

# CHAPTER

# 0

**A COMPETITIVE EUROPE  
FOR A SUSTAINABLE  
FUTURE –  
WHAT SRIP 2024  
TELLS US ABOUT KEY  
CHALLENGES FOR EU R&I**

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**Since the 2022 edition of this report, the need for decisive action to make Europe more competitive, green and fair has further intensified.** The global geopolitical situation has become more complex, and the future is ever more uncertain. Europe is often seen to be trailing the US and China in the technological race. Temperature records are being broken regularly and previously rare extreme climate events are becoming commonplace. Popular discontent is rising, some of it linked to increasing (perception of) inequality. Policies need to address these challenges and deliver on the ambitious long-term goals of the European Union (EU), while maintaining the capability to respond to emergencies in the short term. This is a tall order.

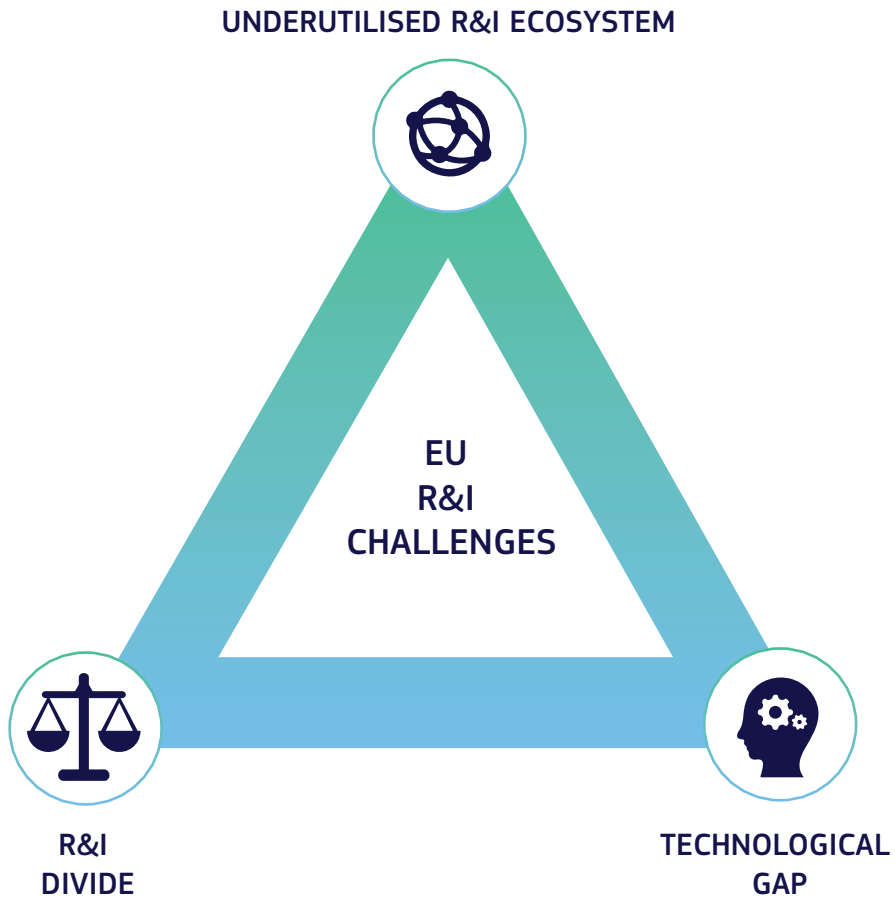
**Research and innovation (R&I) is a particularly valuable instrument for finding solutions to these challenges:** it is key to build ***a competitive Europe which will also shape a sustainable future***. Investing in R&I means investing in Europe's ability to handle the difficulties of the 21st century (European Commission, 2024a). It is crucial for boosting Europe's long-term competitiveness and improving living standards. And its role in supporting productivity growth and transition towards a sustainable economy will further increase with population ageing and the consequent shrinking of the labour force. It is also essential for meeting the EU's climate objectives, building a stronger circular economy and supporting the transformation of agro-food, energy and transport

systems, which is needed for the green transition. Furthermore, it plays a significant role in building a fairer Europe, ensuring well-being and revamping the social contract.

**But R&I is not a silver bullet.** It helps to generate knowledge, technologies and skills that are crucial for tackling certain societal challenges. It makes some policy trade-offs less biting. However, it needs to be part of a comprehensive policy mix to deliver its potential benefits. Moreover, R&I does not materialise on its own and requires well-designed policies, which themselves often involve trade-offs.

