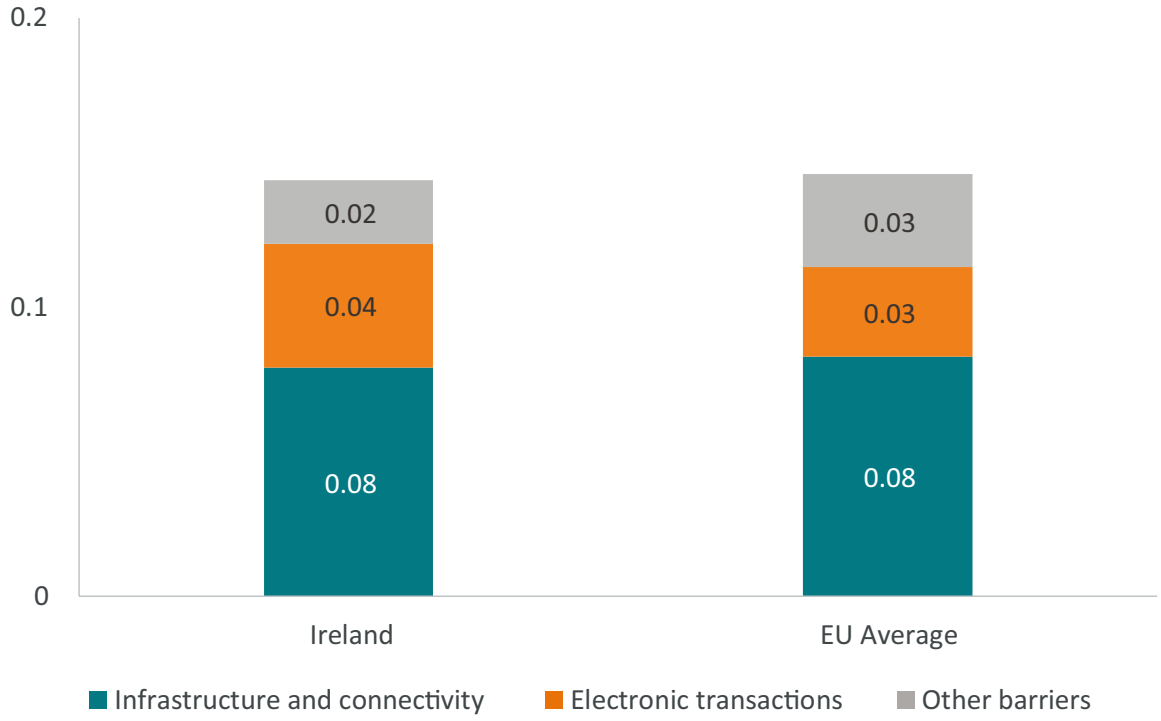


FIGURE 6.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



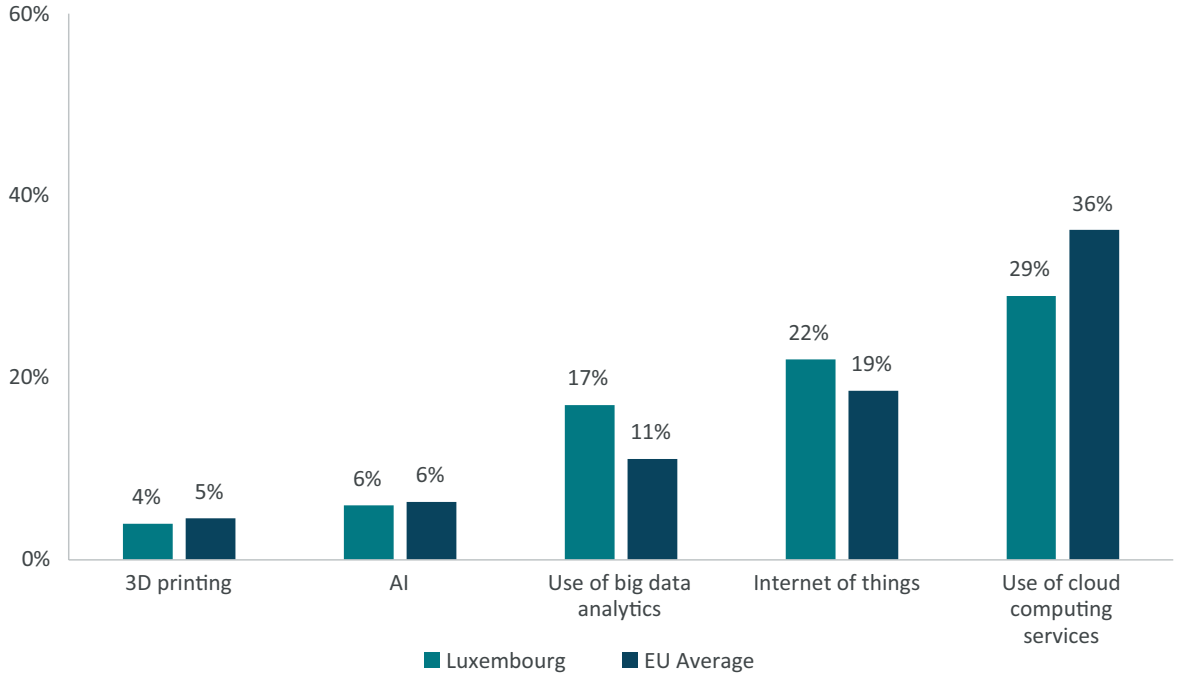
7. Luxembourg

Luxembourg shows a percentage of firms using digital technologies similar to the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 14% of businesses used e-commerce to sell their products, which is below the EU average. This specialisation results in a flow of resources. Trade in digital services represents 9% of Luxembourg total trade, while on a per capita basis digital services trade is above the highest in the EU. Luxembourg's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Luxembourgish economy suffers from some of these restrictions, particularly on infrastructure and connectivity, but less than the EU average. Luxembourg is likely to be disproportionally affected by the indirect costs of new digital regulations given its vibrant ecology of young and fast-growing firms, its size disadvantage and digital trade specialization.

TABLE 7.1: DIGITAL INDUSTRY STRUCTURE

	Luxembourg	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	0.9	2.6
Number of fast-growing firms per 100,000 people (2018)	9.1	3
Number of data suppliers per 100,000 people (2019)	93	42

FIGURE 7.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)



Note: IOT was not available for Luxembourg in 2020, instead we use the value for 2021.

