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Universities must contribute to enhancing Europe's innovative performance

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European universities vary widely, in their financing, governance, research/teaching balance and interaction with businesses. These interactions with other organisations are important in forming "knowledge ecologies" from which emerge "systems of innovation." Public policy-makers and university leaders must avoid confusing research and invention with innovation. Research discoveries and inventions certainly are needed to sustain innovation, yet universities are organisations with specialized capabilities and cannot exert effective influence upon many critical conditions -- financing, regulations, macroeconomic and fiscal policies affecting business investment demand – that govern the vitality of a region's "innovation systems." While stronger inter-connections between universities and businesses are to be encouraged, care must be taken in developing them to suit the particular circumstances of the participating organisations. Generally, the principal source of academic knowledge transfers supporting business innovation remains the flow of university-trained graduates – including scientists and engineers. Patent licensing can be a useful transfer channel, but experience in the US shows that too much emphasis by universities on acquiring and exploiting intellectual property rights can hamper knowledge-sharing and collaborative research with the business sector, without solving research universities' collective funding needs.

There are approximately 4000 higher education organisations across the EU and at least 600 other public research laboratories. Their activities are divided between applied and basic research and dissemination of that knowledge. Even though one label is generally used in referring to institutions of higher education – "universities"[3] –differences among the organisations lumped under that heading

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[3] It is convenient -- and now conventional usage (at least in European Commission documents) -- to take "universities" as a collective descriptor for tertiary educational organisations. We do so here without suggesting that in specific policy contexts one may safely disregard the important differences that exist between universities and other higher education

can be vast, in terms of their size, balance between of research and teaching, range of disciplines covered, extent of commitment to inter-disciplinary teaching and research, and international status. Moreover, the mix of institutions with different purposes and characteristics varies considerably among the regions of the European Research Area (ERA).

The research universities (among other public research organisations) are a natural focus of attention when considering the EU's approach to knowledge generation and innovation. Several concerns have been raised in this context:

- Are there enough EU universities at the forefront of international research to be able to provide EU firms and governments with the best and most relevant research findings?
- Do EU business firms have the capabilities need to grasp the research output of the region's university faculties and trainees, and so interact effectively with them in solving operations problems and developing innovations?
- Should there be specific organisations to connect universities and commercial firms and facilitate "knowledge transfers" among them?

This briefing focuses on the question: **How should European universities be contributing to the improvement of innovative performance by Europe's firms and the region's ability to compete successfully in the global marketplace?** There is a widespread view that the performance of the ensemble of European universities is not adequately responding to the challenges posed by the region's internal needs and the intensified competition in its global economic environment. Frequently mentioned reasons include lack of funding, insufficient coordination of national policies and initiatives, barriers to cooperation among institutions across Europe due to outmoded regulatory and governance systems, inadequate incentives for interactions with the business community, and excessive disciplinary specialization at the expense of relevant trans-disciplinary approaches in research and training.

There have been remarkable changes over the last 40 years that have created continuing pressures for organisational innovation and institutional adaptation within the European university sector. The developments of major significance here are:

- the general demise of centralized corporate R&D laboratories in manufacturing industry and the reorganisation of corporate R&D around divisional, near-to-market activities;
- the decline of defence R&D, as a result of the ending of the Cold War;
- the changed status of many public laboratories in research areas such as defence or metrology, that removed them from government -- through privatization or other new forms of governance, and pushed them to search for other sources of funding;
- the increased internationalization of R&D activity (see Policy Brief 1), as large firms become more willing to engage with universities and technology research institutes on a world wide scale;

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institutions such as the *grandes ecoles*, *fachhochschulen*, *politecnicos*, and other, emerging technical research and training institutes, including the prospective European Institute of Technology (EIT).

- the rise of "knowledge-based service" activities, increasing the importance of forms of "service sector R&D" that are quite different from the R&D traditionally performed in connection with manufacturing.

In short, current consensus of opinion among informed observers is that the institutions of the Community's higher education sector are in urgently need of "modernising" changes if they are to play their part in Europe's drive to sustain growth and job creation.

The present challenges arise on many fronts that have been well identified in the European Commission's Green Paper on the European Research Area.[4] Salient among them are: excellent and properly resourced research institutions that are able to develop and maintain partnerships with other entities, either through joint research ventures, clusters, or virtual networking; effective knowledge-transfers between public research and industry; forming a cadre of highly competent researchers who are mobile -- willing to move across institutional, disciplinary, sector and national boundaries.