**Against this backdrop, the 2024 Science, Research and Innovation Performance of the EU (SRIP 2024) report offers rich analytical insights to underpin policy.** The various chapters of SRIP 2024 provide a basis for discussion on R&I policies by exposing three main challenges for EU R&I today (Figure 0-1): an underutilised R&I ecosystem which faces several obstacles, deep and persistent R&I divides showing a stratified EU landscape, and a technological gap with respect to other regions. The challenges are big, ranging from the need for a long-term vision and economic integration to the need to foster an environment where inclusion and excellence in innovation coexist harmoniously. This chapter sets the stage for the in-depth examination that the individual chapters provide, highlighting the main messages.

Figure 0-1 The triangle of current R&I challenges



Science, research and innovation performance of the EU 2024  
Source: DG Research and Innovation – Common R&I Strategy and Foresight Service – Chief Economist Unit.

# 1. An underutilised R&I ecosystem - an opportunity to strengthen efforts and impact

## R&I efforts<sup>1</sup>

**Although the EU has set itself an ambitious research and development (R&D) investment target<sup>2</sup> of 3 % of GDP, it is struggling to achieve this objective.** R&D efforts vary immensely across Member States. Moreover, R&D budgets often lack the necessary long-term stability as they might be cut when emergencies arise to address more immediate needs. The strategic direction of European R&I thus needs strengthening. Globally, the EU lags behind key peers such as the US, Japan, South Korea and, since recently, China. This gap is mainly caused by large differences in private R&D investment, which highlights the need for the EU to create better conditions for stimulating private sector engagement in R&I.

**The European R&I ecosystem continues to be fragmented along national lines, which restricts the EU's ability to achieve global leadership.** SRIP 2024 discusses the need for more concertation and, in some cases, harmonisation to align priorities and direct financial resources efficiently. Greater commitment to coordinating policies through tools like the European Semester or the European Research Area (ERA) will be key to achieving a well-coordinated and effective R&I ecosystem. At the same time, the implementation of structural reforms in EU Member States' national R&I systems is essential for modernisation and adaptation to a fast-changing innovation environment. The EU framework programme (FP) for R&I is a crucial EU-level instrument for creating synergies of the kind that could not be created by individual countries acting alone. It enables the development of more ambitious projects, fosters

transnational collaborations, addresses EU-wide challenges, reduces redundant efforts, allows for EU-wide competition and sets unified standards (European Commission, 2024b).

**A shift towards a greater adoption of transformative R&I policies has been observed.** Such policies are designed to ignite transformative changes in the economy by directing R&I efforts towards greater sustainability and inclusivity. As such, formulation of these policies requires a profound understanding of the socio-economic systems and the complex interactions embedded within them. The policies are based on involvement of different stakeholders and multi-level governance. Their design must, therefore, be underpinned by a comprehensive approach which includes systems thinking, experimentation, stakeholder involvement and continuous monitoring.

**Public authorities must design the mix of policy instruments to support R&I with care. Current trends show an increased use of tax incentives compared to direct subsidies, to encourage private R&I investment.** Tax incentives come with a lower administrative burden, but they also bring challenges in terms of potential reductions in both efficiency and focus on societal problems, and a risk of creating tax competition. SRIP 2024 points to the role of government venture capital (GVC) in promoting innovation, particularly by making finance and human resources available. On the other hand, the risk of GVC crowding out private investment sources necessitates careful design and implementation of such measures.

1 Based on Chapters 2.1, 4.1 and 6 of the report.

2 This 3 % target was stressed in the European Council conclusions of 18.4.2024.

## The ‘R’ in the ecosystem...<sup>3</sup>

**The EU is a top global player in scientific research.** Yet the global knowledge frontier is expanding ever more quickly, as shown by the fast growth in high-quality scientific output in countries like China and India, especially in STEM fields. This emphasises the fact that the EU must work hard to maintain its level of excellence and to enhance its scientific competitiveness globally. This requires not only the allocation of sufficient funding for science but also the promotion of international collaboration and mobility so as not to lose prominence within the global knowledge economy.

