

# TO THE COMMISSIONER FOR RESEARCH

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*Europe on average has consistently failed to exploit its potential for innovation-based growth. The slow pace of improvement is especially worrying because Asia's star is rising, and Europe is less inter-connected than the United States with Asia*

## **STATE OF AFFAIRS**

You inherit a portfolio about which there are great expectations. Europe's low growth prospects mean there is a focus on science, research, technology and innovation as sources of future sustainable growth. New ideas from fields such as digital technology, new materials and biotechnology are expected to generate economic growth and competitiveness, while addressing new global societal demands related to ageing, health, the environment, security and inclusion.

There are many highly innovative European companies, but the evidence shows that Europe on average has consistently failed to exploit its potential for innovation-based growth, despite a series of innovation policy strategies and targets. For example:

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### **Innovation performance**

- The Innovation Union Scoreboard (IUS) 2014, a composite indicator exercise developed by the enterprise and industry directorate-general that captures a multitude of factors for measuring Europe's innovation capacity, shows that the EU scores consistently behind the US. The gap with the US has recently narrowed (IUS, 2014). But in the meantime, China is very quickly improving its IUS position relative to Europe. Another disturbing finding from the latest IUS (2014) is the slow process of convergence of EU member

# *Innovation performance is improving too slowly; Europe lacks the capacity to change*

state IUS performance. There has even been growing divergence in recent years.

- Since the introduction of the Lisbon Strategy target for member states to spend three percent of GDP on research and innovation, one of the closely monitored headline indicators of the health of the EU innovation system has been investment in R&D. Business R&D intensity has held up pretty well over the crisis, sitting at 1.26 percent of GDP in 2011. It nevertheless still remains far below that in the US, South Korea and Japan and even China (with more than 1.4 percent in 2011).
- Public investment in R&D has in Europe held up well on average in the face of the crisis thanks to stimulus funding. But in more recent years, under fiscal consolidation pressures, the trend has been for less public spending on R&D. This is the case especially in the weaker, innovation-lagging countries that were under fiscal pressure, resulting in an increasing intra-EU divergence in public R&D spending.
- On science, the EU has caught up with the US in terms of number of PhDs and number of publications. But the big rising star is China, both in terms of students trained and publications. But when it comes to top-quality and frontier research, the US maintains a substantial lead. The EU is catching up on in quality terms, but only very slowly, and mainly thanks to small pockets of excellence in specific sub-fields. Europe still has few world class institutes that excel in multiple and broader fields.

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## Public investment

Although there is good news to be found in the evidence, Europe's innovation performance is improving too slowly. Europe lacks the

capacity to change, lacking young innovators who can assume world-leading positions in new innovation-based growth markets, such as digital industries, but also in biotech, clean technologies and others. These areas and these types of firms offer the greatest opportunities for innovation-based growth. Europe's slow pace of improvement is especially worrying because, in a multipolar global science and innovation landscape, Asia's star is rising rapidly and the EU is less interconnected than the US with Asia in this respect.

## CHALLENGES

Some of the challenges you face are structural and longstanding. These classic challenges relate to (i) Europe's failing capacity for creative destruction, innovation-based growth and change and (ii) the challenge of building an integrated European science, research and innovation area. The process of integration, with a single market for research and innovation, in which ideas, know-how, researchers, students and innovative products can move freely between EU countries, remains a dream, which seems to become less realistic. It remains a challenge to link regional and national innovation systems within a more integrated European innovation system, and to better link science, research and innovation players so that new science and research insights can be transferred more swiftly into commercial ideas that can command world-leading positions.

These challenges have been difficult to address in the past. Having been not seriously tackled, they have unfortunately become even more difficult, being fed by the crisis in Europe and globalisation and the speed of change outside Europe.

