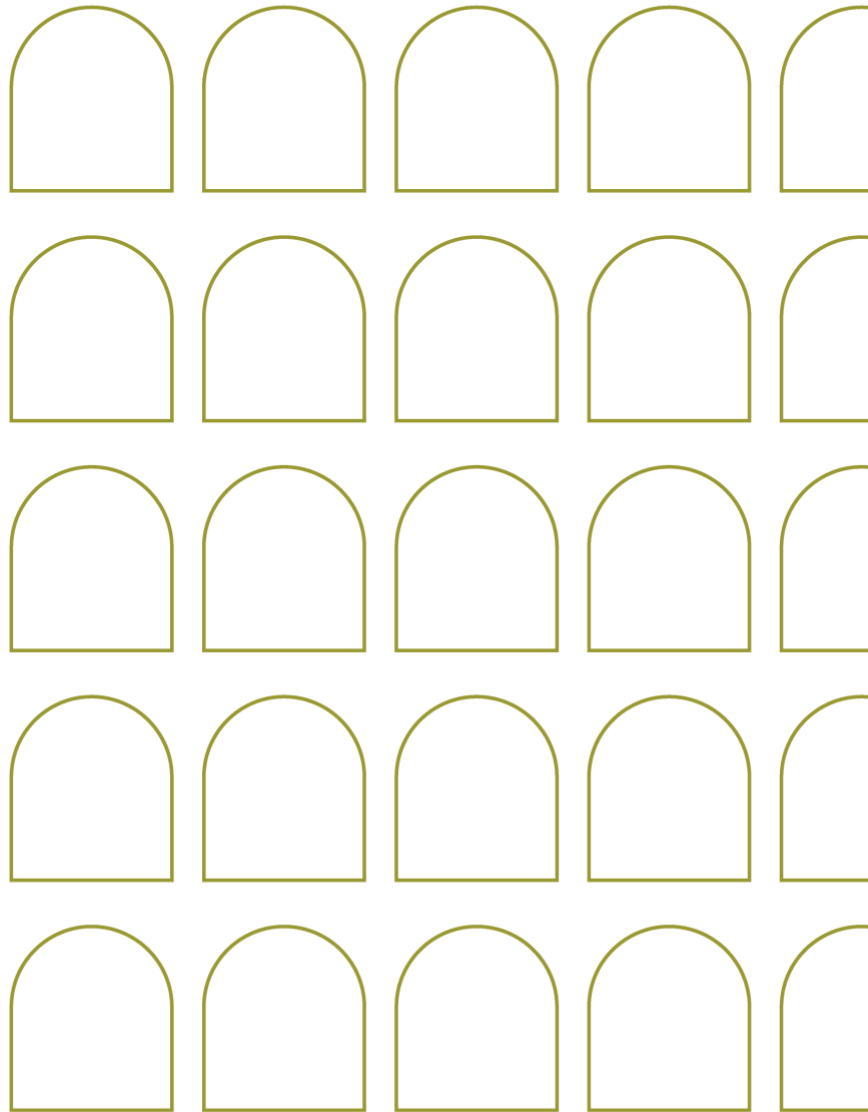


Strengthening EU digital competitiveness

Stoking the engine



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Strengthening EU digital competitiveness

Stoking the engine

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Abstract

Concerns over declining EU competitiveness in the digital world compared to other major economies have been widespread for many years. While Europe has substantial research capabilities and skills, we have failed to incubate global champions that could compare with those of our global trading partners and rivals, the USA and China. In June 2024, Europe will complete one five-year mandate for the European Parliament and Commission and will embark on the next. It is therefore a good time to take stock and to consider forward-looking approaches to remedying Europe's shortfalls as regards our competitiveness in the digital world. The Commission has already asked two prominent Europeans, Mario Draghi and Enrico Letta, to produce blue ribbon reports to this end. In this vein, and taking into account the just-released Letta Report, this report seeks to dig deep into well-known EU shortfalls such as weak capital markets, lack of access to skills, burdensome insolvency rules that vary greatly among the Member States, regulatory burdens, remaining obstacles to the Single Market, and inadequate technical infrastructure. It reviews mitigation measures that have been attempted to date, reflects on why they have not yet achieved the desired results, and reflects on possible solutions that have not been adequately reflected in EU and Member State policy to date.

Executive Summary

Concerns over declining EU competitiveness in the digital world in comparison to that of our global rivals have been widespread for many years. The EU has substantial research capabilities and skills, and has produced some technology leaders; however, we trail in important respects, and we have conspicuously failed to incubate global champions comparable to a Google (Alphabet), an Apple, an Amazon, a Facebook (Meta), a Microsoft, an Alibaba, or a TikTok (Bytedance).

The reader might well ask, “Why not?” Many answers are known, many mitigations have been attempted, but individually and collectively they have not brought the desired results. What we seek to do in our report is to dig deep into well-known EU shortfalls such as weak capital markets, lack of access to skills, incomplete integration of the EU Single Market, regulatory burdens, and inadequate female labour force participation (FLFP). We review mitigation measures that have been attempted to date, reflect on why they have not yet achieved the desired results, and offer possible proposed solutions that have not been adequately reflected in EU and Member State policy to date.

It is opportune to undertake this research at this time. In June 2024, the EU will complete one five-year mandate for the European Parliament and the Commission and will embark on the next. Two prominent Europeans, Enrico Letta and Mario Draghi, are producing blue ribbon reports to take stock and to consider forward-looking approaches to strengthen the EU’S competitiveness in the digital world, and we draw on the Letta Report in this study. We hope that our report will be of use to Mario Draghi, to all European policymakers, and to all European stakeholders.

This Executive Summary to our report opens with salient recommendations for EU policymakers, continues with a discussion of *production* versus *use* of digital technology, and closes by explaining the challenges that motivate the recommendations: poor access to finance, insufficient access to skills, a still fragmented EU Single Market, onerous and inconsistent insolvency rules, the need for improvements in technological infrastructure, and burdensome EU laws and regulations.

Recommendations to stoke the engine of EU digital innovation

Our recommendations relate to access (1) to finance; (2) to access to skills; (3) to strengthening the Single Market; (4) to insolvency rules; (5) to technological infrastructure; and (6) to creating and implementing better laws, and thereby reducing the degree to which EU-27 firms are needlessly subjected to legal, regulatory and taxation burdens.

Access to finance

- Measures are needed to **increase the financial literacy of the EU public** such that they understand that a mixed personal investment portfolio that includes some high-risk high return investments can be appropriate.

- Creation of a **trusted EU structure for investment instruments** might potentially make it easier for households with limited financial sophistication to achieve more balanced household investment portfolios.
- Legal and regulatory changes are needed to enable and **encourage pension funds and insurance to include investments in pre-IPO risk capital and in IPOs** as a modest part of their portfolios. Additional actions may be needed to ensure that overhead costs associated with making these investments do not get in the way.

Access to skills

- **Increase the quantity and diversity of technically skilled human capital.** In the short term, adopt measures that increase the attractiveness of Europe to foreign talent and facilitate talent mobility across the EU, in order not only to address skill shortages, but also to exploit the benefits of cultural and educational diversity for innovation. Over a longer timeframe, focus on increasing the participation of female workers to both research and the ICT labour force.
- **Overhaul EU-level education policies** to align them with four principles: (1) focus on EU-level comparative policy advantage in managing uncertainty and stabilising expectations; (2) structured dialogue with private stakeholders, to align education and training to technological evolution and increase the returns to individual investment; (3) scale, to exploit meaningful knowledge network effects across society and specifically across the workforce; and (4) comprehensiveness, to enable the power of complementarities across different types of knowledge, including ‘21st Century skills’.
- Step up availability of public funds for experimental development to redress the current imbalance and lack of continuity throughout the different R&D stages. Also, expand the set of public financing tools beyond call-driven solutions such as Horizon Europe to enable greater bottom-up experimentation with **productisation projects, especially from SMEs**. Finally, devote specific attention to devising ways of increasing productisation of open knowledge made available through EU research financing

The Single Market

- Detailed study is warranted to **determine whether the many EU legislative measures** put in place over the past decade in order to reduce cross-border frictions with digital transactions **have truly been effective**. If they have not been effective, it will be necessary to determine why not.

Insolvency rules

- **Divergent and onerous Member State provisions on non-bank insolvency are a very serious impediment to innovation**, both because they tend to needlessly tie up entrepreneurs and resources for years, and because the lack of certainty as to whether any assets can be recovered in the event of a bankruptcy impedes cross-border investment in the EU. Regrettably, Member States are deeply resistant to harmonising

and liberalising these rules because they are intertwined with property law, labour law and more. Small reforms such as those proposed by the Commission in 2022 should be feasible in the near or medium term, but the general overhaul that is needed might have to wait until some crisis makes it unavoidable.

- The **Simplified European Company structure that has been put forward in the Letta Report** as an adjunct to the proposed codification of EU business law **deserves serious consideration** as a possible long-term means of providing a simplified approach to non-bank insolvency in the EU for firms that choose it. It would be exceedingly challenging to put something like this in place, but the problem of non-bank insolvency is serious and long-standing, and no other solution has been found to be politically feasible.

Technological infrastructure

- Continued efforts to **ensure the reliability, robustness, resilience and diversity of the EU's supply chains** for both raw and manufactured elements that are important for EU productivity are fully in order. These measures **should not, however**, be permitted to **drift into protectionism** of EU industry at the expense of our trading partners.
- **Continued attention not only to deployment, but also to adoption and use of both fixed and mobile broadband is needed.** For the most part, the necessary measures are well understood, and the level of attention being paid on the part of the EU is sufficient, but the balance between supply side measures versus demand side measures could be better.
- Network operators in the EU argue that some **consolidation of the sector on an EU-wide basis** would likely generate beneficial economies of scale, and it is true that there are some network operators in the United States and China that dwarf most EU network operators. The appropriate response, however, is not a loosening of competition rules (except perhaps for some minor fine tuning), because current rules already permit the mergers that would tend to be beneficial. The real root problem is that **network operators are not motivated to seek the cross-border mergers that would produce genuine benefits.** The solution is not obvious.
- Responsibility for spectrum management should continue to reflect a division of labour between the Commission and the Member States, but **the Commission's ability to enforce timely and coordinated implementation** of measures that have been agreed needs to be made **much faster and more effective.** The ability of Member States to **jack up spectrum auction prices** needs to be curtailed.
- The need to **progressively refine regulation of electronic communications** so as to improve harmonisation and to reduce regulatory burden is likely to be with us far into the future. Policy needs to frankly acknowledge this.

Creating and implementing less burdensome laws and regulations

- As much as possible, the co-legislators should **slow the pace of enactment of new laws** for a few years in order to give firms and the Member States time to catch up with implementation.
- The three co-legislators committed in 2016 to jointly implement the Better Regulation system. **Parliament and Council need to step up** to do their share in order to provide better checks and balances within the overall **Better Regulation system**.
- Any significant piece of EU legislation will differ substantially from the initial legislative proposal submitted by the Commission. Late in the process but prior to final enactment, **an addendum to the Impact Assessment should be prepared to summarise the differences between the law as proposed and the law as enacted**, including an update of the expected administrative costs and adaptation costs.
- The “one in one out” program is genuinely important and promising, but it needs to be seeking to **offset the administrative cost of a new program as enacted, not only** the administrative cost of the program **as initially proposed**. “One in one out” cannot hope to fully offset the adaptation costs of the program, which will usually be far greater than the administrative costs, but it should at least monitor the adaptation costs for comparison purposes. Economic gains from the program should ideally also be reflected.
- Much more attention is needed when the Impact Assessment is drafted to ensure that data will be collected for the new program that enables **subsequent Evaluation of whether the law is actually mitigating the problem for which it was created**.
- The process of **Evaluation of legislation ex post should not be done by the Commission**. Moving the function for instance to the Court of Auditors, together with assigning it adequate staff resources, could lead to more objective and impartial Evaluations. The schedule for Evaluations, as well as quality control measures, are likely to need some re-thinking in light of this proposed move.

The importance of both *production* and *use* of technology to the EU economy

It is sometimes asked whether the EU should concentrate on *production* of digital technology in the form of ICTs, or solely on their *use*. We would argue that both are important.

A lack of European digital champions is concerning because it reveals weaknesses in the *production of frontier digital innovation*. Standard economic concerns are relevant. Frontier innovation is a major contributor to productivity, and therefore to the improvement of living standards. For the EU to miss out on key digital innovations therefore means missing an important chance to improve our lives. Digital competitiveness, however, goes well beyond nurturing digital champions. Productivity also generates societal benefits in other ways through (digital) innovation. It improves through waves of less radical forms of innovation, that apply and adapt technologies through process innovations and incremental product

innovations developed “on the job” – what we may call *productisation of technology*. Most importantly, productivity improves societal welfare through the diffusion of technology, in particular digital/ICT technology, throughout society, i.e. through the *use of technology*.

Europe can learn from American experience. Solow (1957) emphasised the importance of innovation as a key driver of US productivity. Gordon and Sayer proposed in 2020 that it is primarily differences in the ability to make adequate use of ICT technologies, in addition to differences in ICT investment, that explain the marked differences in productivity across the two sides of the Atlantic in the period of most remarkable US performance (1995-2005). In 2014, Jorgenson and his co-authors emphasised that the IT producing industries were the major driver of growth through the entire period 1973-2010. But the superior ability of US firms to productise technology is also a key factor in explaining the transatlantic productivity gap.

The EU digital productivity challenges that motivate our recommendations

Lack of access to finance

The European economy is roughly similar in scale to that of the USA and China, and Europeans save at similar overall levels; however, very little of this investment is available to innovative EU firms. There are multiple reasons for this. First, at retail level, Europeans put a higher proportion of their savings into low-risk investments. Second, capital markets in the EU are small, both for equity and for debt (e.g. bonds), compared to those of our global rivals. Venture capital and private equity are growing but are still tiny in comparison with our global competitors. Third, most European borrowing by firms is consequently in the form of bank loans rather than equity – this is not conducive to the provision of risk capital to innovative firms. Fourth, and relatedly, *Initial Public Offerings (IPOs)* in the EU raise far less money than in the USA.

As a result of these deficits, innovative high technology EU start-ups are cash-starved. The EU creates more of these start-ups per year than the USA, but they are unable to scale up.

The EU has not been asleep, but the solutions attempted to date are simply not of sufficient scale. They generate substantial percentage improvements on a tiny base. They do not remotely approach the magnitude of the problem.

We find that the America’s success had a great deal to do with a little-noticed regulatory change in 1974 that permitted pension funds to make prudent investments in risky ventures – it unleashed a flood of pension money for the venture capital funds (Lerner & Nanda, 2020). There is no reason why the EU could not do the same – indeed, the UK did so last year, and France is also considering reforms. It must be remembered that EU-27 pension funds hold some €4 trillion euros in assets, and insurance funds another €9 trillion. Even a tiny re-balancing of these funds into higher risk, higher reward investment would not only provide the funds and their beneficiaries with a better balanced overall portfolio, but could potentially inject **many tens of billions of euros** into EU-27 venture capital funds and private equity. **This one**

reform alone could potentially be more than adequate to fully solve the serious, long-standing problem of inadequate capital for high technology start-ups.

In parallel, steps to improve the financial literacy of Europeans could go a long way toward correcting the flawed balance between banks and capital markets. Survey results indicate that a large number of Europeans do not invest in equity because they simply do not know how to do so.

An EU-wide investment scheme, as proposed in (Letta, 2024), might also help Europeans with less financial sophistication to achieve a better balanced portfolio with higher returns and lower fees than the simple bank accounts that make up a large fraction of household investment today.

Lack of access to skills

Technological change might open up a range of new opportunities for Europe. Advancements in deep tech fields like artificial intelligence, quantum computing and synthetic biology, to name a few high-growth areas, could provide exogenous impetus to European competitiveness by potentially making firm scale – a notable structural weakness of the European economy – less relevant than before as compared to talent, and by creating many novel chances for cross-fertilisation among previously separate fields. Talent is key to effectively catching these opportunities. Unfortunately, it is also by no means in adequate supply in Europe. EIB survey data indicate that about 85% of both large and small EU-27 firms are concerned about lack of access to individuals with the skills that are needed today.

Basic digital skills are not homogeneously available throughout Europe and have only slightly increased in the past 10 years. Most importantly, new types of skills are needed to adopt technologies, to adapt them to different uses and industrial contexts, and to come up with innovative applications: STEM and advanced ICT skills, but also basic digital skills and so-called “21st Century skills” such as cognitive skills and interpersonal/social skills, whose role and importance are increasing with the shift towards jobs with non-routine abstract tasks. Our report highlights that some improvement can be seen in key indicators: material increases in the share of R&D personnel and researchers, in the number of ICT specialists in the EU workforce and in firms’ investment in the ICT skills of their personnel. The overall level of workplace skills remains, however, far from satisfactory.

In view of this situation, education and skills have recently become buzzwords in EU policy circles. Numerous policy initiatives have been undertaken, especially in the past few years, to make education needs (both digital and non-digital) more salient to EU citizens. Yet these initiatives appear to lack focus, and may potentially end up dispersing financial resources whose size and availability are difficult to quantify in the first place. The pressing needs for skills identified in our report suggest the opportunity for EU-level institutions to level up the Member States in line with the supporting role that the EU is assigned by the Treaties.

Europe also appears to have a weak profile as regards both the skills and the resources needed to productise technology. The structure and means of public support to R&D need a shift in focus in order to redress the current imbalance between basic/applied versus

experimental research, and to remedy the lack of continuity in investment and public support throughout the different R&D stages.

We also note that not only the *quality* of labour is important to EU innovation, but also the *quantity*. Indeed, the contributions of labour and capital are fundamental to our understanding of the drivers of economic growth. The latest research suggests that improving workplace conditions for females would not only be in line with EU values, but could have a disproportionately positive effect on EU-27 productivity, including productivity in the technical sphere. “Macroeconomic data ... point to economic gains from raising [female labour force participation (FLFP)] that could be up to a fifth larger than estimates from headcount exercises which ignore the gender composition of the headcount. Women complement men in the production process, and there is thus value in gender diversity as such (as there is in diversity more generally in teams of workers). Hiring women can increase the productivity of women already in a company, by reducing within-firm discrimination. *Gender inclusion also seems to have favourable effects on the value of companies whose strategies depend on innovation, including high-tech manufacturing and knowledge-intensive services.* [emphasis added]” (Ostry, 2022); (Ostry, Alvarez, Espinoza, & Papageorgiou, 2018).

Incomplete integration of the EU Single Market

One of the greatest strengths of the EU is its Single Market, which seeks to secure the free movement within the EU of goods, services, people and capital. Unfortunately, despite decades of work to improve the integration of the EU, there are still many gaps. Dozens of new laws were enacted during the 2014 – 2019 legislative term under the Digital Single Market (DSM) strategy in an effort to facilitate cross-border e-commerce, and more digital legislation followed during the current legislative term. There surely have been gains, but surveys of businesses suggest that they perceive little improvement. Much work remains to be done.

Burdensome and inconsistent insolvency rules

Rules for non-bank insolvency vary greatly across the Member States and can be quite onerous. As a result, people and resources can be locked up, often for years, thus interfering with serial entrepreneurship. Non-harmonised insolvency rules also tend to inhibit cross-border investment by creating uncertainty as to whether any assets can be recovered in the event that the target of an investment goes bankrupt.

To date, this problem has been politically intractable. A suggestion in (Letta, 2024) might possibly provide a long term mitigation by enabling firms who wish to do so to operate under codified European business law, including as regards possible insolvency – a *twenty-eighth regime*.

Onerous regulatory burdens

It is normal for firms to complain about the regulatory burden, but the complaints have become louder in recent years, and we think that there is justification. The number of new laws that have been introduced to promote digitalisation and green sustainability is simply enormous (Zenner, Marcus, & Sekut, 2023).

We join the many voices, both among stakeholders and also within the European institutions, who suggest that the next few years should reflect as much as possible a pause in new legislation, and a focus on correct implementation of the many laws that were just put in place.

We also recommend some significant re-tuning of the EU's *Better Regulation* process. The Better Regulation process ranks overall among the best in the world, but there are nonetheless long-standing and obvious problems that have been ignored. The process of Evaluation ex post is clearly in need of reform. The “one in one out” principle that was introduced in 2022 is promising, and has probably produced some regulatory simplification; however, it seems unlikely that the scale is sufficient, and the numbers produced to monitor the process are meaningless.

The need for improvements in digital technological infrastructure

Geopolitical tensions imply a risk to global value chains for technology components on which the EU depends. EU goals in addressing this should be supply chain resilience and diversity, and promotion of EU industry, but not protectionism. The measures recently put in place by the EU generally do so.

The deployment of broadband is an important contributor to the EU's technological advancement. The EU will not necessarily hit EU Digital Compass targets, but our progress may nonetheless be reasonably good relative to the actual needs of Europeans. The deployment of 5G base stations compares favourably to the USA and Japan, but very unfavourably to China.

Network operators in the EU argue that consolidation of the sector is essential. Many have argued that some consolidation on an EU-wide basis would likely generate beneficial economies of scale; however, current rules already permit the mergers that would tend to be beneficial.

Responsibility for spectrum management necessarily reflects a division of labour between the Commission and the Member States, but the Commission lacks the ability to enforce timely and coordinated implementation of measures that have been agreed. The ability of Member States to jack up spectrum auction prices is an additional, serious problem.

Progressive refinement of regulation of electronic communications so as to improve harmonisation and to reduce regulatory burden will continue to be needed.

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1. Introduction

Concerns over declining EU competitiveness in the digital world compared to other major economies have been widespread for many years. While Europe has substantial research capabilities and skills, we have failed to incubate global champions that could compare with those of our global trading partners and rivals, the USA and China. The EU has produced technology leaders in some areas, but we have conspicuously failed to produce a Google (Alphabet), an Apple, an Amazon, a Facebook (Meta), a Microsoft, an Alibaba, or a TikTok (Bytedance).

The reader might well ask, “Why not?” Many answers are known, many mitigations have been attempted, but individually and collectively they have not brought the desired results. What we seek to do in this report is to dig deep into well-known EU shortfalls such as weak capital markets, lack of access to skills, societal attitudes and institutions that do not sufficiently value entrepreneurship, incomplete integration of the EU Single Market, regulatory burdens, remaining obstacles to the Single Market, and inadequate female labour force participation (FLFP). We review mitigation measures that have been attempted to date, reflect on why they have not yet achieved the desired results, and on possible proposed solutions that have not been adequately reflected in EU and Member State policy to date.

It is opportune to undertake this research at this time. In June 2024, Europe will complete one five-year mandate for the European Parliament and the Commission and will embark on the next. It is a good time to take stock and to consider forward-looking approaches to remedying Europe’s shortfalls as regards our competitiveness in the digital world. The Commission has already asked two prominent Europeans, Mario Draghi and Enrico Letta, to produce blue ribbon reports to this end. We hope that this report will be of use to them, to all European policymakers, and to all European stakeholders.

1.1 The importance of both production and use of technology to the EU economy

A lack of European digital champions is concerning because it reveals weaknesses in the *production of frontier digital innovation*. Standard economic concerns are relevant. Frontier innovation is a major contributor to productivity, and therefore to the improvement of living standards. For the EU to miss out on key digital innovations therefore means missing an important chance to improve our lives.

An additional reason to worry about our lack of digital champions is that Europeans may not be able to align the direction of technological evolution with their values and vision as much as they would like. For example, we risk having too little influence over predictive algorithms (which intrinsically incorporate the human values of their creators), and thus being at a disadvantage as regards frontier innovation.

Digital competitiveness, however, goes well beyond nurturing digital champions. Productivity also generates societal benefits in other ways through (digital) innovation. It improves through

waves of less radical forms of innovation that apply and adapt technologies through process innovation and incremental product innovations developed “on the job” – what we may call *productisation of technology*. Most importantly, productivity improves societal welfare through the diffusion of technology, in particular digital/ICT technology, throughout society, i.e. through the *use* of technology. These drivers of productivity are empirically closely related: European firms that invest in the adoption of advanced digital technologies have a higher propensity to also invest in innovation and R&D (EIB, 2022). Reviving European digital competitiveness thus depends on finding ways of improving European performance along all three of the dimensions indicated: frontier innovation, technology productisation, and technology use.

These dimensions have been key in the past to driving US productivity performance. Solow famously emphasised innovation as a key driver of US productivity (Solow, 1957). Gordon and Sayed more recently proposed that it is primarily differences in the ability to make adequate use of ICT technologies, in addition to differences in ICT investment, that explain the marked differences in productivity across the two sides of the Atlantic in the period of most remarkable US performance (1995-2005). (Gordon & Sayed, 2020) Jorgenson and his co-authors draw attention on the direct contribution to US productivity offered by IT producing industries, which they identify as the major driver of growth through the entire period 1973-2010 (Jorgenson, Ho, & Samuels, 2014). Finally, (Ortega-Argilés, Piva, & Vivarelli, 2015) emphasise the superior ability of US firms to productise technology, i.e. the ability to translate R&D investment into new products and processes and therefore productivity gains, as an explanation for the transatlantic productivity gap. Whatever the dominant force, all of these aspects of digital competitiveness have historically played an important role.

Today, some argue that digital technologies do not have the same transformative potential as the (general purpose) technologies of the past. (Gordon, 2012), for instance, views the slowdown in productivity of the US after 2005 as linked to the inherent features of current ICT technologies, which he describes as being subject to diminishing returns.

Underlying our report is, by contrast, a more optimistic view of the potential economic impact of current technologies. Along with authors such as (Brynjolfsson, Rock, & Syverson, 2019), we believe that the latest wave of technological evolution can deliver many benefits to society, but that it takes time and effort for technologies to permeate the economy: resources have to be committed and skills need to be developed sooner rather than later for firms and individuals to capitalise on technological opportunities.

This can be an exciting time for European industry. The scale and nature of technological change is such that many new opportunities very different from those of the past may swiftly open up. While the latest wave of digital innovation and mass internet adoption has been dominated by social media and search, areas in which European firms have not excelled, we do not yet know what the “next big thing” will be. Possibly, there will be a number of “next big things” and thus a chance for Europe to gain (digital) competitiveness through new specialisations. Deep tech fields like artificial intelligence, quantum computing and synthetic biology all have the features of General Purpose Technologies (GPTs) with the potential to transform the entire economy, and all are advancing at an unprecedented pace. This more

optimistic view of emerging technology (and of the opportunity that it presents to the EU) makes it urgent to take action in order to mitigate any known obstacles to the EU's digital innovation capacity, and to its production and use of digital technology.

1.2 Known impediments to innovation in the European Union

Any number of impediments to the EU's innovation capacity in the digital sphere have been known for many years; nonetheless, they persist. In some cases, not enough has been done to combat them; in other cases, fixes have been attempted, but have failed to deliver.