**The speed of the diffusion of artificial intelligence (AI) across scientific areas brings opportunities and challenges for the EU’s research environment.** AI has the potential to greatly improve research productivity and push forward scientific progress, but it is essential to tackle the ethical, transparency and privacy challenges linked with this technology. Policy actions that encourage responsible use of AI, and traditional R&I tools, are necessary to maintain a balanced and human-centric approach to innovation.

**The EU’s research ecosystem also faces a significant challenge in terms of brain drain compared with other regions of the world.** Europe’s attractiveness is hindered by language barriers, rigid academic hierarchies, lower salaries and strict immigration laws in contrast to the US, Canada and Australia. Open immigration policies and internationalisation of education – as demonstrated by the Bologna and Lisbon processes – are key elements for



bringing in and keeping highly skilled talent. In addition, the fact that immigrants are strongly represented among inventors and entrepreneurs underlines how crucial it is to create an environment that is inviting and inclusive for global talent.

**The increasing prevalence of public-private collaborations demonstrates the important complementarities between universities and industry partners in terms of skills sets and missions.** This is facilitated by open access policies, which strengthen the research ecosystem by fostering collaboration and enhancing participation of all actors, notably underrepresented actors. Notwithstanding challenges like the shifting of publication costs to authors, potential quality compromises and the creation of financial disparities within the research community, such policies help make knowledge equally accessible for all and improve research visibility. The EU’s open access publication rates show a commitment to an inclusive R&I environment that promotes collaboration.

<sup>3</sup> Based on Chapters 3.1, 3.2 and 3.3 of the report.

## ... and the 'I'<sup>4</sup>

### **Translating scientific advances into innovation is key to boosting the competitiveness of the EU.**

Investments in R&D, software and organisational capital across multiple sectors are a critical driver of efficiency improvements in our economies, as captured in productivity metrics. A crucial precondition for the positive effects of R&I is a well-functioning innovation ecosystem which fully exploits the innovative potential of individual actors and facilitates cooperation and interaction. The EU path towards achieving this depends on proper valorisation of R&I outputs. We thus need a strategic focus that not only encourages scientific advances but also ensures and speeds up the translation of knowledge into industrial applications, solutions and innovations that reach the market, are broadly diffused in the economy and benefit society. This can be achieved, for instance, by wider use of incentives, interactive tools and models of collaboration between industry, academia, civil society and policymakers, as well as by increasing access to knowledge through efficient intellectual asset management. This will help Europe to become more competitive and boost long-term economic growth. In this respect, AI has the potential to boost knowledge valorisation and reverse the productivity slowdown that has plagued western economies in recent decades. However, for this to happen, it is crucial to implement policies that ensure AI augments, rather than replaces, human labour.

**For the EU to be a leader in innovation and technology, a concerted effort is needed to create an environment which allows for innovative, ground-breaking advancements.** A comprehensive approach can not only address the immediate requirements for technological progress but can also put the EU in a position to greatly influence future global



innovation. But building an innovation-friendly environment and an innovation-centric culture in the EU is not just about putting money into state-of-the-art R&I; it also requires a paradigm shift towards knowledge valorisation to speed up the process of turning research results and new technologies into marketable products, as well as adequate strategic alliances, increased multi-stakeholder co-creation, regulatory frameworks, adequate skills and policy tools, openness to new ideas, risk tolerance and recognition, and incentives for entrepreneurship and innovative approaches. These are core elements in the New European Innovation Agenda. The creation of the European Innovation Council (EIC) as a catalyst for deep tech innovation also highlights the EU's commitment to leading the next wave of breakthrough innovations.

<sup>4</sup> Based on Chapters 5.1, 5.2, 5.3, 7, 10 and 11 of the report.

**A thriving landscape of innovative firms is crucial to the innovation capacity of an economy.** The cooling of venture capital (VC) investment after 2021 and the difficulties of EU tech firms in scaling up show an urgent need for policy action. This requires a multifaceted approach to encouraging investment, especially in strategic technologies – including deep tech – and clean energy, crucial for navigating the green and digital transitions, supporting start-ups and scaleups and ensuring the availability of a highly skilled workforce. This is particularly relevant for deep tech technologies which require a unique skillset (a key element here is also addressing gender imbalances in STEM fields). These policies should aim at closing the financing gap and promote business dynamism.

