



SCIENCE AND TECHNOLOGY OPTIONS ASSESSMENT OPTIONS BRIEF No 2012-07, December 2012

Knowledge Transfer from Public Research Organisations

One of the key roles of Public Research Organisations (PROs) is to support development and growth through economic and social innovation. In the case of universities, this extends their traditional roles of teaching and research. It is often argued that Europe lags behind the USA in knowledge transfer as a result of the Bayh-Dole Act that gave US PROs the right to exploit the intellectual property they generate. This Options Brief is based on a STOA study by the same name and argues that this view is inaccurate and oversimplified. Europe needs policies that go beyond the idea of a linear transfer of new ideas from researchers to industry. Instead we should promote a wider and more active knowledge exchange between research organisations and other parts of society.

Does Europe lag behind in technology transfer?

There is a widespread perception that Europe lags behind the USA in technology transfer from PROs to industry, reducing Europe's competitiveness. US universities started setting up Technology Transfer Offices (TTOs) in the late 1970s to develop and manage their intellectual property. The number of patents taken out by US universities grew rapidly from then until about 2000, since when it has stagnated. US universities' licensing income rose from \$183 million in 1991 to \$2.4 billion in 2010. The surge in patenting by US universities was given visibility by the Bayh-Dole Act of 1980, but it seems likely that US case law changes – especially the decision that 'engineered molecules' were patentable – triggered much of the growth. A large share of university patenting continues to be in just two domains – biotechnology and ICT.

Most European countries have copied the Bayh-Dole legislation. Early European policies were heavily focused on 'technology transfer' from PROs in the form of the commercialisation of intellectual property (IP). So European universities followed the US practice of setting up TTOs – but typically did so much later. European universities' or PROs' income from licensing is an order of magnitude smaller than that of the USA. So, in terms of the simple Bayh-Dole idea of 'technology transfer' as patenting PRO knowledge and generating licence income, Europe does indeed lag behind. We started later, our TTOs are not so well established and the direct income produced is smaller, even if there are some individually very successful European TTOs.

Are 'Technology Transfer Offices' what we need?

US-style TTOs give rise to a number of concerns:

First, while there are important examples of PRO inventions leading to commercial products, overall this kind of linear transfer is only involved in a very small proportion of innovative activity. Where PROs are involved in innovation, signals from the outside world are often needed to focus the research effort and there are many more forms of interaction than IP commercialisation, such as training, collaborative and contract research. Some of these are compromised if the PRO tries to take ownership of the intellectual property produced. For example, companies become more reluctant to do research together with the PRO.

Second, rewards are highly skewed because most patents are never exploited and only a very small number generate big rewards. In

both the USA and Europe, a small number of PROs get the great majority of the licence income. Most TTOs barely cover their costs and many lose money. Where TTOs do generate income, this tends to be dominated by a small number of patents; when they expire, the economics of the TTO can quickly go sour.

Third, while PROs are happy to receive licence revenues, what TTOs do is to redistribute income from the company sector to the PRO sector. It makes little or no difference in overall economic terms whether universities or companies own patents.

However, the concern often voiced by academics that doing patentable research means doing poor quality science is not justified. There is a large body of research literature showing that the most prolific producers of academic patents also publish a lot in the scientific literature and are highly cited. There are of course many good researchers who do not patent at all, but patenting and scientific excellence are clearly not mutually exclusive. A wider concern that the growth of patenting in biology and ICT tends to inhibit research in some areas is probably justified – but laws that determine what is patentable, not the TTOs, cause this.