Among the well-known impediments are:

- Lack of access to finance, especially to pre-IPO risk capital, and especially by SMEs;
- Burdensome and uneven insolvency rules that tie up people and resources for years, and discourage cross-border investment due to uncertainty as to what might happen if a firm fails;
- Lack of access to skills;
- A still less-than-fully integrated Single Market;
- A level of regulatory burdens that is higher than that of our main global competitors;
- Deficits in EU infrastructure, coupled in recent years with uncertainty as to the reliability and robustness of global supply chains on which EU technological innovation relies.

1.3 Methodology and sequence of this report

The methodology of this report is straightforward – desk research, analysis of publicly available data sources, and a few carefully chosen interviews to check and validate the findings.

An overview of some Key Performance Indicators of the EU in comparison with those of global competitors appears in Chapter 2. The following chapters then deal with various problem areas, most of which have been known for many years, in line with what has been sketched out in Section 1.2: lack of access to finance in Chapter 3, lack of access to skills in Chapter 4, incomplete integration of the EU Single Market in Chapter 5, rules for dealing with insolvency that inhibit investment and tie up people and capital for years in Chapter **Error! Reference source not found.**, regulatory and taxation burden in Chapter 7, and gaps in technical infrastructure in Chapter 8. We provide a re-cap of our recommendations in Chapter 9, including pointers to the page on which we made and justified each recommendation.

2. The digital economy in the EU lags behind global competitors

Key Findings

- The EU lags global competitors in terms of the ability to give birth to high-growth and high-market-cap tech firms.
- The EU has strong capabilities to generate technology. Yet its research system is not capable of placing Europe in a leadership position when seen in comparative perspective.
- The low degree of specialisation in the scientific and patenting areas most closely related to digital innovation indicates that enhancing digital competitiveness is not only a matter of improving Europeans' entrepreneurship propensity.
- The EU has a low level of R&D investment, especially by businesses; investment in experimental development is also particularly low as compared to competitors, suggesting limitations to the EU's ability to productise technology
- The low level of R&D investment in experimental development as compared to that of competitors suggests limitations to the EU's ability to productise technology.

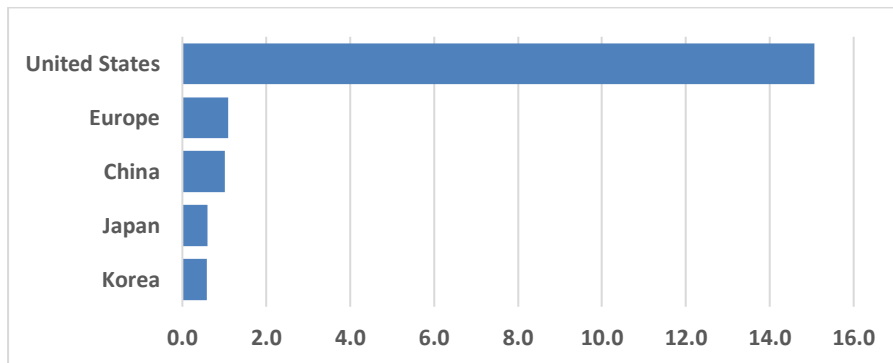
In this chapter, we set the scene for the report by reflecting on the EU's standing relative to key global competitors based on a number of Key Performance Indicators (KPIs) in Section 2.1, and by providing stakeholder perceptions of the EU's shortcomings in Section 2.2.

2.1 Comparison of Key Performance Indicators (KPIs) of innovation

Digital competitiveness can be measured along many dimensions. Among the particularly eye-catching statistics are, however, the data capturing Europe's limited ability to give birth and nurture successful digital firms with a significant scale. Europe has so far underperformed with respect to other advanced economies in terms of the total market capitalisation its major tech firms have been able to obtain, as can be seen from

Figure 1.

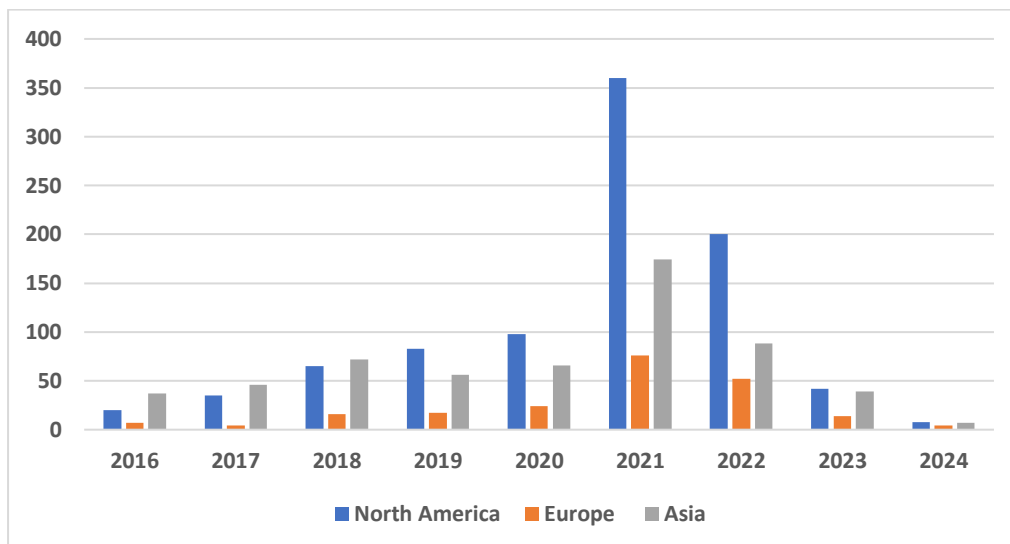
Figure 1. Total market cap of the first 10 tech firms in each region (\$T), as of March 2024.



Source: Authors' elaboration of data from CompaniesMarketCap.com, retrieved on 25 March 2024.

Another commonly used metric for digital competitiveness is the number of “unicorns”, a term usually understood to refer to privately held start-ups with a value of over \$1 billion. Along this dimension as well, as illustrated in Figure 2, Europe appears to lag its main competitors. Pitchbook reports that, as of March 2024, the US leads the ranking of the countries with the highest number of active unicorns with 702 companies, or 51.2% of the global total. China ranks second, with 291 companies, followed by India (65 unicorns), the UK (49 unicorns) and Germany (25 unicorns).

Figure 2. Total number of unicorns by year and region (2016-2024).

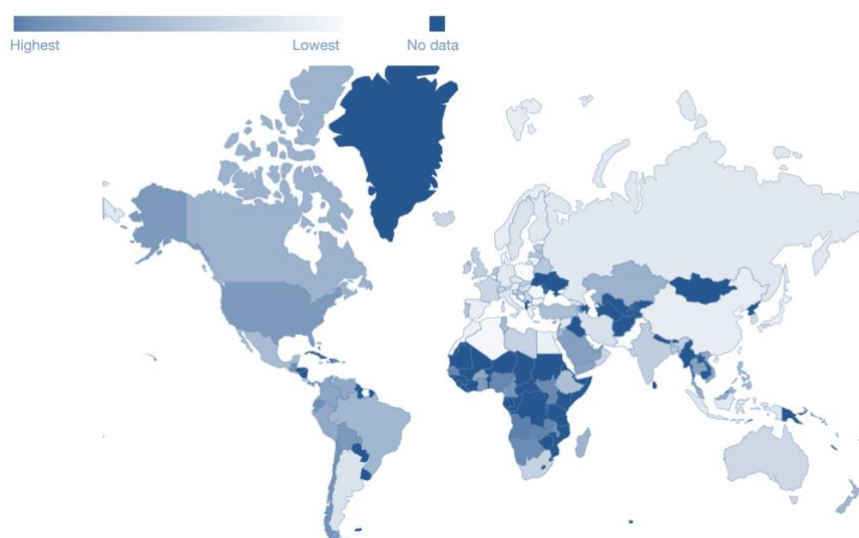


Source: Authors' elaboration on Pitchbook data, March 2024⁵.

⁵ PitchBook defines a unicorn “as a venture-backed company that raised a round at post-money valuation of \$1 billion or more. We stop considering the company a unicorn if it is no longer venture-

These figures may perhaps appear not particularly surprising if examined in conjunction with an indicator of the overall level of entrepreneurial activity such as that computed every year by the Global Entrepreneurship Monitor, reported in Figure 3, which suggests an overall lower propensity of Europeans towards undertaking new business ventures. However, early-stage entrepreneurial activity in the European tech sector does not align with this general observation. In its annual surveys of the “State of European Tech”, Atomico has tracked the number of founders starting new tech startups in Europe. Its latest report highlights that this number has been consistently higher than that of the US in each of the past five years (2019-2023) (Atomico, Orrick, HSBC Innovation Services & Slush, 2023). Thus, one should look beyond the number of new ventures created to understand Europe’s shortcomings in digital competitiveness.

Figure 3. Percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business (Total early-stage entrepreneurial activity), latest available year.



Source: Global Entrepreneurship Monitor, available at <https://www.gemconsortium.org/data>.

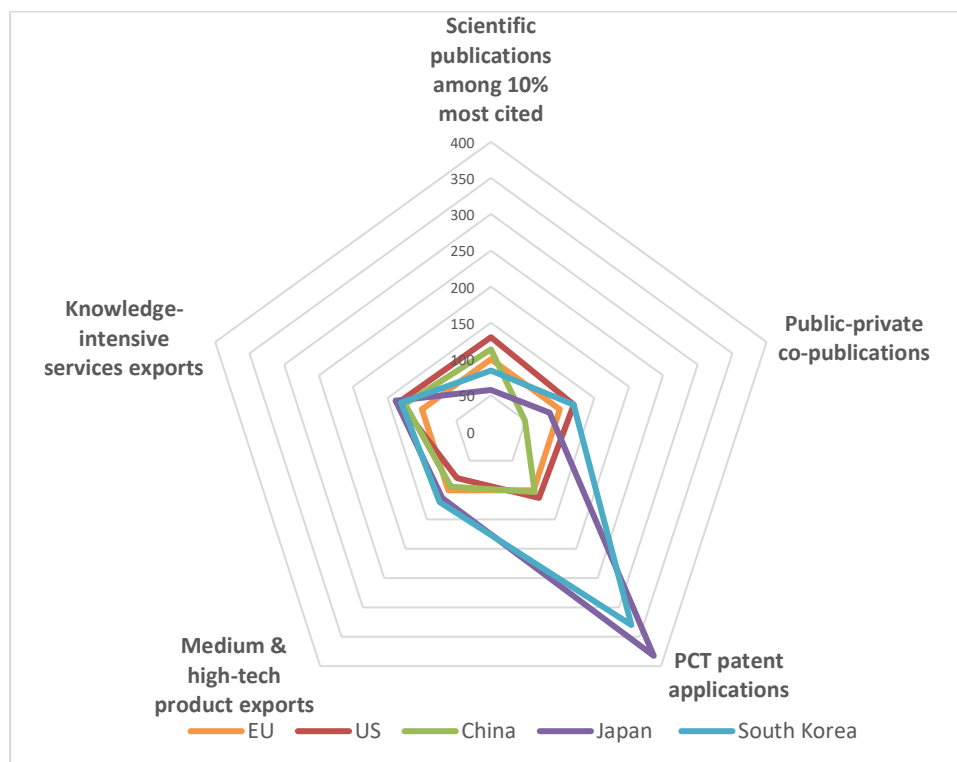
The measures of European digital competitiveness noted above necessarily constitute only a partial list, as they focus only on “the tip of the iceberg”. As noted in the Introduction to this report, European digital competitiveness can be defined as the ability of the European economy to adopt digital technologies, to adapt them to local productive and societal needs, and to produce innovative digital products and services. These abilities fuel not only productivity growth, but also the scope for addressing socially relevant objectives such as environmental protection. To obtain a more refined understanding of the current state of the

backed because it goes public or is acquired, or if its valuation falls below the \$1 billion threshold — for example, because it went out of business or had a down round”. See <https://pitchbook.com/news/articles/unicorn-startups-list-trends>.

European digital economy, it is thus useful to consider more broadly in comparative perspective the European capability to generate new technologies, to deliver them to the market, to customise them to new uses, and to adopt the new technologies.

These aspects, and in general the innovation performance of the EU, are tracked yearly by the European Innovation Scoreboard (EIS) through a variety of indicators. The picture that emerges is one of a strong research system – one that is able to generate new technologies – but with an unimpressive performance if compared with other world regions. In particular, the latest EIS Report (2023), while highlighting some notable strengths of the European innovation system, underscores that there is not one single indicator where the EU outperforms all the leading global innovators. This is apparent from Figure 4, which reports a selection of the EIS indicators of innovation output that are most salient for our present purposes.

Figure 4. Benchmarking of key innovation output indicators, year 2023

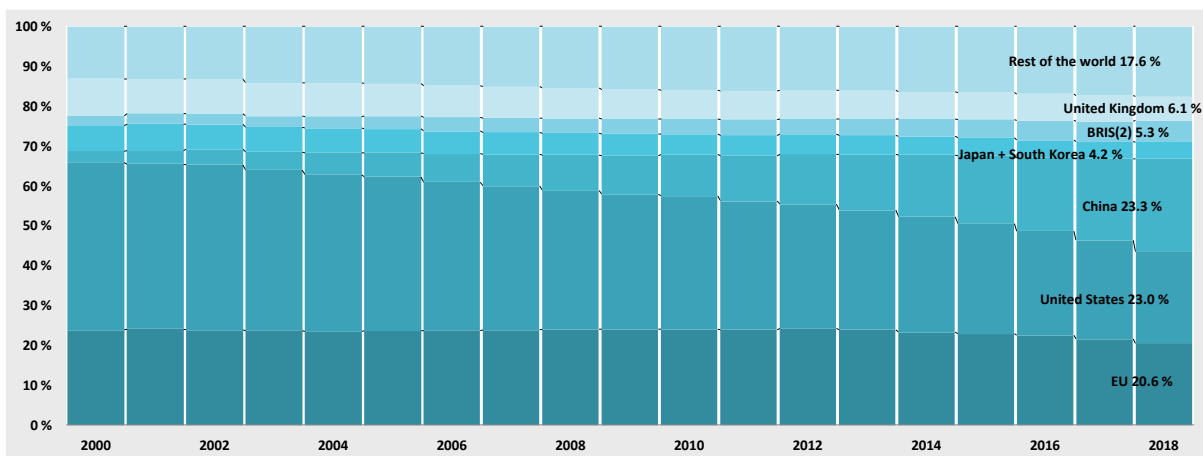


Source: Authors' elaboration based on the European Innovation Scoreboard 2023.

The figure highlights that Europe lags its competitors particularly with regards to PCT patent applications and knowledge-intensive services exports. Along the other dimensions considered, although the EU never leads the ranking, differences with respect to competitors are less pronounced. In particular, the scientific knowledge base remains relatively strong and therefore a key asset that may potentially contribute to the ability to exploit novel technological opportunities.

The following Figure 5 illustrates how the relative position of the EU in this area has changed since the year 2000. It shows a moderate worsening of the EU's position as a fraction of global highly cited scientific publications, driven mostly by the increased role played by the Chinese scientific system; however, this decline is substantially less pronounced than that experienced by the United States. Thus, the European research system appears resilient, and capable of preserving its performance over time.

Figure 5. World share of top 10% highly cited scientific publications, 2000-2020.

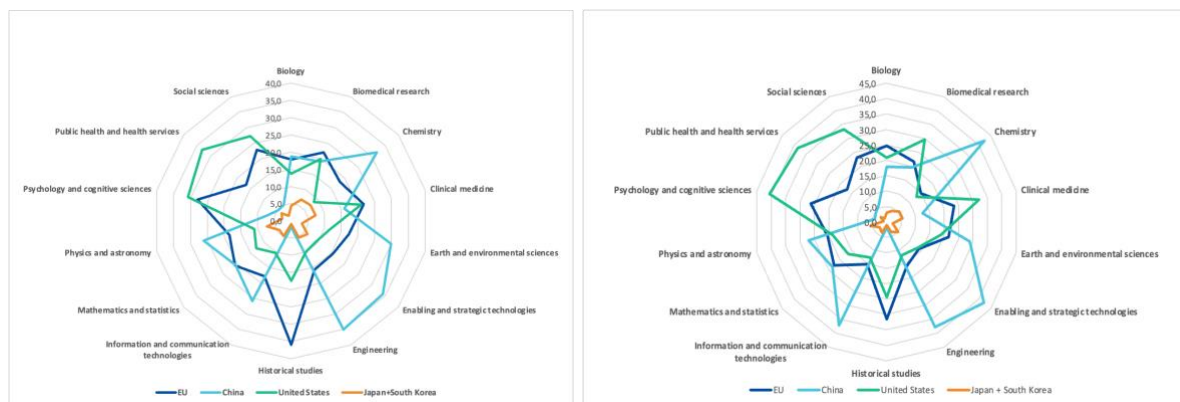


Source: authors' elaboration from European Commission, Science, Research and Innovation Performance of the EU 2022 (2023), based on Science-Metrix, using Scopus data. BRIS: Brazil, Russia, India and South Africa. 2000 (citation window: 2000-2002) - 2018 (citation window: 2018-2020)

A decomposition of scientific publications by field provides additional insights useful to interpret the state of European digital innovation. On closer inspection, it appears that the EU does not hold a strong position in the areas most closely related to digital innovation, i.e. information and communication technologies, enabling and strategic technologies, and engineering, where China currently holds a clear leadership role⁶ (Figure 6, left panel). Europe holds, by contrast, a leadership position in historical studies, biomedical research and clinical medicine. The European scientific knowledge base is also quantitatively strong in biology, mathematics and statistics, psychology and cognitive sciences, and in the social sciences. The relative strengths and weaknesses of European research appear very similar when one looks at an indicator that captures to some extent the quality of scientific research – the shares of top 10% most-cited scientific publications – but according to this metric Europe loses its leadership position in biomedical research and clinical medicine and remains the leader only in historical studies and biology (Figure 6, right panel).

⁶ The category of enabling and strategic technologies is one of the categories defined by the Science-Metrix journal/article classification scheme. It includes the following sub-fields: Bioinformatics, Biotechnology, Energy, Materials, Nanoscience & Nanotechnology, Optoelectronics & Photonics, Strategic, Defence & Security Studies.

Figure 6. Word shares of scientific publications in selected scientific fields (2020, left panel) and word shares of top 10% most-cited scientific publications (2018, right panel)

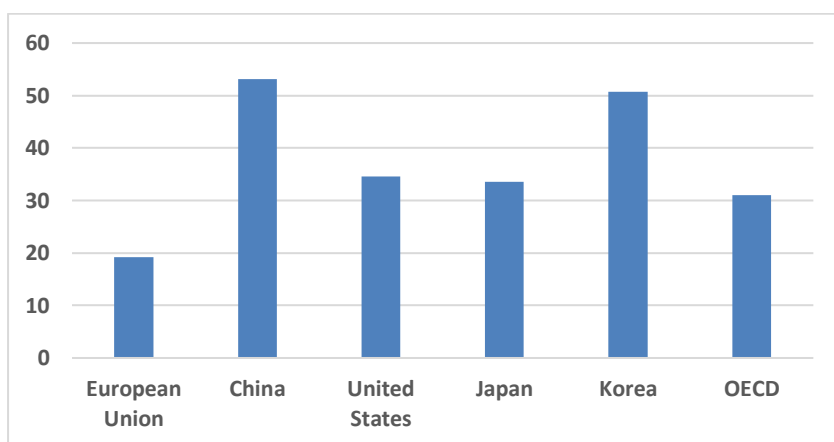


Source: Authors' elaboration based on European Commission, Science, Research and Innovation Performance of the EU 2022 (2023), based on Science-Metrix, using Scopus data. Top 10% most-cited scientific publications refer to the citation window 2018-2020.

More fine-grained analyses reveal that the EU is leading in terms of basic research in the AI field (Dernis et al., 2019) and that there has been a recent increase in the EU share of global publications in the fields of ICT and enabling and strategic technologies (European Commission, 2023), but overall the EU position in the areas most closely related to digital innovation cannot be considered strong.

The low degree of technological specialisation in the ICT field is also apparent from the OECD STI data on patents in ICT technologies as a share of total IP5 patent families, reported in Figure 7.

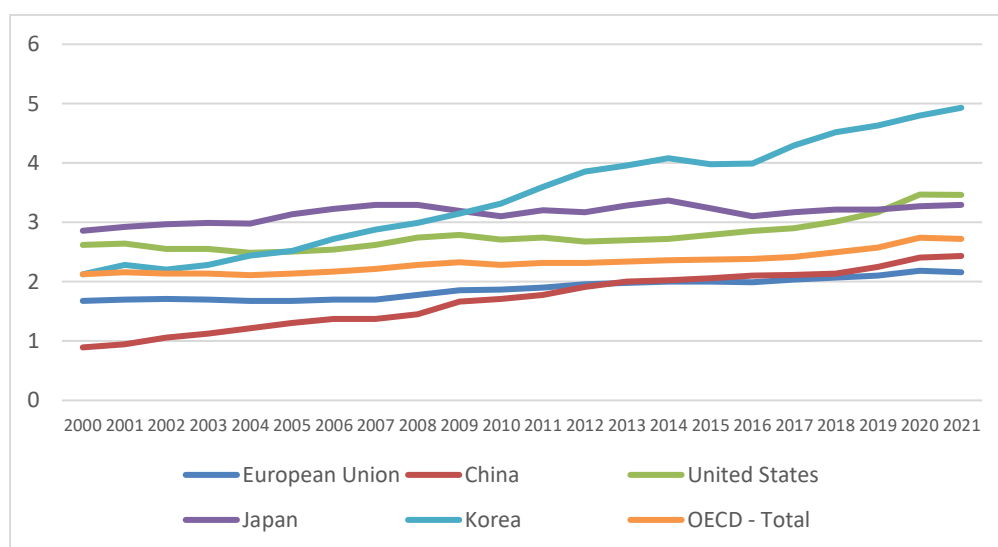
Figure 7. Patents in ICT technologies as a share of total IP5 patent families, latest year available (2019).



Source: Authors' elaboration based on OECD STI data (<https://goingdigital.oecd.org/indicator/33>)

The unimpressive current innovation output performance of the EU can be clearly linked to the overall level of investment in R&D as a share of GDP – a metric that indicates the EU is an absolute laggard with respect to the other economies that are its main competitors globally (Figure 8). Total R&D spending as a percentage of GDP is only about 60% of that of the United States.

Figure 8. Total Gross Domestic Expenditure on R&D as a percentage of GDP, 2000-2021.



Source: Authors' elaborations on OECD STI Database.

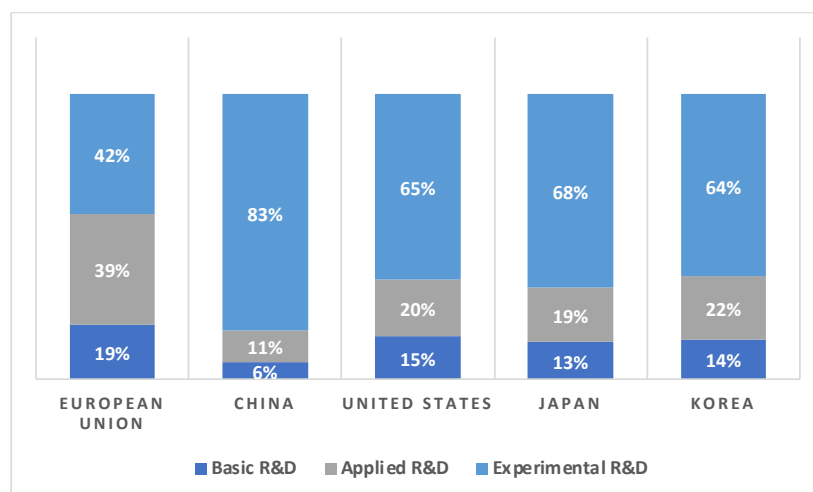
Behind these aggregate data is a worrisome phenomenon. Looking at the decomposition of government-financed and business-financed R&D as a percentage of GDP in the period 2015-2021, for which comparable OECD data are available, it appears that it is European businesses that find it more difficult or less convenient to invest relative to their US, Chinese and Korean counterparts. Government-financed R&D as a percentage of GDP has increased on average by about 7% in the biennium 2020-2021 relative to the period 2015-2019 – an increase of similar size to that observed in most of the other countries that we are considering⁷. The increase in business-financed R&D has been, by contrast, much lower than in the US, China and Korea: in Europe the figure stands at 5%, while the corresponding figures for the US, China and Korea are 23%, 16% and 14%⁸. The result is a worsening of the EU position in terms of investment, which is particularly acute in the ICT services and producer sectors. The European Commission reports that the ratio of R&D investment between the EU and the US has substantially decreased in both ICT sectors between 2010 and 2019 and that in 2019, in the software and internet sub-sector, R&D investment stood at 92.7 billion euro in the US vs 7.5 billion euro in the EU (European Commission, 2021)

⁷ The increase is actually much higher in Korea (18%).

⁸ The increase in Japan is lower than in the EU, at about 3%.

An examination of the qualitative composition of the overall R&D expenditure from any source (business, government, education and non-profit) is also instructive. It shows one additional weakness of the EU innovation system, namely the low levels of skills in experimental development. Figure 9 highlights that the EU research ecosystem allocates by far the lowest share of R&D spending to this area relative to other comparable countries. This may be considered to be indicative of the limited performance of the EU when it comes to the productisation of technology rather than its simple generation. Indeed, low levels of experimental development correlate with lower skills and investment in the area of R&D that is closer to bringing products to market.

Figure 9. Decomposition of Gross R&D expenditure from any source by type



Source: Authors' elaboration of ERT (2023), based on OECD data.

Overall, the indicators summarised in this section show that the EU has a research system that can be considered to be strong in absolute terms, but not capable of placing Europe in a leadership position when seen in comparative perspective. They also indicate a low degree of specialisation in the scientific areas most closely related to digital innovation, as well as weaknesses in terms of total R&D investment as well as more specifically with regard to the type of investment that drives the ability to bring products to market.