**Fostering a strategic approach to the management of intellectual assets within the R&I ecosystem can help generate more breakthrough innovations in Europe.** This approach should balance economic interests with the goal of generating societal benefits, such as by adopting open science and socially responsible licensing practices. Facilitating access to and use of intellectual assets such as intellectual property rights (IPRs), know-how and data will support the competitiveness of the EU and help to address societal challenges. Several initiatives have been taken around the globe, for example in Australia<sup>5</sup> and Japan<sup>6</sup>, to stimulate use of research results and to offer guidance to R&I actors on efficient intellectual asset management and collaboration between industry and academia.

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5 National principles of intellectual property management for publicly funded research, updated in June 2022 and the Higher education research commercialisation intellectual property framework, released in 2022.

6 Intellectual property strategic programme 2022 and University intellectual property governance guidelines.



## 2. The R&I divide - an opportunity to build bridges and inclusiveness<sup>7</sup>

**A serious obstacle to the creation of a thriving EU R&I ecosystem is the persistence of spatial divides in R&I performance highlighted in this report.** These gaps are caused by differences in the ability to innovate, levels of cooperation, costs and job opportunities linked to R&I activities. Even though there have been improvements in some regions over the past decade, the persistence of these regional disparities highlights the importance of specific actions to promote cohesion and ensure that the benefits of R&I are widely shared.

**At regional level, the map of R&I performance levels largely coincides with national borders, but developments differ across regions.** Regions that are innovation leaders and strong innovators are mainly in northern and western Europe. Moderate and emerging innovators are more common in the south and east of the continent. This pattern is not static: some regions are improving their R&I performance while others fall behind. Also, many small and medium-sized enterprises (SMEs) in less advanced regions of Europe have made progress in various R&I indicators. This is in contrast to SMEs in stronger regions, which have declined in several R&I indicators. Degrees of industrial clustering also differ across regions. The industrial structure of European regions and asymmetric developments in productive specialisation across countries and regions have underpinned the emergence of spatial disparities in R&I. The emergence of social innovation clusters adds another layer to these disparities, suggesting that overcoming the R&I divide requires a nuanced approach.

**Overall, EU funding for R&I can play a role in narrowing the divide, as regions with low levels of R&I performance rely significantly on it to support their R&I systems.**

At the same time, EU FP for R&I funding is quite concentrated due to its excellence-driven nature, which gives rise to concerns about exacerbation of disparities. Dedicated actions within programmes such as the EU FP for R&I and the European Structural and Investment Funds, which help with territorial development, build institutional capacity and improve public administration, are important to promote cohesion while counterbalancing a potential ‘closed club’ effect so as to increase the competitiveness of the EU. The Recovery and Resilience Facility (RRF) funding dedicated to R&I is also expected to play a role in closing the R&I gap, as data shows that it provides significant support for countries with weaker innovation performance. Synergy between sources of funding can help to harness the concentration of innovation in hubs of excellence while connecting these hubs with each other and integrating them in their regional context, to enable redistribution of the benefits of innovation.<sup>8</sup>

**The general increase in R&I collaborations across the EU shows how crucial EU-level R&I policies are for encouraging ecosystem linkages.** Despite this, the intensity of cross-border cooperation is much lower than that of cooperation across different states in the US. This points to a huge underutilisation of the potential of Europe’s innovation ecosystem.

<sup>7</sup> Based on Chapters 4.1, 4.2, 9 and 11 of the report.

<sup>8</sup> Expert group on the Economic and Societal Impact of R&I, Combining Regional Strengths to Narrow the Innovation Divide, upcoming June 2024.

The EU FP for R&I has played a key role in establishing an extensive EU-wide collaboration network which is helping to overcome national fragmentation and encourage cross-border collaborations. Programmes like Interreg also play a significant role in promoting territorial cooperation and steering R&I collaboration throughout the EU.

**The R&I divide manifests itself in different dimensions, which calls for tailored policies at regional and local level that concentrate on increasing inclusiveness and utilising unused potential.** It is important that local R&I ecosystems become more dynamic, diverse and attractive to talent from different backgrounds. Actions such as the

EIC's gender-balance portfolio and dedicated funding schemes for female entrepreneurs, along with work to improve access to EU financing for newcomers, are good practices for enhancing inclusiveness.

**Helping countries and regions to develop capabilities and talent is important for turning existing pockets of excellence into flourishing ecosystems.** This can be enhanced by funding policies that are harmonised and aligned so as to foster synergies. Making R&I results from projects more accessible can improve knowledge spillovers. It can also help researchers and innovators to use newly generated knowledge.