FIGURE 7.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

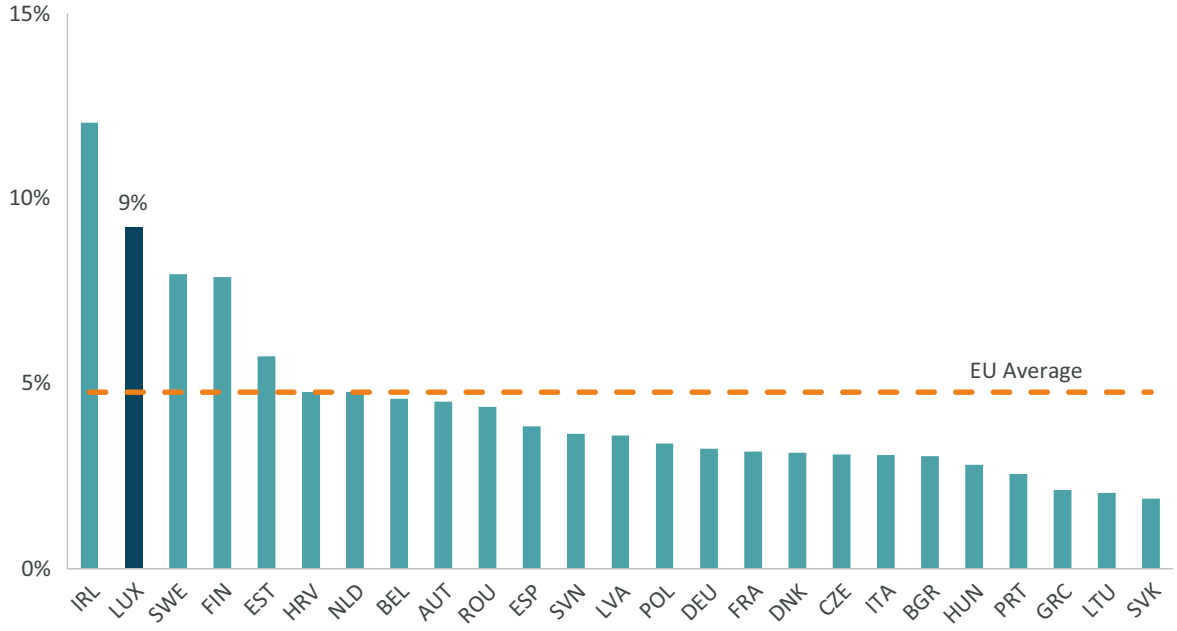
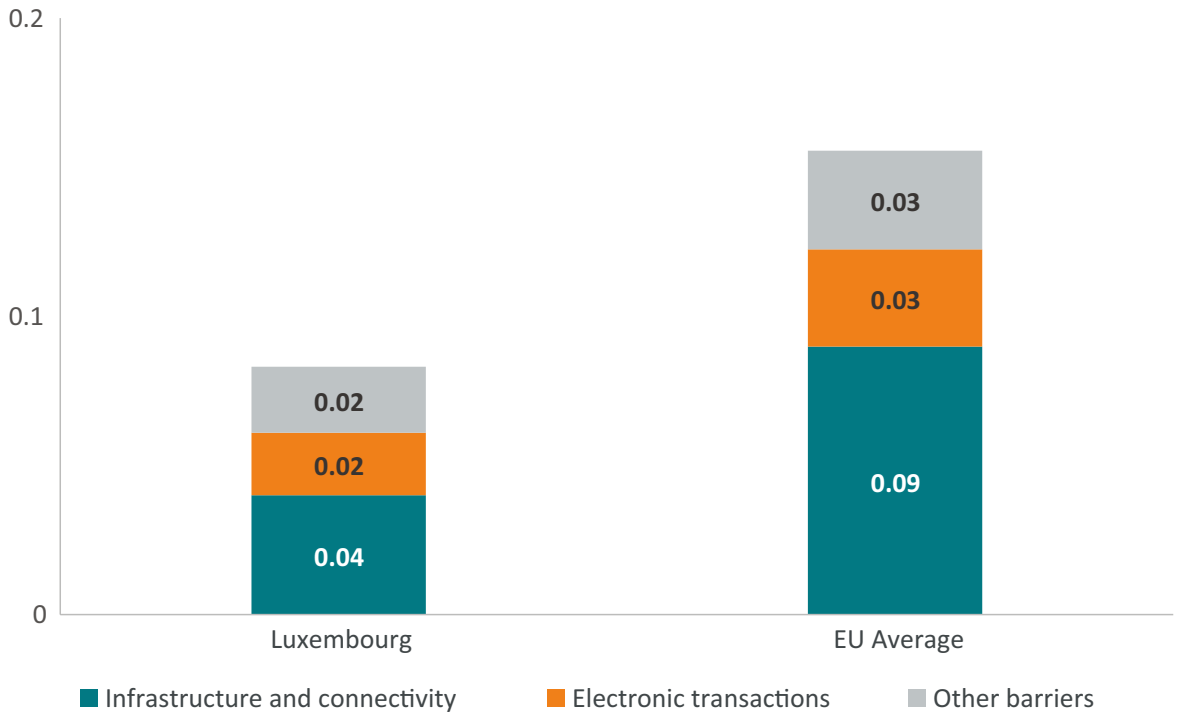


FIGURE 7.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



8. *Netherlands*

The Netherlands shows a level of R&D in the digital sector and a number of data suppliers close to the EU average, while the percentage of firms using digital technologies is also close or higher than the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 184 thousand people worked in the apps sector and 27% of businesses used e-commerce to sell their products, which is above the EU average. This specialisation results in a flow of resources to digital sectors. Trade in digital services represents 5% of the Netherlands' total trade, while on a per capita basis digital services trade is above the EU average. The Netherlands' ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Dutch economy suffers from some of these restrictions, particularly in infrastructure and connectivity. The Netherlands has higher levels of digital intensities than the EU average.

