Intersectoral Mobility

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Introduction

Researchers, entrepreneurs and companies are Europe's main strengths, especially in comparison with other regions in the world, many of which have economies developing much faster than the European.[1] Innovation, therefore, lies at the heart of the Europe 2020 strategy. There are indications, however, that Europe might not be using this competitive advantage to the best and is not investing sufficiently, or not adequately, in Research and Innovation. European Higher Education Institutions and Research Centres, for example, produce significant amounts of new knowledge but except for a few high performing member states, Europe has a relatively low number of researchers employed in the business sector, compared with the US and Japan (figure 1).

Country	2000	2009	2010
Finland	8.65	8.82	8.57
Denmark	3.85	7.97	7.85
Japan	6.23	7.41	7.63
United States	7.24	7.36	7.40
Iceland	5.39	6.28	6.44
Luxembourg	7.53	5.99	6.31
Sweden	6.85	5.93	6.13
European Union 27	2.27	2.91	2.98

Figure 1: Researchers (Full Time Equivalent) in the business sector, top five European countries, EU-27, Japan, US, 2000, 2009 and 2010 (in million) Eurostat / Deloitte. European Commission, DG Research & Innovation (2014). Researchers' report 2013

European countries continue to train an increasing number of doctoral candidates, but many of these doctoral candidates seem to be ill-prepared for realizing their full potential in the non-academic labour market. Academic institutions remain the major employers in most European countries; employment of doctorate holders in the business sector is low (figure 2).[2] This leaves a great terrain of innovation potential outside academia unexplored. Doctorate holders and others with research experience should be able to develop meaningful careers in many different directions, from self-

[1] European Commission (2010) Europe 2020 Flagship Initiative Innovation Union. Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions.

[2] OECD (2010), Careers of Doctorate Holders dataset. www.oecd.org/sti/cdh

employed entrepreneur to innovative employee in schools, media, NGO's,... This would benefit not only the researchers themselves but also the organisations that employ them.

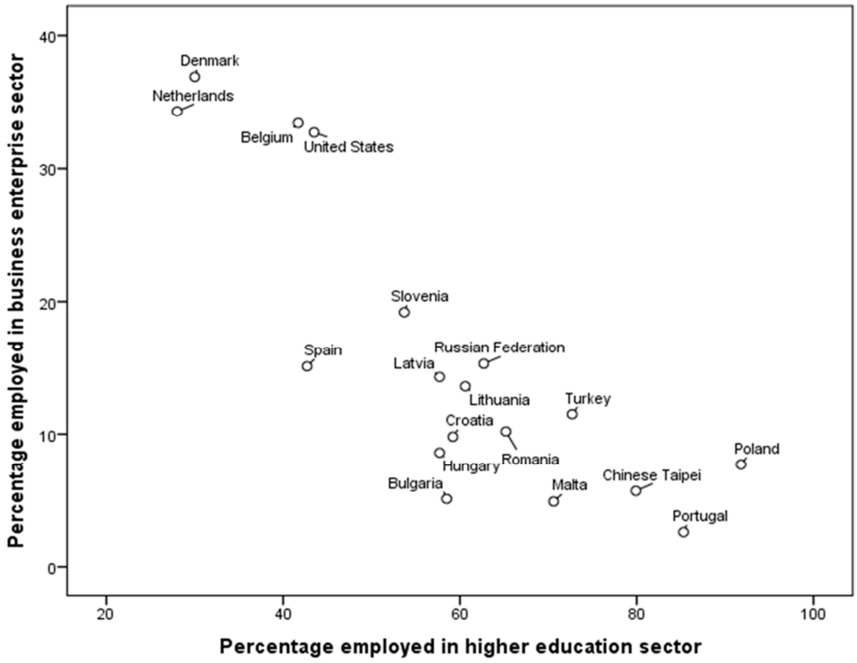

Figure 2: Sectoral distribution of doctorate holders: percentage employed in Higher Education and Business Enterprise sector. Data: OECD, Careers of Doctorate Holders (2009). Graph: ECOOM UGent.

Europe continues to generate excellent new knowledge, but too often these research results are not turned into competitive products or better services, are not making society more research intensive and do not sufficiently help to address societal challenges. Bringing academia and other sectors closer together is the way forward to bridge this gap. "Intersectoral mobility", in the broadest sense of the term, refers to all possible bridges that can be built between university, industry and other sectors of employment. Here, the transaction of knowledge is most often a transaction of *coded knowledge* – publications, research reports, patents, or other results that are tangible and can be transferred. A small part of this knowledge transfer is however a transaction of *uncoded or tacit knowledge* – ideas, insights and experiences that are transmitted through people. In its most narrow sense, therefore, the term "intersectoral mobility" is defined as the physical mobility of researchers from one sector (academia in particular) to another (industry in the first place, but other sectors of employment as well).[3]

[3] The definition proposed in the MORE2 study focuses on the mobility from academia to other sectors, not from other sectors into academia: "Intersectoral mobility is defined as being mobile to a sector outside academia, in the researcher's own country or abroad. This not only relates to private industry but also to the private not-for-profit sector as well as the public and government sectors". www.more-2.eu

Broadly speaking, "intersectoral mobility" refers to all possible bridges between university, industry and other sectors of employment. In its most narrow sense, the term "intersectoral mobility" is defined as the physical mobility of researchers from one sector (academia) to another.