From technology transfer to knowledge exchange

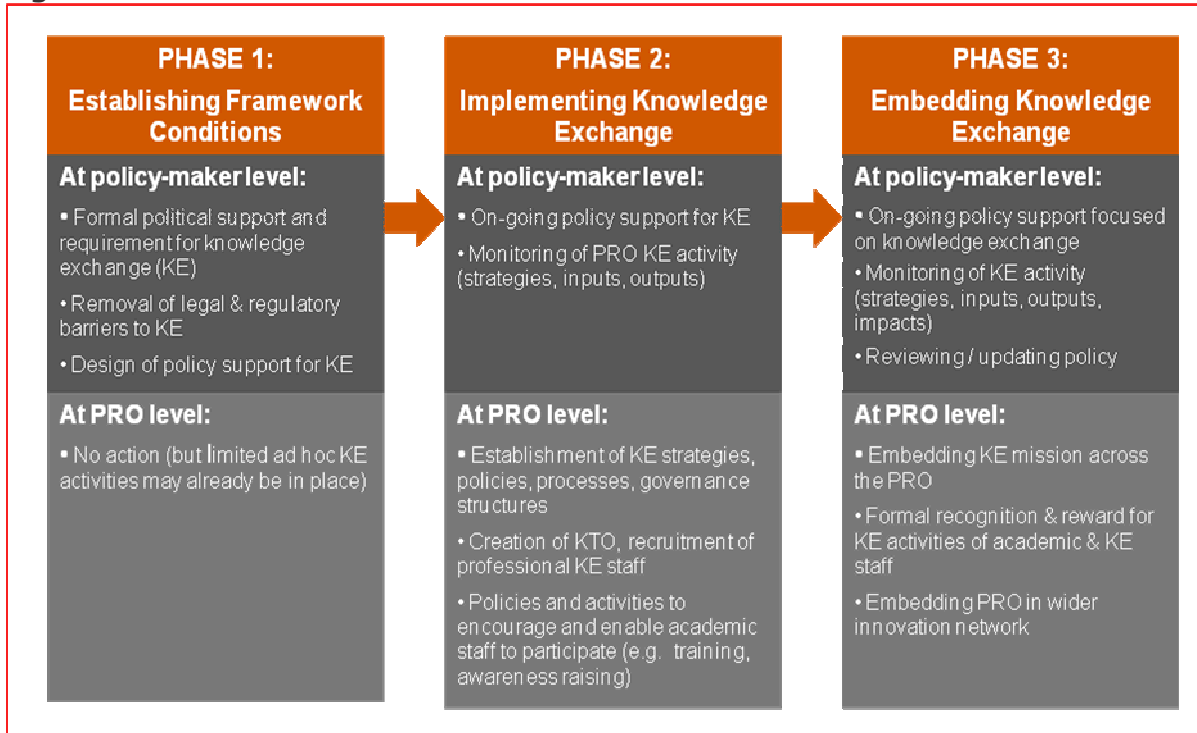
European policy rightly emphasises PROs' 'third mission' to support innovation in addition to their traditional missions of education and research. Few European PROs have Knowledge Transfer Offices (KTOs) that focus solely on exploiting intellectual property. Their role of KTOs is to reduce the transaction costs of transferring knowledge from PROs to industry and bridge the barriers between PRO researchers and industry.

Most European PROs now have strategies that explicitly include a knowledge transfer mission, usually under the responsibility of a member of the leadership team and an expectation that academic staff will increasingly engage in knowledge transfer activities. It is important that KTOs do not become a barrier to knowledge transfer. This can occur if, for example, they take an overly protective position on intellectual property.

A European knowledge transfer profession has been developing over the last 10-15 years, with KTOs increasingly staffed by knowledge transfer professionals. However the development of a third mission for PROs takes time and countries and individual PROs are on a journey, with each country and PRO at different stages. The aim is to create a functioning innovation system that contains pro-active and well-connected PROs with appropriate and effective knowledge exchange strategies and processes (including KTOs). Achieving this requires significant cultural, as well as strategic and operational changes within PROs.