2.2 Stakeholder view on EU entrepreneurship deficits

Section 2.1 has made clear that a hallmark of the lack of EU competitiveness is that the EU largely lacks innovative digital platform firms at the level of a Google (Alphabet), an Apple, a Facebook (Meta), an Amazon, or a Microsoft. Needless to say, these firms did not start as gigantic undertakings. Each of them grew from tiny roots. Indeed, what we learn from the renowned economist Schumpeter is that much innovation takes the form of *creative destruction*, a process "... of industrial mutation ... that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new

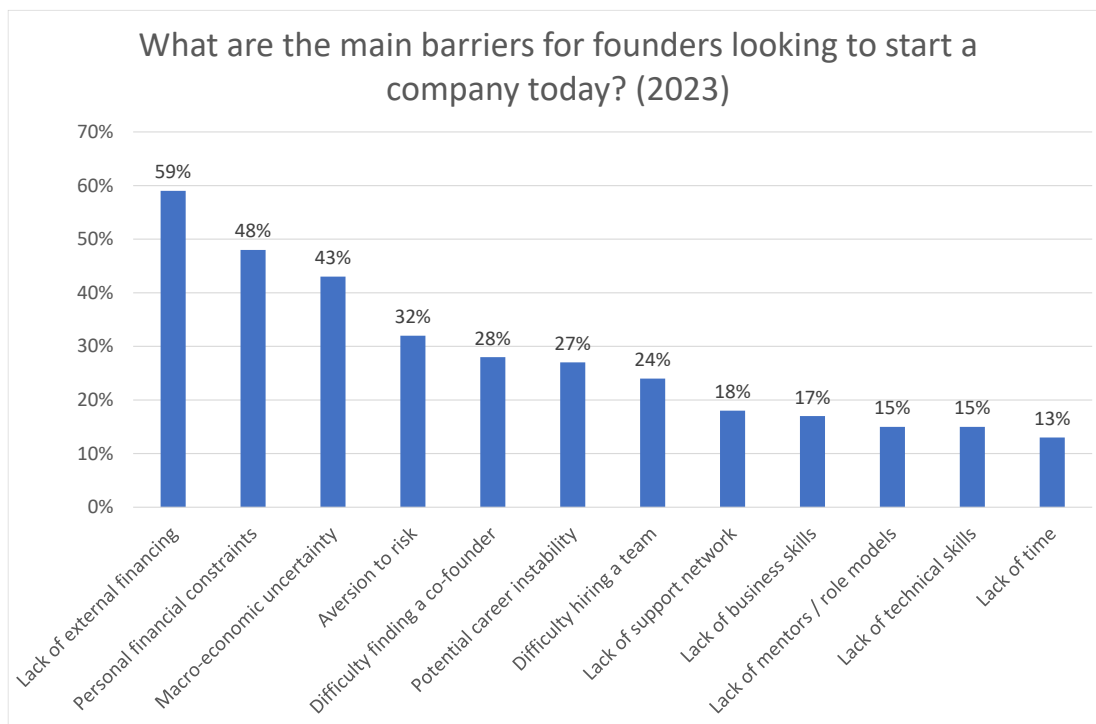
one.” (Schumpeter, 1950) And much of this creation is necessarily driven by new firms that start small.⁹

With that in mind, a fundamental challenge to innovation in the European Union is that, while we produce as many start-ups as our most successful global competitors or more, we fail miserably when it comes to scaling them up (as we explain further in Chapter 3).

In order to understand why this is the case, it is best to begin with the views of businessmen, and especially of the entrepreneurs who create start-up firms.

In a survey of entrepreneurs in 2023, Atomico identified the factors shown in Figure 10 as the main barriers to entrepreneurs looking to start a new company (Atomico, Orrick, HSBC Innovation Services & Slush, 2023). We would point out that lack of external financing was their biggest concern, followed by personal financial constraints. But difficulty hiring a team, lack of business skills, and lack of technical skills were also significant factors.

Figure 10. Main barriers to European entrepreneurs looking to start a new company (2023).

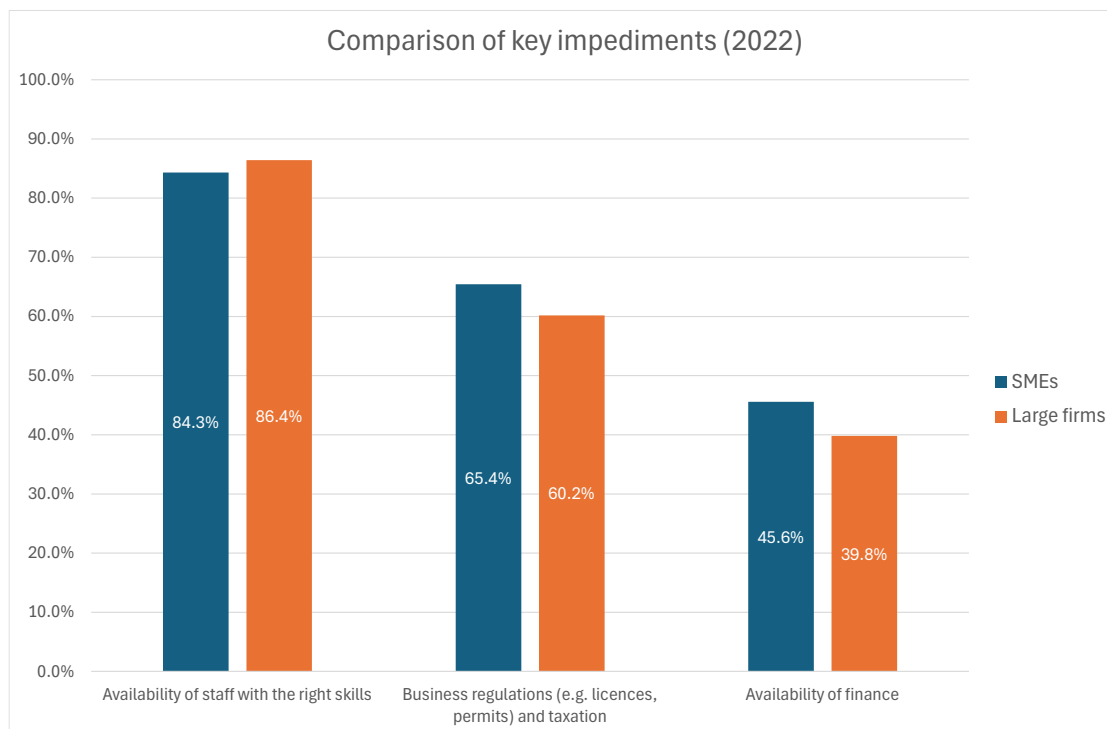


Source: Authors' elaboration, data from Atomico et al. (2023), "State of European Tech 23"

⁹ To be sure, Schumpeter argued in the same book that large firms also produce a great deal of innovation.

A survey by the European Investment Bank (EIB) provides a more rigorous and representative sample of businesses. This allows us to more clearly identify the perceptions of small and large businesses as regards the key impediments to investment (see Figure 11). Here we see that availability of staff with the right skills was the greatest perceived impediment to innovation (by 84.3% of SMEs), followed by business regulations such as licences and permits, together with taxes (65.4% of SMEs), and availability of finance (45.6% of SMEs). The corresponding figures for large firms were 86.4%, 60.2%, and 39.8% -- different, but not as different as one might have anticipated. In sum, staffing was viewed by both large and small firms as their greatest challenge to investment, followed by regulation, then finance in 2022. These results make clear that *large numbers of EU businesses see these as serious impediments*. Large firms were less impacted than small by regulation, and especially by access to finance.

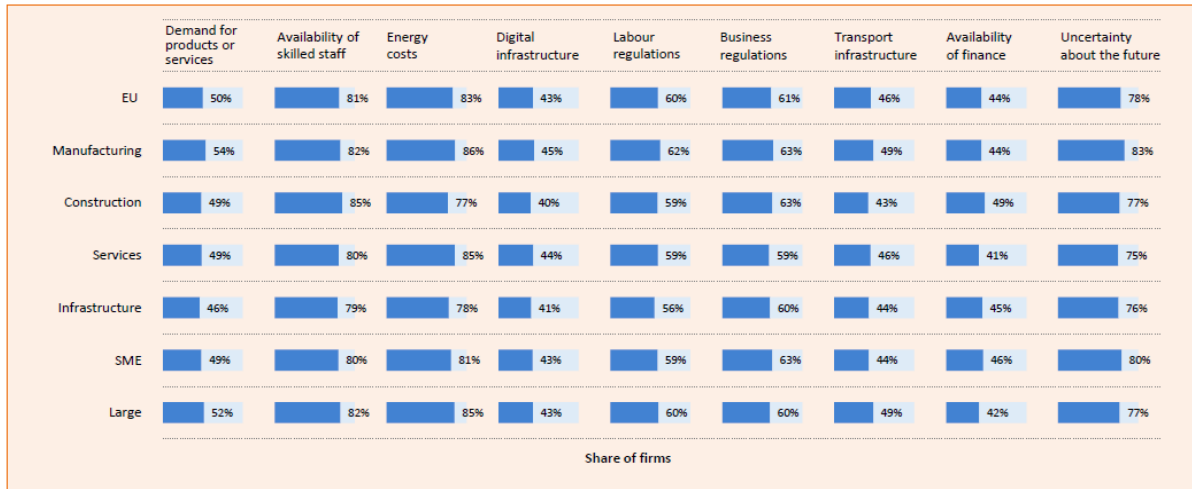
Figure 11. Key impediments to investment (2022).



Source: Authors' elaboration, EIB Investment Survey (<https://data.eib.org/eibis/graph>)

These are not the only impediments to investments as perceived by businesses, but they are perhaps the most noteworthy. A more granular view of results from the same survey (European Investment Bank (EIB), 2023) shows additional perceived impediments (see Figure 12).

Figure 12. Perceived impediments to investment in the EU by firm sector and size (2022).



Q. Thinking about your investment activities, to what extent is each of the following an obstacle? Is it a major obstacle, a minor obstacle or not an obstacle at all?

Reported shares combine "minor" and "major" obstacles into one category.

Source: European Investment Bank (EIB) (2023), *EIB Investment Survey: European Union overview*

In sum, current survey data suggest, consistent with many other sources, that the ability of the EU to scale up its many start-ups into successful world class firms has a great deal to do with (1) shortages of skilled staff, (2) regulatory burdens and taxation, and (3) poor access to capital. In the chapters that follow, we focus on each of these deficits, along with many others.

3. Limitations in access to finance

Key Findings

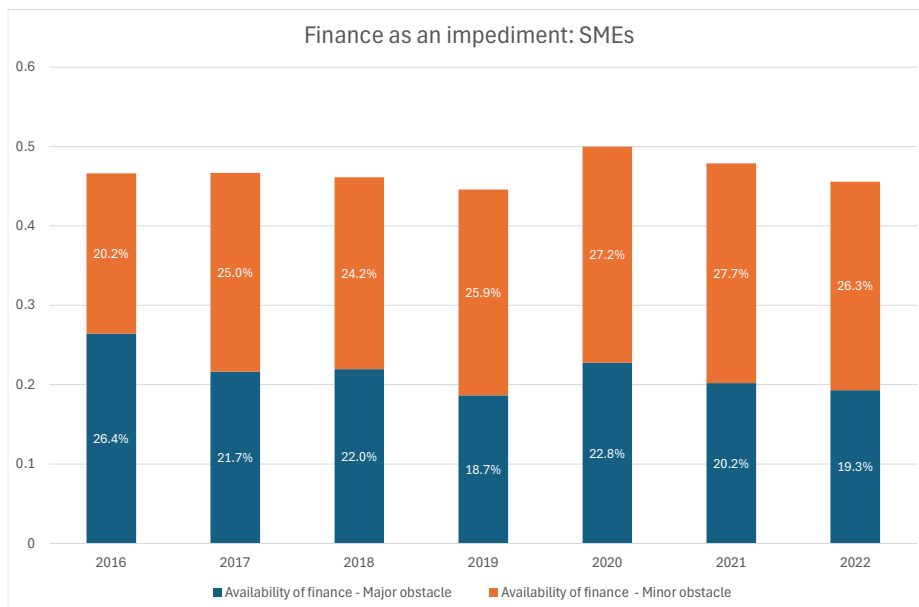
- The EU is actually creating more high technology start-ups per year than the United States or China – this is no longer the blocking problem in EU innovation.
- “Money makes the world go round.” A key challenge to innovation in the EU-27 is the difficulty that our start-ups face in obtaining finance when seeking to scale up to the next level, even though total investment capital in the EU is substantial.
- At retail level, Europeans put a greater proportion of their savings into low-risk investments than do Americans or Chinese.
- Largely as a result, capital markets in the EU are small, both for equity and for debt (e.g. bonds), compared to our global rivals.
- Venture capital and private equity are growing, but are still tiny in comparison with our global competitors.
- Most European borrowing by firms is consequently in the form of bank loans rather than equity – this is not conducive to the provision of risk capital to innovative firms.
- Initial Public Offerings (IPOs) in the EU raise far less money than in the USA.
- Pension funds and insurance invest surprisingly little into venture capital, and also under-invest into private equity funds. Current investment levels are a negligible share of their holdings. They could expand their investments greatly with still negligible risk to solvency, and would likely benefit from doing so.

In previous research, we identified numerous challenges to innovation in the European Union. Prominent among these were several specific to the financing of *start-ups*, and enabling them to grow to become *scale-ups*. As we wrote in 2015, “... the startup ecosystem in Europe is improving rapidly, with several startup hubs across Europe such as London, Berlin and Amsterdam positively booming. Although some areas in Europe have a lot of catching up to do, the overall number of startups in Europe is starting to rival the number in the US,¹⁰ which is testimony to the potential of the European startup ecosystem. When it comes to scale-ups, however, the story is different. The majority of high growth Internet companies in the world is still from the US and Asia. Two key barriers for scaleups remain to be addressed: (1) fragmentation of regulation ... and (2) access to risk capital.” (Godlovitch, et al., 2015) The trend that we identified in 2015 has continued - Europe now produces *more* new start-ups per year than the United States (Atomico, Orrick, HSBC Innovation Services & Slush, 2023); however, the challenge with scaling them up remains, and this is to a significant degree a challenge in obtaining adequate financing.

¹⁰ That was in 2015. The number of start-ups per year in Europe now exceeds that in the United States (Atomico, Orrick, HSBC Innovation Services & Slush, 2023).

Survey data From the EIB make clear that access to finance is a major concern for EU-27 businesses of all sizes, and especially so for SMEs (45.6% for SMEs versus 39.8% for large enterprise, as depicted in Figure 11 in Section 2.2). The same survey data also indicate that concern on the part of EU-27 businesses over access to finance remain in a 45 to 50% bracket over time (see Figure 13).

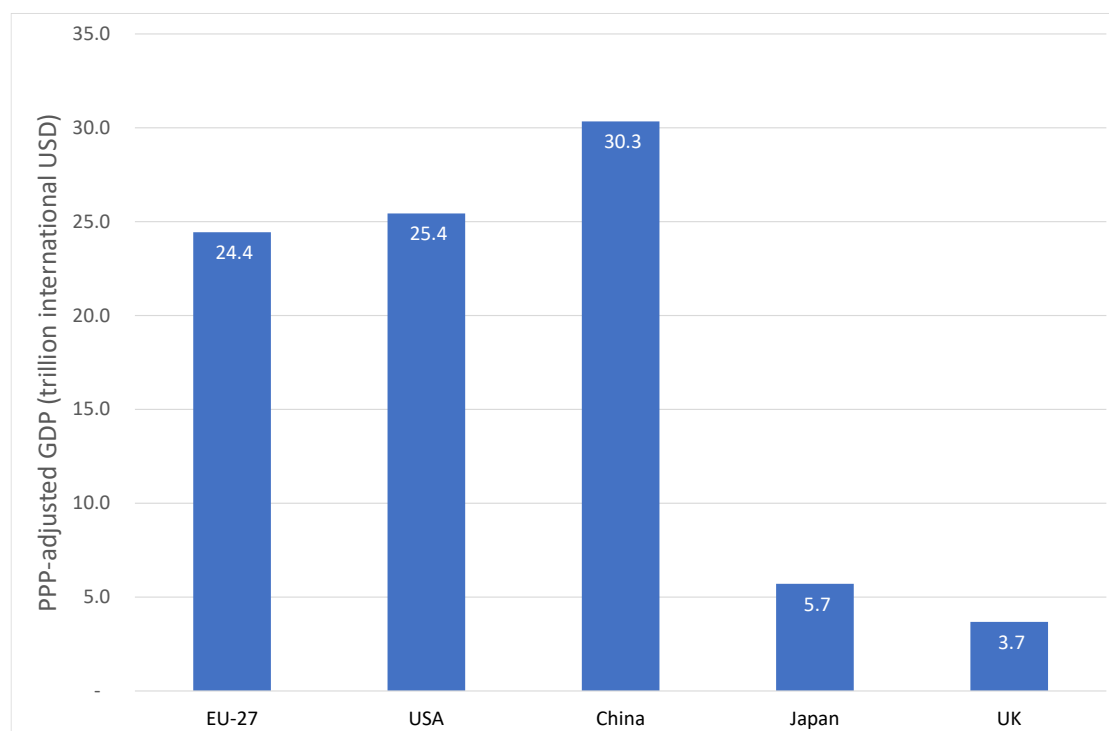
Figure 13. Evolving SME perceptions of finance as an impediment to investment (2016-2022).



Source: Authors' elaboration, EIB Investment Survey (<https://data.eib.org/eibis/graph>)

Even though the economy of the EU-27 is of the same order of magnitude of those of its largest global trading partners and competitors, China and the United States (see Figure 14), the EU nonetheless suffers from multiple deficits in its financial markets in comparison with global competitors.

Figure 14. PPP-adjusted GDP (trillion international USD) of selected leading global economies (2023).



Source: Authors' elaboration, World Bank data

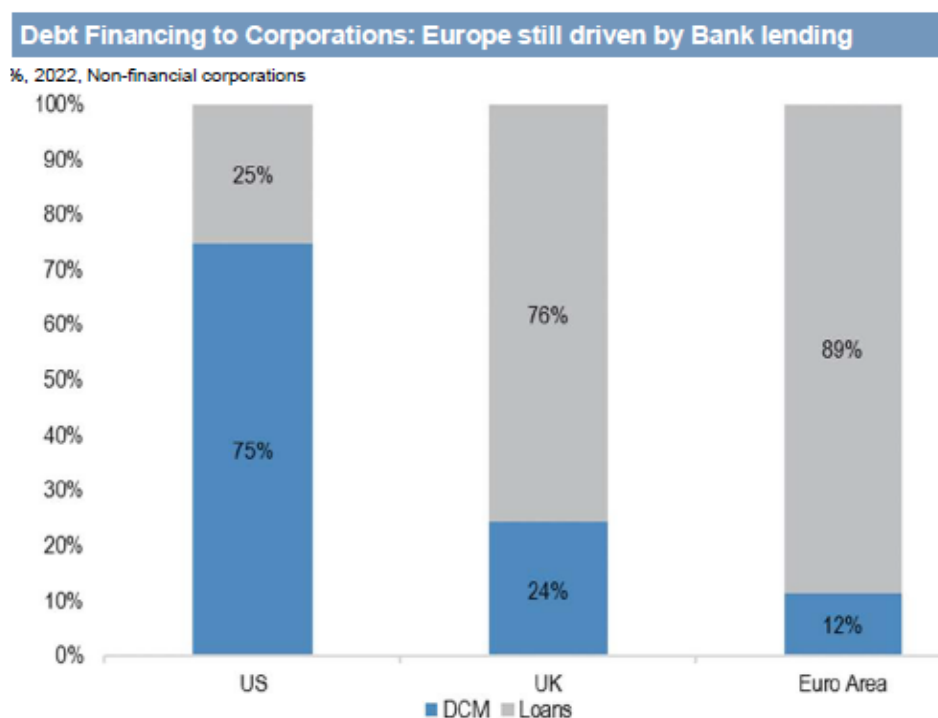
Notable among these deficits are:

- Excessive reliance of EU firms on bank loans rather than other means of finance;
- Weakness of both equity and debt capital markets in the EU-27;
- Weakness in particular of pre-IPO (Initial Public Offering) finance, defined for our purposes as being comprised of venture capital (VC), private equity, angel investors, and crowdsourcing;
- Weakness in the ability to issue Initial Public Offerings (IPOs), which are a key means of monetising promising start-up firms;
- Inability in practice of pension funds and insurance to participate in any but the most risk-free investments.

3.1 Weak capital markets, but strong banks

European firms are heavily reliant on bank loans to finance their operations and their expansion, far more so than in the United States or in China. Equity markets in the EU are weak. Debt funding comes primarily for bank loans rather than from the *Debt Capital Market* (DCM, e.g. bonds), as is clearly visible in Figure 15.

Figure 15. Debt financing to corporations in the USA, the UK, and the EU (2022).



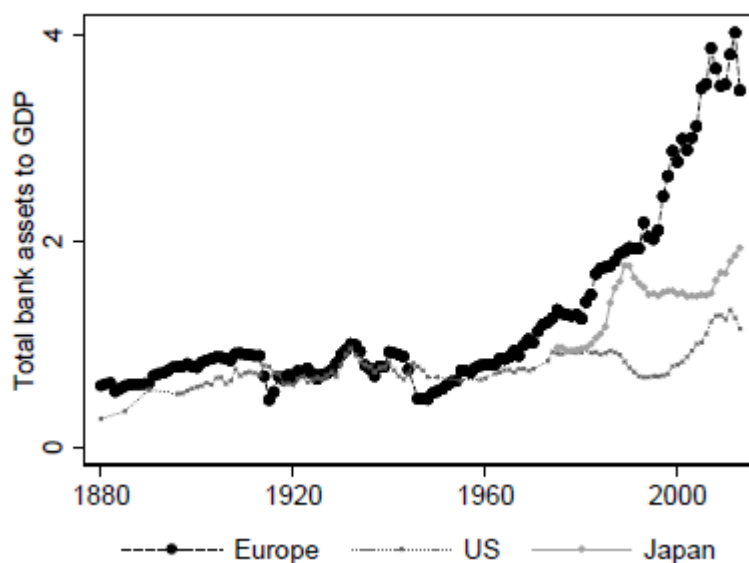
Source: SIFMA 2023 Capital Markets Factbook.

Source: Kian Abouhossein (2023), “Europe’s Capital Markets and Banks in perspective”, J.P. Morgan Securities, presentation at ECMI 2023 Annual Conference, 7 November 2023.

The reasons for this very different pattern in the EU in comparison to the USA are complex, but the results are clear and perverse. Banks primarily lend money to firms that have a business plan that has been shown to be profitable. Since many digital start-up firms have little to offer in the way of collateral, they will have difficulty in securing bank loans until they have demonstrated positive cash flow. This means in practice that EU start-ups are largely excluded from financing their operations with capital from the EU.

In the not-too-distant past, EU financial markets were better in balance; however, the balance shifted. As (Langfield & Pagano, 2015) explain, “Since the early 1990s, Europe’s banking system has expanded rapidly: much faster than Europe’s economic output and wealth, and much faster than most other banking systems. Meanwhile, Europe’s capital markets have barely grown. Europe’s financial structure has therefore become strongly bank-based – far more so than in other advanced economies.” The authors go on to note that “... an increase in the size of the banking system relative to equity and private bond markets is associated with more systemic risk and lower economic growth, particularly during housing market crises. ...” (Langfield & Pagano, 2015)

Figure 16. Total bank assets in relation to GDP for Europe, the USA, and Japan (circa 1880 - 2014).



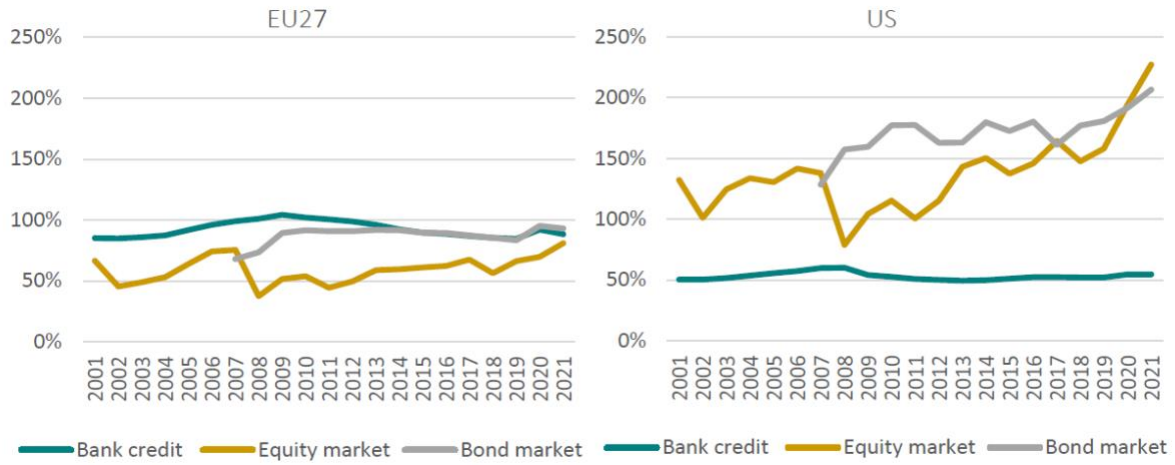
Source: (Langfield & Pagano, 2015)¹¹

The shifts in the relative magnitude of bank credit, equity markets and bond markets in the EU-27 and in the USA over the past twenty years is obvious in Figure 17. The US bond market increased over this period, so as to exceed 200% of GDP in 2021, while EU-27 bond and equity markets remained fairly flat at a level a bit under 100% of GDP. During the same period, bank credit remained fairly flat as a fraction of GDP in both the USA and the EU-27,¹² but at some 50% of GDP in the USA versus nearly 100% of GDP in the EU27. In broad terms, the three are similar in scale in the EU-27, while US equity markets and bond markets are each four times as large as US bank credit.

¹¹ The *Europe* series represents the median of bank total assets to GDP in seven European countries for which reliable long time series data are available: Belgium, Denmark, Germany, Italy, the Netherlands, Spain and the UK. A detailed list of sources appears on pages 34 - 35 of (Langfield & Pagano, 2015).

¹² The very substantial growth in EU 27 bank assets had largely run its course by the year 2000 (see Figure 16).

Figure 17. Bond and equity markets as % of GDP in the EU-27 and the USA (2001 – 2021).



Source: (Thomadakis, Lanoo, & Moloney, 2022)

Another hallmark of the same decline in EU-27 capital markets is that the EU-27 share of revenue of both debt and equity capital markets have declined as a share of global capital markets (see Figure 18). This is a further indication that the EU is slipping relative to global competitors.

Figure 18. Europe's share of global revenue in debt and equity markets (DCMs and ECMs) (2006 – 2022).

DCM revenues by geography					
	2006	2010	2014	2018	2022
US	48%	43%	41%	40%	40%
Europe	38%	33%	30%	26%	24%
APAC	9%	15%	19%	26%	26%
Middle East/ Africa	1%	1%	1%	1%	1%
Others	5%	8%	9%	7%	9%
Total	100%	100%	100%	100%	100%

Source: Dealogic, J.P. Morgan calculations. % market share = (DCM revenue in specific region/ DCM revenue Global) x 100. DCM revenue region is based on nationality of the issuer.