TABLE 8.1: DIGITAL INDUSTRY STRUCTURE

	Netherlands	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	2.1	2.6
Number of fast-growing firms per 100,000 people (2018)	4.4	3
Number of data suppliers per 100,000 people (2019)	34	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	3.2%	3.2%

FIGURE 8.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

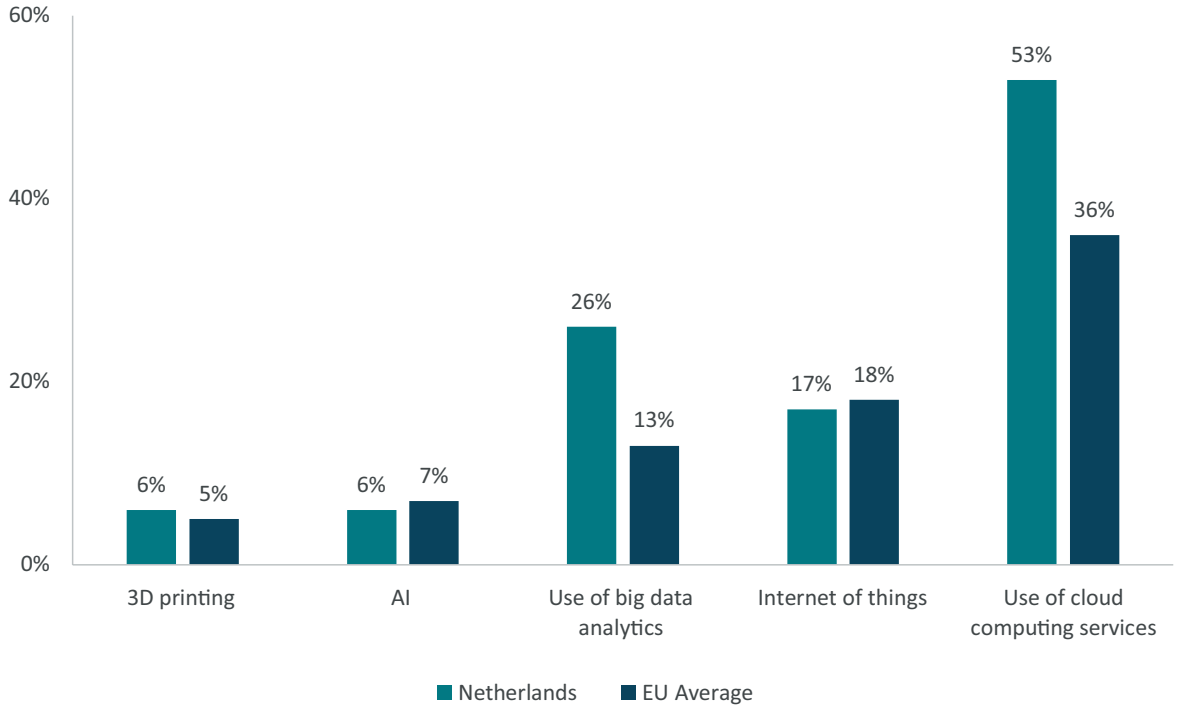


FIGURE 8.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

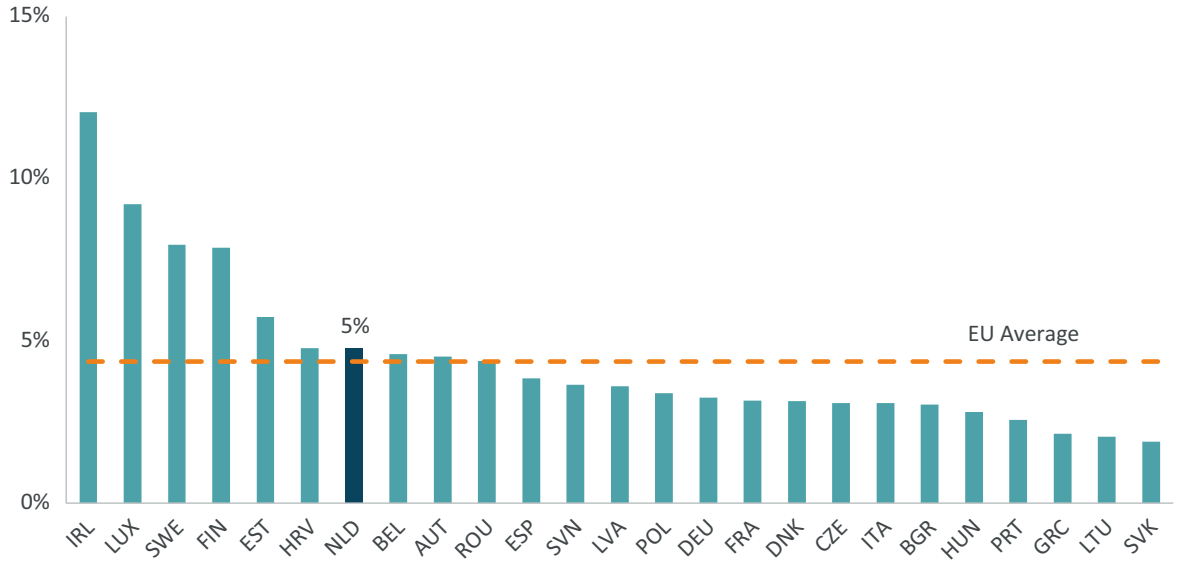
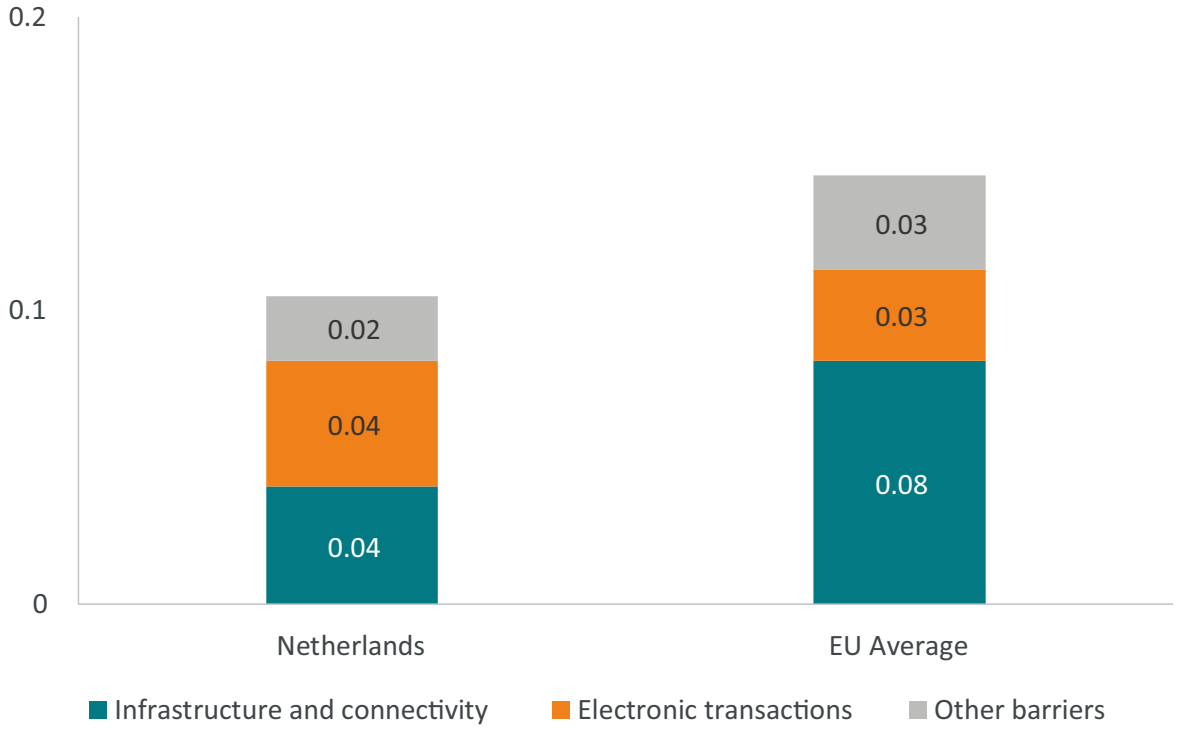


