INVESTMENT IN THE EURO AREA:
FOCUSBING ON RESEARCH AND INNOVATION

Technical Note for the Eurogroup1

1 This is a technical background paper prepared by services of the Commission. It does not represent the Commission position and does not bind the Commission in any way
The common principles to promote investment agreed by the Eurogroup in 2017 underline the importance of fostering knowledge-intensive and sustainable growth, including via incentives for investment in R&D. The latest Council recommendation on the economic policy of the euro area points to the need for investment in tangible and intangible assets in order to increase productivity and innovation. The Eurogroup discussion in October 2019 identified reforms and investments in research and innovation as a priority in the current economic situation. In the context of the Budgetary Instrument for Convergence and Competitiveness (BICC), it is proposed that strategic orientations for the reform and investment priorities of the euro area will be integrated into Euro Area Recommendation. Discussion in the Eurogroup will be required before strategic orientations are adopted by the Council upon Commission’s recommendation. Reforms and investments to promote innovation play an important role in this regard. They are also at the centre of the ongoing discussions on new EU industrial policy and link to the discussions on regional convergence as well as inclusiveness of growth.

Research and innovation account for up to two-thirds of economic growth in Europe. They are vital for creating knowledge that leads to technological progress and thus to productivity growth, which will be the main engine of growth in the future in light of ageing societies (Chart 1). High levels of research and development (R&D) spending are associated with higher levels of prosperity. Moreover, stimulating investment in research and innovation has multiple dividends for the society since it is also crucial to address societal challenges, such as e.g. digital transformation, climate change or ageing.

Chart 1: Productivity will be the engine of growth in the future – innovation is vital

How to read the graph:

Potential output can be decomposed into the contributions of labour and capital and growth of Total Factor Productivity (TFP), which is a proxy of technological progress and shows how efficiently and intensely labour and capital are utilised in production.

Source: European Commission calculations based on the European Economic Forecast of Spring 2019

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5 COM (2019) 354 final Proposal for a Regulation on a governance framework for the budgetary instrument for convergence and competitiveness for the euro area.
Investments in research and innovation can help boost convergence, resilience and adjustment capacity, which are important in the context of the euro area. In the absence of appropriate policies, different speeds of transition to the digital economy among euro area Member States could prove a significant risk to convergence and macroeconomic stability. This is reinforced by strong agglomeration effects and winner-takes-all dynamics, which are often present in the area of digital technologies, and can also lead to undesirable increases in inequality. Ensuring high levels of effective competition is thus crucial. Moreover, promoting not only innovation creation but also wider diffusion, including by completing the Single Market, is indispensable in order to stimulate convergence across and within the euro area Member States. At the same time, innovation-led growth will boost competitiveness and equip economies with the necessary adjustment capacity.

Investments in research and innovation – where do we stand?

Europe underinvests in research and innovation compared to its main competitors. The overall spending on R&D has hovered around 2.1% of GDP for a number of years, well below the headline target of 3%. This contrasts with the strong expansion in R&D spending in China, which has overtaken the EU both in relative and in absolute terms and currently accounts over one fifth of global R&D expenditure, rising from a share of only 5% in 2000 (Chart 2).

In particular, business expenditure on R&D remains sluggish in the EU at roughly 1.2% of GDP, compared to 2.5% in Japan, 1.7% in US or 1.6% in China. In terms of public spending on R&D, Europe’s performance is comparatively stronger as euro area spends about 0.7% of GDP, which is somewhat higher than e.g. in China or Japan and roughly at par with the US. There is, however, a large dispersion across the euro area in terms of R&D investments and their composition (Chart 2). The considerable differences between countries reflect variations in their corresponding industrial structures, knowledge intensity of sectors and research capabilities.

