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**NOTE**

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From: Presidency  
To: The High Level Working Group on Competitiveness and Growth  
Subject: Research and innovation as drivers of economic growth and job creation

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Delegations will find in Annex a Presidency discussion paper on Research and innovation as drivers of economic growth and job creation, in view of the meeting of the High Level Working Group on Competitiveness and Growth on 15 February 2018.

***Research and innovation are crucial drivers of economic growth and social prosperity and sustainability, and Europe's ability to grow robustly will increasingly rely on its ability to create and diffuse innovation across its economy.***

Research and Innovation are fundamental drivers of economic and social prosperity and sustainability. They boost economic growth, create new and better jobs, enable social mobility, fight climate change and poverty, and improve overall quality of life. The benefits of research and innovation for economic growth have been widely documented by ample academic and empirical literature. A study by NESTA and the Lisbon Council<sup>1</sup> estimated that about two-thirds of all economic growth in Europe between 1995 and 2007 could be traced back to innovation, broadly defined, and research conducted by the OECD<sup>2</sup> forecasts that around 90% of the economic growth in advanced economies will rely on their ability to boost their total factor productivity, which in turn depends on research, technology and innovation creation and diffusion, in addition to the functioning of product and services markets.

The positive effects of R&D investment on labour productivity growth – one of the main drivers of economic growth and closely associated to the notion of prosperity – have also been estimated to be large and significant<sup>3</sup>. The positive returns of R&D investment, as one of the main sources of innovation investment, for firms in advanced economies have been estimated to be in the 10% to 30% bracket<sup>4,5</sup>, while the social returns, i.e. the net positive benefits that spill over to society, can be two to three times larger.<sup>6</sup>

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<sup>1</sup> <http://www.lisboncouncil.net/publication/publication/99.html>

<sup>2</sup> <https://www.oecd.org/eco/growth/Shifting%20gear.pdf>

<sup>3</sup> <https://research.vu.nl/en/publications/the-fruits-of-rampd-meta-analyses-of-the-effects-of-research-and-> An increase of 10% in R&D investment would lead to a boost in productivity gains around 1.1% and 1.4%.

<sup>4</sup> <http://www.nber.org/papers/w15622>

<sup>5</sup> The rate of return to an R&D investment represents the average annual benefit a company obtains for every 100 euro invests in R&D is between 10 and 30 euro during the life time of an R&D project

<sup>6</sup> For a more ample review on the economic benefits and rationale of public R&I, please see European Commission (2017): "The economic rationale for public R&I funding and its impacts"

Research and innovation play a different role to spur productivity growth depending on the stage of economic prosperity of a country. While for some lower and middle income countries, productivity growth can be driven by factors such as foreign direct investment, investment in infrastructure or the better functioning of markets, in the long run, only research, innovation and entrepreneurship can spur productivity and growth. Currently, an innovation divide persists in Europe, even if it has become more nuanced, notably in terms of investment, where certain countries have made significant progress to catch up. Bridging this innovation divide will require mobilising resources at regional, national and European level.

Horizon 2020 is the EU's largest research and innovation framework programme. European businesses and organisations should make the most of this resource to boost their innovation activity and its impact on economic growth. A challenge is for new Member States (EU13) to improve their participation in Horizon 2020. The EU funding from Horizon 2020 to new Member States has a slow increasing trend (4.2% in FP7 to 4.7% in Horizon 2020) while their participation rate fully reflects their national investments in R&I and the resources active in R&I.

Widening participation is therefore a shared responsibility, requiring efforts at all levels, local, national and EU. Horizon 2020 can stimulate reforms and leverage higher and better R&I investments across Europe, but R&I excellence is and will remain the cornerstone objective and unique evaluation criterion enabling Europe to compete worldwide and deploy measures that mutually benefit all parties involved.

Under Horizon 2020, the specific programme part on 'Spreading Excellence and Widening Participation' (SEWP) aims to *'fully exploit the potential of Europe's talent pool and to ensure that the benefits of an innovation-led economy are both maximised and widely distributed across the Union in accordance with the principle of excellence'* with a total budget of 816 million euros. Furthermore, the Cohesion Policy (2014-2020) provides substantial support in particular to the less developed EU regions for capacity building in R&I.

The results of the mid-term evaluation of Horizon 2020 will provide a good basis for considerations on this issue as well as on the amount of respective allocations in the next multi-annual financial framework.

In addition to economic growth, research and innovation also contribute to creating new and better jobs. While technological change and innovation can in the short term deeply disrupt existing jobs, they also generate new and more productive jobs that lead to enhanced overall prosperity. For example, for the period between 2008 and 2013, 400,000 net jobs in technology and knowledge-intensive sectors were created in Europe<sup>7</sup>.