FIGURE 8.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



9. Poland

Poland shows a high level of R&D in the digital sector, whereas the percentage of firms using digital technologies and the number of data suppliers are below the EU average. In 2017, 52 thousand people worked in the apps sector and 16% of businesses used e-commerce to sell their products, which is below the EU average. This specialisation results in a flow of resources to some digital sectors. Trade in digital services represents 3% of Poland's total trade, and on a per capita basis digital services trade is below the EU average – partly a result of Poland being a relatively large economy. Poland's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Polish economy suffers from the highest restrictions among the EU, particularly in infrastructure and connectivity.

TABLE 9.1: DIGITAL INDUSTRY STRUCTURE

	Poland	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	2.8	2.6
Number of fast-growing firms per 100,000 people (2018)	1.2	3
Number of data suppliers per 100,000 people (2019)	16	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	4.3%	3.2%

FIGURE 9.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

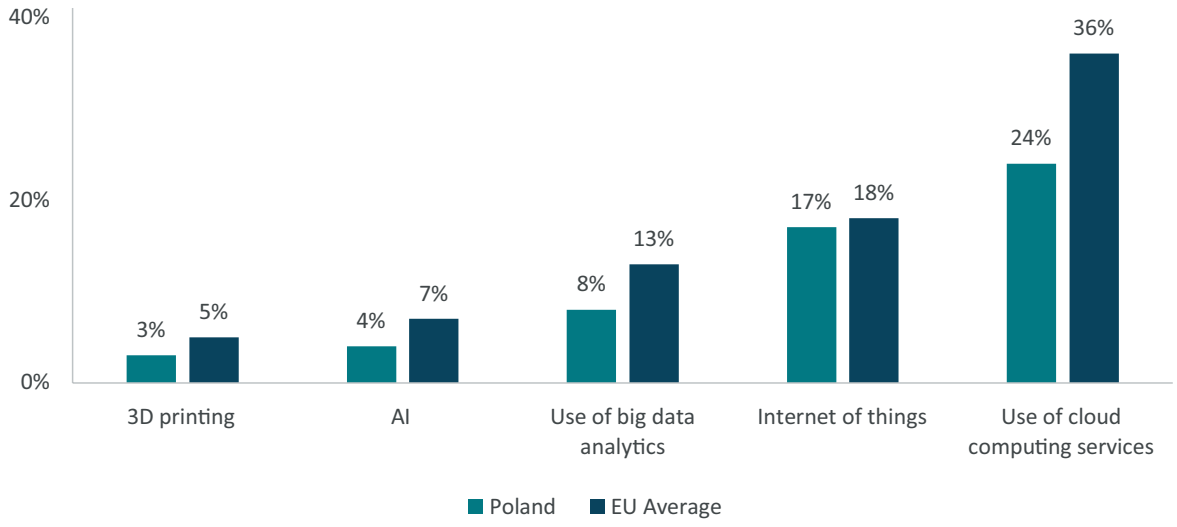


FIGURE 9.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

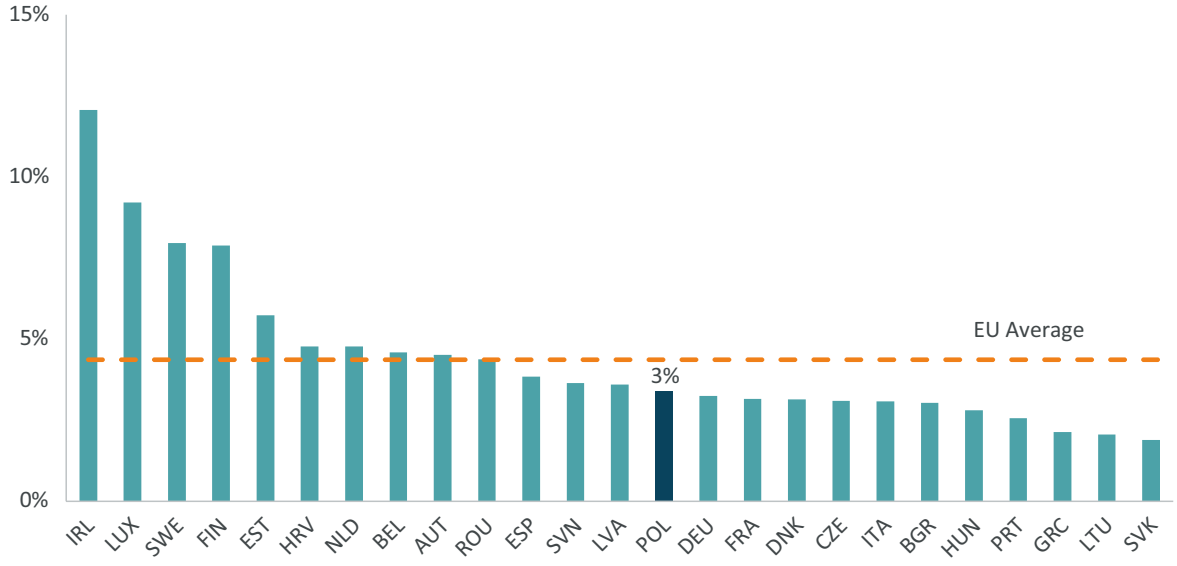
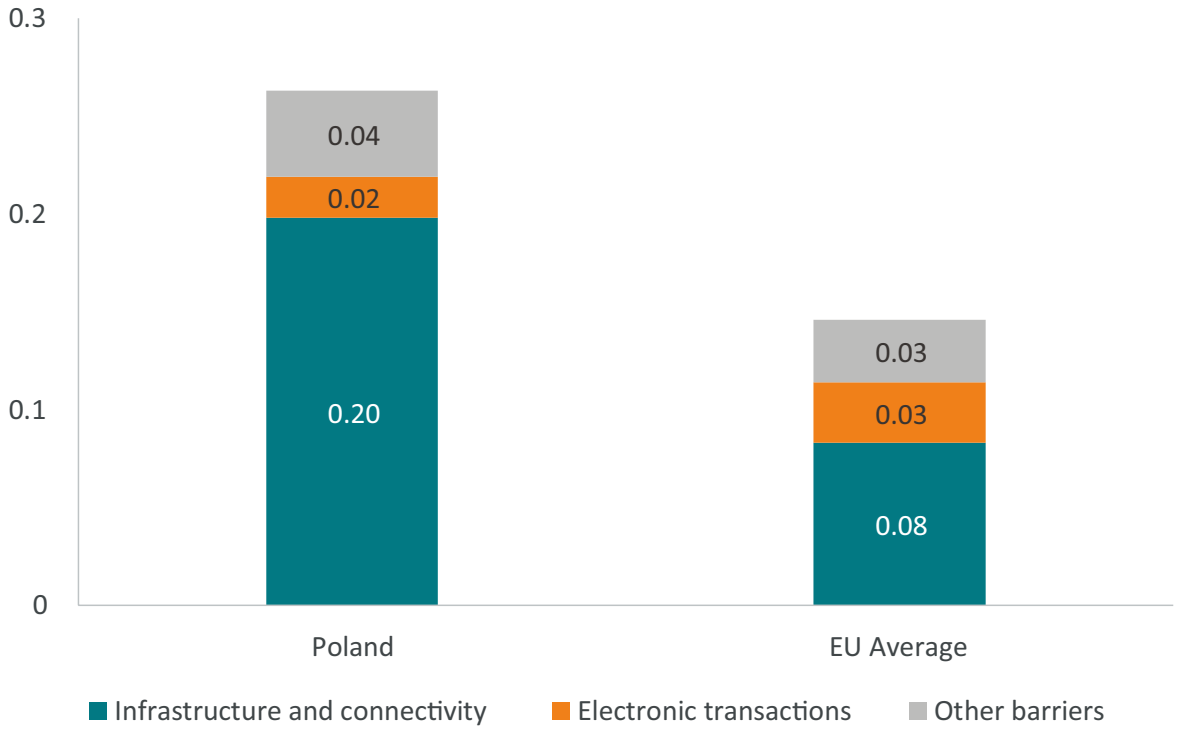


FIGURE 9.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



10. Portugal

Portugal shows a high level of R&D in the digital sector, whereas the percentage of firms using digital technologies and the number of data suppliers are below the EU average, except for the use of AI. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 31 thousand people worked in the apps sector and 17% of businesses used e-commerce to sell their products. This specialisation results in a flow of resources. Trade in digital services represents 3% of Portugal's total trade. Portugal's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Portuguese economy suffers from some of these restrictions, but equivalent to the EU average.

TABLE 10.1: DIGITAL INDUSTRY STRUCTURE

	Portugal	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	2.8	2.6
Number of fast-growing firms per 100,000 people (2018)	1.2	3
Number of data suppliers per 100,000 people (2019)	16	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	4.4%	3.2%