ECM revenues by geography					
	2006	2010	2014	2018	2022
US	36%	30%	38%	43%	29%
Europe	24%	16%	23%	14%	11%
APAC	29%	42%	28%	32%	50%
Middle East/ Africa	1%	1%	2%	1%	3%
Others	10%	11%	9%	9%	7%
Total	100%	100%	100%	100%	100%

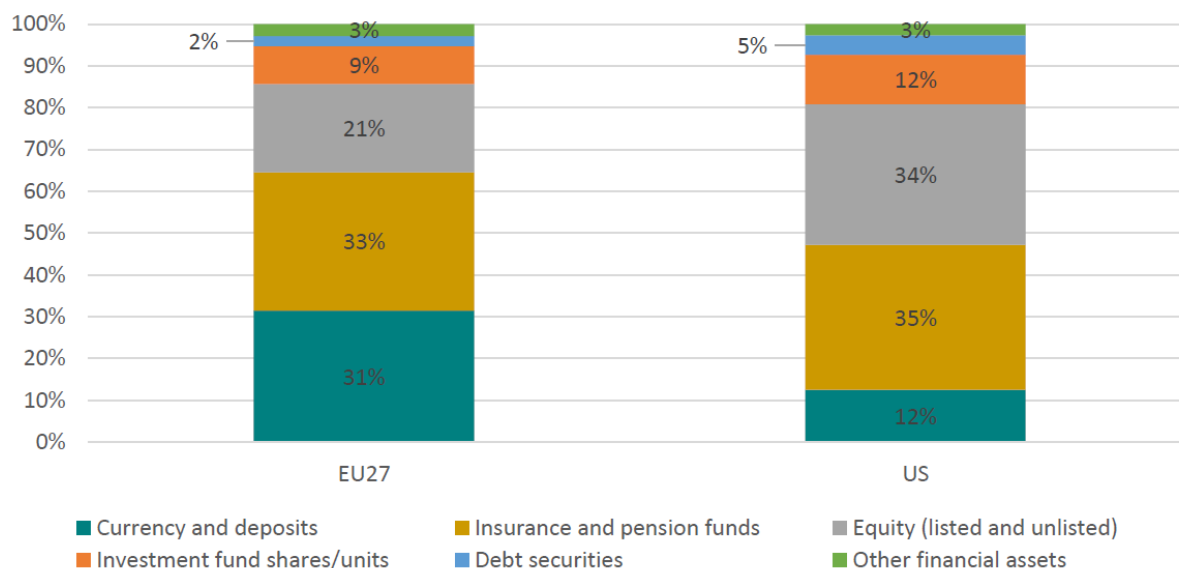
Source: Dealogic, J.P. Morgan calculations. % market share = (ECM revenue in specific region/ ECM revenue Global) x 100. ECM revenue region is based on nationality of the issuer.

Source: Kian Abouhossein (2023), “Europe’s Capital Markets and Banks in perspective”, J.P. Morgan Securities, presentation at ECMI 2023 Annual Conference, 7 November 2023.

A major underlying root cause why EU capital markets are so weak, even though Europeans save a great deal, is that individual European consumers place far more of their savings into relatively risk free investments such as saving accounts than do their counterparts in the United States. This is perhaps a structural difference, and also a consequence of World War I and World War II, both of which were fought largely on European soil; however, there are also aspects that are relevant for public policy. The portion of household retail assets in pensions and insurance are similar in the EU-27 and the USA (33% versus 35%, respectively), but the portion of household assets in currency and deposits in the EU-27 is 31% while the corresponding figure in the USA is just 12% (see Figure 19). This leaves only 35% of EU-27 household savings available for investments that entail some risk (albeit higher reward) including equity, debt securities, and investment fund shares, versus 54% in the USA.¹³ The low EU retail participation in equity markets is sometimes referred to as the *stock-market participation puzzle*.

¹³ There are, to be sure, significant differences among the EU Member States. Denmark and Sweden have a distribution of investments across asset classes that is broadly similar to that of the United States (Christie, McCaffrey, & Pinkus, 2024).

Figure 19. Households' financial assets in in the EU27 and the US (% of total financial assets, average 2015-2020).



Source: (Thomadakis, Lanoo, & Moloney, Time to re-energise the EU’S capital markets: Building investable and competitive ecosystems, 2022) based on data from Eurostat and FRED.¹⁴

There is evidence that lack of financial literacy contributes to this propensity – in one survey, 40% of people who choose not to invest make this decision because they simply do not know how, while roughly 70% of all respondents would be more likely to invest, or would invest more, with expanded financial education (Thomadakis, Lanoo, & Moloney, 2022, p. 31). In the same vein, Enrico Letta has argued for “initiating a campaign aimed at raising awareness about the advantages (along with the risks) of capital markets [so as to serve] as a vital bridge between supply and demand” of capital for small and mid-cap companies (Letta, 2024, p. 32). Increasing training in financial literacy is perhaps an obvious recommendation, but it is important, unavoidable, and often overlooked.

*Recommendation 1. Measures are needed to **increase the financial literacy of the EU public** such that they understand that a mixed personal investment portfolio that includes some high-risk high return investments can be appropriate.*

¹⁴ The category ‘Other financial assets’, for the EU includes other accounts receivable, financial derivatives, and loans. For the US it includes other miscellaneous assets, and loans.

The Letta Report also speaks of the need for an EU *Savings and Investments Union*, to include an EU *Long-Term Savings Product* (Letta, 2024, pp. 28 - 30), possibly a kind of pension, possibly a more general workplace savings product, that would be “valid across companies and borders within the Single Market”. Digging deeper into Letta’s proposal, (Christie, McCaffrey, & Pinkus, 2024) argue that there is an opportunity for a broader EU-wide investment vehicle that should not be limited to pension-like investments (which we cover in Section 3.3). Funds might be offered at local or national level, but would carry an EU trustmark (analogous to the “CE” label) that indicates that the fund has met a rigorous set of pan-European standards and portability requirements. This would help EU investors with lower financial sophistication to invest in instruments that should ideally offer higher returns and lower fees than the relatively inefficient products of local banks that are the recipients of a huge fraction of the investment funds of EU households today (Christie, McCaffrey, & Pinkus, 2024).

Such products could readily accommodate the needs of investors, including the degree to which they are risk-tolerant versus risk-averse. In doing so, however, it would be of vital importance to structure the default investment appropriately, and to recognise that a proper investment portfolio typically entails a mix of different instruments with different risk and reward profiles. Experience with pension funds clearly demonstrates that even when investors are offered a mix of preferences, a large fraction will take the default distribution in practice – in a study of UK pensions for 2022-2023, 97% took the default choice (Pensions Europe, 2024).

*Recommendation 2, Creation of a **trusted EU structure for investment instruments** might potentially make it easier for households with limited financial sophistication to achieve more balanced household investment portfolios.*

3.2 Funding to enable EU start-up firms to scale up

Historically, the EU struggled to create new start-up firms. This appears to no longer be the case – “What will, however, be surprising to most is the fact that the annual volume of founders starting new tech startups in Europe [slightly] exceeds the US, and has done so consistently for every one of the past five years.” (Atomico, Orrick, HSBC Innovation Services & Slush, 2023, S. 47), as is clear in Figure 29 in Chapter **Error! Reference source not found..** The challenge today is in creating EU start-ups, but in scaling them up so as to enable them to become globally relevant competitors.

The impact of the lack of risk financing for scale-ups¹⁵ is not new news. Nearly a decade ago, we observed that “While the European startup ecosystem is growing quickly in terms of the number of startups and facilities across regional hubs, scaling-up remains a challenge. ... The

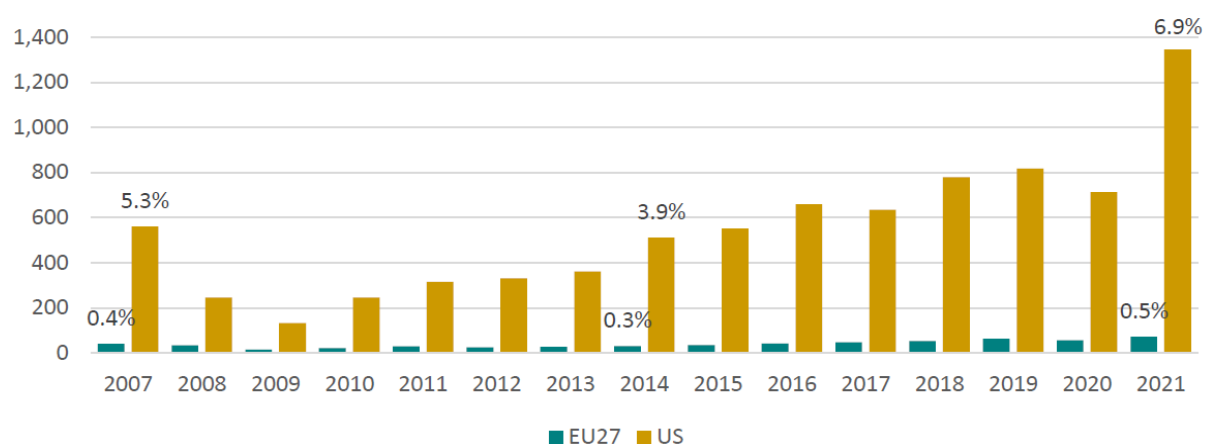
¹⁵ For our purposes in this report, “Scale-ups are enterprises with average annualised growth in employees (or in turnover) greater than 20 per cent a year over a three-year period, having 10 or more employees at the beginning of the observation period.” (OECD, 2008)

European capital market does not cater well to the needs of potential scale-ups. For ... startups in Europe to successfully scale (and thus to create jobs and growth), the quality (culture, focus, instruments, size) of the VC market is paramount,” (Godlovitch, et al., 2015)

The concern continues to be relevant today – (Thomadakis, Lanoo, & Moloney, 2022) argue that “developing strong capital markets in Europe that would foster equity financing and offer access to alternative funding sources could help to overcome funding constraints stemming from overreliance on banking. *This is particularly relevant for young, small, fast-growing, and innovative companies given that these firms tend to depend more on intangible assets that are difficult to value and have greater difficulty accessing capital markets than larger firms.* [emphasis added] Pre-initial public offering (IPO) risk capital – such as equity crowdfunding, business angels, venture capital (VC), or private equity (PE) – not only supplements traditional forms of financing but can also act as a ‘bridge’ toward listing on regulated markets.”

How big is the gap in pre-IPO risk capital? Simply stated, it is enormous! And it is getting worse, as is evident in Figure 20. “The amount of pre-IPO risk capital invested in the EU has increased over the past few years at an average annual growth rate of 8% and reached €72 billion at the end of 2021. Despite this positive development, it represents only 0.5% of European GDP ... By comparison, the US pre-IPO market has grown at an annual average rate of 14% and totalled €1.3 trillion in 2021 while, relative to the size of the US economy, it stands at 6.9% of GDP.” (Thomadakis, Lanoo, & Moloney, 2022)

Figure 20. Pre-IPO risk capital investment in the EU27 and the US (billion Euro and percent of GDP) (2007 – 2021).

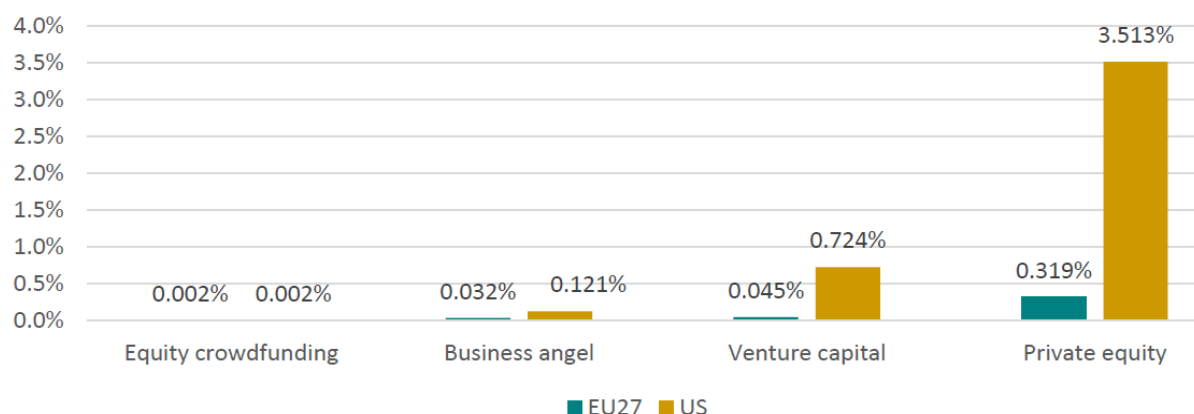


Source: (Thomadakis, Lanoo, & Moloney, 2022)

Much of the literature tends to focus solely on venture capital as a means of financing risky innovative ventures prior to IPO, but in fact it is only one mechanism out of many. Private equity is substantially larger and more important than venture capital in funding for start-ups,

and angel investors and crowdfunding are not irrelevant. Once again, Figure 21 makes clear the enormous disparity between funding in the EU and the United States in all asset classes (except for crowdfunding, which however is too small to be very relevant overall).

Figure 21. Pre-IPO risk capital investment in the EU27 and the USA across asset class (% of GDP, average 2015-2021).



Source: (Thomadakis, Lanoo, & Moloney, 2022)

What we also see in (Thomadakis, Lanoo, & Moloney, 2022), which is an excellent source, is that the difference in overall funding of pre-IPO risk capital leads to a huge difference in the investment per firm. They point out that “Private equity and VC funds are fragmented in the EU, and are smaller than their US counterparts. ... They are also less networked with one another than their US counterparts. This limits the amount of funding that they can provide. ... In Europe, the average amount received by a VC-backed company is about EUR 2 million, while a US company will get almost five times this amount. ... On average, US-backed [private equity (PE)] companies receive 20 times more funding compared to their European peers.”

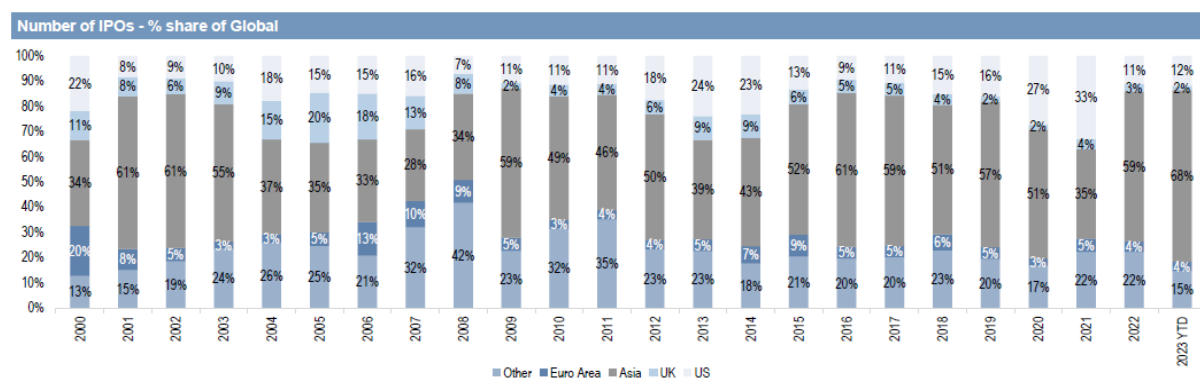
The funding gap also means that EU start-ups struggle to find any venture capital funding at all. “After five years, US tech startups are 40% more likely to have successfully secured venture capital funding.” (Atomico, Orrick, HSBC Innovation Services & Slush, 2023)

Once a scale-up has demonstrated its viability, one of the key means for the founders to further capitalise the firm and to “cash out” is by means of the Initial Public Offering (IPO). Here, too, EU start-ups are at a considerable disadvantage, both in the ease with which an IPO can be implemented, and in the amount of money that they can expect to raise with an IPO.

The number of IPOs is the first indicator that the EU has a problem. The EU also had far fewer IPOs than either the USA or Asia, and a significant fraction of those IPOs were in the UK (which of course is no longer EU). In recent years. The EU implements only about 4% of

worldwide IPOs, which is far below the level that one might expect based on the size of the EU economy relative to the size of the global economy.

Figure 22. Number of IPOs per country or region as a percentage share of global IPOs (2000 – 2023).

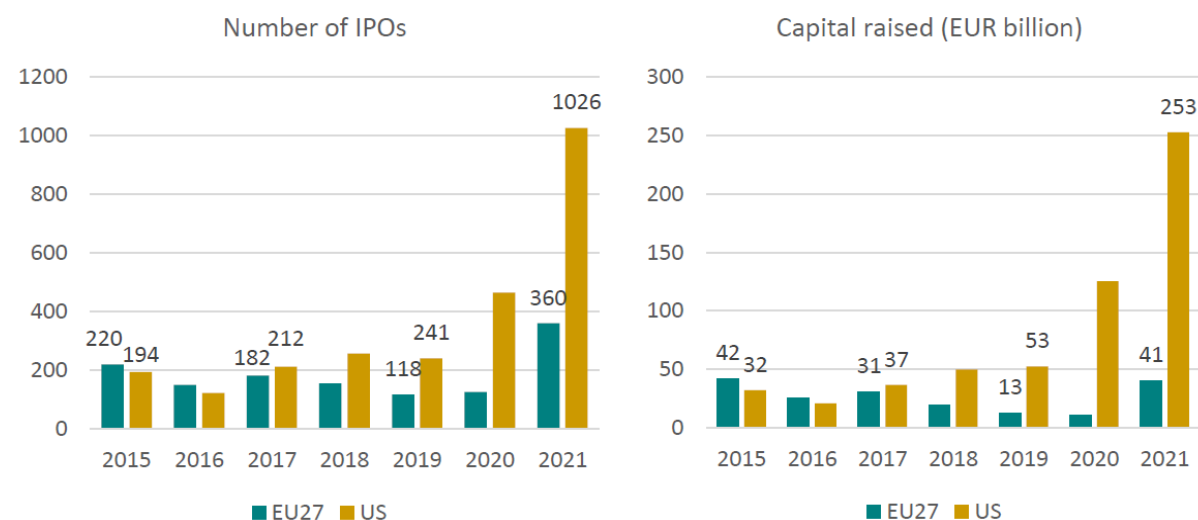


Source: Dealogic, YTD as of 12th Oct 2023

Source: Kian Abouhossein (2023), “Europe’s Capital Markets and Banks in perspective”, J.P. Morgan Securities, presentation at ECMI 2023 Annual Conference, 7 November 2023.

In comparison to the United States, the problem to which the EU is subject is not only that the number of IPOs is too low, but also that the revenue that they raise is too low (see Figure 23). In the aggregate, US IPOs raised 6.2 times as much capital as EU IPOs in 2021. The average US IPO in 2021 raised €247 million, while the average EU27 IPO raised €114 million.

Figure 23. Number of IPOs and capital raised (EUR billion) in the EU27 and the US (2015 – 2021).



Source: (Thomadakis, Lanoo, & Moloney, 2022)

Another way of visualising the degree to which investment via IPOs in the EU27 is low in comparison with that of global competitors is depicted in Table 1. The aggregate investment in existing firms aggregated over the period 2015 – 2022 is higher in the EU-27 than in United States, but the aggregate investment in new firms by means of IPOs over the same period is only half as great. Over the period 2015 – 2022, the investment in new firms via IPOs in the EU27 represented only 19.1% of total investment, versus 29.3% in the UK, 29.5% in China, 28.8% in Japan, and a whopping 39.0% in the United States. This represents an enormous gap.

Table 1. Investment in existing firms versus in new firms via IPO (millions of Euro) (aggregate 2015-2022).

	Investment in existing companies	Investment in new companies (IPOs)	IPOs vs total investment
EU-27	881,582	208,224	19.1%
UK	169,415	70,203	29.3%
China	1,322,289	554,484	29.5%
Japan	143,028	57,754	28.8%
USA	677,480	432,954	39.0%

Source: Authors' elaboration, ECMI data

In sum, the challenges that EU27 start-up firms face in seeking capital to enable them to scale up are considerably worse than the lack of overall debt and equity capital in the EU27 alone would tend to suggest. In terms of both pre-IPO risk capital, and capital raised through the IPO itself, they are at a serious handicap relative to the United States, and to a significant extent also in comparison to other global competitors.

3.3 Pension funds and insurance – locked-up value?

A potential EU asset that might fill in a key piece of the puzzle as to how to scale up EU start-ups appears to have been largely overlooked in the literature to date. The USA experience provides the key.

In the United States, as much as two-thirds of venture capital is said to be provided ultimately by pension funds. Some 27% of the limited partners (LPs) of US venture capital firms are pension funds (Redstone, 2023, p. 12). A small change in US law in the seventies (the ERISA statute) changed the interpretation of what constitutes a prudent investment for a pension fund so as to recognise that allocating a small fraction of the portfolio to investments that have higher risk, but also higher return, is consistent with appropriate investment practice for a pension fund. The change came at an auspicious time. It funnelled a huge amount of money into US venture capital funds (Lerner & Nanda, 2020). Silicon Valley would not have become the Silicon Valley that we know without it.

In reality, this was not a radical departure – investment counsellors in general would tend to say that any portfolio should be comprised of a mix of instruments with different risk and return profiles, and that it is often appropriate to include some higher risk higher return elements. For the portfolio as a whole, what matters is the overall return over the long term, not the ups and downs of individual portfolio elements in the short term.¹⁶

Analogously, an investment portfolio for an individual should typically also be comprised of a mix of instruments with different risk and return profiles. A younger investor might accept a higher level of risk in his or her retirement portfolio than an older investor, because there is more time for short time fluctuations to even out. As long as the long term overall performance yields a good result at retirement, any bumps in the road in getting there do not matter.

As a high yield option, albeit with correspondingly high risk, venture capital and private equity are clearly attractive. Over the past ten years, one analyst finds that venture capital and private equity were the asset classes that performed best, with returns of 19% and 15% respectively over the years 2013 - 2022 (Redstone, 2023, p. 4). Over the years 1996 – 2021, average venture capital fund returns were 19.1%, compared with 2.74% for ten-year German government bonds (Redstone, 2023, p. 9).

How much risk is associated with mixing venture capital and private equity into the portfolio? An intriguing analysis by J.P. Morgan (J.P. Morgan, 2024, p. 6) found not only that returns tended to be higher, but also that volatility was often actually lower for a hypothetical portfolio that included 10% private equity (and 10% each of hedge funds and real estate) than for a portfolio comprised only of equities and bonds. In this context, it is perhaps worth noting that bonds are not necessarily as risk free as we might like to think – their market value depends on fluctuations in the overall market interest rate, together with the number of years until they are due to be redeemed.

The total assets of pension funds in the Euro area as of Q3 2023 were 3.2 trillion Euro (ECB, 2024) and growing; for the EU-27, total assets in 2022 were 3.9 trillion Euro (ECMI, 2024). Pension funds in the EU, and more generally in OECD countries and other countries, are

¹⁶ We intentionally over-simplify a bit here. In practice, most pension funds today pay close attention to when their various obligations are going to come due so as to plan for their returns to be realised at the right time.

about 50% in bonds and otherwise to a significant degree in equity (either directly or indirectly through funds) (OECD, 2021).

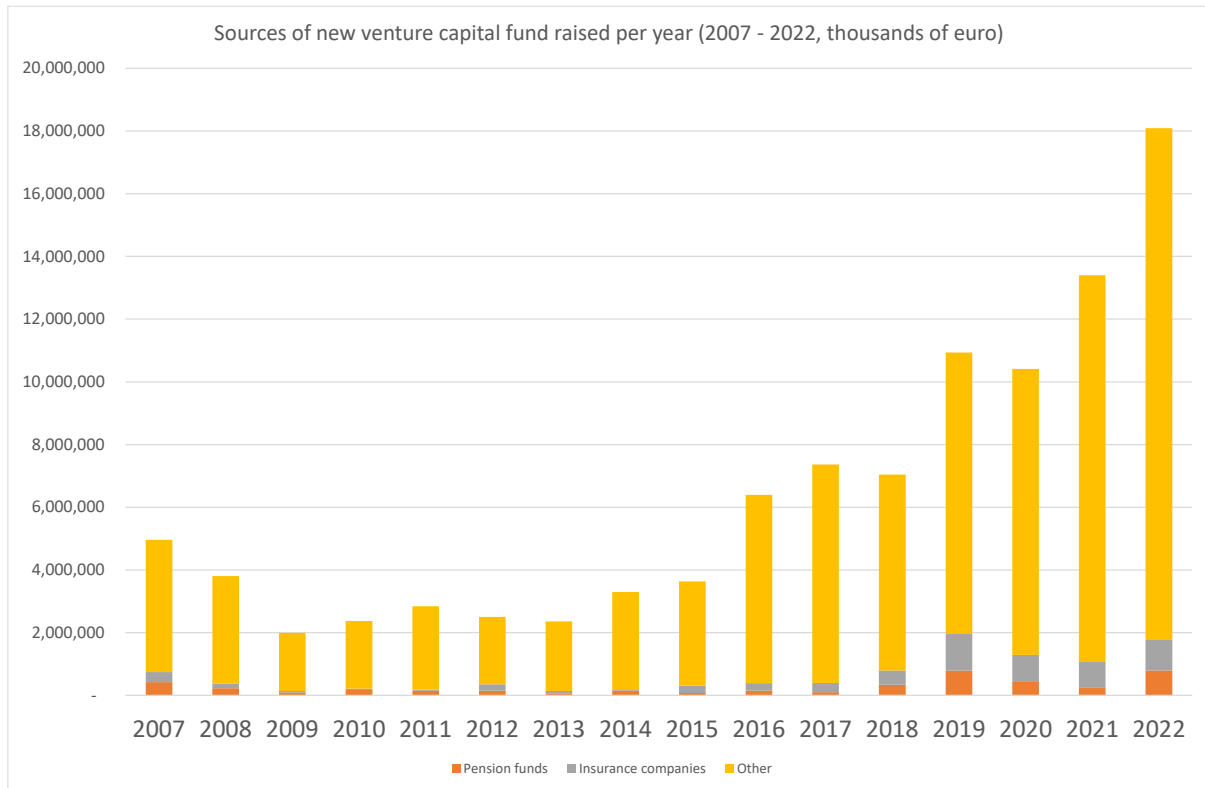
As previously noted, pension funds are said to contribute about two thirds of the funds available as venture capital in the USA. In the EU-27, by contrast, the combined contribution of pension funds and insurance over the period 2007 – 2022 to venture capital¹⁷ has never exceeded 15%, as becomes obvious in Figure 24. Over the period 2015 – 2022, aggregated contributions of pension funds represented 3.8% of all new funds, versus insurance contributions of 6.5%, for a combined total of 10.3% of all contributions for those years.

