

BOOSTING INNOVATION IN EUROPE

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Highlights

- Europe will only be able to meet the global competition challenge if it excels in research and innovation by fostering the development of firms and institutions that are global leaders in their fields. This requires action to boost basic research, to develop young, innovative companies, and to reform patents.
- On basic research, the European Union needs to raise standards through monitoring and encouragement, introduce more merit-based competition, and help researchers to be more mobile across borders.
- To support young, highly innovative companies, the EU should further the integration of venture capital markets and introduce a programme for public funding of projects to commercialise high-risk innovative ideas.
- On patents, the EU should abandon plans for a three-layer system of national, EU and European patents, and should make patenting more affordable, especially for start-up companies.

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THE EUROPEAN COMMISSION IS PREPARING a research and innovation strategy, which will be a part of the Europe 2020 strategy, and which should be endorsed by the European Council at its October 2010 summit. The Commissioner for Research, Innovation and Science will propose:

- To re-focus Europe's research and innovation policies on the 'grand challenges' facing society, such as climate change and ageing populations;
- To create the conditions for a more dynamic Europe, "where excellent research improves knowledge capital and leads to innovation in successful and dynamic businesses"¹.

This policy contribution is addressed to the July 2010 informal Competitiveness Council (Research), under the Belgian EU Presidency. We take as a starting point the Commission's broad aims and make concrete suggestions for boosting European research and innovation, based on three essential principles:

- Giving primacy to excellence and merit-based selection of projects at European level;
- The importance of the single market for research and innovation;
- Removal of barriers that hinder dynamic restructuring.

The principle of giving primacy to excellence should be seen in the context of two of the three priorities of the Europe 2020 strategy, namely smart growth and sustainable growth, seen as central to equipping Europe to face the challenges of global competition. Only by excelling in research

and innovation at the global level by fostering through merit-based selection the development of firms and institutions that are global leaders in their fields – will Europe be able to meet the global challenge. Emphasising excellence and merit-based competition does not have to come, however, at the expense of the remaining Europe 2020 priority: inclusive growth and its attendant concern for territorial cohesion, which aims to give member states and regions the opportunity to take part in the quest for excellence. In other words, Europe can have both world-class research and innovation, and cohesion provided it uses two different instruments to meet the two objectives: EU-wide merit-based selection for the former and cohesion policy for the latter.

Based on the three principles spelled out above, this Policy Contribution makes concrete proposals in three interrelated areas:

- Basic research and in particular the role of universities;
- The creation and development of young, innovative companies;
- A patent system that underpins the growth of innovative firms.

BASIC RESEARCH

It has become increasingly clear that the disappointing European growth performance of the last 30 years is closely linked to Europe's research performance. Applied research and innovation must be based on solid basic research, and the connection between university research and patenting has been empirically documented². The

1. Máire Geoghegan-Quinn, EU Commissioner for Research, Innovation and Science, 'Preparing Europe for a new renaissance: how science can help restore sustainable prosperity', speech to the European Research Area Board Conference, Seville, Spain, 6 May 2010.

2. See for example Philippe Aghion, Mathias Dewatripont, Caroline Hoxby, Andreu Mas-Colell and André Sapir (2010) 'The Governance and Performance of Research Universities: Evidence from Europe and the U.S.', *Economic Policy*, vol. 25/01.

'It has become increasingly clear that the disappointing European growth performance of the last 30 years is closely linked to Europe's research performance. Applied research and innovation must be based on solid basic research.'

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connection between higher education and (basic) research – HER – is also obvious, and the US, the model for other countries in terms of its successful HER system, demonstrates a very close association between higher education and research through its highly successful research universities. These excel in publications, while attracting foreign talent and developing worldwide research links, including with emerging Asian economies³. Meanwhile, Europe invests too little in higher education. The EU spends less than two percent of its GDP on R&D, compared to more than 2.5 percent in the US. But the gap between Europe and the US is even wider for universities than for R&D spending: total (public and private) spending on higher education in the EU accounts for less than 1.5 percent of GDP, against more than three percent in the US. In terms of expenditure per student, the contrast is starker still, with annual spending more than three times higher in the US.