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### Pressure for fiscal consolidation

A looming danger is fiscal consolidation pressure, which leads member states to freeze or even cut their public research and innovation budgets and/or to redirect their attention and public R&I funds to shorter-term, more targeted spending that delivers more immediate returns and impacts. The risk here is that more risky long-term investment in basic science and research goes unfunded, although it is this type of investment that most clearly requires the government to play a role, because it is here that the divergence between social and private returns, and the chance of market failure, is greatest. Because these high social returns are often more risky and are accrued in the longer term, these investments

may be the least favoured ‘pets’ for politicians to keep in a situation of consolidation.

And as fiscal consolidation pressure is greater in Europe’s innovation-lagging countries, the innovation divide runs the risk of widening in future. Together with rising euroscepticism, this increasing divide threatens to completely destabilise the European Research Area project.

While the science, research and innovation world is rapidly globalising, Europe is only slowly responding. Europe is far less open than some other economies, and is less good at attracting talent from abroad and connecting to the new emerging science poles.

Your challenges are accentuated by limited powers. The resources at your disposal are, despite their growing share of the overall EU budget, still limited: public science, technology and innovation budgets are mostly controlled by member states or their regions. The challenge is therefore to use your limited budget to leverage the larger pots of national and private funding.

Furthermore, the set of tools to shape the framework conditions for innovation-based growth, such as competition policy, regulations and standards, are also mostly in the hands of other European commissioners and/or member states or regions. You therefore need to convince others to activate the most powerful instruments that can shape the demand for innovation – such as regulation and standards – a big challenge that blocked your predecessor. Your main initial challenge is therefore the governance of EU research and innovation policy. For coordination with other policy areas, the Barroso II Commission established an Innovation Group, which was led by your predecessor and included the commissioners for competition, transport, the digital agenda, energy and industry and entrepreneurship, and occasionally also internal market, regional policy, employment and education and culture. It is hard to find anybody saying that this has been a success. Also the appointment of a Chief Scientific Officer by Barroso II has only made the coordination challenge more difficult. In terms of coordination with member states, the Council of the European Union meetings on science, research and innovation with your member states colleagues have not been very impactful, and have resulted in little more than nice declarations.

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## Globalisation of science

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## Coordination

# *Remove innovation from your portfolio; it was a mistake previously to include it*

## **RECOMMENDATIONS**

A first recommendation is to remove innovation from your portfolio. It was a mistake by Barroso II to include it in your portfolio. Having innovation within a portfolio and directorate-general that historically had a science and research mandate runs the risk that innovation will be steered too much as a push from science and research. Innovation needs a broader approach that also includes non-technological innovation and diffusion and adoption of existing science and technology knowledge. Such a broader integrated approach requires the mobilisation of a broad set of instruments, most notably single market and competition policy. Achieving this leverage proved to be virtually impossible for your predecessor. Making the ‘innovation agenda’ the priority of one commissioner almost by definition seemed to exclude others from engagement. In an attempt to improve the governance of the Commission’s innovation policy, you should therefore recommend hand the ‘innovation agenda’ to the new vice president for growth. There it will sit at more horizontal, strategic level, more closely aligned with the Europe2020 innovation-based growth objective. The vice president for growth should be given more power to mobilise the relevant instruments from the various directorates-general that currently oversee them.

Such a restructuring will free you from time-consuming but ineffective efforts to chair coordination meetings with other commissioners. This is not to say that you no longer need to care about innovation. On the contrary, it will help you to make your science and research portfolio more powerful as the cornerstone of Europe’s innovation-based growth. How can this be done? First, save us all from yet another big ‘Communication’. The existing Innovation Union Flagship and the European Research Area, along with Horizon 2020 are the policy plans you should work with during your mandate. It’s time to walk the talk.