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**Chart 2: Europe falls short in R&D intensity compared to main competitors**

*Source:* Eurostat for R&D expenditure

Notes: Intensity as percent of GDP, "Other" includes "Higher education sector", "Private non-profit sector" and "Abroad"

Data for 2015 (*), 2014 (**) and 2013 (***), used when 2016 data unavailable. Data on R&D expenditure by source of funds is available only until 2016. Data on total R&D expenditures is available until 2017.

**There are many other ingredients beyond R&D that drive innovation.** In fact, successful innovation also requires investments in other intangible assets such as skills, software, data or organisational capital. Overall, intangible investments in Europe are increasing, although they also fall short of those in the US. The composition of intangible investments varies significantly across Member States, reflecting substantial differences in the economic structures (Chart 3). For instance, in Member States with the best innovation performance, investments in intangible assets are at par or even exceed the ‘traditional’ tangible investments, while in other Member States investments in tangible assets tend to have a higher share.

**Chart 3: Investments per asset type** (based on survey data)


*How to read the graph:* Category (A) and (B) in Chart 4 represent tangible investment while (C) and (D) are intangible assets as captured in official statistics (according to SNA, ESA 2010). The shares of total spending represented by category (E) and (F) represent intangible asset types, which are commonly not captured as ‘investments’ in statistics (such spending is accounted as ‘expenditures’ instead). The graph illustrates the order of magnitude of such investment.
Overall, Europe has a relatively strong public research, but performs less well in exploiting research results and bringing innovations to the market. This is also apparent in promising new fields such as Artificial Intelligence (Box 1). Despite recent improvements in innovation performance reported by the 2019 European Innovation Scoreboard⁸, further progress in tackling Europe’s weaknesses in the innovation performance is needed.

**Box 1: Artificial Intelligence**

The EU ranks among global leaders when it comes to scientific production in AI. However, it lags behind when it comes to innovation performance. In 2016, investments in AI in Europe were estimated to be between 2.5 and 3.3 billion euro (both internal corporate investments and external investments such as venture capital, private equity and mergers & acquisitions). However, North America and Asia invest much more: between 12.2 and 18.8 billion and 6.5 and 9.8 billion euro, respectively.⁹ AI start-ups in the US have attracted around 2/3 of the total private equity investments since 2011.¹⁰

Most developed economies recognise the game-changing nature of AI. In the beginning of 2019, the US Government announced the American AI Initiative.¹¹ China is planning to become a global leader in AI by 2030 and is investing heavily. Large companies in the US and China are investing significantly in AI (including R&D labs)¹² and are exploiting large amounts of data. Japan and Canada have also adopted AI strategies.

Against this background, Europe must ensure that it keeps the pace with the AI revolution. It should build on its comparative advantages, i.e. by promoting a strong and balanced regulatory framework, which can set the global standard for a sustainable and ethical approach to this technology, while aiming to be flexible enough to allow experimentation. The EU is increasing its annual investments in AI by 70% under the research and innovation programme Horizon 2020¹³ and has launched in April 2018 a strategy on AI. In December 2018, Member States joined forces with the European Commission in a Coordinated Plan on AI for increased cooperation that will boost AI’s scale in Europe.

**Policies to stimulate investments in research and innovation**

There is no one-size fits-all research and innovation strategy. A broad-based and coordinated policy effort is needed to promote an effective innovation system and facilitate innovation diffusion. Besides R&D activities, it should target investments in a range of intangibles, while taking into account possible synergies, for instance, between investments in ICT (hardware), software, and training of employees and managers on how to work with the new technologies. The choice of tools will depend on the maturity of the innovation system and the specific bottlenecks.¹⁴ The lead innovators should rather aim at promoting generation of frontier technologies and their diffusion, including by supporting highly innovative SMEs. For countries or sectors further away from the