Moreover, the unsatisfactory research performance of Europe's universities also results from inadequate institutions: they suffer from poor governance, are insufficiently autonomous and offer often insufficient incentives to devote time to research.

Europe started to recognise some years ago that its university system faced a problem. The 1999 Bologna Declaration was the starting point for the creation of a European Higher Education Area. The objectives were to establish a degree of comparability between higher education qualifications and to improve mobility within Europe. In 2000, the European Commission initiated the European Research Area in a drive to improve the effectiveness of research in Europe. An increasing number of EU member states have also tried to reform their university systems. But much more remains to be done. In particular, the economic and financial crisis should not be allowed to undermine basic research funding.

It has been empirically documented that for quality basic research, a mix of increased funding, stronger autonomy and more vigorous competition is required. Specifically, recent empirical evidence shows that increased university funding does lead to both higher levels of academic output (measured by publications or citations) and more patenting, and that these gains are stronger for universities that are more independent of public funding authorities, and which face a more competitive funding environment⁴. The complementarity of funding, autonomy – in terms of hiring and wage setting, for example – and competition is intuitive: (i) more money helps, and helps more when universities are allowed to allocate their resources efficiently; (ii) the discipline of competition in turn induces autonomous universities to make efficient decisions in resource allocation.

While giving universities more autonomy is the responsibility of member states, and several of them are making progress in this area, the EU could help greatly in the areas of funding and competition, by:

- Encouraging and monitoring – by relying on the Open Method of Coordination – a concerted effort to raise university funding in European countries, for example by one percent of their GDP. While the precise mechanism by which university revenue is raised could be left to the member states, it is important to make sure that it is raised. Note that higher US university funding comes partly from higher public funding but, more importantly, from much higher student fees⁵. If university funding were to come from higher student fees, it is critical that a well-functioning system of grants or loans to help poorer students is set up.
- Enhancing excellence thanks to EU-wide merit-based competition (open to anybody in the world who wants to do research in the EU), by increasing funding for the European Research

3. See Reinhilde Veugelers (2010) 'Towards a multipolar science world?', *Scientometrics* 82:439-456.

4. See Philippe Aghion, Mathias Dewatripont, Caroline Hoxby, Andreu Mas-Colell and André Sapir (2008) *Higher Aspirations: An Agenda for Reforming European Universities*, Bruegel Blueprint, volume V; and Philippe Aghion, Mathias Dewatripont, Caroline Hoxby, Andreu Mas-Colell and André Sapir (2010) 'The Governance and Performance of Research Universities: Evidence from Europe and the U.S.', *Economic Policy*, vol. 25/01.

5. The contribution of private donations and university intellectual property revenue is also higher than in the EU, but accounts for a modest share of the overall difference.

Council and the European Institute of Technology⁶. The EU should also start merit-based competitions for doctoral schools, since many EU students are lured away at that stage of their careers to the US (where more than half of the PhD's in science and engineering are foreign-born), and often settle there afterwards.

- Enhancing researcher mobility through the completion of the European Research Area. In this respect two major areas in which progress needs to be made are the introduction of an EU research visa and the portability of social security benefits across the EU.

YOUNG INNOVATIVE COMPANIES

Europe's innovation gap results from an inappropriate industrial structure in which young firms fail to play a significant role, especially in high-tech sectors. A forthcoming Bruegel policy contribution⁷ shows that the EU has fewer young firms among its leading innovators relative to the US. This matters for the overall private R&D deficit of the EU relative to the US, because these companies are more R&D intensive. But this effect only accounts for about one third of the US-EU R&D differential. The largest part of the differential is due to the fact that the EU's young leading innovators are less R&D intensive than their US counterparts. Further unravelling why EU young leading innovators are on average less R&D intensive than their US counterparts shows that this is almost entirely due to a different sectoral composition, with US young leading innovators more often located in highly R&D-intensive young sectors, with biotechnology and Internet services being the most obvious cases. This analysis confirms that the EU-US private R&D gap is mostly a structural issue. Overcoming this will require the EU to nurture more young firms to grow to leading innovator status. This should be done in particular in young, innovation-intensive sectors. These sectors are often tightly linked to cutting edge scientific research.