### *Horizon 2020*

The relevant decisions have already been taken about the Horizon 2020 budget, and so your task is to get the most out of it. We still know very little about how to get the greatest impact from EU research funding, and you should therefore not shy away from experimenting with new programmes. But this is not a license for trial and error. Any experiments should be scientifically sound (consider randomised trials), with proper evaluation, feed-back learning and early exits if necessary. Scientifically sound evaluation is not only needed for new programmes, but should also be applied to the stock of currently running programmes. You should assess with proper counterfactuals the causal impact of Horizon 2020 funding – what the outcome would have been without this funding. You should assess its added effect on funding from member states and on private funding. Such evaluations require state-of-the-art quantitative and qualitative micro-level assessments fed into macro-modelling. The quantitative assessment should go beyond measuring the publications and patents coming out of funded programmes. It should also assess the impact on innovation and growth in Europe. These assessments should be done by independent outside experts. In addition, you should be an avid ‘open government, big data’ provider. You should make the historical data on applications and grants from previous EU research programmes (the Framework Programmes) and from the Horizon 2020 funding programmes publicly available for analysis. This would boost the emerging academic community in the ‘science for science policy’ field by giving them access to rich and large datasets. It will provide you with more scientific analysis of how to get more bang for your buck.

When looking at the individual pillars within Horizon 2020, the European Research Council (ERC) under the ‘excellent science’ pillar is widely recognised as a success story. The roots of this success, namely its independence, embodied in its Scientific Council, and its unique position as a funder of bottom-up, individual-investigator driven, frontier research should be left untouched. Your task is to prevent the ERC from being drawn into demands for more cohesion, ‘juste retour’ or the targeting of specific ‘challenges’. You must assess if the ERC is delivering, which is not just about publications in top scientific journals, but about supporting risky frontier research with the potential for major breakthroughs. The assessment should also consider the ERC’s role in global science, in attracting top talent from outside

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Getting the most  
from Horizon  
2020

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European  
Research Council

Europe and a catalyst for EU researchers to link with the best non-EU researchers. Finally, you should ensure that the best ERC-funded science results are diffused more easily within Europe and can cross into the realm of research and innovation. The ERC's own small 'Proof-of-Concept' programme shows that a bottom-up science programme like the ERC grant programme can generate brilliant ideas that can be brought to market. Other instruments in the Horizon 2020 programme which are more dedicated to helping bring ideas to market, should be better connected to ERC-funded science.

An important bridging programme, long awaited, but still in the pipeline, is a Small Business Innovation Research (SBIR) type of programme, which would fund proposals from young innovative firms that would help bridge the gap between idea and market. You should speed up the launch of this programme, while ensuring that it is properly designed. It should be a bottom-up programme, which funds entrepreneur-driven proposals. The quality of the selection is crucial because it provides a form of certification to the beneficiaries, which will help them to access other financing and partners. The European value added comes from the economies of scale in selection and evaluation. You should avoid an insistence on European networks of proposers, which would not be the right format for this programme. It should be an entrepreneur-focused programme. A proper *ex-post* evaluation should be included in the design of the programme from the start.

The other programmes under the Horizon 2020 'excellent science' pillar (Marie Curie Fellowships, Research Infrastructure and Future Emerging Technologies), which rest on the principle of bottom-up proposals selected on the basis of scientific excellence, should be organised in line with the successful formula adopted by the ERC, or should be integrated into the ERC.

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### Cooperation programmes

A major part of the Horizon 2020 budget goes to the large-scale cooperation programmes under the 'societal challenges' and 'industrial leadership' pillars. These are much more targeted programmes compared to the 'excellent Science' pillar. They deal with specific technologies and applied research, and consequently involve greater industry participation. Nevertheless, they are and should remain pre-competitive and sufficiently broad, with room for bottom-up proposals

# *The European Research Area has lost momentum in recent years; this should be remedied*

within the targeted areas, and scope for selection to be made on the basis of excellence-driven potential for impact. These pillars would gain tremendously from having a better mission orientation, call description and selection process, designed by an independent agency, such as in the case of the ERC. The agency could be structured similarly to the ERC, with an independent Technology Council that would organise the calls and be responsible for the selection of the panel members that will review the proposals. The Technology Council would be a collection of several parallel mini-technology councils, one for each area/grand challenge, and the technology councils would include, in addition to academics, experts from industry and civil society. Such a governance structure should lead to greater excellence, particularly by improving the selection process through the composition of panels. You would oversee the selection committee that nominates the Technology Council, and would monitor and evaluate its performance.