FIGURE 10.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

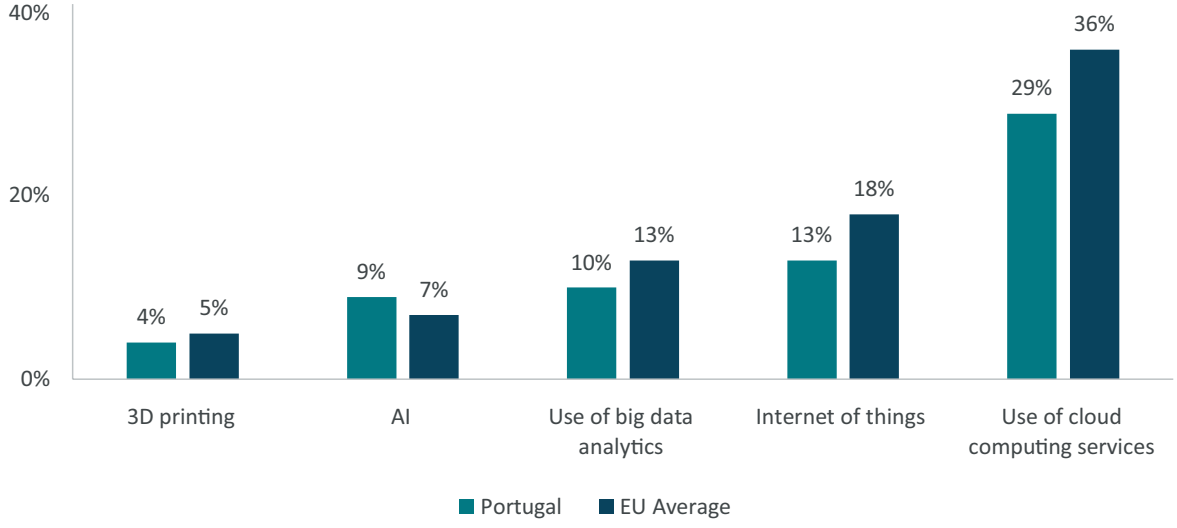


FIGURE 10.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

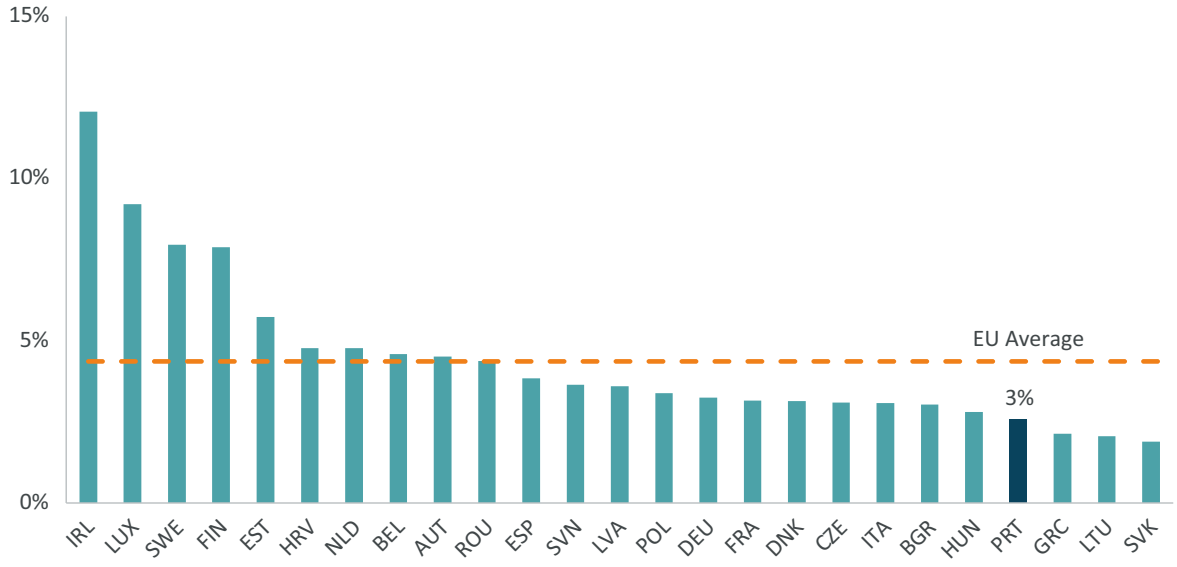
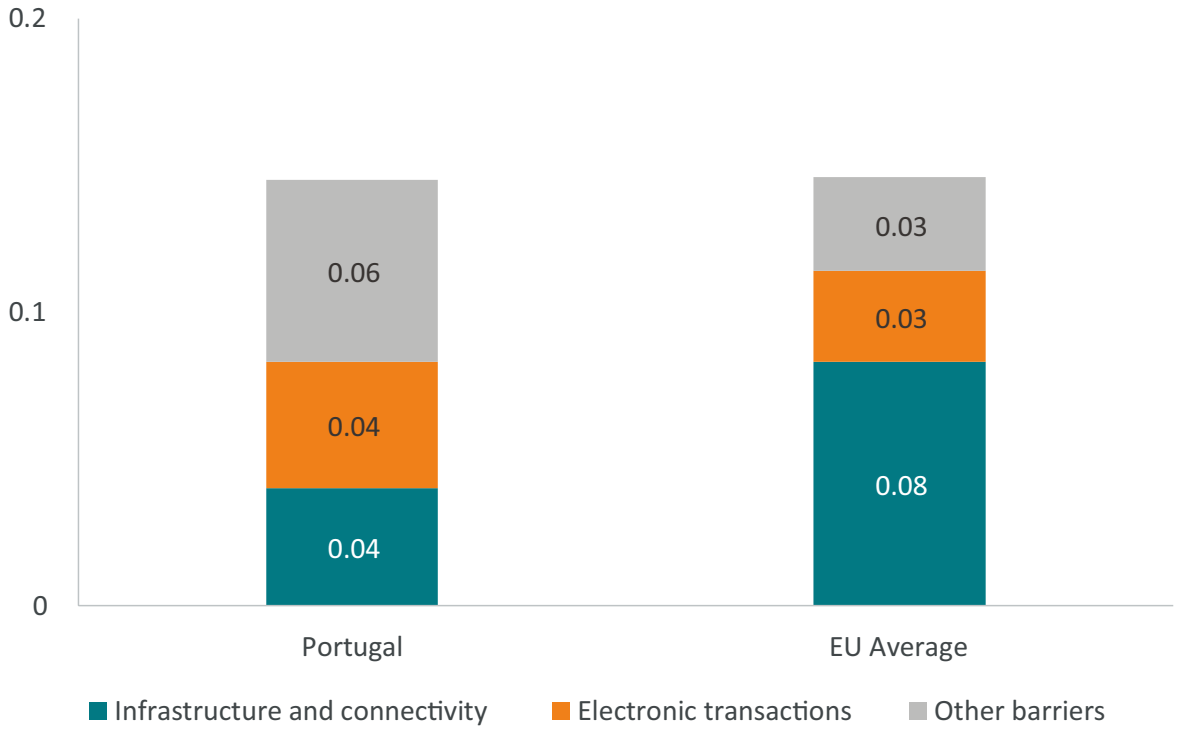


FIGURE 10.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



11. Spain

Spain shows a level of R&D in the digital sector, a percentage of firms using digital technologies, and a number of data suppliers a bit lower than the EU average. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 86 thousand people worked in the apps sector and 21% of businesses used e-commerce to sell their products, which is in line with the EU average. This specialisation results in a flow of resources. Trade in digital services represents 4% of Spain's total trade. Spain's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Spanish economy suffers from some of these restrictions, particularly in infrastructure and connectivity, but less than the EU average.

TABLE 11.1: DIGITAL INDUSTRY STRUCTURE

	Spain	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	2.4	2.6
Number of fast-growing firms per 100,000 people (2018)	2	3
Number of data suppliers per 100,000 people (2019)	35	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	2.1%	3.2%