### 3. The technological gap - an opportunity to strengthen strategic focus and build cooperation<sup>9</sup>

**The EU still struggles with raising private sector investment for R&I, especially in important sectors like ICT and health, and tends to specialise its R&I in technologies characterised by lower complexity<sup>10</sup> and in mid-tech sectors, a situation that some call a technological trap.<sup>11</sup>** An approach that combines R&I with wider industry objectives could help to bring about the necessary change by supporting sectors with high R&D intensity, promoting an environment for private investment in critical technologies like advanced semiconductors, biotech, space tech and advanced materials tech, for which the EU needs to regain technological leadership (European Commission, 2024a).

**More generally, at a time when digital strength and green innovation are key factors in competitiveness, the EU's strategic focus on these fields is crucial.** This report shows that the EU has already made strong progress with green technologies, but it needs to improve its R&I capabilities in the digital area. As regards digital technologies, especially important technologies such as Internet of Things (IoT), blockchain and cybersecurity, there is a gap between the EU and other global leaders such as the US and China. Moreover, supply chain vulnerabilities for critical raw materials and the manufacturing of semiconductors, batteries and green

technologies highlight the need for a strong R&I policy set-up that promotes technological sovereignty and strategic autonomy. At the same time, supported by initiatives such as the Net-Zero Industry Act, the Critical Raw Materials Act and the STEP Regulation, the EU can enhance its role in green technologies thanks to the growing worldwide demand for critical technologies created as a result of decarbonisation efforts. However, this comes with challenges such as the US Inflation Reduction Act, which provides significant incentives, mainly in the form of tax credits, for energy and climate in the US. The STEP regulation is a first element of the EU response.

**There is a growing need for actions that reconcile the objectives of adopting a coordinated approach to climate neutrality and securing critical supply chains,** while limiting foreign interference. International R&I cooperation has a major role to play in this. Meeting the strategic requirements of encouraging science diplomacy and building collaborations worldwide could enable the EU to harness complementary technologies and mitigate risks associated with technological dependencies. As a strategic framework for international R&I cooperation, this imperative of preserving an open economy while safeguarding EU and national interests is in line with the Global Approach to R&I<sup>12</sup> (as open as possible, as closed as necessary) and

<sup>9</sup> Based on Chapters 2.2, 2.3 and 8 of the report.

<sup>10</sup> The approach used in SRIP 2024 for complex technologies relies on the economic complexity literature. Less complex technologies are relatively easy to copy and move over space and their development typically requires fewer capabilities. This confers a lower competitive advantage on the countries/regions in which they are located. More complex technologies combine a higher number of capabilities, are more concentrated geographically and have higher potential in terms of growth and overall competitiveness.

<sup>11</sup> Fuest et al (2024).

<sup>12</sup> COM(2021) 252 final. Communication on the Global Approach to Research and Innovation.

the European economic security strategy<sup>13</sup> (de-risk, not decouple). In this regard, preserving academic freedom by supporting European research-performing organisations also remains crucial to addressing research security risks linked to increasing international conflicts and competition.<sup>14</sup>

**The geopolitical landscape, with its emerging threats and conflicts, also highlights the need for a robust EU defence R&I framework and the importance of dual-use technologies to reap the full potential of such a framework.** Innovative defence and security technologies are crucial to counter the security challenges posed by climate change, demographic shifts, political polarisation and geopolitical changes and to ensure global stability in a rapidly evolving world. In the EU, there is a notable focus on spending on the later

stages of defence technology development rather than on foundational research and technology demonstration. However, at lower technology readiness levels (TRLs), defence R&D spillovers and overlaps between civilian and military interests are expected to be more significant. Within the current EU FP for R&I, activities carried out under the European Defence Fund should have an exclusive focus on defence R&D, while activities carried out under the ‘civilian’ specific programme and the European Institute of Innovation and Technology should have an exclusive focus on civil applications. Coordination between programmes may strengthen synergies in dual-use technology areas. The EU can fully harness the potential of dual-use technologies by fostering synergies and bridging the divide between civilian and defence R&D, both within the EU as a whole and among its Member States.<sup>15</sup>

13 JOIN(2023) 20 final. Joint Communication to the European Parliament, the European Council and the Council on European Economic Security Strategy.