A bit hidden among the Horizon 2020 programmes are the policy support calls. These are very much top-down projects, with the objective being to provide support for specific policies. For these projects, policy users (from the relevant Commission directorates-general or from national and regional levels) should be more systematically involved in identifying the topics for calls, the selection panels, project monitoring and *ex-post* assessment. Then there are two ‘special cases’ in Horizon 2020: the autonomous European Institute of Innovation and Technology (EIT) and Joint Research Centre (JRC), each with a specific mission and dedicated budget. Both of these (and also EURATOM) still require a serious *ex-post* evaluation of their accomplishments in order to justify their special status in Horizon 2020. This should be part of your overall evaluation strategy. The Horizon 2020 pillar on widening participation, although modest

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Policy support  
calls

in budget, is nevertheless important. It will allow you to clearly focus the objectives under the other pillars solely on excellence, freeing them from cohesion concerns. Coordination with cohesion objectives can be further improved, for instance by convincing the regional development commissioner to allocate a greater share of the Structural Funds to making scientific teams ready to compete for Horizon 2020 funding, to fund runners-up in Horizon 2020 contests and to award fellowships to researchers to stay at hubs that have been successful Horizon 2020 applicants.

#### *The European Research Area (ERA)*

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### European Research Area

ERA, and its vision of free movement of knowledge within Europe as the fifth dimension of the single market, has lost momentum in recent years. This should be remedied. Furthering the integration of Europe as a common market of ideas and knowledge is perhaps the most important contribution you can make to the European growth agenda. The problem with ERA is that the creation of a single market for knowledge requires material progress in many fields that are not under your direct control, such as immigration, social security or labour laws. Nevertheless, you can set up a ‘big-data’ ERA infrastructure to measure the various channels through which knowledge flows (or not) inside the EU. This will help to better monitor the progress being made towards ERA, to better understand how the various channels operate, and to evaluate their impact. This will form a valuable evidence base for ERA policy making.

Researchers crossing national borders are important carriers of knowledge and important bridge-builders between their host and home locations. In the same vein, mobile researchers can be important carriers of knowledge between science institutes, technology institutes and industry. It is unfortunate that in Horizon 2020, the programmes for intra-EU mobility and networking – the Marie Curie Fellowships – are in the portfolio of the Commissioner for Education and Culture and are managed by the autonomous Research Executive Agency. These fellowships are potentially the most powerful instrument the Commission has for furthering ERA. To make the most of this instrument, the responsibility should be transferred to you.

But ERA is not only about removing barriers to mobility inside the European block. ERA is also about making Europe attractive for top

# *If Europe wants to be a research powerhouse, it should be more open to the outside*

non-EU talent. A global perspective on science and research is indispensable for you. Countries such as China and South Korea have established themselves as science and technology giants, and are making genuine breakthroughs in fields from green energy to microelectronics. The US is much better connected to these emerging giants thanks to the mobility of researchers into and out of the US from these emerging powers. If Europe wants to be a research powerhouse, it must not only be internally integrated, but should also be open to the outside. International research cooperation should be much higher on your agenda. Partners for bilateral cooperation should be much more strategically chosen. These should be first and foremost partners that offer complementary research excellence. In particular, improving the EU-China link should be among your first priorities. Rather than installing top-down collaboration projects, the aim should be to build bottom-up links and networks involving EU and Chinese researchers. To facilitate this, the Marie Curie extra-EU mobility fellowships are a pivotal instrument, and you should be able to operationalise this tool, either by having it transferred to your portfolio or at least through close coordination with your internationalisation strategy.

Finally, open access to publications and scientific data should be much more than a technical issue in your portfolio. It is a strategic ERA issue that can improve the free flow of scientific knowledge as codified in publications. You should use your power as big funder in negotiations with scientific publishers to establish fair conditions for the allocation of the true cost of open access. It would harm ERA integration tremendously if only the well funded can access scientific publications and data.

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Open access