Two other challenges may be added to the Commission's list. First, the diversity of specialised expertise within the university sector must be complemented by that in the business sector, requiring both improved information flows from research universities about relevant qualifications and talents of their trainees and, on the other side of the market, active demand from the private sector for such researchers and technical personnel. Second, the cooperative ethos of open knowledge-exchange, generally found among academic scientists, should be prominent among the driving forces in university-industry scientific research collaborations. That may require reconsidering the attention that Europe's universities give to efforts to commercialise knowledge gained by their faculties and research trainees.
To state the goals toward which the "modernising" of Europe's universities should be directed is much easier than to attain them. Bearing in mind their specialised capabilities and institutional constraints, how best can the research universities contribute to formation of an organisational ecology that generates sustained innovation?

An important point of departure in answering this question is that ***research and invention is not innovation***; there is much more to the process of bringing new products and processes into commercial use than R&D, wherever it is performed. University-business linkages form only part of this process (albeit an important part) and their impacts on innovation are not independent of the many other factors that are at play.

It is hard to find an innovation policy document from government, business or university sources that does not call for greater, wider or deeper "interactions" between private business firms and the universities. The obvious and important question is ***what is meant by interactions****?*

The modes of connection between businesses and universities are many and varied and used in different ways at different times. They range from informal contacts,

[4] See IP/07/469 or COM(2007)161.

attendance at conferences and access to published literature, to recruitment of graduates, staff exchanges and joint research programmes or specific contracts. It is clear, however, that the principle connections that businesses value in the sphere of knowledge-based interactions with universities take the form of their employment of graduates, qualified scientists and technologists. Faced with information needs relating to existing operations and innovation, firms that turn to external knowledge sources are more likely to use their links with customers and suppliers then their contacts with academia.

Yet, in many discussions of universities' role in innovation processes, two very different and sometimes conflicting notions of "connections" or "interactions" with business are often lumped together. One conceptualisation looks toward the better connection of universities with firms' innovative activities, through stronger networking arrangements, collaborative funding of research programmes, and foresight activities in which scientific and technical experts participate.

The other sense of "connection" is about having universities better exploit the ideas developed within their precincts, through professional management of intellectual property, opening technology licensing offices and launching and investing in their own "spin-off" and "start-up" companies, and developing fee-charging consultancy services. This panoply of commercial activities is sometimes described as the "third" stream of university contribution to innovation, distinguishing it from the two traditional "streams" of fundamental research and training.

While the first of these concepts of "connection" respects the division of labour between academia and commerce, the second seeks to transform it by bringing higher educational institutions more fully into market as a supplier of innovation services. This contrast opens much room for debates about the virtues or vices of each conceptualization, but, ***the practical policy issues concern the balance that should be struck between universities' engagements in these two kinds of interactions with business.***

Approaching this question calls for a proper understanding not only of the benefits, but also of the costs. By pursuing the commercialisation connections with innovation, it is quite possible that universities will sacrifice the individual and systemic gains that would come from forging closer cooperative interactions with firms, based on mutual advantages of research collaboration and personal networks of knowledge exchange.

Further, even though some universities can enter the business of innovation and succeed in competition players from industry, to acquire and maintain those capabilities requires attention and problem-solving efforts academic leaders that may come at the expense of responding to new challenges in fulfilling the institution's two traditional social missions.

Strong reinforcement has been given by national governments and the EC to European universities' initiatives in obtaining and exploiting patent rights as a means of commercialising the research findings of their faculties. In a significance

sense Europe has been following a path pioneered in the U.S. since 1980.[5] But there is growing recognition in U.S. corporate and innovation policy circles that the right balance between the two kinds of university-business knowledge-transfer interactions has not been found there; that the pendulum has swung too far toward university research commercialisation based on intellectual property rights. This has been reflected recently in the recently announced Open Collaborative Research Program, under which I.B.M., Hewlett-Packard, Intel, and Cisco Systems and seven U.S. universities have agreed to embark on a series of collaborative software research undertakings in areas such as privacy, security and medical decision-making, under terms that commit all the parties to making their research results freely and publicly available.

The longer term consequence of effective university reform is likely to be a more refined division of labour within the research system, with a clear recognition that different models of a modern university are possible: interactions with the business sector won't conform to "one-size-fits-all" prescriptions, and ***a combination of incentives and liberalised regulations will permit differentiated institutions to adopt different modes of governance that will enable them to compete for varied sources of funding***.

[5] The Bayh-Dole Act [passed in 1980 as Pub. Law No. 96-517, Section 6(a) 3015, 3019-28, and codified as amended as 34 U.S.C. Sections 200-212 (1994)] simplified and codified the terms on which higher educational institutions conducting federally sponsored research could seek intellectual property rights in the results.