14 Council recommendation on Enhancing Research Security, C/2024/3510.

15 European Commission (2024c).

## 4. Trade-offs

### **R&I policies need to act along all three dimensions of the innovation triangle.**

They should make the European R&I ecosystem more performant and connected, especially in terms of producing and diffusing innovations; exploit talent and innovation potential across the EU to achieve inclusive excellence; and ensure that Europe can fully benefit from advances in transversal digital technologies and shape the direction of their development.

### **Nonetheless, these impacts can generate important trade-offs, which need to be adequately addressed (Figure 0-2).**

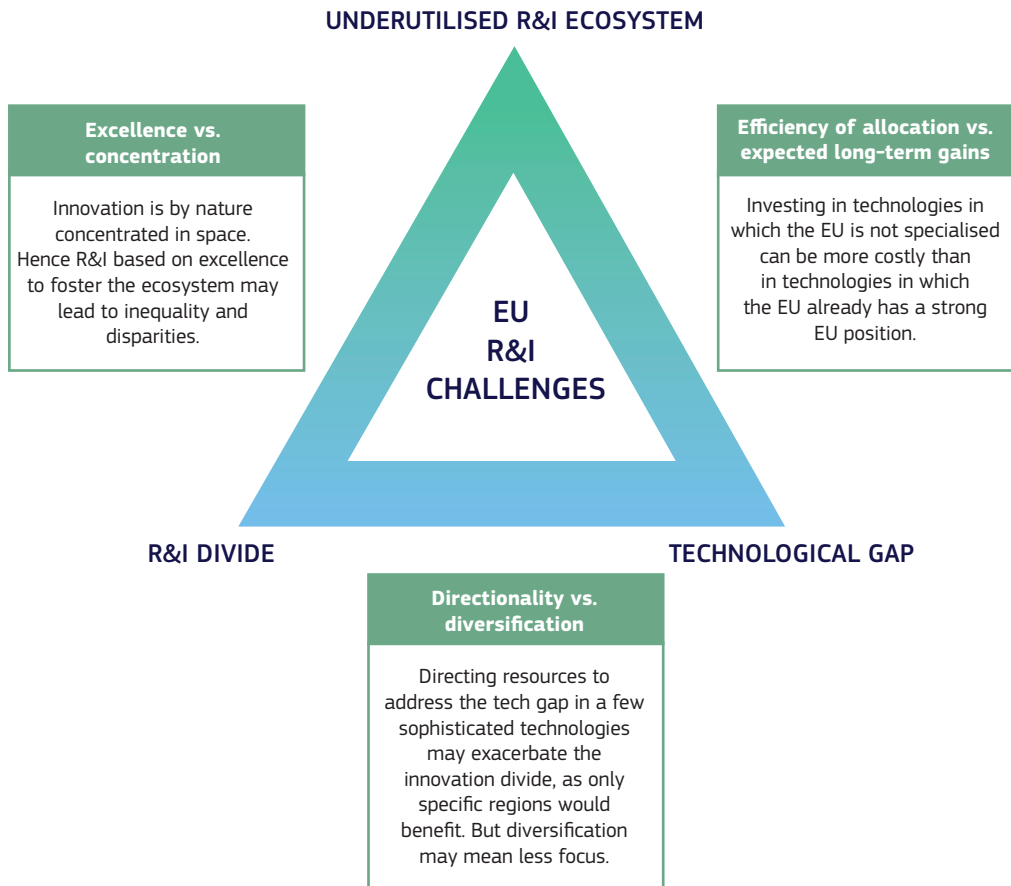
This is particularly true when resources are scarce and policymakers need to make choices regarding their optimal use. One trade-off concerns achieving excellence while avoiding deepening the R&I divide. Promoting the development of the European R&I ecosystem implies promoting excellence. However, R&I activities have an inherent tendency to concentrate in certain places – a tendency that can be reinforced through provision of support to the highest achieving activities and actors. This can exacerbate inequality and regional divides. A second source of tension is that achieving efficiency in resource allocation, such as by focusing on what the EU is already good at, may conflict with the goal of building up capacities in sectors which are strategically important but where Europe lags behind. Investing more in fields where the EU does not have a comparative advantage