This journey consists of three phases (Figure 1):

- **Phase 1: Establishing framework conditions** – the creation of formal policy support for *knowledge* (and not *technology*) transfer. This typically occurs at national and/or regional level. At a policy-making level this requires the removal of legal and regulatory barriers to knowledge transfer (where they exist) and the establishment of a strong policy position with respect to knowledge transfer and exchange between PROs and industry (and other potential users of PRO-generated knowledge).
- **Phase 2: Policy implementation** – the development and implementation of knowledge transfer strategies, institutional policies, processes and governance structures at PROs – all of which should be closely aligned with the research mission. This includes the creation of a KTO and the recruitment of professional knowledge transfer staff. Strategies and activities will acknowledge that academic staff are at the heart of knowledge transfer and put processes in place (training, awareness raising, etc.) to encourage and enable their participation in knowledge transfer.
- **Phase 3: Embedding knowledge exchange mission** – consolidating the knowledge exchange mission and embedding a knowledge exchange culture across the PRO and developing an outward-looking and entrepreneurial culture throughout the PRO, with appropriate incentives and rewards for academics and KTO staff and, over time, embedding the PRO within appropriate professional, sector and disciplinary networks.

Figure 1 Transition from two to three missions

The majority of European countries have reached phase 1 but their individual PROs are in various stages of development in phase 2. No European PROs can be considered to have fully reached phase 3, though a number in the early-adopting countries are getting close to that point.

Barriers to fully embedding a culture of knowledge exchange remain

Even for those countries that have made significant progress in knowledge transfer, to achieve a fully embedded knowledge exchange mission in PROs a number of remaining challenges need to be overcome:

- An over-focus on intellectual property-based transfer can hinder knowledge transfer between PROs and businesses.
- A lack of well-defined metrics for knowledge transfer.
- Lack of a culture of knowledge transfer within the academic community.
- Inability to recruit and retain professional knowledge transfer staff.
- Differences in knowledge transfer strategies and policies at national and PRO level can impede cross-border knowledge transfer.
- Failure to share experience gained in the early-adopting countries and PROs to enable later adopters to benefit.

Policy options

While the US-style TTO model is too narrow to allow PROs to optimise their contribution, the broader knowledge exchange function that is emerging should significantly increase economic and social development and growth. At the European level, there are several policy options for promoting this:

A. A Commission communication on knowledge exchange. The Commission and Council policy recommendations on knowledge transfer¹ were published 4-5 years ago and should be updated to place much greater emphasis on the importance of *knowledge exchange* rather than *technology transfer*.

B. Greater use of Structural Funds to support the development of capacities for knowledge exchange. DG Regio could be encouraged to place a much greater emphasis on the development of *knowledge exchange* capabilities and capacities within regional PROs and to ensure that regional innovation strategies avoid the technology transfer paradigm.

¹ COM (2007) 182 final & COM(2008) 1329

C. Support for sharing good practice, in particular: public support for the identification, collection and dissemination of good practice; widening the provision of professional networks in knowledge exchange to meet the needs of different types of PRO; support to individual PROs in the process of establishing knowledge exchange missions.

D. Pan-European knowledge exchange, via a study to identify and disseminate best practice in pan-European knowledge exchange and by encouraging the development of the European Institute of Technology's KICs as models of good practice.

E. Incorporate advice on changing academic career structures in Commission communications on Higher Education. Future Commission Communications on higher education should include recommendations on the need for academic reward and recognition systems to encompass all three institutional missions – education, research and knowledge exchange.

F. Coordinate and promote the development of a professional career structure for KTO staff. A number of processes are underway to develop and accredit a career structure for KTO staff and provide continuing professional development at both national and European level. Their outputs should be promoted and disseminated widely.

G. Monitor and measure knowledge exchange at a European level. Collecting statistics not only facilitates monitoring and analysis, but also establishes a subject as important and so drives behaviour. The Commission could initiate a regular survey of PROs to collect data on knowledge exchange activities and outputs.

H. Open access. Publications remain an extremely important knowledge exchange mechanism for industry to access PRO generated knowledge. An open access approach to publication is needed and should be encouraged inside and outside Horizon 2020.

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