Those might sound like large sums, but it is important to remember that *relative to the total holdings of pensions and insurance, they would barely qualify as a rounding error*. The contributions of pensions and insurance to venture capital in 2021 represent 0.0074% and 0.0089% of the respective assets of these funds – to be clear, this is less than one one-hundredth of one percent in each case. In other words, the sums involved do not represent a threat to the stability of the funds. They could be increased by a factor of ten or twenty and would still not pose a threat to the stability of the funds.

As a thought exercise, consider hypothetically that if both pension funds and insurance had contributed twenty times as much to venture capital as they in fact contributed, total venture capital contributions for the year would have been 51.6 billion euro instead of the 18.1 billion euro that was in fact contributed. Pension funds and insurance would have represented 30.8% and 37.6% percent of this total, respectively. Comparative information about the United States is hard to come by, but this might have represented something comparable to the two-thirds share that they are said to contribute to venture capital in the United States.

¹⁷ These data are based on firms “managing investment vehicles or pools of capital (Funds) and investing primarily equity capital in enterprises not quoted on a stock market ... The core Private Equity (PE)/Venture Capital (VC) classical model should meet the following features: fund structure or other form of pool of capital, portfolio companies, medium to long period of holding a company in the portfolio, exit strategy”.

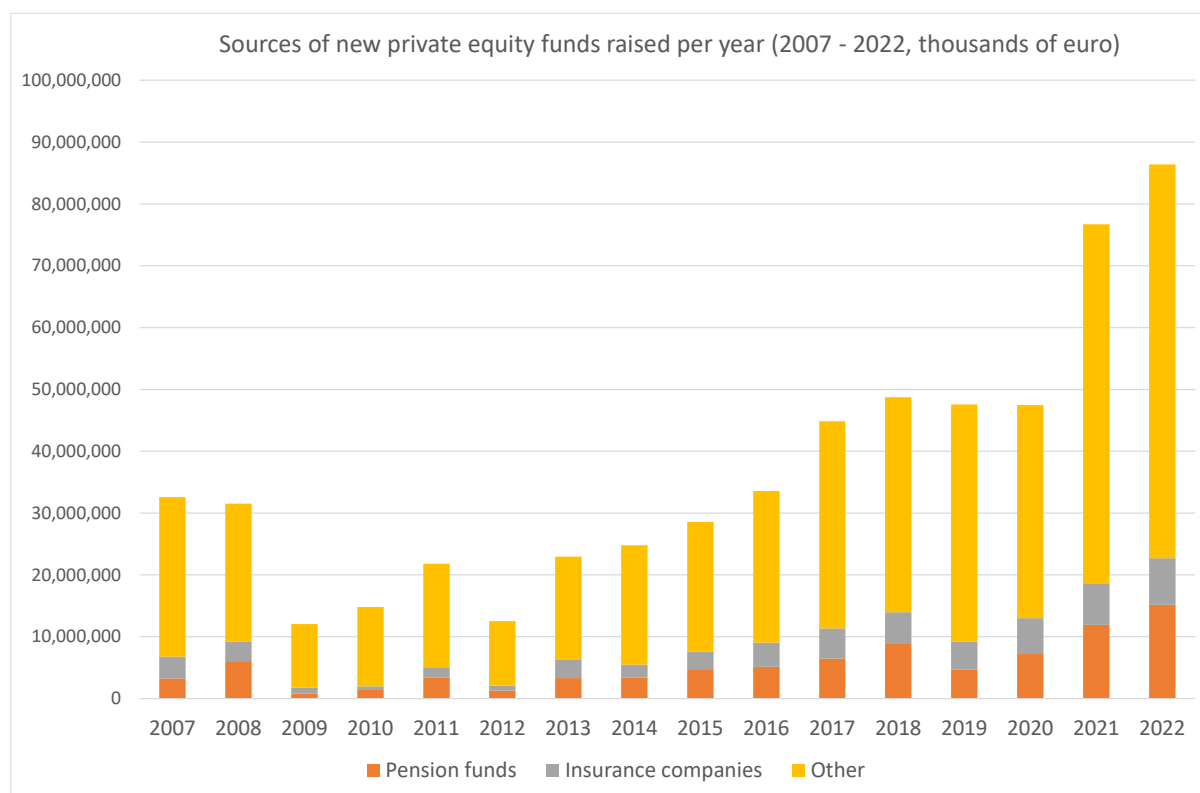
Figure 24. Sources of new venture capital raised (per year, 2007 - 2022, in thousands of euro),



Source: Authors' elaboration, Invest Europe data.

The investment of insurance and especially of pension funds into private equity is much larger than their investment into venture capital, both in absolute terms and as a percentage of the total investment in private equity, but still appears to surprisingly low relative to what one might have expected. The share of the total by pension funds plus insurance approaches 30% in some years. Nonetheless, the share of total pension fund assets invested in private equity never reached or exceeded 0.4% of total assets over the period 2007 to 2022. In most years, it was far less. Once again, there is considerable room to grow the level of investments.

Figure 25. Sources of new private equity funds raised per year (2007 - 2022, thousands of euro).



Source: Authors' elaboration, Invest Europe data.

In proposing that pension funds and insurance companies could potentially play the key role in revitalising acquisition of finance on the part of high technology firms, especially start-ups, we are fully in alignment with the Letta Report, which notes that “investing in deep-tech startups is not for small investors or retail banking, but for pension funds and large asset management firms. Indeed, the latter can take high risk and wait for long term return. It means that a different (less risk adverse) EU prudential regime with supervision at EU level could be envisaged for these investments above a certain threshold.” (Letta, 2024, p. 33)

Before proceeding to explore what steps might be taken to enable pension funds and insurance companies to contribute to pre-IPO risk and benefit from it, it is necessary to say a few words about the complex and fragmented structure of the entire sector in the EU. The Member States look after their citizens and residents in many different ways.

In many of the Member States, a large portion of these responsibilities fall to so-called pay-as-you-go institutions. These institutions pay money from current revenues but do not make substantial long term investments, and thus are largely irrelevant to the discussion in this section.

What we are referring to as pension funds are primarily *institutions for occupational retirement provision (IORPs)*. They are regulated in the EU by the Directive (EU) 2016/2341 on the activities and supervision of institutions for occupational retirement provision (IORPs). This is a minimum harmonisation Directive, which is to say that the Member States enjoy enormous discretion as to its implementation.

A further distinction that is relevant to our discussion is that occupational pension schemes typically are either *Defined Benefit (DB)* or *Defined Contribution (DC)* schemes (or some hybrid of the two). In a DB scheme, the worker knows what he or she will receive, while in a defined contribution scheme, the payment will generally reflect the performance of investments. “These schemes differ in how pension benefits are determined, and who bears the associated risks. In traditional DB schemes, where benefits are often linked to a worker’s final salary, employers bear the vast majority of the risks, while in traditional (or sometimes called pure) DC schemes, risks are shifted towards the individual employees.” (Pensions Europe, 2024)

The constraints on the investments of DB schemes tend to be substantially more stringent than those of DC schemes. At the same time, a broad shift is under way, with some funds and some Member States shifting away from DB schemes and toward DC schemes. This shift has complicated implications, but relative to investments, it will tend to imply greater freedom to incorporate elements with some risk into the investment portfolio (Pensions Europe, 2024).

As already noted, insurance companies have even larger investment holdings than those of pension funds. Many of them offer insurance products that fulfil some of the same functions as pension funds, but they are regulated under *Solvency II*, a different and more stringent EU regulatory regime that reflects maximum harmonisation across the Member States of the EU.

The IORPs Directive requires that IORPs invest in accordance with the *prudent person rule*. The prudent person rule has its roots in United States common law, particularly the law of trusts. A working definition for our purposes is that the IORP “... must discharge its duties with the care, skill, prudence and diligence that a prudent person acting in a like capacity would use in the conduct of an enterprise of like character and aims.” (Galer, 2002)

Prior to the enactment of ERISA in 1974, the fiduciary responsibility of US pension fund managers was interpreted under rather rigid US common law standards. Subsequent to enactment of ERISA, the US Department of Labor made clear that the prudent person rule should be interpreted more broadly to mean that the “prudence of a particular investment decision should not be judged without regard to the role that the proposed investment or investment course of action plays within the overall portfolio.” (Galer, 2002) This enabled pension fund managers to invest in a more balanced portfolio.

Our belief is that the main reason why EU-27 pension funds invest so little in venture capital and private equity is a direct consequence of the EU never having provided an equivalent clarification. The IORPs Directive notes the importance of diversification in very general terms, but does not go further. We infer that overly conservative investment practices, together with

Member State rules, impede investments that otherwise would have tended to be win-win-win, benefitting the funds, the pensioners, and overall EU-27 society.

The fragmented structure of the sector probably also plays a role – smaller pension funds may not have staff to properly evaluate private equity or venture capital opportunities, or may feel that having service providers do this for them would be too costly. If transaction costs along these lines were the main problem, it could surely be solved, for instance by a service provider “cooperative” that serves multiple funds. Our understanding is, in fact, that the UK is hoping to implement such a fund of funds. An approach along these lines might also help to spread risk.

In sum, if pension funds and insurance companies were permitted and encouraged to invest up to, say, 5% of their holdings in the form of pre-IPO risk capital and/or IPOs in promising sectors including digital, sustainability, and health, it could mobilise hundreds of billions of euros of additional capital to enable innovative EU businesses to scale up. The exact measures needed to open the spigot on these investment flows would benefit from further analysis, but key elements are likely to include (1) providing guidance that under the IORP Directive, the prudent person rule should be interpreted relative to the portfolio as a whole, and should not preclude prudent investments of a modest portion of the portfolio in higher risk high reward instruments including venture capital and private equity, coupled with follow-up actions to encourage Member States to adapt their rules accordingly; (2) equivalent legislative changes to Solvency II so as to enable a broader mix of asset classes into the investment mix of insurance companies; and (3) actions to ensure that overhead costs associated with investments into venture capital and private equity do not get in the way.

Recommendation 3. *Legal and regulatory changes are needed to enable and encourage pension funds and insurance to include investments in pre-IPO risk capital and in IPOs as a modest part of their portfolios. Additional actions may be needed to ensure that overhead costs associated with making these investments do not get in the way.*

3.4 Remaining gaps and candidate measures to address them

In sum, it is abundantly clear that while the EU-27 generates enough innovative start-up firms today, more in fact than the United States, they face a monumental challenge: *there is simply not enough money available to enable them to scale up*. This places them at a substantial disadvantage compared to the firms of Europe’s global competitors.

EU policy to date has not done enough to deal with this fundamental issue. Many initiatives have been launched at EU level, particularly as part of the Capital Markets Union (CMU), but progress on CMU has been slow, and the measures attempted to date are simply not at a sufficient scale to make a difference.

An initial problem is that even though Europeans save a great deal, they put a much higher fraction of their savings into cash bank deposits (31%) than do Americans (12%) (Thomadakis, Lanoo, & Moloney, 2022, p. 28). Together with retail investments in pensions and insurance, this leaves only 33% for investment in non-safe assets (Thomadakis, Lanoo, & Moloney, 2022, pp. 28 - 29). This contributes to the EU having weak capital markets both for equity and for debt! The low EU retail participation in equity markets is sometimes referred to as the *stock-market participation puzzle*.

There is evidence that lack of financial literacy contributes to this propensity – in one survey, 40% of people who choose not to invest make this decision because they simply do not know how, while roughly 70% of all respondents would be more likely to invest, or would invest more, with expanded financial education (Thomadakis, Lanoo, & Moloney, 2022, p. 31). A 2023 Eurobarometer survey likewise found troubling gaps in the financial literacy of Europeans; moreover, only 24% of those surveyed had held an investment instrument (funds, stocks, or bonds) in the past two years (Ipsos European Public Affairs, 2023). Increasing training in financial literacy is perhaps an obvious recommendation, but it is important, unavoidable, and often overlooked. This is the rationale for our first recommendation, which we repeat here.

*Measures are needed to increase the financial literacy of the EU public such **that they understand that a mixed personal** investment portfolio that includes some high-risk high return investments can be appropriate.*

A simplified, EU-wide investment instrument might likewise have merit for analogous reasons.

*Creation of **a trusted EU structure for investment instruments** might potentially make it easier for households with limited financial sophistication to achieve more balanced household investment portfolios.*

Again, the measures that the EU has attempted to date are simply not on a sufficient scale. We suggest steps for pension funds (and perhaps also for insurance) because measures that have apparently not been considered to date appear to be possible, and because the scale is large enough to matter. The total assets of pension funds in the Euro area as of Q3 2023 were 3.2 trillion Euro (ECB, 2024) and growing; for the EU-27, total assets in 2022 were 3.9 trillion Euro (ECMI, 2024). Pension funds in the EU, and more generally in OECD countries and other countries, are about 50% in bonds and otherwise to a significant degree in equity (either directly or indirectly through funds) (OECD, 2021). If pension funds were permitted and encouraged to invest up to, say, 5% of their holdings in the form of pre-IPO risk capital and/or IPOs in promising sectors including digital, sustainability, and health, it could mobilise

hundreds of billions of euros of additional capital to enable innovative EU businesses to scale up.¹⁸ Again, we repeat our recommendation for convenience.

*Legal and regulatory changes are needed to **enable and encourage pension funds and insurance to include investments in pre-IPO risk capital and in IPOs** as a modest part of their portfolios. Additional actions may be needed to ensure that overhead costs associated with making these investments do not get in the way.*

In doing so, it would be necessary to manage macroprudential risk for the pension funds, which is why we suggest a cap of perhaps 5% on the amount that could be invested. But current investments are not remotely close to that level – in line with the data that we presented in Section 3.3, that would represent an enormous increase compared to the investments that pension funds and insurance made in 2021, on the order of a factor of 5,000. National authorities and the European EIOPA should continue to play a supervisory role, but should be tolerant of individual losses as long as overall long term performance is adequate, which appears to be easily achievable.

For individuals, it would likewise be necessary to manage risk. For individual retirement accounts, a mixed portfolio (presumably on an opt-in basis) that includes some high risk potentially high return elements makes excellent sense for younger contributors, but risk would need to be managed for older contributors who are closer to retirement. Either the percentage that is permitted to be invested in high-risk activities might be limited, or the total investment amount held in low risk activities should not be allowed to fall below a reasonable floor.

¹⁸ Assets of insurance companies are more than twice as great than those of pension funds, and may represent a substantial additional opportunity.

4. Limitations in skills, education, and training

Key Findings

- Lack of skilled labour is perceived as the most important obstacle to investment and concerns more European companies than ever.
- ICT specialists and researchers are increasing, but the talent gap is still substantial, especially in the AI and cybersecurity fields.
- There is a marked gender gap in both the research environment and the ICT workforce, more pronounced than in the general workforce.
- Europe is currently a net beneficiary of (tech) talent movement, but the opposite is the case for scientific researchers.
- Multiple skills are essential to reignite digital competitiveness, not just basic digital skills and specialised ICT skills.
- A longstanding weakness of the EU workforce, the lack of on-the-job digital skills, remains critical.
- There is no sign that skill shortages will be likely to self-correct.

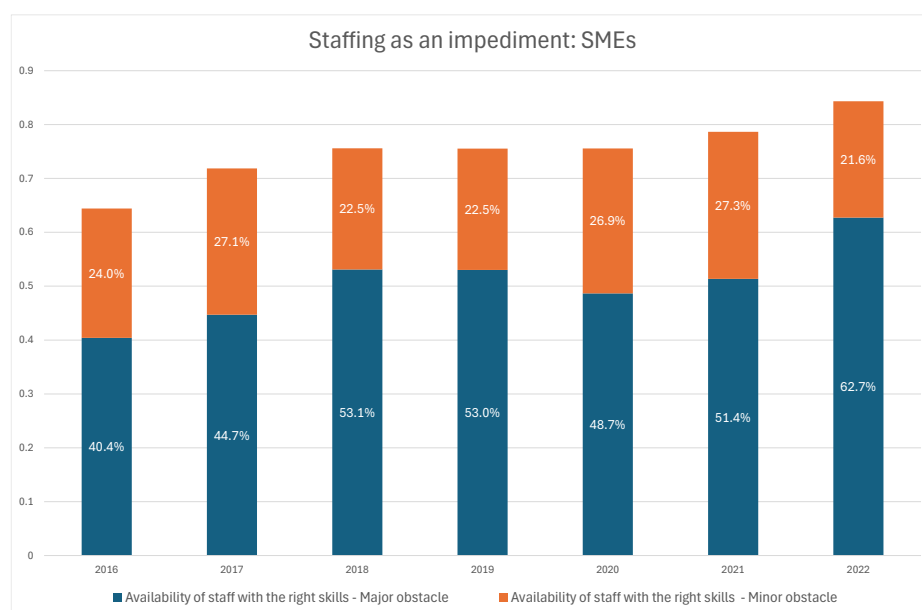
EU institutions have shown themselves in the past few years to be well aware of the opportunities that current technological evolution promises to offer to the European economy. Digitalisation is one of the key pillars guiding the implementation of the EU's Recovery and Resilience Facility (RRF). New forms of industrial policy targeting specific technologies such as artificial intelligence, cloud computing, and nanotechnologies, to name a few, are catalysing policy attention (Rossi, 2024). Overall, there appears to be an increasing level of commitment towards innovation in general and digital innovation in particular. We believe this is highly desirable from the perspective of European competitiveness.

The bulk of the policy support appears to be designed as supply-side stimulus to public and private innovation. The rationale for this choice is solid. We caution, however, that much more serious attention should be paid to the fact that **increasing the supply of innovation requires a corresponding increase in the supply of the right quantity and type of human capital**. Basic economics suggests that, if that were not the case, the increasing demand for human capital associated with increased investments in innovation would drive up the prices of labour, ultimately increasing the costs of innovation. The role of bottlenecks in human capital is an aspect that is receiving increasing attention by economics of innovation scholars (Van Reenen, 2021) but less attention in policy circles. After all, it is human capital that is the primary ingredient of any form of innovation (frontier and more incremental) and of technology adoption. Human capital is also key beyond innovation, as a direct contributor to productivity. Together, human capital, managerial skills and innovation skills explain the bulk of productivity

growth, and there are already signs that the extent to which productivity growth is driven by capital-embodied technical change is decreasing (Haskel & Westlake, 2017)¹⁹.

The imbalance between supply and demand for human capital is clearly perceived by EU-27 firms, who worry that they do not have sufficient access to professionals with the skills that are needed today. What Figure 11 in Section 2.2 tells us, based on EIB survey data, is that about 85% of both large and small EU-27 firms are concerned about lack of access to individuals with the skills that are needed today. This is far more than the number that are worried about burdensome regulation and taxation, and also far more than the number that are worried about lack of access to finance. What Figure 26 tells us, moreover, is that these concerns intensified markedly over the period 2016 – 2022. Thus, **lack of skilled labour is the most important perceived obstacle to investment, and concerns more European companies than ever**. Of course, SMEs struggle more than other firms to fill skill gaps.

Figure 26. Evolving SME perceptions of staffing as an impediment to investment (2016-2022).



Source: Authors' elaboration, EIB Investment Survey (<https://data.eib.org/eibis/graph>)

In this section, we provide an overview of the current European human capital landscape. We argue for the need for a much more serious commitment towards increasing both the quantity and the quality of human capital available in Europe. This is for two main reasons. The first is the urgent need, mentioned above, to avoid that the lack of human capital prevents firms' prospective investments and ends up partially neutralising the effects of supply-side policies. The second has to do with the fact that there is a chance that technological evolution may

¹⁹ Human capital alone explains 50% of the growth of productivity in Europe (European Commission D.-G. , 2023).

prospectively reduce the cost of access to many innovation tools (Suleyman & Bhaskar, 2023). This would make talent much more important than before, relative to the scale of financial investments, for the type of product and process innovation that drives diffusion of digital products throughout society – potentially very good news for many European firms, whose scale has never offered a competitive advantage.

4.1 Talent availability in Europe falls short of needs

The availability of two types of workers may constitute a particularly serious bottleneck for digital innovation writ large: R&D personnel and researchers, and ICT specialists. In quantitative terms, the European situation shows signs of improvement according to key indicators, even if it remains highly heterogeneous across Member States and far from sufficient to accommodate current needs. First, the availability of research skills and technical skills is on the rise. Eurostat data show that the share of R&D personnel and researchers has increased from 1.1% to 1.5% from 2011 to 2022 (a 36% increase), with the bulk of the increase attributable to a greater share of R&D employment in the private sector²⁰. The number of R&D full time equivalent researchers per million people is thus now very similar to that in the United States (around 4,400) and much greater than in China, but 20% less than in Japan and more than 50% less than in South Korea²¹. The number of ICT specialists in the EU workforce has also increased, by 57.8% in the period 2012-2022, significantly rising as a share of total employment²². This, however, is by no means enough. The European Commission estimates in the Digital Compass that this number should more than double by 2030 to keep up with increased demand, i.e. that Europe needs about 8 million more ICT specialists.

These data hide important qualitative features: a marked gender gap in both the research environment and the ICT workforce, more pronounced than in the general workforce. Women accounted for only 26.2% of grade A position in academia in 2018, a percentage that further drops when considering the Science, Technology, Engineering, and Mathematics (STEM) fields, where the figures are 22% for the natural sciences and 17.9% for engineering and technology (European Commission, 2021). Less than 19% of ICT specialists were women in 2023 (European Commission, 2023). Addressing this gap is likely to be a very slow process, as on average females account for only about 25% of ICT students (OECD, 2018).

In terms of areas of specialisation, the gap appears particularly evident in AI, where available estimates indicate that, as of 2022, the US employed about 42% of “top tier AI researchers (top 20%)”, China 28% and Europe only 12%. These numbers have improved from the previous 2019 analysis, but still indicate the persistence of a substantial talent gap²³. Talent

²⁰ All Eurostat data refer to the current set of 27 countries.

²¹ UNESCO Institute for Statistics (UIS). UIS.Stat Bulk Data Download Service. Accessed February 6th, 2024. apiportal.uis.unesco.org/bdds.

²² According to Eurostat, ICT specialists are defined as ‘employees for whom ICT is the main job. For example, to develop, operate or maintain ICT systems or applications.’ This definition includes also professionals that are not directly involved in the production of ICT systems, such as ICT service managers and ICT sales specialists.

²³ <https://macropolo.org/digital-projects/the-global-ai-talent-tracker/>.

shortages are also particularly salient in cybersecurity, cloud, big data, and micro-electronics (European Commission, 2021).

The European economy can in principle address its skill shortages by attracting foreign talent. This is relevant because filling skill gaps is a long-term process, and workers' and researchers' geographic mobility may be a useful short-term solution. To what extent, however, is this the case? A different situation emerges when looking specifically at "tech talent" as defined by Atomico investment fund's annual reports and when considering research talent. Europe is currently a net beneficiary of (tech) talent movement, especially from India, Brazil and (slightly so) from the US (Atomico, Orrick, HSBC Innovation Services & Slush, 2023). The opposite is the case for scientific researchers: more researchers leave the EU for the US or other attractive research systems than vice-versa, so that most Member States are net contributors of scientific talent. This can be attributed primarily to salary levels and security of careers, especially at their early stage.

4.2 Multiple skills are essential to reignite digital competitiveness, not just basic digital skills and specialised ICT skills

Technological evolution is changing the nature of the skills required to catch these opportunities. New types of skills are needed to adopt technologies, adapt them to different uses and industrial contexts, and come up with innovative applications: STEM and advanced ICT skills, but also basic digital skills and so-called "21st Century skills" such as cognitive skills and interpersonal/social skills, whose role is increasing with the shift towards jobs with non-routine abstract tasks (Acemoglu & Autor, 2011) (Morandini, Thum-Thysen, & Vandeplass, 2020). All of these skills are increasingly important not only in science and technology-related sectors, but throughout the European economy. Tertiary-level education becomes a priority, both as a direct input to innovative activities and as a driver of digital skills (Caravella, Cirillo, Crespi, Guarascio, & Menghini, 2023). The breadth of exposure to ICT of citizens and workers, together with the rapidity of its evolution, makes it essential that individual skills and competences are frequently updated through upskilling and reskilling. Of course, scientific skills are also more important than ever.

The following Table 2 provides a succinct overview of the different types of skills relevant to improve digital competitiveness and of why each of them is important. It necessarily simplifies the many interrelationships that exist among different types of skills and technology generation, productisation and adoption.²⁴ The key takeaway the table aims to convey is that **multiple skills are essential to reignite digital competitiveness**, not just basic digital skills and specialised ICT skills.

Table 2. Map of skill requirements for digital competitiveness

²⁴ For example, to drive innovation diffusion throughout society, open innovation processes that mobilize both workplace skills and societal skills to better cater to user needs are often very important, but this is not highlighted in the table.

	Public and private scientific ecosystem	Workplace	Society at large
Skills to generate technology	<ul style="list-style-type: none"> • Basic research skills • Applied research skills 	<ul style="list-style-type: none"> • Technical (ICT/STEM) skills** • Digital skills*** • Managerial and entrepreneurial skills • Advanced cognitive skills • Personal/social skills 	
Skills to productise technology	<ul style="list-style-type: none"> • Experimental development skills* 		
Skills to use technology to drive societal innovation			<ul style="list-style-type: none"> • Digital skills • STEM skills

* Experimental development skills differ from applied research skills in that the former are explicitly aimed at producing new products and processes, while the latter aims at the acquisition of new knowledge, not to its application (OECD, 2015).

**Technical skills refer here to the ability to *develop and integrate* enterprise IT systems, manage security, big data, AI, and so on.

***Digital skills here is used to refer to the ability to *use* digital technologies in the workplace.

How does the EU fare with respect to the availability of the different skills in Table 2? Data on the availability of basic digital skills in the EU are well-known. As of 2023, the share of individuals aged 16 to 74 who have basic or above basic overall digital skills was about 55.4%.²⁵ This share has only slightly increased from the 53.7% of 2015, the first year for which comparable data are available.²⁶ The EU average hides substantial variability across Member States, with the lowest share in Romania at just 27.7%, and the highest share in the Netherlands at 82.7%. Thus, consistently raising the level of digital skills available throughout Europe remains an important challenge, of which the Commission is conscious, as evidenced by its inclusion in the Digital Compass.

As for **workplace skills**, many studies highlight that EU firms are ill-equipped in terms of the skills needed to translate R&D into productivity gains. For instance, (Ortega-Argilés, Piva, & Vivarelli, 2015) empirically show that, beyond the level of R&D investment, it is EU firms' inadequate capacity to translate R&D investment into productivity gains that explains the transatlantic productivity gap. (Castellani, Piva, Schubert, & Vivarelli, 2019) reinforce this point, linking it also to the EU industrial structure, which relies relatively more on capital-embodied technological change.