***The emergence of digital technologies and globalisation has deeply disrupted the nature and impacts of innovation in the past decade. As advanced economies enter a new phase of development, where digital technologies converge with the physical world, innovation will increasingly require research and development in key enabling technologies.***

Reaping the benefits of innovation requires understanding its changing dynamics over time. Innovation today is very different from one or two decades ago, and the pace of change is unparalleled. Innovations are increasingly at the crossroads of various technologies, which makes the creation and diffusion of innovation increasingly complex across firms and sectors. Moreover, a new wave of break-through and deep-technology innovations is on its way, as digital technologies converge with the manufacturing and physical world and bring together science, technology development and engineering in areas such as connectivity and computing, analytics and intelligence, 3D and 4D printing, or advanced production processes. These "deep tech" based innovations will lead to more technically complex consumer and industrial applications with a stronger scientific and engineering foundation than the purely digital applications of the past.

If harnessed and managed intelligently, these new technologies, defined within the concept "Fourth Industrial Revolution", have the potential to transform the EU industry and to roll out significant social, economic and environmental benefits. Furthermore, the technological transformation of business and society in the EU has large growth potential for Europe, as "Europe's largest digital opportunity consists in transforming existing industries and enterprises" (EC, 2016)<sup>8</sup>. Europe occupies leading positions in many manufacturing sectors, from automotive to pharmaceutical industry, but also in many services sectors – tourism and leisure.

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<sup>7</sup> <https://rio.jrc.ec.europa.eu/en/library/science-research-and-innovation-performance-eu-2016>

<sup>8</sup> Accelerating the digital transformation of European industry and enterprises. Key recommendations of the Strategic Policy Forum on Digital Entrepreneurship March 2016

Linking technological development with active policy-making actions as part of smart specialisation strategies is crucial to benefit from the technological revolution and the development of a digital economy. To this purpose, it is necessary to accelerate reforms of research and innovation systems at regional level, boost trans-regional innovation cooperation and promote research and development in less developed industrial regions.

***Europe's research and innovation performance is mixed. While Europe is a global scientific leader, it fails to translate this leadership into innovation and growth***

Against this changing innovation backdrop, Europe performs well in science, now producing one third of all high-quality scientific knowledge, making it the world's scientific leader. However, when it comes to translating this scientific excellence into innovation and growth, Europe falls short. While the overall innovation performance of the European Union – as measured by the European Innovation Scoreboard – is increasing only slowly, Japan and especially South Korea are already far ahead of the EU and continue further increasing their innovation capacity at much higher rates. Notably, businesses in these countries invest more than twice as much in R&D as in the EU.

Technological production as measured by PCT patents is three times lower than in Japan and the EU's position is becoming weaker in several of the emerging technologies, such as big data or the internet of things, which are leading to disruptive innovations in these areas, where Europe accounts for around 16% and 25% of all patents respectively, far behind the 50% and 30% accounted for by the United States. On the other hand, according to the World Economic Forum's Global Competitiveness Index, six countries from Europe – Switzerland, the Netherlands, Germany, Sweden, the UK and Finland – are among the top 10 countries in the world. And according to the Global Innovation Index, the same six countries are among the top 10 countries in the world, along with Denmark and Ireland. This shows both the availability of innovation capacity in Europe and the availability of opportunities for its accelerated development in order to influence economic growth. Therefore, innovation should be stimulated, requiring increased R&D expenditures, investments in education, support for entrepreneurs and start-ups, and the stimulation of increased venture capital.

***Lower investment in business R&D, low access to risk capital and weaker framework conditions hinder Europe's ability to boost stronger innovation creation and diffusion.***

Several factors hamper Europe's ability to transform its scientific excellence into stronger innovation outputs. Total (public and private) investment in R&D in the EU, which stands at 2% of GDP, remains far below that of the US (2.8%), Japan (3.3%) and South Korea (4.2%), and has recently been overtaken by China (2.1%). Regarding business R&D investments, the gap is even more pronounced, with expenditures by EU companies at only half of the US rate, and one third of that of Japan and South Korea. Venture Capital in Europe is one-fifth of that of the US and remains fragmented into small-size funds, which complicates large-scale access to risk and patient capital to develop, and notably hinders the scale-up of innovative businesses. Moreover, a fragmented internal market and regulatory frameworks reduce Europe's allocative efficiency and act as barriers to stronger innovation creation and diffusion in Europe.

In addition, scientific research in universities, foundations, public and private institutes and other units should be a priority in order to enable the European economy to maintain and develop its competitiveness.

*Question 1: What does Europe need to do to ensure that its scientific excellence is efficiently translated into innovation leadership and an accelerated innovation uptake and technology diffusion (e.g. innovation-friendly regulation, funding for scale-ups and market creating innovation, reforms for stronger framework conditions for innovation, new skills, R&I infrastructures, innovation ecosystems)?*

*Question 2: In view of the next Multi-Annual Financial Framework, how should EU investment support, in a consistent and complementary way, the whole cycle of research and innovation from the lab to the market, in order to pave the way for enhanced competitiveness and economic growth in Europe and to secure the European social model?*

*Question 3: What do you think should be the measures and sources to support the introduction of innovations for industry digitisation? How can smart specialisation foster the digital transformation of regional economies?*