There are a number of plausible reasons why Europe has fewer leading young innovators in new sectors able to grow to world leadership status. Segmented markets restrict European firms from accessing large markets and reaching an efficient scale. Less-well functioning industry-science links prohibit the throughput of new scientific insights into successful innovative projects. And access to finance for risky breakthrough projects is a particular problem in Europe, with its fragmented venture capital market. The current financial and economic crisis has widened this access-to-finance gap. Young firms with breakthrough projects, but which lack collateral and reputation, are particularly threatened by the double whammy of constrained credit and higher bankruptcy risk.

Major efforts should be devoted to addressing the EU's structural growth problems. EU member state recovery programmes pay most attention to large incumbent firms, ignoring the young innovators. This approach is motivated by short-term employment concerns, but jeopardises the long-term growth that could result from breakthrough innovations. As programmes aimed at young innovative firms would be focused on small target groups, they would not require huge injections of taxpayers' money. But they would offer potentially huge returns, by creating the foundations for post-crisis growth. Beyond committing resources to young innovators, it is perhaps even more important to get the policy details right, particularly in light of the tight budgetary position of many countries and the risk of government failure.

A fundamental principle guiding policy design is the need for a systemic approach. It is important to put in place the right framework conditions, creating a favourable environment, which promotes competition and safeguards firms' access to markets, finance and skills, even if the framework is not specifically designed for young firms. But, in

6. In the *Economic Policy* paper (footnotes 2 and 4), it is shown that US-wide merit-based competitive basic research funding from the National Science Foundation, National Institutes for Health and National Aeronautics and Space Administration contributes significantly to the productivity of university funding (in terms of both academic output and patents).

7. See Reinhilde Veugelers and Michele Cincera (2010) 'Young leading innovators and the EU's R&D intensity gap', *Bruegel Policy Contribution*, forthcoming.

'EU member state recovery programmes pay most attention to large incumbent firms, ignoring the young innovators. This approach is motivated by short-term employment concerns, but jeopardises the long-term growth that could result from breakthrough innovations.'

addition, governments should redress specific barriers faced by young highly innovative firms, most notably their lack of access to finance:

- Effective IPR protection is often essential to enable young innovators to raise finance, to access new markets and to appropriate the returns from newly acquired market positions. Young highly innovative firms should be a particular target group for reducing the cost of IPR protection, as detailed in the section on ‘Enabling growth by designing the EU patent’.
- It is also important that policies should support the development of private venture capital markets. This is also important because the efficiency of public funding improves in complementarity with private venture capital.

Public funding is an obvious instrument for tackling the financial market failure faced by young highly innovative companies. In the following, we offer a concrete proposal for an EU-wide programme for public funding of highly risky project proposals.

- The programme would be organised as part of the EU Framework Programme for Research and Development through the creation of an independent agency modelled after the European Research Council;
- It should be organised around the grand challenges facing the EU (such as climate change and energy, health and ageing, digitalisation and security);
- Funding will only be for the pre-commercialisation stage of the project, where there are still large uncertainties and financial market failures. Funding should be phased, in view of the high risks/uncertainties involved;
- Evaluation of the projects should be on the basis of scientific and technical characteristics, but also and a fortiori on the likelihood of commercial success. This implies a mix of expertise in the selection committee (scientific, technological, commercial, financial);
- Evaluation should be highly selective and of top quality (on the basis of the highest standards of excellence). Economies of scale in the selec-

tion procedure and competition among applicants at EU level should allow selection of top-quality projects (once again, the European Research Council would be the model). The programme would thus act as a signal of quality (certification), which will help the selected participants to attract complementary public and private funding;

- Contrary to most other current EU-funded projects (and the Eurostars programme), there should be no obligation for collaboration, neither nationally nor internationally, since small and young innovative firms would be reluctant to apply if forced to collaborate;
- The programme should be pilot-designed, evaluated and re-adjusted or cut if not successful.