The ability of the education system to provide firms with a workforce endowed with advanced cognitive skills shows signs of improvement. The share of the European population aged 25-34 years that has completed tertiary education has increased in the period 2010-2022, rising by about 10 p.p., from 32.2% to 42%. This means that, over that timeframe, 30% more individuals in the EU have decided to invest in the acquisition of higher order skills. Within tertiary education, ICT degrees exhibit the highest growth rate among the different fields, although they are still far behind other fields of study, being only in the eighth place by number

²⁵ https://doi.org/10.2908/TEPSR_SP410

²⁶ https://doi.org/10.2908/ISOC_SK_DSKL_I

of students enrolled.²⁷ As of 2023, only 4.2% of graduates had an ICT degree (European Commission, 2023).

A longstanding weakness of the EU workforce, the lack of on-the-job digital skills, remains critical. The OECD indicator of the share of persons employed using a computer regularly at their work, available up to 2019, shows that progress has been slow – with an increase of only 9 p.p. from 2010 onwards – and that as of 2019 more than 40% of the EU workforce did not regularly use a computer²⁸. The pandemic and the associated shift towards greater work from home may have driven a subsequent acceleration, not captured by OECD data. A more positive view emerges from the recent increase in the share of firms who have invested in the development of their personnel’s ICT skills, from 18.1% in 2012 to 22.4% in 2022²⁹, which suggests that firms’ awareness of the need for upskilling is rising. This is consistent with the more general finding that the share of adults participating in learning activities (on the job or elsewhere) is also increasing.³⁰ Eurostat data indicate that it has more than doubled in the twenty years between 2002 and 2020, although the current absolute level – 11.9% on average – cannot be considered satisfactory in light of the ever increasing need for upskilling and reskilling driven by technological change.³¹

As briefly pointed out in Section 2.1, the public and private European scientific ecosystem is overall relatively strong, especially in terms of publications, one of the most commonly used metrics to evaluate **scientific skills**. The EU is also leading in terms of basic research in the AI field (Dernis *et al.*, 2019). In AI, European firms are strong on basic research and publication relative to their competitors, but weak on AI-related developments, patenting and introduction of commercially applicable algorithms, metrics capturing capabilities more closely related to industrial application (Righi, et al., 2022). When looking specifically at ICT and enabling and strategic technologies, however, the picture becomes less rosy even in terms of publications. The EU record of publications is not strong in these technical fields, although there has been a recent increase in the EU share of global publications (European Commission, 2023) . This weakness carries over to indicators such as patents and top R&D performers, both of which confirm a low degree of specialisation in ICT.

The ability to cooperate in R&D is also not satisfactory. Collaborations between innovative enterprises and universities and research institutes are relatively limited (in particular, the EU has the worst performance among its global competitors in terms of “innovative SMEs collaborating with others” (European Commission, 2023), and the share of public-private co-authored scientific publications is not particularly high in ICT. Finally, perhaps the key weakness that needs to be highlighted concerns the low levels of skills in experimental

²⁷ Eurostat, https://doi.org/10.2908/EDUC_UOE_GRAD03

²⁸ OECD ICT Access and Usage by Businesses Database, indicator A1, last accessed February 2024.

²⁹ Eurostat, https://doi.org/10.2908/ISOC_SKE_ITTS.

³⁰ More detailed data show that firms provide trainings predominantly to their high-income quantile workers. Those in the lower quantiles are less likely to benefit. This might be another hint that trends will be slow to correct.

³¹ The indicator refers to the measures the share of people aged 25 to 64 who stated that they received formal or non-formal education and training in the four weeks preceding the survey over the total population. https://doi.org/10.2908/SDG_04_60

development, evidenced by the OECD data reported in Section 2.1 (Figure 9), showing that the EU research ecosystem allocates by far the lowest share of R&D spending to this area with respect to other advanced countries.

In sum, although the various metrics we have considered indicate some improvement through time, the data show that finding effective ways to increase both the quantity and the quality of the skills available throughout the European economy should be considered a priority.

4.3 Steps taken to date at the EU level

The level of attention devoted to societal and workplace skills by European institutions has recently spiked. 2023 has been declared the “European Year of Skills”. In the same year, the Commission has advanced two proposals for Council Recommendations to improve digital education, training and skills³². EU interest in skills is, in any event, not a novelty. Already in 2010, the Europe 2020 strategy and the associated Digital Agenda for Europe included filling the digital skill gap among their priorities. There is long list of EU-level initiatives adopted since then in this area.³³ The scope of these initiatives is limited by the fact that it is Member States that have primary responsibility in education and vocational training, while EU institutions have only a support role, mostly through guidelines, recommendations, supplementary funding and coordination. This is a constraint, but can also be a resource if the labour force is sufficiently mobile across Member States, because cultural and educational diversity is often a key source of innovation³⁴.

The available evidence indicates that the EU funds so far channelled through the initiatives in the field of education and training have not been very effective at improving digital skills. Caravella et al. show that a statistically significant effect is detectable only for the weakest Member States and for basic digital skills (Caravella, Cirillo, Crespi, Guarascio, & Menghini, 2023). Thus, in addition to raising the level of policy attention, there is a need to re-think how these policies are implemented.

Key concerns with regard to features of the EU-level policy effort in education and training are the following. First, *the policy target*. The bulk of the EU-level initiatives have so far concerned digital or basic skills, especially after 2016 (EUCA, 2021). The shift towards a broader

³² COM/2023/205 final, Proposal for Council Recommendation on the key enabling factors for successful digital education and training, and COM/2023/206 final, Proposal for a Council Recommendation on improving the provision of digital skills in education and training.

³³ The main EU-level initiatives focused on skills or including a significant skill component are the following: Digital Competence Framework for Citizens (2013); Digital Single Market Strategy (2015); Digitising European Industry (2016); Upskilling Pathways (2016); Digital Skills and Jobs Coalition (2016); European Education Area (2017); Council Recommendation on key competences for lifelong learning (2018); European Skills Agenda (2020); SME Strategy (2020); Digital Europe Programme (2020).

³⁴ Many initiatives have of course been undertaken to exploit the benefits of a single European market for labour. Portability of pensions across Member States for traditional workers, for instance, has been promoted through specific legislation dating back many years. More recently, a Council Recommendation has been issued to try strengthening rights for non-traditional employees and for the self-employed, but its effects have so far been limited.

approach encompassing other types of skills, especially workplace skills, through initiatives of upskilling/reskilling of the adult workforce (e.g., the 2020 SME Strategy) or of promotion of advanced digital skills (e.g., the Pact for Skills included in the European Skills Agenda) is recent and should be further fostered. Second, *the scale of funding*. The main sources of funding for ICT-related skills initiatives have traditionally been Erasmus+ and the European Social Fund (ESF). In both cases, the EU has chosen not to earmark funds to specific initiatives in the area of digital education and training, and the amount of funds effectively committed to the improvement of digital skills has been extremely limited. The EU Court of Auditors reports the meagre figure of 2% of the 2014-2020 ESF for ICT related training (EUCA, 2021). The current European Skills Agenda³⁵ foresees a broader set of funding sources, but again without allocating specific funding, setting milestones or establishing tools to monitor progress. Even within the funds specifically earmarked for digitalisation in the context of Recovery and Resilience Facility (RRF) spending, only about 1% of the total digital transformation budget has been committed to improving digital education. Third, *the nature of the policy initiatives*. Most Member State-level initiatives co-funded by the EU are small-scale and fail to contribute to a permanent improvement of the education and training system. Moreover, it appears that the EU is not providing sufficient support in the areas where it could have a comparative advantage with respect to Member States. For instance, progress in the definition of EU-level harmonised tools to attract talent has been slow, with the European Blue Card Scheme falling short of expectations and the Proposal for a Regulation on the EU Talent Pool³⁶ still far from delivering concrete benefits.

One final aspect of European education and training policies that deserves particular attention is the *governance of interventions*. The fact that one of the main financing tools has so far been the European Social Fund implies that Regions are called to play a crucial role in the implementation of EU-driven educational policies. Thus, the effectiveness of these policies ends up being very much dependent on the administrative and design skills available at public regional institutions, who are typically not well placed to anticipate the broad effects of technological change.

As for scientific skills, it is undeniable that the EU-level policy effort has intensified also in the R&I domain.³⁷ However, there is scope for improvement both as regards the scale of the effort and the nature of the tools adopted. R&I funding accounts for only 5% of the total 2021-2027 EU budget. Most importantly, not much of these resources goes to the firm-level link between research and production. The Horizon 2020 and Horizon Europe programs have been designed to promote collaborations between public and private actors and across Member States that may help develop productisation skills, but the lack of coordination between funding of scientific research and subsequent funding of its implementation may prevent market application on an adequate scale (EUCA, 2020). Also, the call-based nature of most

³⁵ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Skills Agenda for sustainable competitiveness, social fairness and resilience, COM(2020) 274 final.

³⁶ https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13716-EU-Talent-Pool_en.

³⁷ Among the most important recent initiatives in support of researchers and digital innovators are the following: Horizon Europe, New Innovation Agenda, European Innovation Council, Innovation Radar.

support tools is not well-suited to bottom-up experimentation. This is particularly unfortunate, considering that most Member State-level support to R&I takes the form of tax relief – a tool that is hard to target to the development of productisation skills.

4.4 Remaining gaps and candidate measures to address them

Although there has been some progress with respect to the availability in Europe of all the essential skills reported in Table 2, it is apparent that much more should be done to guarantee that lack of skills does not jeopardise EU (digital) competitiveness. Investments in skill development at all levels – individuals, firms and institutions – are still insufficient to respond to the rapid changes induced by technology and to capture the associated opportunities. There are clear obstacles to overcoming underinvestment. Investments in skill acquisition and human capital are medium-/long-term, intangible and (to a large extent) specific. They have uncertain returns. In particular, for individuals, there may be uncertainties both as regards the type of skills that will be in high demand in the future and as regards the probability of finding a job where these skills will prospectively command a higher remuneration. Moreover, to ensure that life-long learning takes place, obstacles such as these need to be overcome multiple times throughout an individual's lifetime. For firms, returns from investment in training may be difficult to appropriate if workers change jobs. For policymakers, investments in education and training are typically hard to prioritise because their benefits materialise only in the long run, beyond the timeframe of any political appointment. Thus, ways to address the uncertainty and to increase both opportunities and incentives to invest in education and training need to be urgently found.

Another important economic feature of investment in skills is that it generates network effects or complementarities. Knowledge tends to generate network effects and, as it is the case for other network goods, achieving a given diffusion threshold is key to generate virtuous circles of accumulation. A similar phenomenon also exists as regards the combination of different types of knowledge and investments. The availability of complementary types of knowledge (e.g., advanced cognitive skills and technical skills), as well as of other types of innovations investments (in advanced technologies or R&D, for instance, in addition to investments in human capital), magnifies value creation. This is why technology adoption, innovation and productivity tend to agglomerate unevenly both within and across countries (Carlino & Kerr, 2015) and, increasingly, across firms (Andrews, Criscuolo, & Gal, 2016). There is mounting evidence of these phenomena in Europe, also specifically with regard to skill polarisation. Both across and within countries, the levels of education and skills are positively correlated with participation in adult learning (OECD, 2019), a phenomenon that tends to widen the geographical skill divide because individuals with low skill levels tend to invest less in upskilling and reskilling. At the firm level, the 2022 EIBS survey (EIB, 2022) highlights that firms that adopt advanced digital technologies are more likely than other firms to invest in employee training (62% versus 45%) and advanced managerial techniques such as the use of a strategic business monitoring system (59% versus 36%). Thus, vicious and virtuous circles of skill accumulation are ubiquitous.

The combined effect of the structural composition of the European economy, with its limited presence of knowledge-intensive and ICT-intensive productions, and of the virtuous and vicious knowledge agglomeration dynamics imply that we cannot expect skill shortages to self-correct in Europe: policy intervention is indispensable.

Policy intervention aimed at improving education systems requires considerable time and is therefore a medium- to long-term objective. Over a shorter time frame, policy measures that facilitate the access of foreign talent to the European labour market and increase labour mobility across the EU may contribute to increasing both the quantity and the quality of skills available. Bureaucratic obstacles are clearly not a decisive impediment to attracting tech workers, as the experience of the US shows. However, devising EU-level policies that address this barrier could be considered a feasible and cost-effective short- to medium-time objective. Europe is increasingly attractive because of its strong knowledge base (although not homogeneously across the high-tech space), the increasingly profitable career prospects driven by excess demand for tech talent, and by better work-life balance conditions than in many alternative destinations. Yet, as previously explained, talent and investments attract more talent and investments, and Europe still has some way to go to build significant geographical agglomerations that exploit these virtuous circles. Although immigration policies are clearly a sensitive preserve of Member States, harmonisation of recognition of qualifications, measures that streamline visa applications, support for relocation and increased information on the availability of tech jobs in Member States could contribute greatly to improving European attractiveness.

Attracting and retaining foreign talent may be key to enhancing digital competitiveness both directly, through its quantitative effect on the supply of technically skilled human capital, and indirectly, through the diversity it brings to the workplace. Similar effects can be expected from measures addressing the gender gap both in research and in ICT. Recent research points to the existence of positive macroeconomic effects from increasing female labour force participation that “could be up to a fifth larger than estimates from headcount exercises which ignore the gender composition of the headcount” (Ostry, 2022). Women bring diversity to the workplace, something that is particularly valuable in companies that rely very much on innovation, such as high-tech manufacturing and knowledge-intensive services. Thus, addressing the gender gap is an absolute priority.

Recommendation 4. Increase the quantity and diversity of technically skilled human capital. *In the short term, adopt measures that increase the attractiveness of Europe to foreign talent and facilitate talent mobility across the EU, in order not only to address skill shortages, but also to exploit the benefits of cultural and educational diversity for innovation. Over a longer timeframe, focus on increasing the participation of female workers to both research and the ICT labour force.*

A natural place to start to increase both the quantity and the overall quality of human capital over a longer time frame is to re-think education systems to make them more attractive and better able to provide the right type of skills. The previous section has highlighted areas of improvement for EU-level policies. First, to harness the power of knowledge network effects and generate virtuous cycles of investment rather than vicious ones, it is important to devise policies with sufficient scale. The scattered experiments backed by EU funding of the type observed so far are not liable to have any appreciable impact on the evolution of Member States' education systems. The need for a scale-up of investment in education is also corroborated by the fact that both private and public investment in education is limited in Europe as compared to other areas of the world.

In addition to scale, comprehensiveness should also be a feature of the overhaul of EU-level education policies in order to exploit the complementarity among different types of knowledge. There is a need to go beyond basic digital skills – which have attracted the bulk of the policy attention so far – and to be more systematic in addressing a broad variety of skill needs.

EU institutions could leverage their comparative advantage in identifying broad technology trends that impact the European economy through structured interaction with a wide set of stakeholders, and could offer Member States a clear vision as to the future needs for skills, how they match the resources and specialisation available nationally, and what best practices might help address country-specific weaknesses. Existing meritorious initiatives such as the European Skills Index³⁸ and the Cedefop Skills Panorama Country Reports³⁹ already provide Member States with relevant information. However, what is required goes beyond diagnosing high-level needs at Member State level. While the existence of a substantial unmet demand for skills suggests that Europe faces a supply-side problem, the exact drivers and obstacles to individual investment in the acquisition of advanced digital/ICT skills are not fully understood. There is therefore a need to expand the evidence base on which EU policies should be designed. Also, innovative forms of multi-level and multi-stakeholder interaction are needed to ensure that the identification of skills gaps goes hand in hand with concrete policy measures, which mainly fall within the responsibility and competence of Member States. The logic underlying the European Pact for Skills⁴⁰ is particularly interesting. Public and private actors are engaged in a common effort at improving upskilling and re-skilling. To make available to the whole population of future workers the broad set of skills needed to keep up with technology (including “21st Century skills”), however, initiatives of this sort need to be extended beyond training to education systems more generally. Also, in the context of training, a new articulation of the relationship between EU institutions, Regions and private stakeholders needs to go beyond sporadic experiments, to ensure that the training opportunities offered maintain the promise of future returns to individuals. Within education systems, tertiary and PhD level education, in the ICT field generally and in the AI domain more specifically, should be a priority.

³⁸ <https://www.cedefop.europa.eu/en/tools/skills-intelligence>.

³⁹ <https://www.cedefop.europa.eu/en/country-reports>.

⁴⁰ https://pact-for-skills.ec.europa.eu/index_en.

Introducing a step change in EU-level education policies along these lines would have many benefits, including reducing uncertainty and stabilizing expectations for those who are called to invest in skills.

Recommendation 5. Overhaul EU-level education policies to align them with four principles: (1) focus on EU-level comparative policy advantage in managing uncertainty and stabilising expectations; (2) structured dialogue with private stakeholders, to align education and training to technological evolution and increase the returns to individual investment; (3) scale, to exploit meaningful knowledge network effects across society and specifically across the workforce; and (4) comprehensiveness, to enable the power of complementarities across different types of knowledge, including ‘21st Century skills’.

The simultaneous advances we are witnessing in a range of technologies that may have the nature of general purpose technologies, capable of generating vast amounts of complementary innovation, create many opportunities for cross-fertilisation among previously separate fields, which can leverage on the solid scientific knowledge base of the EU, provided that appropriate collaboration and productisation skills are in place (Rossi, 2024). The data on scientific and research skills summarised above indicate that the EU is well positioned to capture these opportunities for cross-fertilisation between advanced digital technologies, primarily AI, and non-ICT-related fields because of its strong scientific knowledge base. However, they also suggest that this would require a significant strengthening of capabilities specifically in the ICT sector and improvements in applied research and experimental development skills. This is particularly apparent in the AI field.

Overall, *the EU appears to have a weak profile as regards both the skills and the resources needed to productise technology.* It is specifically lacking in terms of investment in experimental development. This has, of course, many causes, including the obstacles to raising private capital discussed in other parts of this report. However, as mentioned above, the current structure of public support to R&D does not help to redress this imbalance, both because it is predominantly tax-based, and therefore difficult to tailor to specific stages of the R&D cycle, and because when other instruments are used (e.g., Horizon Europe calls), initial funding of basic research is not coordinated with its follow-up implementation. No specific attention seems to be currently placed on the need to increase the degree of exploitation in production of the treasure of open science that the EU has been accumulating in the past few years.

*Recommendation 6. Step up availability of public funds for experimental development to redress the current imbalance and lack of continuity throughout the different R&D stages. Also, expand the set of public financing tools beyond call-driven solutions such as Horizon Europe to enable greater bottom-up experimentation with **productisation projects, especially from SMEs**. Finally, devote specific attention to devising ways of increasing productisation of open knowledge made available through EU research financing*

5. Incomplete integration of the Single Market

Key Findings

- The Single Market is of fundamental importance in achieving economies of scale that the EU needs in order to fuel its innovation engine.
- The Single Market is, regrettably, still an incomplete work in progress.
- Many measures were put in place during the previous legislative mandate, and during the current mandate, to try to strengthen cross-border synergies within the EU; unfortunately, there is reason to question whether they have been effective.

In a prescient speech, the late, great Jacques Delors explained that the EU had pushed forward with an EU Single Market during his mandate as Commission President because it had been possible to achieve consensus on economic integration, but not on substantial political integration or institutional reform (Delors, 2012). The Single Market was erected on the basis of three distinct pillars: “competition that stimulates, cooperation that strengthens, and solidarity that unites”. He closed with a call to arms that is just as relevant today as it was in 2012: “We must prevent Europe from missing out on the double challenge of internal cohesion, which is crucial and which is threatened by the current climate, and of global competition. Europe is facing a simple choice today just as it did back in the 1970s: survival, or decline.”

The Single Market is indeed essential – it is fundamental to the architecture of the EU. At the same time, it must be viewed as an incomplete work in progress. The Single Market seeks a free and unimpeded flow of people, goods, services and finance, but the flow of services for instance is much less advanced than the flow of goods (Dahlberg, et al., 2020).

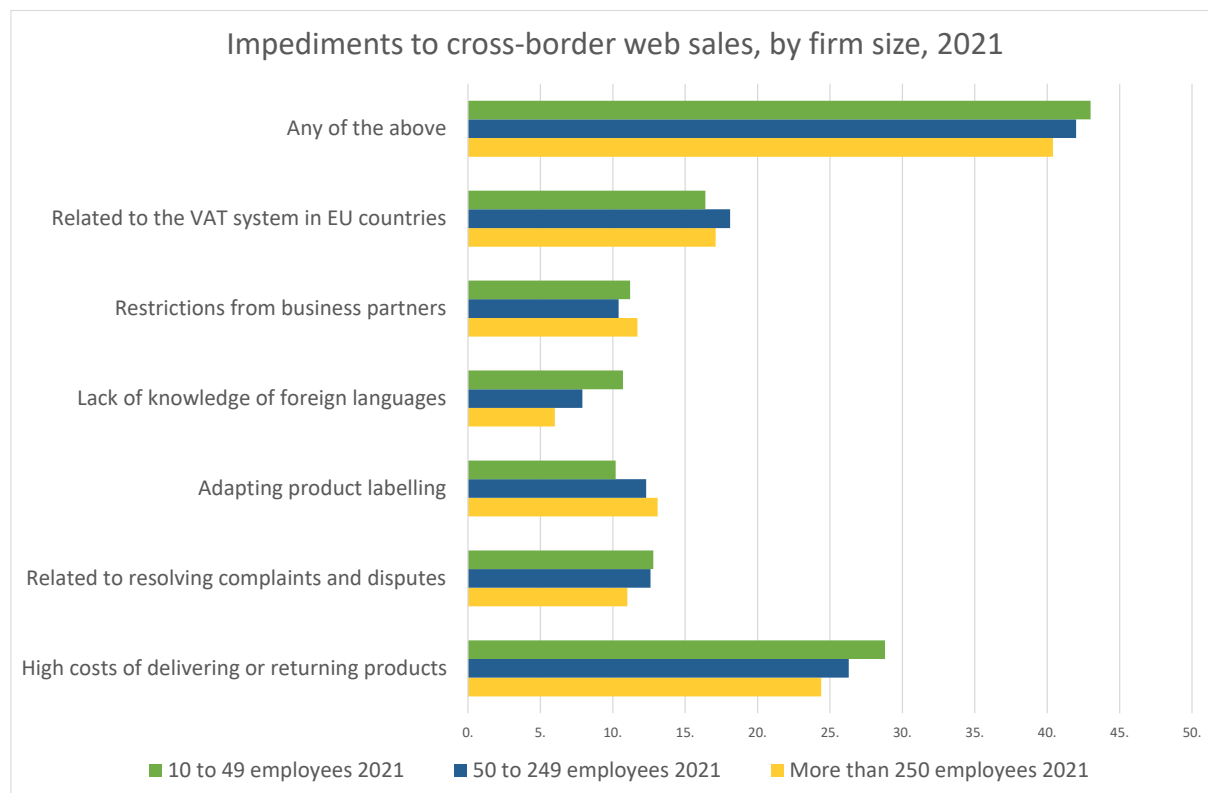
5.1 Many new laws have been enacted since 2014, but progress toward the Digital Single Market does not always follow

During the 2014-2019 mandate, the EU institutions sought to reduce barriers to cross-border e-commerce by means of close to 40 distinct legislative measures under the aegis of a *Digital Single Market* strategy (Marcus, Petropoulos, & Yeung, Contribution to growth: The European Digital Single Market: Delivering economic benefits for citizens and businesses, 2019). Unlike many of the other concerns that we raise in this short study, this thematic area has not been the victim of long-standing neglect.

Nonetheless, there is now reason to question whether the measures that were put in place have been effective as we discuss at greater length in (Marcus J. S., 2024). The Digital Single Market sought to address problems identified by e-merchants and by consumers in conducting

cross-border e-commerce. In multiple surveys, large and small e-merchants identified a range of concerns (see (Dahlberg, et al., 2020)), and these are still visible today (see Figure 27).

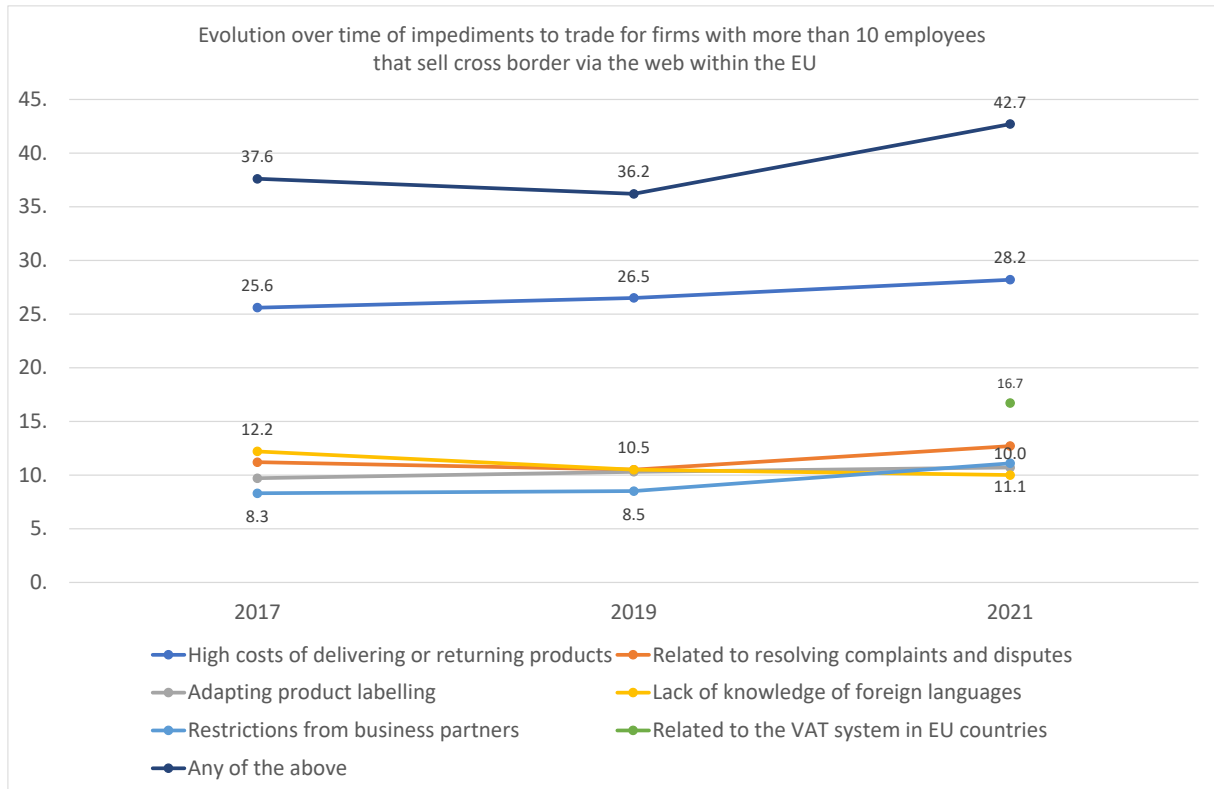
Figure 27. Impediments to cross-border web sales, by firm size, 2021.