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⁸ https://ec.europa.eu/docsroom/documents/36281
¹¹ https://www.whitehouse.gov/ai/executive-order-ai/
¹² See for example https://www.ft.com/content/ac3fd818-ae5f-11e7-beba-5521c713abf4
¹³ COM(2018) 237 final ‘Artificial Intelligence for Europe’
¹⁴ A large policy toolbox is available to policy-makers: direct or indirect financial support to innovation activities can take different forms: grants (e.g. AT, ES, FI, IE MT, NL); loans, guarantees, equity finance (e.g. FI, FR, LU, MT, PT, SI); tax incentives (e.g. AT, BE, FR, IT, LV, NL, PT) or innovation procurement (e.g. AT, BE, CY, FR, IT, LT). Innovation prizes are another promising tool. For example, the proposed mission-oriented approach under Horizon Europe follows a similar logic. Provision of appropriate infrastructure or advisory services can also be important. Most Member States also provide specific support to innovative ventures through incubators, accelerators or facilitation of equity finance. Note that the country examples are illustrative and non-exhaustive.
innovation frontier, absorptive capacity building and, in general, the emergence of an advanced innovation system is critically important. This will allow them to promote a broad catching up and ideally develop pockets of excellence in specific cutting-edge technologies. Bottom-up approaches have an important role to play especially where regional disparities are large.

**Given the importance of public expenditures on R&D, it is crucial to ensure the effectiveness and efficiency of this spending.** Governments need to make choices as regards the use of generic instruments (such as a general tax incentives, guarantees or favourable taxation of employee stock options) and/or more targeted interventions (such as the prioritisation of research activities in a specific field). The objective is to use the limited resources that are available in the most effective and efficient way. Spending reviews and assessments of the quality of public finances can be helpful as discussed in the September 2019 Eurogroup meeting.15

**EU level measures complement the Member States’ initiatives.** The European Semester puts emphasis on promoting investment across Europe, including in research and innovation. Boosting innovation is also relevant in view of the discussions on the Budgetary Instrument for Convergence and Competitiveness and in terms of the discussions concerning EU industrial policy. The EU budget provides additional direct and indirect support to innovation activities. For example, the Horizon 2020 programme is the largest publicly funded, cross-disciplinary and cross-sectoral scheme in the world with important European value added.16 The support to research and innovation is proposed to be further stepped up in the new Multiannual Financial Framework, for instance by expanding the proposed budget for the next research programme Horizon Europe to 100 billion euro from current nearly 80 billion euro. For an overview of key EU initiatives, see the Box 2 below.

**A market environment conducive to innovation and its diffusion is essential.** Investments in research and innovation tend to be more sensitive to framework conditions than other types of investments. This includes appropriate product and labour market regulations, a high quality education sector with strong linkages to the innovation system, good quality public administration, as well as high-quality public investments.

**Lack of financing often stifles research and innovation.** Research and innovation projects have more difficulties to access finance because of information asymmetries, the intangible nature of the investment, and higher risks related to innovative technologies. This is why many firms finance innovative activities from internal resources. These are, however, severely limited for a number of innovative start-ups. The establishment of the Capital Markets Union can greatly facilitate access of innovative firms to external financing, e.g. loans, equity or venture capital. Moreover, market–based policy instruments can help to pool risks and mobilise private investment. For example, the European Fund for Strategic Investment (EFSI) helps to finance research and innovation projects in the European Union.

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16 To date, it has funded about 25,000 grants and provides vital support to top scientists and innovators, including several Nobel Prize laureates. Examples of achievements of Horizon 2020 are multiple: new Ebola vaccines that were rapidly developed by pooling resources, better breast cancer treatments, rare disease therapies, reduction of food waste thanks to nano-packaging, the discovery of planets outside our solar system, the Higgs boson and gravitational waves, the first image of a black hole, the development of bombproof technologies making passenger aircraft safer, re-entry proof devices to guide falling satellites safely into the seas and the use of graphene to make ‘never-ending’ batteries.
activities across a wide range of sectors, such as key enabling technologies, bio-economy, circular economy, health and well-being, new transport energy technologies; it also helps innovative SMEs to access finance. Around a quarter of EFSI projects target research and innovation. From 2021 onwards, the InvestEU will further enhance this support through a policy window dedicated to research, innovation and digitisation. The related VentureEU initiative could double the total venture capital investment in Europe.