FIGURE 11.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

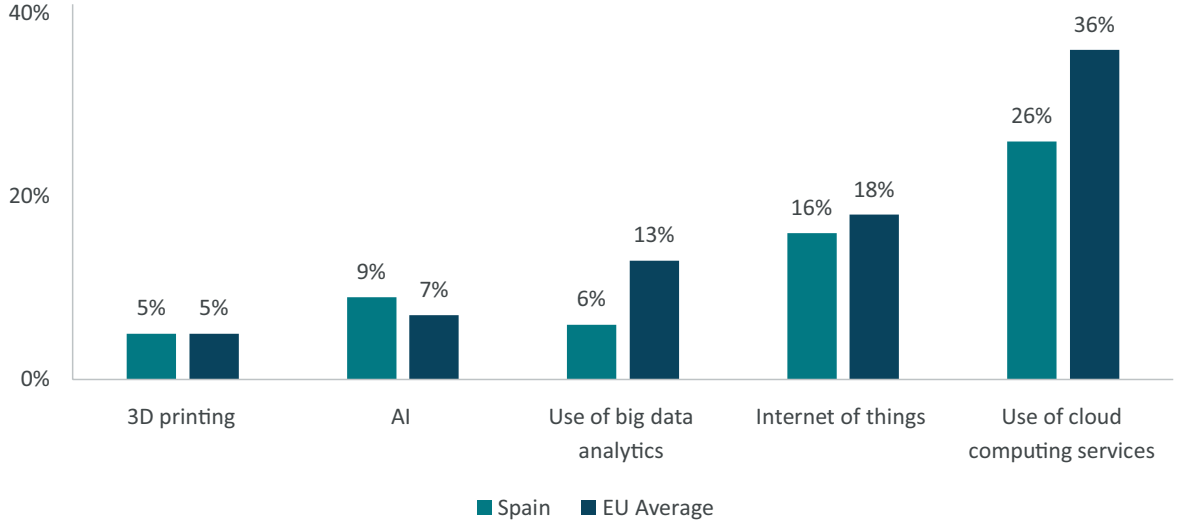


FIGURE 11.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

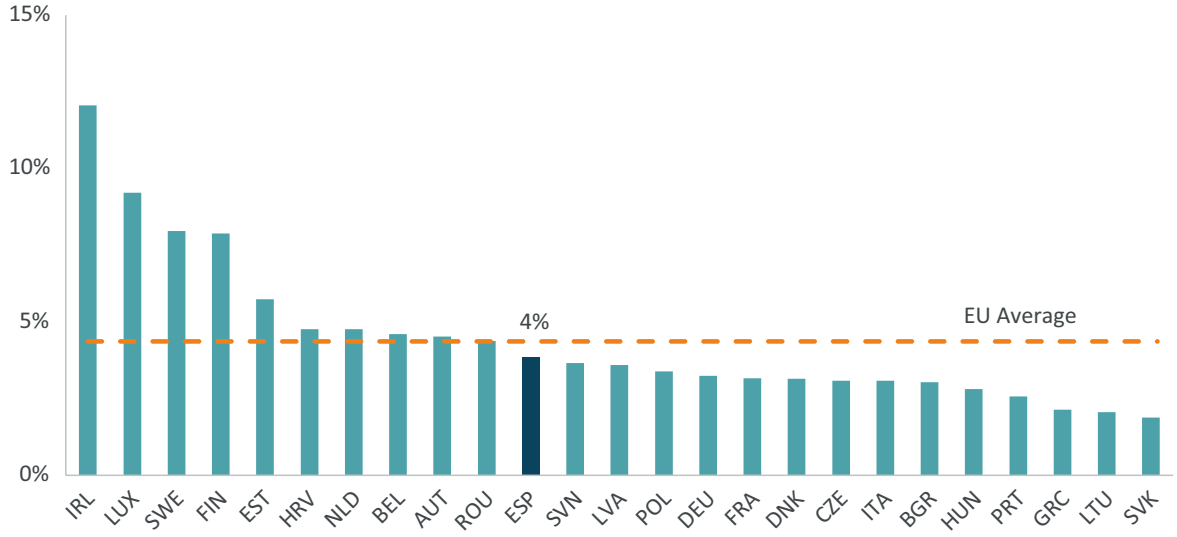
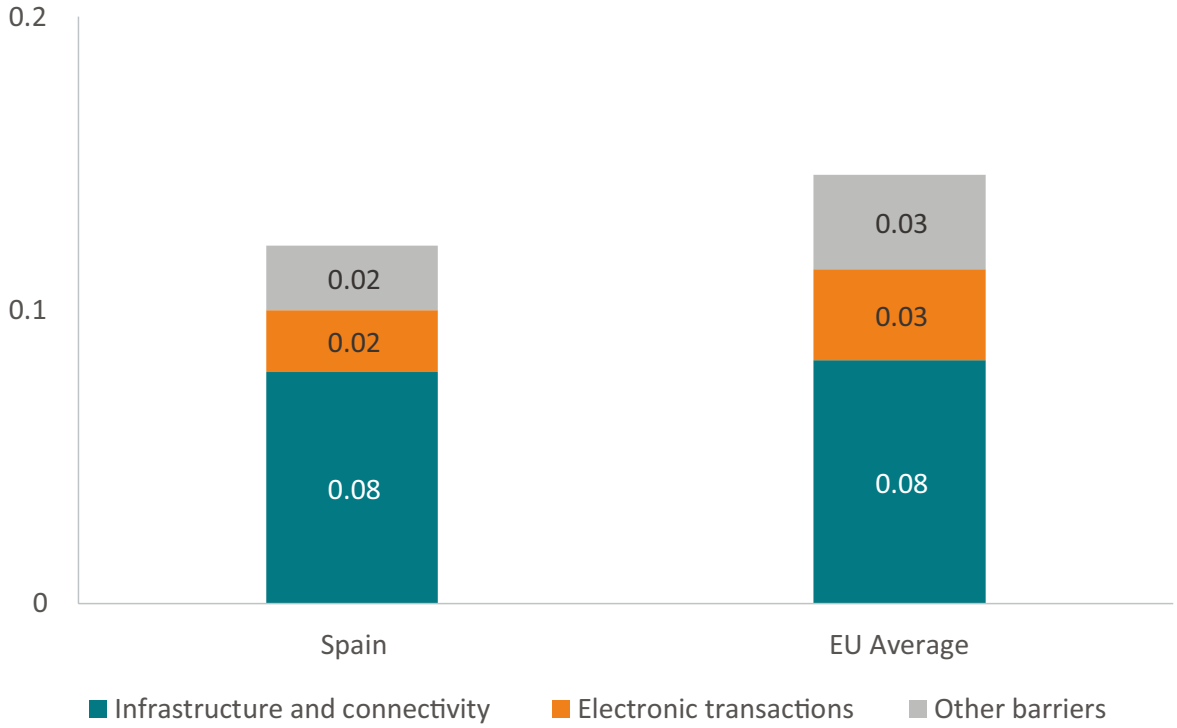


FIGURE 11.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)



12. Sweden

Sweden shows a level of R&D in the digital sector and a percentage of firms using digital technologies consistently above the EU average. Sweden ranks first for having the highest number of data suppliers in the EU. The use of these endowments leads to a specialisation in the digital sectors. In 2017, 96 thousand people worked in the apps sector and 33% of businesses used e-commerce to sell their products, which is above the EU average. This specialisation results in a flow of resources to digital sectors. Trade in digital services represents 8% of Sweden's total trade, while on a per capita basis digital services trade is the second largest in the EU. Sweden's ability to transform its digital endowments to its advantage depends on its digital regulatory restrictions. The Swedish economy suffers from some of these restrictions, particularly on infrastructure and connectivity, at a similar level to the EU average.