Source: Eurostat data (table isoc_ec_wsobs), analysis by the authors (Marcus J. S., 2024).

Unfortunately, more recent survey results suggest that the merchants perceive no significant improvement in any of these, with the exception of lack of knowledge of foreign languages (which was not an issue that the Digital Single Market sought to address). In fact, among e-merchants who do business across borders within the EU, the fraction who perceive problems in one or more crucial areas (delivery and returns, VAT, and so on) actually appears to have increased from 38% to 43%. In other words, **dozens of new laws had no visible positive impact as of 2021 on the Single Market problems that they sought to address. This has to be viewed as a surprise, and a cause for serious concern.**

Figure 28. Evolution over time of impediments to trade for firms with more than 10 employees that sell cross border via the web within the EU.



Source: Eurostat data (table isoc_ec_wsobs), analysis by the authors (Marcus J. S., 2024).

During the current legislative term (2019-2024), numerous additional measures have been enacted, many of which sought to reduce cross-border frictions in the digital world (Zenner, Marcus, & Sekut, 2023). Many of the measures enacted – for instance, simplification of VAT, enhanced harmonisation of consumer protection – logically *should* have generated benefits.

5.2 Remaining gaps and candidate measures to address them

Some elements of the legislation enacted during the 2014-2019 mandate could not have been expected to generate substantial benefits, including the Parcel Delivery Directive and the Geo-Blocking Regulation. In other cases, however, the new legislation might have been expected to have positive impact, but that impact either failed to materialise, or else had not materialised as of the most recent Eurostat survey data in 2021. The reasons are not always immediately obvious.

The problems with a number of the measures are covered at some length in (Marcus J. S., 2024). For some, such as Value Added Tax (VAT), promising legislative proposals are already working their way through the mill.

Repairs are clearly needed, but the specific nature of the repairs that are called for will require substantial study. In principle, this study should be undertaken using Better Regulation methodology, but subject to the caveat that the Better Regulation methodology is itself in need of review and repair (see Chapter 7).

*Recommendation 7. Detailed study is warranted to **determine whether the many EU legislative measures** put in place over the past decade in order to reduce cross-border frictions with digital transactions **have truly been effective**. If they have not been effective, it will be necessary to determine why not.*

Several measures have been put in place in recent years to ensure that citizens and merchants had access to reliable information about laws and regulations in all of the Member States in commonly spoken languages, primarily English. The *Single Digital Gateway (SDG)* has compiled a large volume of information, and it is being accessed frequently; however, it does not appear to be accessed as often as it potentially could be. In a recent Eurochambres survey of 1,004 business owners and entrepreneurs across all EU member states from September to November 2023, 61.2% identified “inaccessibility to information on rules and requirements” as either a significant or an extremely significant single market impediment (Eurochambres, 2024, p. 4). This cannot be viewed as a solved problem.

The *SOLVIT* network is potentially helpful for solving cross-border problems, but it has known limitations, and is not used much by e-merchants – the same Eurochambres survey finds that if e-merchants encounter a Single Market problem, they are far more likely to hire a lawyer (35.0% very likely, 41.5% likely), or to simply give up (9.5% very likely, 23.3% likely), than to rely on the *SOLVIT* network (4.2% very likely, 19.3% likely) (Eurochambres, 2024, p. 9) (Marcus J. S., 2024).

6. Problematic non-bank insolvency rules

Key Findings

- Rules for non-bank insolvency vary greatly across the Member States, and many are quite onerous.
- This has the effect of locking up people and resources, often for years. It gets in the way of serial entrepreneurship.
- To the extent that non-harmonised rules introduce uncertainty as to whether any assets can be recovered in the event that the target of an investment goes bankrupt, they inhibit cross-border investment.
- The Commission has made several attempts to mitigate this challenge, but often has been unable to overcome resistance from the Member States. Insolvency is linked to Member State property law and labour law, and therefore challenging to modernise.

Insolvency rules for firms other than banks are enormously diverse across the Member States, and unduly burdensome in many of them. The Commission and the Parliament have made a number of attempts in recent years to liberalise and harmonise insolvency proceedings across the Union, but large differences persist. Among the root problems are first, that insolvency proceedings are intertwined with many other aspects of Member State law, including labour law and property law; and second and relatedly, that many of the Member States are strongly opposed to further harmonisation.

6.1 The consequences of burdensome and non-harmonised insolvency rules

The lack of consistent rules is not only a Single Market impediment, but also an impediment to overall innovation to the extent that entrepreneurs and resources are needlessly tied up for years, and thus unavailable for the promotion of further innovation.

To the extent that rules for dealing with insolvency are highly diverse, investors have difficulty predicting whether they would be able to recover any of their money in the event that a firm were to become insolvent. Experienced investors are often good at dealing with risk, but the unpredictability of this particular risk makes it difficult for investors to “price in”, and thus serves as a serious impediment to cross-border investment. It thus constitutes a major impediment to the free flow of capital, which is intended to represent one of the four great pillars of the Single Market (along with the free movement of goods, services, and people).

Overly long and inefficient insolvency regimes at Member State level can tie up innocent individuals and resources, thus impeding their ability to contribute to new innovative EU-27 enterprise, and thereby negatively impacting the innovation capacity and competitiveness of the EU-27.

The Member States vary enormously in their handling of insolvency, leading to diverse outcomes (some rather poor) as regards the time it takes to deal with an insolvency, and the fraction of the originally available remaining assets that eventually get distributed to creditors and to the debtor. A study carried out by the European Banking Authority (EBA) in 2020 found a weighted average time to recovery⁴¹ to be 3.9 years for loans to corporations, versus 3.5 years for loans to SMEs; the corresponding median values were, however, 2.7 and 2.2 respectively (European Commission, 2022, S. 21). The substantial difference between median and mean values implies that some insolvencies drag on for a long period of time. The same EBA study also identified wide variations among the Member States, with the average recovery time ranging from 0.6 years to 7 years.

Delays in recovery are also harmful not only for tying up people and resources, but also in terms of the fraction of the value of the distressed firm that can be recovered due to the “melting ice cube” phenomenon. “Beyond the depreciation of physical assets over time, their value deteriorates if they are not used. Business lines that may still be viable on their own become less valuable if business relationships are interrupted.” (European Commission, 2022, S. 116)

In the United States and in the EU-27, serial entrepreneurs play a significant role in enabling new technology-oriented start-up firms, as shown in Figure 29. Yet the *number* of repeat entrepreneurs probably understates their importance to innovation overall – we suspect that many of the largest and most successful start-ups are launched by entrepreneurs on their second or third attempt.

⁴¹ In years, from the start of the formal enforcement status to the date of ultimate recovery from the formal enforcement procedures.

Figure 29. Number of first-time and repeat founders starting new companies per year (2019 to 2023).



Source: (Atomico, Orrick, HSBC Innovation Services & Slush, 2023, S. 47)⁴²

6.2 Steps taken to date at EU level

A regime to deal with insolvency must seek to deal with many goals at once, including maximising returns to creditors and fairly allocating them among the creditors of different classes, while providing as much recovery as possible to the debtors, and more. Recent efforts at EU level to liberalise and harmonise insolvency law across the Member States have rightly sought to do more. In 2019, for instance, a new EU Directive on restructuring sought to ensure that "... viable enterprises and entrepreneurs that are in financial difficulties have access to effective national preventive restructuring frameworks which enable them to continue operating; honest insolvent or over-indebted entrepreneurs can benefit from a full discharge of debt after a reasonable period of time, thereby allowing them a second chance; and that

⁴² To adjust for lags in reporting, the authors compare snapshots of data at different points in time, which enables them to estimate future growth of current figures by extrapolating differences between time points. 2023F is based on data adjusted for lag effect and extrapolated based on data as of 20 September 2023.

the effectiveness of procedures concerning restructuring, insolvency and discharge of debt is improved, in particular with a view to shortening their length.”

Insolvency rules are an extremely challenging area in EU policy. They are closely linked to aspects of law that are Member State competence, including labour law and property law, and yet there is clearly an EU dimension – uneven insolvency rules that introduce uncertainty as to whether creditors will be able to recover their investments in the event of insolvency clearly impede cross-border investment, and thus run counter to the *free movement of capital*, which is one of the four freedoms associated with the EU Single Market. As the Commission’s High Level Forum on the Capital Markets Union has explained, “... investors’ concerns about the lack of efficiency of insolvency law in different jurisdictions contribute to a home bias. Investors ... shy away from legal risks and costs, which, however, they would incur if dealing with an insolvency regime different from their own, and third country investors are reluctant to familiarize themselves with all 27 of these national regimes. This is why legal convergence in insolvency (with a view to efficient systems) is a key element of the Capital Markets Union.” (European Commission, 2020)

The European institutions have not been asleep. A Recommendation was introduced in 2014, with limited effect, as we explain shortly; further legislation was enacted in 2015.

A Directive on preventive restructuring frameworks (Directive (EU) 2019/1023) was enacted in 2019 in an effort to introduce simpler and more uniform rules across the EU-27 to enable firms that were at risk of insolvency to constructively restructure, such that distressed but potentially viable firms might avoid costly insolvency proceedings and possible dissolution. “Restructuring should enable debtors in financial difficulties to continue business, in whole or in part, by changing the composition, conditions or structure of their assets and their liabilities or any other part of their capital structure — including by sales of assets or parts of the business or, where so provided under national law, the business as a whole — as well as by carrying out operational changes.” This is a genuinely promising measure, but it is too soon to say how effective it will be in practice.

Finally, the Commission proposed further legislation in 2022 (COM(2022) 702 final) in an effort to harmonise further aspects of Member State insolvency proceedings. The legislation appears to be appropriate, but it is not a game-changer.

6.3 Remaining gaps and candidate measures to address them

Of all of the problems that we have identified, those associated with insolvency proceedings are perhaps the most intractable in terms both of substance and of political feasibility.

In the Impact Assessment for a proposed further legislative measure on insolvency, the Commission noted that the public authorities in many of the Member States were opposed to further harmonisation measure; in consequence, they dropped the idea, viewing it as politically infeasible. Further, they discarded the idea of using “soft law” to try to drive greater

harmonisation in Member State insolvency policy, noting that the approach had been tried but had failed. “The invitation addressed to Member States in the form of the Commission Recommendation of 12 March 2014 on a new approach to business failure and insolvency (2014/135/EU) was only sporadically followed by them. Even those who enacted national legislation on the basis of the Recommendation, have done this in a divergent and inconsistent manner, that did not produce convergence towards the standards suggested in the Recommendation.” (European Commission, 2022) This pessimistic assessment is fully in line with (Veron, 2024, S. 12).

The problems are compounded by a lack of reliable data, despite the fact the existence of a substantial general literature on non-bank insolvency. The main source of data historically was the World Bank *Doing Business* project; however, the Doing Business data were of uncertain quality, so much so that the World Bank discontinued the program in 2021, and has not yet begun to issue reports under its successor program (World Bank, 2021).

Historical experience suggests that the EU is able to take large steps when it is forced to do, as for instance with vaccine procurement during the COVID-19 pandemic; otherwise, the forces of inertia often overwhelm those of potential progress. The serious overhaul of non-bank insolvency rules that is so urgently needed may have to wait until some new crisis makes reform unavoidable.

Recommendation 8. Divergent and onerous Member State provisions on non-bank insolvency are a very serious impediment to innovation, both because they tend to needlessly tie up entrepreneurs and resources for years, and because the lack of certainty as to whether any assets can be recovered in the event of a bankruptcy impedes cross-border investment in the EU. Regrettably, Member States are deeply resistant to harmonising and liberalising these rules because they are intertwined with property law, labour law and more. Small reforms such as those proposed by the Commission in 2022 should be feasible in the near or medium term, but the general overhaul that is needed might have to wait until some crisis makes it unavoidable.

The Letta Report takes note of these problems but stops short of explicitly proposing a solution: “Harmonising insolvency regimes is often rightly cited as a means to promote cross-border investment and market access in the EU, as it substantially reduces administrative and legal costs associated with insolvency proceedings. However, there is an urgent need to take action to overcome national short-sightedness.” (Letta, 2024, p. 35)

We think, however, that another of the Letta proposals holds a possible key in the long term to “cutting the Gordian knot” of Member State resistance to the reform of non-bank insolvency rules. Letta has proposed codification of EU business rules at EU level under a *European Code of Business Law* and has argued moreover that this long term approach should not only codify existing rules, but should also offer new, more flexible rules at EU level to which firms

could opt-in, specifically including insolvency rules (Letta, 2024, p. 108). This proposed *Simplified European Company* structure would represent a twenty-eighth legal regime that would operate in parallel with the existing legal arrangements in each of the Member States. It is intended to constitute a more flexible legal structure for businesses, including as appropriate general commercial law, market law, e-commerce law, company law, securities law, enforcement law, insolvency law, banking law, financial market law, intellectual property law, employment law, and tax law.

In order to address insolvency issues, the twenty-eighth regime would have to either override or address many potentially conflicting aspects of Member State law for the firms that opt into it, including various aspects of Member State property law and labour law. Putting such a system in place at EU level in parallel with existing arrangements would be exceedingly challenging, but no solution to non-bank insolvency will be easy in any case, and no other solution seems to be on the table at present.

*Recommendation 9. The **Simplified European Company structure that has been put forward in the Letta Report** as an adjunct to the proposed codification of EU business law **deserves serious consideration** as a possible long-term means of providing a simplified approach to non-bank insolvency in the EU for firms that choose it. It would be exceedingly challenging to put something like this in place, but the problem of non-bank insolvency is serious and long-standing, and no other solution has been found to be politically feasible.*

7. Burdensome regulation

Key Findings

- The complaints of many firms in recent years as regards regulatory burdens must be taken seriously in light of the torrent of new laws that have been enacted in order to implement the twin transition to green sustainability and digitalisation.
- The burden tends to be greatest for SMEs, who have more limited revenue with which to carry any costs.
- Many of the new measures seek to ease the burden for SMEs, but SMEs that are in value chains with larger firms may nonetheless be forced to comply.
- Each law has its own mechanisms for ensuring consistency among the Member States, and between the Member States and the European institutions.
- The co-legislators have attempted to identify and mitigate conflicts among the laws, but it is quite likely that some will have been missed.
- The Commission has, to its credit, attempted to reduce regulatory burden by means of a “one in one out” approach; however, the savings do not seem to be dramatic, and the means used to measure the savings are not meaningful.
- The flood of new laws calls into question many aspects of the Better Regulation methodology whereby the European institutions attempt to produce new laws that accurately respond to real needs. Some significant corrections seem to be needed both on the Impact Assessment side (which is used to design new laws) and even more so on the Evaluation side (which comes into play once a law or program has been in force for a few years).

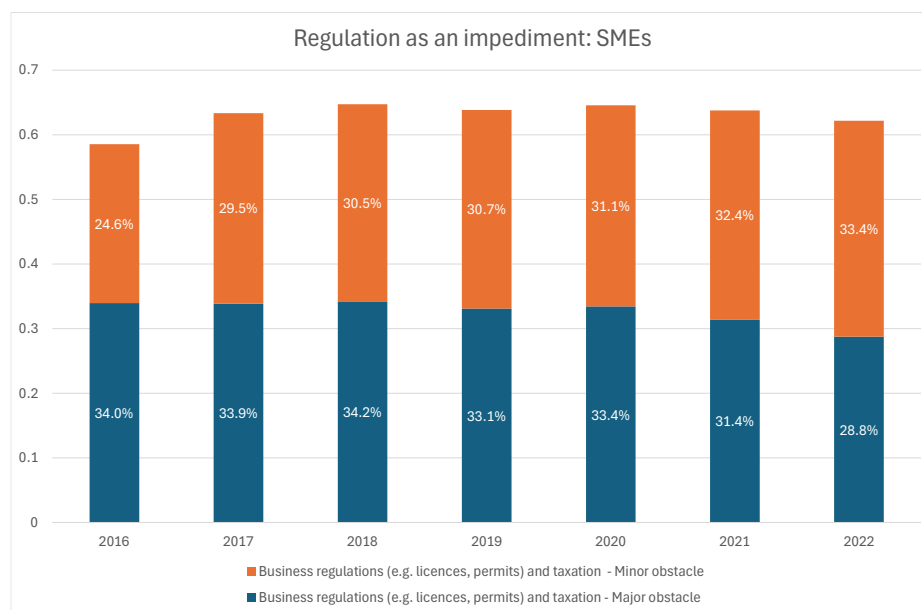
It is nothing new for businesses to complain about EU regulations; however, the intensity of the dissatisfaction is growing, and there appears to be a solid basis for many of the complaints. On the one hand, the number of new and potentially burdensome measures enacted to implement EU digital policy (Zenner, Marcus, & Sekut, 2023) and the Green Deal is simply enormous; on the other, many of the policy approaches meant to reduce the burden do not appear to be very effective yet.

How burdensome are the new rules? Concerns over the impact on business, especially SMEs, were sufficiently prominent to inspire the IMCO Committee of the European Parliament to commission a new study on exactly this question (Godlovitch, I., 2024, forthcoming), which should be available shortly.

The burdens appear to be substantial both for large firms and for small, but the burden of regulation and of tax administration can be presumed to fall particularly hard on SMEs because they have to rely on a much smaller revenue stream to carry any administrative costs.

Indeed, EU-27 SMEs clearly view regulation and taxation as problematic, even more so than access to capital (with 65.4% of SMEs versus 60.2% of large firms identifying regulation and taxation as an issue in an EIB survey, as we saw in Figure 11 in Section 2.2); however, these concerns are not visibly worsening over time for SMEs (see Figure 30).

Figure 30. Evolving SME perceptions of regulation and tax as an impediment to investment (2016-2022).



Source: Authors' elaboration, EIB Investment Survey (<https://data.eib.org/eibis/graph>)

These results are reinforced by a recent Eurochambres survey of 1,004 business owners and entrepreneurs across all EU member states from September to November 2023, where “different contractual/legal practices” was identified as a significant single market obstacle by 44.4% of respondents, and as an extremely significant single market obstacle by 24.6% of respondents; and where “different national service rules” was identified as a significant single market obstacle by 41.3% of respondents, and as an extremely significant single market obstacle by 21.6% of respondents. *These two categories of obstacles were the first and second highest ranked obstacles in the survey* (Eurochambres, 2024, p. 4)

7.1 Steps taken to date at EU level

Many of the new acts that deal with digital matters have extensive carve-outs to exempt SMEs, or to regulate only the very largest firms. SME stakeholders tell us, unfortunately, that the carve-outs are not fully effective because SMEs are part of larger value chains. They are

sometimes forced to comply with new rules despite carve-outs because they are suppliers to larger firms that are subject to the new obligations.

Our sense is that the three co-legislators collectively are not paying sufficient overall attention to the burden that the laws that they are enacting impose on firms. It must also be said, however, that the Commission has launched a number of initiatives to try to reduce regulatory burden. One can debate whether these initiatives have delivered enough to date, but there is a new and welcome willingness to engage on questions of regulatory burden.

Since 2022 (with a pilot program in 2021), the Commission has sought to adhere to a “one in one out” principle in proposing legislation. This does not literally mean that as many laws should be repealed as are enacted; rather, it means that each new burden imposed should be matched by a comparable reduction in burden somewhere. “One in one out” is a promising approach, and can be said to be in line with best practice (Trnka & Thuerer, 2019). The Commission has, to its credit, provided a public progress report on the effects of “one in one out” and related burden reduction programs, and finds that 52 legislative measures introduced in 2022 should increase burdens by €4,500 million, but also reduce burdens by €11,800 million, for a net burden reduction of €7,300 million. (European Commission, 2023, p. 15) If we take the numbers at face value for the sake of argument, this is positive, but in macroeconomic terms these numbers are not all that dramatic.

The report is a useful exercise, but it is hard to place much confidence in the numbers for numerous reasons. To begin with, “one in one out” seeks to reduce *administrative* costs so as to fully offset any increase in *administrative* costs in the same policy area; however, while the Commission also seeks to offset any *adjustment* costs (which will tend to be far greater), they are not explicitly included in the “one in one out” calculations. For this reason, and for another reason that we will come to shortly, the reduction in administrative costs is being compared to a number that has little if any significance to the European public.

The Commission has also implemented a mandatory competitiveness check, and has committed to a substantial reduction in administrative burden – a 25% reduction in reporting requirements (European Commission, 2024, S. 4). This will be difficult to measure and demonstrate in practice, but it is a worthy goal.

Stakeholders also tell us that although the European institutions and the Member States give lip service to the “think small first” principle, implementation in practice is fragmented and limited. Relatedly, while most Impact Assessment documents include a section that seeks to deal with SME issues, it sometimes appears to be a hastily constructed afterthought rather than a more substantive analysis.

7.2 Remaining gaps and candidate measures to address them

It is useful to distinguish between gaps in terms of how new EU legislation is *formulated and created*, versus how it is *implemented*.

In terms of how new law is formulated and created, it is necessary to say at the outset that there has simply been too much of it in recent years. Many stakeholders argue for a pause in new legislation in these areas in order to allow time for Member States to put in place the laws already enacted, and to allow time for firms to implement them at their level. We see merit in a pause, but caution that it is difficult – not only because of the obvious political economy problem that the co-legislators are motivated to enact new laws in order to demonstrate their worth to their constituents, but also because many of the measures enacted in recent years are going to require corrections and fine tuning.

*Recommendation 10. As much as possible, the co-legislators should **slow the pace of enactment of new laws** for a few years in order to give firms and the Member States time to catch up with implementation.*

In formulating and creating new EU laws, the three co-legislators signed a 2016 inter-institutional agreement where they committed to seek to follow the principles of the Commission's *Better Regulation Guidelines* and *Better Regulation Toolbox*. Under Better Regulation, every Commission legislative proposal is supposed to be accompanied by an *Impact Assessment* ex ante (i.e., in advance of enactment). After a new program has been in place for a sufficient period of time, and periodically thereafter, the program should be subject to *Evaluation* ex post.

In principle, Better Regulation is among the best frameworks of its type in the world. In practice, however, there are many issues with Better Regulation that urgently need to be addressed. We address only a few of the most important gaps here.

First, although Parliament and Council are parties to the 2016 inter-institutional agreement, in practice the Council plays no significant role. The Parliament has an internal directorate that is competent to conduct its own Impact Assessments, but the directorate is under-staffed, and it has no mandate to work on topics unless directed to do so by the Parliament's political leadership. The Commission generally tries to do a conscientious job in producing Impact Assessments, but the absence of checks and balances by some other institution is not conducive to good regulation.

*Recommendation 11. The three co-legislators committed in 2016 to jointly implement the Better Regulation system. **Parliament and Council need to step up** to do their share in order to provide better checks and balances within the overall **Better Regulation system**.*

Second, the Impact Assessment relates only to the Commission's legislative proposal, not to the law that is ultimately enacted. The difference is sometime enormous! Relatedly, there is a political economy problem – as the legislative proposal works its way through the process, there is a tendency – especially in the Parliament – for substantial new and costly obligations to be added on. This process is in practice a one way street – more obligations are added relative to the Commission's proposal than are subtracted. (Council may roll back some of the

obligations that the Parliament has added, but the balance is usually for far more obligations than the Commission initially proposed.) At the end of the process, the enacted measure is often very different from the original legislative proposal, but the Impact Assessment is not revised to reflect the changed state of affairs.

The net effect is that the only detailed analysis currently available to the co-legislators when it is time to make their final compromises is a static Impact Assessment that corresponds to a different proposed law than the legislative measure under consideration at the end. It also means that any subsequent analysis – not only ex post evaluation, but also the one-in-one-out process (as discussed in Section 7.1 and also in this section) – are based on a formal assessment of a law that typically bears little resemblance to the measure that was ultimately enacted. It seems clear that the Impact Assessment needs to be updated at least once during the legislative process, and prior to final enactment of the measure. We would add that this recommendation is very much in the same spirit as that of the *Dynamic Impact Assessment (DIA)* put forward by (Letta, 2024, p. 124), which speaks of the need for “simplified update of the original impact assessment with ‘back of the envelope’ evaluations and explicit guesstimates to forecast the implications of amendments ...” that have been put forward.

*Recommendation 12. Any significant piece of EU legislation will differ substantially from the initial legislative proposal submitted by the Commission. Late in the process but prior to final enactment, **an addendum to the Impact Assessment should be prepared to summarise the differences between the law as proposed and the law as enacted**, including an update of the expected administrative costs and adaptation costs.*

And here we see another substantial implementation flaw in the “one in one out” strategy. As the Commission honestly acknowledges, “Costs following from amendments tabled at the legislative stage and or from national implementation measures could alter the cost estimates. They are not part of the Commission’s ‘one-in, one-out’ approach, which stops at the level of the Commission’s proposal.” (European Commission, 2023, p. 31) At one level, it is appropriate that the Commission not take the blame for costs that were added after it submitted the legislative proposal, and over which it had little or no control; but on the other, as a practical matter, it means that any Commission reporting for one in one out bears no clear relationship to the costs or benefits associated with the law as enacted. EU citizens presumably care about regulatory burdens (both administrative costs and adjustment costs) that are actually experienced, not only about the administrative costs of legislation as proposed.

*Recommendation 13. The “one in one out” program is genuinely important and promising, but it needs to be seeking to **offset the administrative cost of a new program as enacted, not only** the administrative cost of the program **as initially proposed**. “One in one out” cannot hope to fully offset the adaptation costs of the program, which will usually be far greater than the administrative costs, but it should at least monitor the adaptation costs for comparison purposes. Economic gains from the program should ideally also be reflected.*

Yet another deficit relates to the Evaluation process. When the Evaluation is expected to take place is not obvious in the current Better Regulation Guidelines, and the Commission is under no pressure to provide it. For the Impact Assessment, the Commission is likely to experience difficulty in getting its legislative proposal enacted (and possible pressure from the Regulatory Scrutiny Board (RSB)) if it neglects to provide an Impact Assessment, or submits an Impact Assessment of poor quality. For the Evaluation, however, there is no equivalent pressure on the Commission. The RSB is often presented with weak or self-serving Evaluations, but there is little that they can do about it – it is too late.

Weak Evaluations are often in part a result of a lack of relevant data. If the data is not collected when a new program is launched, the Evaluation is typically unable to create it after the fact. In principle, the Impact Assessment is supposed to identify in advance the data that will be needed, but in practice, it appears that this is often a hastily contrived afterthought in the process of drafting the Impact Assessment report. The result is that the Evaluation often suffers from a “lamppost problem”⁴³ – the typical evaluation assesses indicators that are readily available, typically reflecting whether the explicit obligations in the law have been complied with, but ignoring the question of whether the measure as implemented has actually mitigated the problem that the law was meant to address.