The changing nature of innovations require policy-makers to be innovative.17 With the increasing role of intangible investments, innovation cycles are accelerating, calling for an agile reaction on the side of policy-makers. A systematic experimentation and evaluation in the process of policy design can thus be a helpful tool to fine tune the set of policy interventions to encourage research and innovation. This allows discontinuation of ineffective policy actions and upscaling policies yielding the desired effects and can be more effective and cost saving than the more traditional approach of introducing reforms across the board.18

Box 2: Main EU policy initiatives to unlock investments in research and innovation

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<th>At European level, regulation, cross-border cooperation and the EU budget can all be effective policy levers for both R&amp;D and innovation. Specific programmes have been developed to deliver on key aspects.</th>
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<td>In the proposal on the Multiannual Financial Framework 2021-2027, a number of EU initiatives aim at stepping up investment in innovation capacity, thus including areas such as e.g. digital skills, critical research infrastructure and other budgetary instruments relevant for innovation.</td>
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<td>Overall, EUR 100 billion are earmarked for the future programme Horizon Europe. It will bring in some new elements. For example, a European Innovation Council will offer a one-stop shop for high potential and breakthrough technologies, as well as for innovative companies with potential for scaling up. EU-wide missions with ambitious goals will focus on issues such as fighting cancer, preserving health from all kind of pollutions, or ensuring food security.</td>
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<td>Equally, the Commission proposed to mobilise around EUR 11 billion for market-based instruments (including financial instruments and budgetary guarantees) in a dedicated window under the InvestEU Fund, which is expected to mobilise EUR 200 billion of private investment to support R&amp;D and innovation.</td>
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<td>A major new initiative combines the Research Framework Programme, the EFSI and the Programme for the Competitiveness of Enterprises and SMEs to launch VentureEU, with a potential to double the total venture capital investment in Europe. Moreover, also the European Investment Fund provides risk financing for SMEs and small mid-caps, ensuring access to affordable finance for European enterprises.19</td>
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<td>The new Digital Europe Programme20 inter alia provides coherent and comprehensive support for building up the digital skills needed to support reskilling and upskilling in Europe (EUR 700 million).</td>
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<td>Innovation also has an important regional dimension and EU structural funds promote the ‘smart specialisation strategies’. Member States and regions have developed over 120 such strategies establishing priorities for research and innovation investments for the 2014-2020 period, with a contribution of more than EUR 40 billion through the European Regional Development Fund.</td>
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<td>The Budgetary Instrument for Convergence and Competitiveness will help euro area economies to enhance resilience through support to targeted reforms and investment.</td>
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18 An example would be innovation vouchers, which have been introduced in the Netherlands after running a policy experiment, and currently are used also in other countries across Europe (e.g. EE, LT, PT). EU structural funds also support experiments in innovation policies, for example through the Urban Innovative Actions with a budget of about EUR 370 million in the current programming period.
The EU Industrial Policy Strategy (2017)\textsuperscript{21} inter alia seeks to improve the regulatory framework and relevant conditions for investment in R&D and innovation. Recent initiatives e.g. on artificial intelligence, high performance computing and the data economy (amongst others) may help placing Europe at the forefront of the next innovation wave.

State Aid rules will be simplified to enhance synergies and support public funding of innovative projects. This will facilitate the blending of EU and national funds and will also allow Horizon Europe projects with the ‘Seal of excellence’ label to be easily funded under European Structural and Investment Funds.

Questions for discussion:

- With a view at supporting research and innovation, how to ensure that public resources are used most effectively and efficiently? Are there any best practices and experiences to share?

- What are the ways to attract more private investment in research and innovation?

- Given the relevance of research and innovation at the euro area level, how can EU instruments (BICC, InvestEU) best support and complement the efforts done at the country level?