TABLE 12.1: DIGITAL INDUSTRY STRUCTURE

	Sweden	EU Average
Medium-high R&D intensive activities over R&D information industries (2017)	2	2.6
Number of fast-growing firms per 100,000 people (2018)	5.3	3
Number of data suppliers per 100,000 people (2019)	90	42
Business expenditure on R&D in digital sectors as a percentage of value added (2017)	7.4%	3.2%

FIGURE 12.1: PERCENTAGE OF FIRMS USING DIGITAL TECHNOLOGIES (2020, EUROSTAT, SCALE 0-100%)

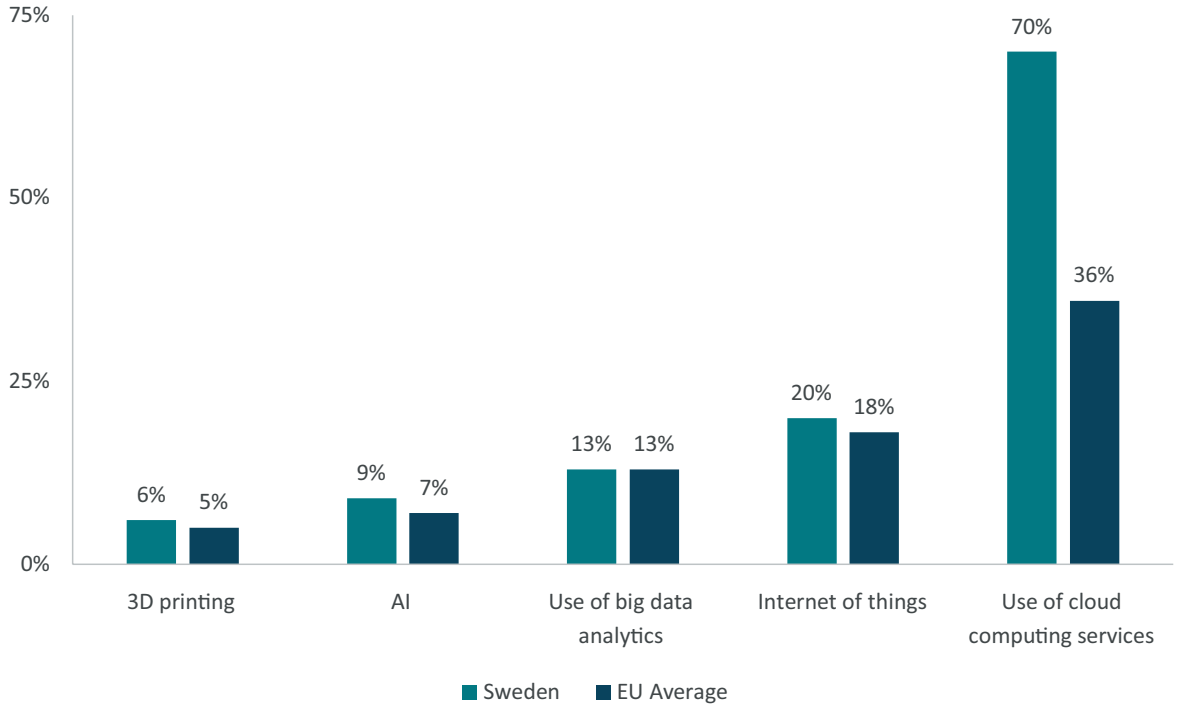


FIGURE 12.2: TRADE IN DIGITAL SERVICES (2015, OECD, PERCENTAGE OF DIGITAL TRADE OVER TOTAL TRADE)

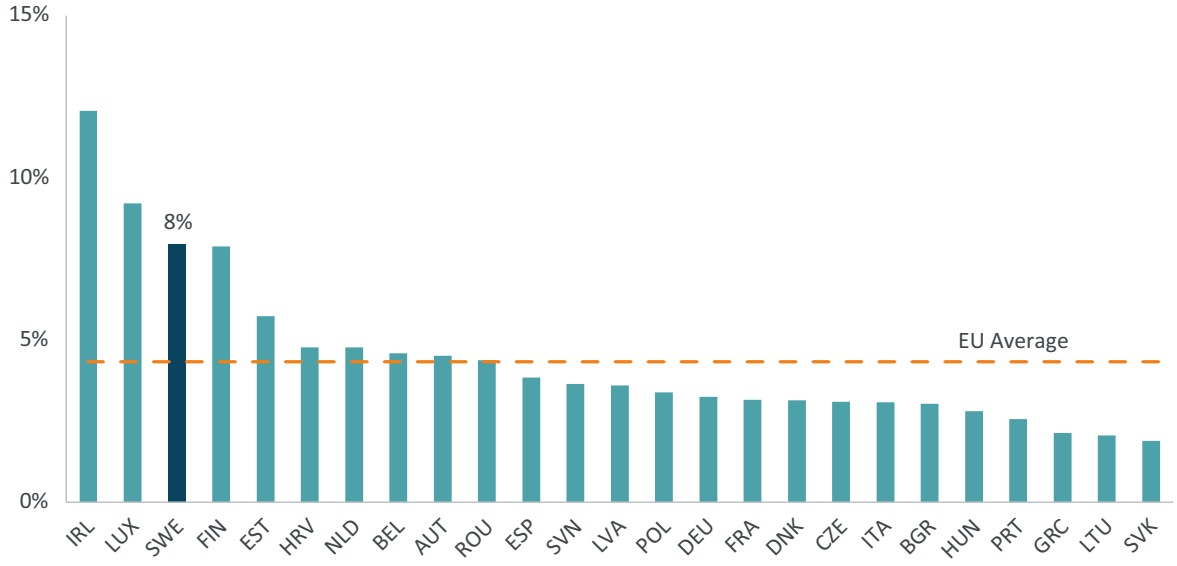


FIGURE 12.3: DIGITAL SERVICES TRADE RESTRICTIVENESS INDEX (2020, OECD, SCALE 0-1)