*Recommendation 14. Much more attention is needed when the Impact Assessment is drafted to ensure that data will be collected for the new program that enables **subsequent Evaluation of whether the law is actually mitigating the problem for which it was created**.*

Relatedly, the Commission is subject to a substantial conflict of interest in conducting an Evaluation of a law that it itself proposed. In most cases, the Commission will be motivated to produce a “check the box” Evaluation that claims that the law is working well, since to do otherwise might reflect negatively on the Commission. In a few cases, the Commission already perceives a need to change a law, and is likely to slant the Evaluation accordingly. In neither case is an impartial and objective Evaluation to be expected.

⁴³ Named for an old Mutt and Jeff cartoon in which a drunk looks for a lost coin, not where he lost it, but rather under a nearby lamppost because the light is better there.

*Recommendation 15. The process of **Evaluation of legislation ex post should not be done by the Commission**. Moving the function for instance to the Court of Auditors, together with assigning it adequate staff resources, could lead to more objective and impartial Evaluations. The schedule for Evaluations, as well as quality control measures, are likely to need some re-thinking in light of this proposed move.*

Ensuring proper implementation of EU laws at Member State level is just as important as enacting good law, and perhaps more so; however, any recommendations would necessarily be specific to the legislative act involved, and will often be Member State-specific as well.

In response to long-standing complaints over the years by business and consumer groups, the EU has created a number of tools over the years to inform consumers and businesses about EU and Member State laws and regulations, and in some cases to help them to resolve cross-border issues within the EU. These initiatives are promising, but have not yet delivered to their potential (see Section 5.2). The Single Digital Gateway has made good progress, but much work remains to be done. The SOLVIT network is likewise promising, but is clearly under-performing relative to the needs of EU-27 businesses.

8. Gaps in technological infrastructure

Key Findings

- Geopolitical tensions imply a risk to global value chains for technology components on which the EU depends.
- EU goals in addressing this should be supply chain resilience and diversity, and promotion of EU industry, but not protectionism. The measures put in place by the EU to date generally do this.
- The deployment of broadband is an important contributor to the EU's technological advancement. The EU will not necessarily hit EU Digital Compass targets, but our progress may nonetheless be reasonably good relative to the actual needs of Europeans.
- On the other hand, while the deployment of 5G base stations compares favourably to the USA and Japan, it compares very unfavourably to China.
- Network operators in the EU argue that consolidation of the sector is essential. Many have argued that some consolidation on an EU-wide basis would likely generate beneficial economies of scale, including (Letta, 2024, pp. 55 - 56); however, current rules already permit the mergers that would tend to be beneficial. The real root problem is that network operators are not motivated to seek the cross-border mergers that would produce genuine benefits.
- Responsibility for spectrum management necessarily reflects a division of labour between the Commission and the Member States, but the Commission lacks the ability to enforce timely and coordinated implementation of measures that have been agreed.
- The ability of Member States to jack up spectrum auction prices is a serious problem.
- The need to progressively refine regulation of electronic communications so as to improve harmonisation and to reduce regulatory burden is likely to be with us far into the future.

Many aspects of EU infrastructure are relevant to the EU's innovation capacity, but we focus here on just two: first the need for open strategic autonomy; and second, the need to strengthen the electronic communications infrastructure of the EU.

8.1 Open strategic autonomy

The EU has a strong technological base, but is nonetheless dependent on other countries for many elements on which our own technological progress depends. The disruptions of global supply chains caused first by the COVID-19 pandemic, and then by the return of kinetic war to Europe, have brought these points home to EU and Member State policymakers.

Various aspects of *open strategic autonomy* have worked their way into EU policy as a result, and appropriately so. We emphasise here the word “open” in open strategic autonomy. The goal should be to ensure robustness and resiliency of the supply chains on which we depend,

coupled with an increased emphasis on self-supply where necessary; however, the goal cannot be to needlessly de-couple the EU from global supply chains. *Protectionism is not the way for the EU to achieve or maintain global competitiveness and leadership.* Protectionism is not the European way, and risks moreover provoking responses that are counter-productive from the EU's perspective.

The importance of openness in strategic autonomy is especially relevant to areas where international coordination matters, and particularly to knowledge generation. A case in point concerns standardisation activities. The 2022 European Commission's European Strategy on Standardisation, for instance, proposed some measures limiting the weight of non-European participants in standards development within the European Telecommunications Standards Institute (ETSI) that risk jeopardising the conventional approach to standardisation based on wide international cooperation (European Commission, 2022). The resulting costs in terms of foregone cooperation that would otherwise have led to the selection of best solutions should be frankly acknowledged. Furthermore, it should always be borne in mind that the most future-proof way of strengthening the EU's digital autonomy is for the EU to invest in talent and research.

The EU has been active in these areas, usually combining positive industrial policy with the mitigation of supply chain risks. Examples include the Net-Zero Industry Act, the Chips Act and the Critical Raw Materials Act.

*Recommendation 16. Continued efforts to **ensure the reliability, robustness, resilience and diversity of the EU's supply chains** for both raw and manufactured elements that are important for EU productivity are fully in order. These measures **should not, however, be permitted to drift into protectionism** of EU industry at the expense of our trading partners.*

8.2 Electronic communications infrastructure: What truly requires attention?

It is all too easy to lament the fact that markets for electronic communications in the EU continue to have many Member-State-specific aspects; however, this simplistic view loses sight of practical realities, and of the path dependencies that got us where we are.

Many EU Member State electronic communications networks were originally built as monopoly SOEs known as *postal, telegraph, and telephone services (PTTs)*. Competition in most Member States was first introduced with a series of five directives (the *Regulatory Framework for Electronic Communications (RFEC)*) that were enacted in 2002. The physical infrastructure of these networks was however already in place, and could not be changed with a stroke of the pen. Infrastructure is expensive to deploy and maintain, especially the *last mile* infrastructure to individual residences. Large differences persist in the *technology* of those lines, including the degree of concentration of so-called *main distribution frames* and *street*

cabinets and relatedly the length of cabling to homes. Huge differences were present with infrastructure of the Member States that entered the EU with the fall of the Iron Curtain versus those of Western Europe, and some of those differences persist to a degree.

The status of *competition* in the Member States also varied greatly when the RFEC was introduced, and continues to vary substantially today. Cable for television is universal in a few Member States (Netherlands, Belgium, and Malta, for instance), but totally absent in others such as Italy.

For all of these reasons, an undifferentiated one size fits all approach would have made no sense, and it was not attempted. What the RFEC (and its successor, the EECC) put in place instead was a regulatory system entailing asymmetric regulatory burden on firms that possessed market power, to be eliminated once competition was firmly established. Member State *National Regulatory Authorities (NRAs)* were to assess the definition of key markets in their respective Member States, and whether any network operators possess significant market power (SMP) on those markets; if so, they were to impose adequate, proportionate, and minimally burdensome set of obligations only on those operators. (There are many other obligations that apply symmetrically to all network operators.) All of this was to be overseen in detail by the European Commission.

This might seem to be a horribly complex system, and indeed it is! But after twenty years of progressive refinement, it works surprisingly well. It does not produce *uniformity* (which was never its goal in any case), but rather generates a substantial degree of *regulatory harmonisation* across the Member States. Relative to what was possible at the time, and even to what is possible today, this was and is a pragmatic and workmanlike solution. As Einstein liked to say, “Things should be as simple as they can be ... but no simpler.”

With all of that established, we reflect in the following sub-sections on a few main issues for electronic communications policy going forward: (1) the ongoing deployment of upgraded network technology based on fibre optics (especially in the fixed network) and on 5G and subsequently 6G technology in the mobile network; (2) the degree of fragmentation of the industry, and the need for consolidation; (3) issues of management of electromagnetic spectrum; and (4) the possibilities of further harmonisation of regulation. All of these are highly visible in the current policy debate, including in an assessment that Enrico Letta, the former Prime Minister of Italy, just completed for the Commission (Letta, 2024).

8.2.1 Driving further deployment of advanced fixed and mobile networks

Fixed and mobile broadband are clearly essential to a modern, high technology society. The EU-27 is not an overall leader in deployment of these networks (although some Member States rank very well), but we would argue that the deployment of fibre-based fixed networks is going reasonably well relative to the actual needs of EU consumers (Marcus, Garcia Herrero, & Guetta-Jeanrenaud, 2023).

It is common to compare the fragmented EU electronic communications market to the purportedly unified markets of China and the United States, but this comparison is at least in part misleading. Both countries do indeed have some very large players; however, the United States also has a hugely fragmented market for fixed network rural coverage, with many small, inefficient and significantly subsidised players. In China, the three large network operators (all of which are essentially state-owned enterprises (SOEs)) operate in practice with enormous autonomy at provincial level – this is not a unified juggernaut.

In terms of mobile broadband, the EU has reportedly deployed 356,000 5G base stations. Compared to 100,000 5G base stations in the United States and 146,000 in Japan, this might seem to be impressive; compared however to an estimated 2,937,000 in China, the EU coverage seems rather anaemic (European 5G Observatory, 2023). This is a genuine deficit that warrants the continued attention that it is already receiving.

At the same time, one must guard against “mission creep”. In a recent white paper (European Commission, 2024), for example, the Commission argues that “prospects for deployment of 5G stand-alone networks ensuring high reliability and low latency, which are key enablers for industrial use cases, are not good. The deployment of such networks can be estimated at significantly less than 20% of populated areas in the EU.” The argument that *full population coverage* is needed in the near or medium future for low latency and high reliability mobile capabilities would appear to be seriously misguided.

On a positive note, a Gigabit Infrastructure Act was just approved by Parliament and Council in April 2024. When it takes full effect, it should help to reduce administrative burden in deploying networks – perhaps less than some had hoped, but it should still be positive. In parallel with this, the Commission adopted a Gigabit Connectivity Recommendation in February 2024, thus replacing two earlier Recommendations that no longer addressed current market and technical realities. Given that it will not be possible to measure the effects of these new measures for at least two or three years, caution is in order before attempting any further major adjustments.

There are a great many factors to take into account in driving deployment, and we have covered them in detail in the past in work for the OECD and the T20. In the interest of brevity, we merely point the reader to (Marcus, Garcia Herrero, & Guetta-Jeanrenaud, 2023), (OECD, 2021), (Rossi, 2022), and (Visionary Analytics, Hocepied, & Marcus, 2021).

At the same time, we would note that EU policy has tended to focus on the deployment of networks, but deployment alone is not the issue – *for the networks to have value, Europeans must subscribe to them, and must use them*. Once a critical mass of deployment has been achieved, as is clearly the case in the EU, *policy measures to promote adoption and use are likely to be even more important to societal welfare than measures to drive further adoption* (Marcus, Garcia Herrero, & Guetta-Jeanrenaud, 2023), (Marcus, Porciuncula, Reisch, & Weber, 2021). Survey data in the EU, and also in the United States, imply that lack of digital skills together with a sense that internet access at home is not needed (because the content is not helpful or not interesting, for example) are the main reasons for people to lack internet

access at home – not cost, not lack of availability. And these factors combine with growing public concern over privacy and security. The demand side measures put forward in (Parcu, 2011) were (1) demand aggregation policies; (2) direct demand subsidies (discounts on the purchase of equipment or broadband services, direct subsidies or tax breaks); (3) coordinating government demand (through procurement policy or by promoting e-government services); (4) incentives to private demand for the poor and the elderly; and (5) incentives to business demand.

Recommendation 17. Continued attention not only to deployment, but also to adoption and use of both fixed and mobile broadband is needed. For the most part, the necessary measures are well understood, and the level of attention being paid on the part of the EU is sufficient, but the balance between supply side measures versus demand side measures could be better.

8.2.2 The need for consolidation of EU-27 networks

Large network operators have been complaining for many years that they are too small in comparison to international competitors, and there are indeed some players in the United States and China that dwarf EU network operators (see Section 8.2.1). Large network operators often follow by saying that merger regulations should be loosened in order to permit consolidation, but we would say that caution is in order here.

The consolidation that is needed is at European level (or beyond). This largely depends on cross-border mergers within the EU. *No loosening of rules is needed to permit these mergers* – EU competition authorities have typically had no issues with them, because the merging firms typically do not compete with one another pre-merger in the same geographic area.

The problem is that these are not the mergers that the large network operators want – they normally want *in-country* mergers (see for instance (Chee, 2024)).⁴⁴ It is normal, proper and necessary to have competition law scrutiny of these mergers because they typically reduce competition, thus raising consumer prices and reducing consumer choice. And the expected price increase is probably one of the main reasons why network operators want them, together however with the fact that synergies may also be greater for in-country mergers.

In other words, there is a tension of goals between scale economies for the firms versus consumer welfare: As Enrico Letta wrote: “Allowing EU companies to scale up within the Single Market is not just an economic imperative but also a strategic one. However, not all EU companies and markets are in need of a bigger size. ... No company can be allowed to grow undermining fair competition, which is the bedrock of consumer protection and economic progress.” (Letta, 2024, p. 50)

⁴⁴ As one article puts it, “the trouble with the single market idea – aside from manifold practical issues – is that the operators themselves aren’t really that invested in it”. (Lennighan, 2023)

If one grants that there are dynamic benefits to the EU from permitting more consolidation of network operators that may compensate for a modest loss of consumer welfare, then there could be an argument for some re-thinking of borderline cases. Notably, many of the proposed mergers have been from four *mobile network operators (MNOs)* to three in a national market. It might be possible to tolerate a bit more anticipated consumer price increase in these cases than we historically have to date, bearing in mind the longer term benefits. This would represent minor fine tuning, not a sea change.

The more fundamental problem here is that *the EU is a victim of its own regulatory success*. In the historic past, a major incentive for cross-border mergers was that the merged entity would face only its true now-internal costs for services such as mobile termination and roaming, rather than the highly inflated charges that its competitors would otherwise assess.⁴⁵ After more than a decade of intensive successful regulation, mobile termination rates (MTRs) and Inter-Office Tariffs (IOTs) for mobile calls and international mobile roaming respectively have been brought down to levels that can be said to closely correspond to true costs; thus, there is no longer a gain to be had from merging cross-border. But this poses a conundrum: How can MNOs be motivated to merge in this new world, other than to pursue synergies (which apparently are not very compelling)? The appropriate response is clearly *not* to reverse the regulatory process, thus sacrificing the consumer benefits won over two decades of increasingly effective regulation.

And it also begs a question: *If network operators apparently feel that the synergies of cross-border consolidation are limited, and not enough to motivate them to attempt it, then why do EU policymakers think differently?*

Bearing all of this in mind, and with all due respect, we would tend to view a recent statement by former Italian Prime Minister Mario Draghi (Draghi, 2024) as being for the most part unhelpful. He said that “... we have 34 mobile network groups in Europe often operating only on a national scale, versus three in the United States and four in China. To produce more investment, we need to streamline and further harmonise telecoms regulations across Member States and *support – not hamper – consolidation*. [emphasis added]”

⁴⁵ This is especially obvious when one considers the Vodafone-Mannesmann merger of 1999 – 2000. International mobile roaming played a large role both in the merger, and in the fears of competitors.

*Recommendation 18. Network operators in the EU argue that some **consolidation of the sector on an EU-wide basis** would likely generate beneficial economies of scale, and it is true that there are some network operators in the United States and China that dwarf most EU network operators. The appropriate response, however, is not a loosening of competition rules (except perhaps for some minor fine tuning), because current rules already permit the mergers that would tend to be beneficial. The real root problem is that **network operators are not motivated to seek the cross-border mergers that would produce genuine benefits**. The solution is not obvious.*

8.2.3 Management of radio spectrum

The Regulatory Framework for Electronic Communications (RFEC) harmonised many aspects of electronic communications policy across the EU, but left management of the radio spectrum largely under the control of the Member States. The Commission has repeatedly sought to expand its control over this crucial element, but has repeatedly failed to win the support of the Member States. With the evolution of mobile networks from 3G to 4G, and now from 4G to 5G, there has been increasing recognition on all sides of the need for a greater degree of central coordination; however, little real power has been transferred to the Commission in practice.

Once again, a complete transfer of power to the EU is probably not the right answer. There are complex path dependencies, and also issues such as cross-border interference in the east and south of Europe, that will tend to be best understood by Member State authorities.

But the evolution of the network over the past few years has also made clear that current arrangements are problematic. In clearing bands that were previously used for broadcast television in order to make them available for high speed mobile services a few years ago, for instance, the Member States performed at very different speeds – substantial delays were commonplace. This created complex interference issues that were difficult for NRAs and for network operators to deal with. Assignment of 5G spectrum today is similarly problematic.

Once consensus has been reached on EU-wide decisions on spectrum management, the Commission needs faster and more effective mechanisms in order to ensure that they are carried out in a timely manner by the Member States.

It is sometimes suggested that spectrum should be auctioned on an EU-wide basis. This once again is probably not the right answer, and it would tend to be highly problematic for large network operator groups. A bad result in a single auction might put a large firm out of business.

A related problem is that, as long as Member States are in full control of the spectrum assignment process and are sole beneficiaries of any revenues generated, they will be subject to enormous temptation to view spectrum as their secret, private piggy bank. They will be tempted to jack up auction prices, either by setting the reserve price high or by creating artificial scarcity, thereby raising money for the Member State in a way that is largely invisible to the public (see also (Letta, 2024)). But this scam is not without cost – it tends to raise costs for

the network operators, and thus to raise prices for consumers. It is important to bear in mind that the purpose of spectrum auctions is not generation of revenue, but rather efficient allocation of scarce electronic spectrum resources.

In previous work, we recommended that the EU put in place a peer review process for spectrum assignment procedures (e.g. auctions), together with limitations on the ability of the Member States to set an extortionary reserve price (Marcus, et al., 2016, S. Section 3.4.3). The Commission proposed something along these lines, but the co-legislators watered it down by making the peer review voluntary, which predictably rendered it totally ineffective.

Fundamentally, this is a political economy problem. As long as many Member States view the spectrum assignment process as a low visibility means of surreptitiously raising cash, sort of a private slush fund, it will be challenging to achieve the reforms that are needed.

*Recommendation 19. Responsibility for spectrum management should continue to reflect a division of labour between the Commission and the Member States, but **the Commission's ability to enforce timely and coordinated implementation** of measures that have been agreed needs to be made **much faster and more effective**. The ability of Member States to **jack up spectrum auction prices** needs to be curtailed.*

8.2.4 Possibilities for further harmonisation of regulation

For reasons noted at the beginning of this section, it continues to be appropriate to strive for harmonisation of EU regulation of electronic communications, but not for full uniformity across the Member States. Reduction of regulatory burden over time is also a goal.

This implies a need for *progressive refinement* – a need that is unlikely to ever fully disappear.

Over twenty years of regulation, there have been substantial refinements and simplifications. The number of markets susceptible to asymmetric regulation has been reduced from eighteen to just two. Termination rates for fixed and for mobile call termination were brought into rough alignment after many years of hard work, and subsequently set to single EU-wide rates.

The Commission recently published a White Paper (European Commission, 2024) in which it put forward a number of possible means of simplifying or harmonising EU regulation of electronic communications. We will not comment in full detail here, since that is a large topic worthy of a report of its own. We would merely note that, while some Commission proposals have merit, others seem to be of dubious value. For example, we question whether the Commission's call for an EU-wide authorisation scheme addresses a real versus an imagined problem. The authorisation process is unproblematic, and even if there were a desire to further simplify it, merely requiring all NRAs to accept a standard online application form in a common EU language such as English would be sufficient to reduce the already low administrative burden (Marcus, et al., 2016).

*Recommendation 20. The need to **progressively refine regulation of electronic communications** so as to improve harmonisation and to reduce regulatory burden is likely to be with us far into the future. Policy needs to frankly acknowledge this.*

9. Stoking the engine

As noted at the outset in Section 1.2, many of the impediments to innovation in the digital sphere in the EU are well-known. In a number of instances, potential solutions are also known – for these, political will is needed to put the solutions in place. For the rest, study and persistence will be needed in order to tease out pragmatic and politically feasible solutions.

We believe that the problems with access to finance can actually be solved, not merely mitigated, using the tools that we have proposed. For education and training, and also for remaining gaps in the Single Market, progressive improvement is likely to be needed for many years. As for excessive regulatory burden, if the EU created the burden, the EU can fix it – but it will not be easy.

More generally, the Better Regulation process by means of which new laws are designed and existing laws are modernised, and which also provides tools for assessing existing laws, is itself in need of assessment and modernisation.

With that said, a brief recap of our recommendations follows, together with the page number on which each recommendation appears.

Recommendation 1. Measures are needed to **increase the financial literacy of the EU public** such that they understand that a mixed personal investment portfolio that includes some high-risk high return investments can be appropriate. 38

Recommendation 2, Creation of a **trusted EU structure for investment instruments** might potentially make it easier for households with limited financial sophistication to achieve more balanced household investment portfolios. 39

Recommendation 3. Legal and regulatory changes are needed to enable and **encourage pension funds and insurance to include investments in pre-IPO risk capital and in IPOs** as a modest part of their portfolios. Additional actions may be needed to ensure that overhead costs associated with making these investments do not get in the way. 49

Recommendation 4. **Increase the quantity and diversity of technically skilled human capital.** In the short term, adopt measures that increase the attractiveness of Europe to foreign talent and facilitate talent mobility across the EU, in order not only to address skill shortages, but also to exploit the benefits of cultural and educational diversity for innovation. Over a longer timeframe, focus on increasing the participation of female workers to both research and the ICT labour force. 61

Recommendation 5. **Overhaul EU-level education policies** to align them with four principles: (1) focus on EU-level comparative policy advantage in managing uncertainty and stabilising expectations; (2) structured dialogue with private stakeholders, to align education and

training to technological evolution and increase the returns to individual investment; (3) scale, to exploit meaningful knowledge network effects across society and specifically across the workforce; and (4) comprehensiveness, to enable the power of complementarities across different types of knowledge, including '21st Century skills'.

63

Recommendation 6. Step up availability of public funds for experimental development to redress the current imbalance and lack of continuity throughout the different R&D stages. Also, expand the set of public financing tools beyond call-driven solutions such as Horizon Europe to enable greater bottom-up experimentation with **productisation projects, especially from SMEs**. Finally, devote specific attention to devising ways of increasing productisation of open knowledge made available through EU research financing

64

Recommendation 7. Detailed study is warranted to **determine whether the many EU legislative measures** put in place over the past decade in order to reduce cross-border frictions with digital transactions **have truly been effective**. If they have not been effective, it will be necessary to determine why not.

68

Recommendation 8. **Divergent and onerous Member State provisions on non-bank insolvency are a very serious impediment to innovation**, both because they tend to needlessly tie up entrepreneurs and resources for years, and because the lack of certainty as to whether any assets can be recovered in the event of a bankruptcy impedes cross-border investment in the EU. Regrettably, Member States are deeply resistant to harmonising and liberalising these rules because they are intertwined with property law, labour law and more. Small reforms such as those proposed by the Commission in 2022 should be feasible in the near or medium term, but the general overhaul that is needed might have to wait until some crisis makes it unavoidable.

73

Recommendation 9. The **Simplified European Company structure that has been put forward in the Letta Report** as an adjunct to the proposed codification of EU business law **deserves serious consideration** as a possible long-term means of providing a simplified approach to non-bank insolvency in the EU for firms that choose it. It would be exceedingly challenging to put something like this in place, but the problem of non-bank insolvency is serious and long-standing, and no other solution has been found to be politically feasible.

74

Recommendation 10. As much as possible, the co-legislators should **slow the pace of enactment of new laws** for a few years in order to give firms and the Member States time to catch up with implementation.

78

Recommendation 11. The three co-legislators committed in 2016 to jointly implement the Better Regulation system. **Parliament and Council need to step up** to do their share in

order to provide better checks and balances within the overall **Better Regulation system**. 78

Recommendation 12. Any significant piece of EU legislation will differ substantially from the initial legislative proposal submitted by the Commission. Late in the process but prior to final enactment, **an addendum to the Impact Assessment should be prepared to summarise the differences between the law as proposed and the law as enacted**, including an update of the expected administrative costs and adaptation costs. 79

Recommendation 13. The “one in one out” program is genuinely important and promising, but it needs to be seeking to **offset the administrative cost of a new program as enacted, not only** the administrative cost of the program **as initially proposed**. “One in one out” cannot hope to fully offset the adaptation costs of the program, which will usually be far greater than the administrative costs, but it should at least monitor the adaptation costs for comparison purposes. Economic gains from the program should ideally also be reflected. 80

Recommendation 14. Much more attention is needed when the Impact Assessment is drafted to ensure that data will be collected for the new program that enables **subsequent Evaluation of whether the law is actually mitigating the problem for which it was created**. 80

Recommendation 15. The process of **Evaluation of legislation ex post should not be done by the Commission**. Moving the function for instance to the Court of Auditors, together with assigning it adequate staff resources, could lead to more objective and impartial Evaluations. The schedule for Evaluations, as well as quality control measures, are likely to need some re-thinking in light of this proposed move. 81

Recommendation 16. Continued efforts to **ensure the reliability, robustness, resilience and diversity of the EU’s supply chains** for both raw and manufactured elements that are important for EU productivity are fully in order. These measures **should not, however**, be permitted to **drift into protectionism** of EU industry at the expense of our trading partners. 83

Recommendation 17. **Continued attention not only to deployment, but also to adoption and use of both fixed and mobile broadband is needed**. For the most part, the necessary measures are well understood, and the level of attention being paid on the part of the EU is sufficient, but the balance between supply side measures versus demand side measures could be better. 86

Recommendation 18. Network operators in the EU argue that some **consolidation of the sector on an EU-wide basis** would likely generate beneficial economies of scale, and it is true that there are some network operators in the United States and China that dwarf most EU network operators. The appropriate response, however, is not a loosening of

competition rules (except perhaps for some minor fine tuning), because current rules already permit the mergers that would tend to be beneficial. The real root problem is that **network operators are not motivated to seek the cross-border mergers that would produce genuine benefits**. The solution is not obvious. 88

Recommendation 19. Responsibility for spectrum management should continue to reflect a division of labour between the Commission and the Member States, but **the Commission's ability to enforce timely and coordinated implementation** of measures that have been agreed needs to be made **much faster and more effective**. The ability of Member States to **jack up spectrum auction prices** needs to be curtailed. 89

Recommendation 20. The need to **progressively refine regulation of electronic communications** so as to improve harmonisation and to reduce regulatory burden is likely to be with us far into the future. Policy needs to frankly acknowledge this. 90

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