will be costly and implies risk. This particularly concerns transversal digital technologies, including AI, which are likely to transform our economies in the years to come. Failing to build appropriate technological capacity in these areas could have wide implications for Europe's competitiveness across the board. However, catching up with the EU's global competitors, who are currently well ahead, will require substantial resources and resolute policy action. Finally, a third source of tension arises from the trade-off between directionality and diversification in R&I investments. Concentrating resources mainly on closing specific technology gaps may favour specific regions and actors, thus deepening the R&I divide. Also, focusing investment on cutting-edge technologies might fill certain gaps and bring valuable results but would also run the risk of the EU missing out on wider gains from diversification. Overall, R&I policies should be aimed at attaining excellence without ignoring equitable progress, maintaining efficiency without jeopardising the achievement of future strategic goals and staying focused while enhancing technology throughout the EU.

### **Moreover, R&I policies that work in tandem with other policies maximise their impact.**

It might be a tall order for R&I policies to address all these trade-offs on their own. It is, therefore, important that they are closely aligned with other economic policies, for example, industrial policies.

Figure 0-2 Trade-offs between R&I challenges and their solutions



Science, research and innovation performance of the EU 2024

Source: DG Research and Innovation – Common R&I Strategy and Foresight Service – Chief Economist Unit.

## 5. A future-proof policy approach to leverage the potential of R&I

### **In an increasingly complex and uncertain environment, R&I policies must contribute to fostering economic and societal resilience.**

This has implications for policies themselves, which need to be more adaptable and forward looking. Recent crises, such as the COVID-19 pandemic, have emphasised the need for policies that can be quickly adjusted to new situations – with a focus on preparedness and an agile response system. This requirement goes well beyond crisis management, also covering future planning and readiness, as well as using foresight in policy design with particular emphasis on long-term risk assessment. In this context, the expert group on the economic and societal impact of research and innovation (ESIR) has stressed the need for policies that prevent the EU from falling into the trap of short-termism and instead adopt a ‘protect, prepare and transform’ approach: protect through a timely and coordinated response to emergencies; prepare for a broad set of future risks, through coordination, foresight, community involvement and re-skilling; transform the economy and society to create a competitive, green and fair Europe. Hence, R&I can be seen as a strategic tool to deal with disruptions and provide future-focused solutions to societal challenges.<sup>16</sup>

### **The ongoing discussions on the future of the FP provide an opportunity for strategic reflection on European R&I policies.**

The fundamental changes in the external environment and the increasingly pressing societal challenges and weaknesses in Europe’s R&I performance justify a rethink of our R&I policies. More than ever, there is a need for a future-proof policy approach which will leverage the potential of R&I to act as a key instrument for societal progress.

When discussing the specific design of R&I policies, several aspects need to be considered.

- ▶ To fully exploit their potential, R&I policies need to be aligned with other policies in a comprehensive and complementary economic policy mix, such as industrial policies.
- ▶ R&I policies need to be focused on long-term objectives, while retaining the agility to respond to short-term emergencies. A key factor in enabling R&I to deliver is long-term stability, including as regards funding. This, however, often falls victim to short-term shifts in priorities. As we are entering an era of polycrisis or permacrisis, a balanced approach is warranted to ensure that policies address immediate needs without compromising long-term aspirations.
- ▶ Both curiosity-driven and mission-oriented research are part of an effective policy mix. Bottom-up scientific advances are a key driver of disruptive innovation and productivity growth in the longer run. At the same time, transformative changes require directed R&I efforts geared towards results that can help solving wider societal problems.
- ▶ Knowledge valorisation is about ensuring that the ideas produced by curiosity-driven research are being put in practice through innovation and widespread adoption. Connecting different spheres of innovation means more than just linking up separate initiatives; it also involves aligning the actors involved: those who perform research, formulate policies and run businesses, and society as a whole.

<sup>16</sup> Based on Chapter 2.4 of the report.

- ▶ The dual challenge of encouraging excellence and being inclusive requires providing conditions under which R&I activity can flourish, while at the same time fostering the dissemination of the benefits of innovation through all parts of society, leaving no region or group behind. ERA and the single market play a crucial role in this respect by facilitating the free circulation of knowledge in the EU.
- ▶ Finally, the meta-challenge of making innovation policy more innovative highlights the need for R&I policies that are as dynamic and forward-looking as the research they support. Continuous learning through experimentation and evaluation helps to adjust policies to changing needs in a fastly evolving world.



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