ENABLING GROWTH BY DESIGNING THE EU PATENT

The EU is a market of 500 million people. A well functioning patent system in Europe would not only stimulate innovation by existing firms; it could also help young innovative companies and entrepreneurs to improve their growth and funding prospects. At the same time a patent that is automatically valid for such a large market would contribute to the creation and emergence of a Europe-wide market for technology that could rival the US and compete with the emerging Chinese market. The maturation of this market would be associated with greater transparency and predictability of intellectual property rights, and would facilitate technology transactions at European and worldwide level.

Unfortunately, the current system hinders the growth prospects of companies and holds back the crystallisation of innovation efforts into successful ventures, especially for technology-based entrepreneurs and young innovative companies. This is a consequence of several drawbacks of the current fragmented system, in which patents granted by the European Patent Office (EPO) must be managed and put in force at the national level, with the desired geographical scope for protection (ie in one, or several, or all of the 27 EU countries or 35 member states of the European Patent Convention)⁸. The current system:

8. Bruno van Pottelsberghe (2009) *Lost Property: the European patent system and why it doesn't work*, Bruegel Blueprint, volume IX.

- Is prohibitively expensive, due to multiple validation and yearly renewal fees, and translation costs⁹;
- Is complex and associated with a high uncertainty, because parallel litigation frequently leads to conflicting outcomes in different countries;
- Reduces the overall quality of the selection process, as national patent offices grant patents independently from the EPO (about 25 percent of all patents granted by national patent offices are granted to non-domestic applicants).

The creation of the EU patent (formerly called Community patent) would drastically improve the European innovation system. The most recent proposal made by the Competitiveness Council (conclusions published on 4 December 2009) initially looks promising. It suggests the creation of an EU patent and of a European and EU Patent Court (EEUPC), which would centralise patent-related litigation in Europe. However, the proposal has serious shortcomings, which could actually result in a worse system than the current one. There is no agreement on language and translation requirements, and the proposal argues that the EU patent should be additional to current European and national patents. In addition, no provision is made to make the system more affordable for young technology-based firms, for whom intellectual property is often their main asset.

In order to be fit for its ultimate purpose of

stimulating innovation, the EU patent proposal should be modified as follows:

- There should be no three-layer system in which three types of patent (national, European, and EU-wide) co-exist. The current European patent should be phased-out, and national patent offices should stop granting patents, though this would not preclude them from supporting national priority applications, and eventually performing search services for domestic firms and international applications following the Patent Cooperation Treaty (PCT) route;
- English-only translation for granted patents should be the norm, with machine translations into all other languages. In case of litigation, the patent owner would secure the translation into the language(s) of the main litigants¹⁰;
- A grace period of six months should be allowed, during which scientific or technical publication would not preclude the patentability of the published invention. This system allows academic scientists and researchers to publish and still be able to file a patent afterwards (there is a one year grace period in the US, and the Japanese patent system has a six month grace period);
- A 50 percent reduction in entry fees (filing, search and examination fees) should be allowed for smaller or young innovative firms to reduce early patenting costs. Later, firms could reimburse the discounted fees if the patent remains valid for, for example, more than five years.

9. Bruno van Pottelsberghe de la Potterie and Malwina Mejer (2010) 'The London agreement and the cost of patenting in Europe', *European Journal of Law and Economics*, 29(2).

10. It has been argued that English-only translations would be justified for four main reasons: 1) it is the most frequently used language, even for patent filings; 2) it would help sustain English as the main communication channel, especially in context of the current emergence of scientific research in China; 3) it would help secure Europe's firm IP right in global markets; and 4) protecting national SMEs is a mistaken argument, as PCT applications can easily be extended in any country.

See Bruno van Pottelsberghe (2010) 'Europe should stop taxing innovation', *Bruegel Policy Brief* 2010/02.