Why foster intersectoral mobility?

For the purpose of this ERAC Mutual Learning Workshop, the focus is on the physical intersectoral mobility of researchers. Researchers operate as "knowledge brokers" between academia and other sectors of society. Intersectoral mobility is not a goal in itself, but one of many methods towards obtaining better knowledge exchange, acquiring a wider set of research-related skills and better matching academic research results to the needs (or the application potential) in non-academic sectors. Policy initiatives focused on intersectoral mobility are strongly linked to other policy areas and therefore resonate through the entire innovation system. For example, fostering intersectoral mobility of researchers has triggered new methods of researcher training and development, making researchers better suited for the challenges of the current labour market[4]; it has fostered research collaboration; continues to build sufficient critical mass; and intensifies R&D activity in particular areas. This type of impact is illustrated by the arrow pointing downward in the pyramid of figure 2.

The pyramid also illustrates a different aspect. Intersectoral mobility occupies only the top layer of the pyramid. The layers below are occupied by a range of other activities which are preconditions to this type of mobility, or which can directly enhance intersectoral mobility. The stronger the knowledge base and R&D intensity, for example, the larger the numbers of researchers, the better the research collaboration & training and the more evident the flows of researchers between sectors – a different dynamic illustrated by the arrow pointing upwards.

[4] See, for example, Science Europe's 2013 workshop and forthcoming report (2014) on Researchers' intersectoral mobility. http://www.scienceeurope.org/

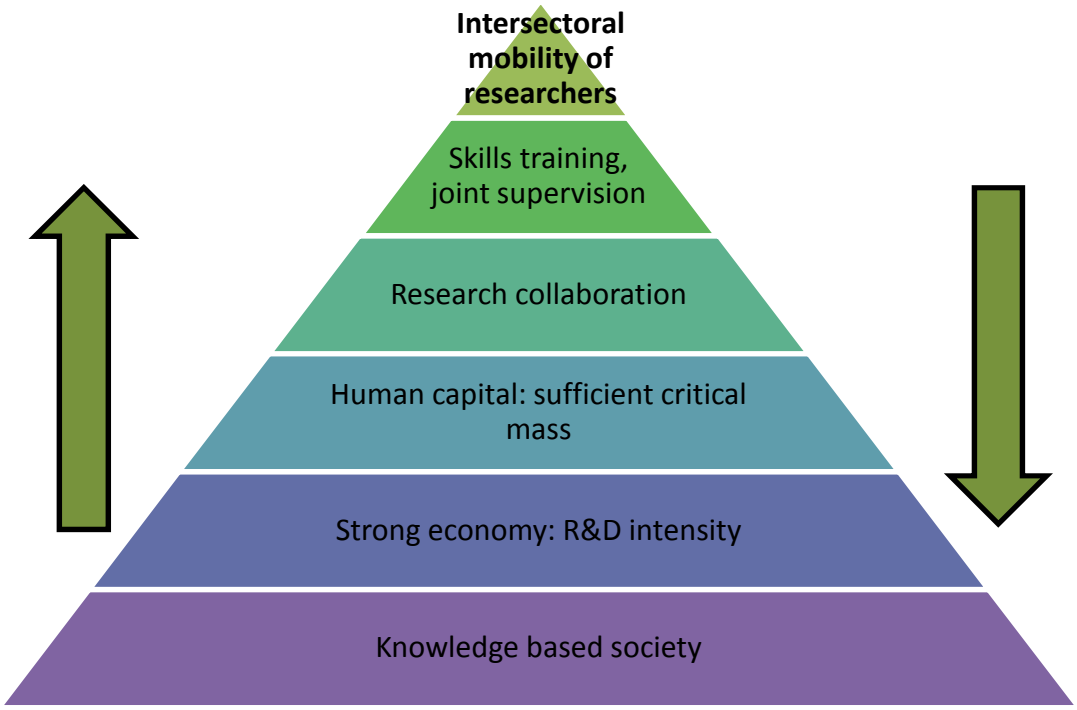

Figure 3: the role of intersectoral mobility in the knowledge transfer pyramid.

Finally, the pyramid illustrates that although intersectoral mobility occupies only a small component in a dynamic science system, it is a useful focus if we want to examine the weak elements in the knowledge transfer system because it is fully embedded in the layers below. Innovative doctoral training and research collaboration, for example, may be in place, but if the numbers of researchers are insufficient and R&D intensity levels low, the actual impact of policy initiatives focused on intersectoral mobility is seriously affected. Alternatively, a lack of intersectoral mobility activities in national research policies might be caused by problems in the layers below, leaving no room to build up towards this. The knowledge transfer pyramid helps to identify weaknesses and to develop a shared vocabulary in addressing these. The discussions during the workshop also suggested that the stronger the knowledge transfer system, the more these layers are integrated, and the more often policy initiatives incorporate actions operating simultaneously at multiple levels.

Intersectoral mobility occupies only a very small part in a dynamic science system, but it is a useful focus if we want to identify and address the weak elements in the knowledge transfer system because it is fully embedded in the deeper layers of this system.

The role of intersectoral mobility in the European Research Area

The European Commission aims to intensify its knowledge economy primarily through increasing its *number* of researchers, making this into Commitment number one in the Innovation Union (2010). Without sufficient critical mass, the member states' R&D targets simply cannot be met. In order to support the role of highly trained researchers in this challenge, one of the Commitments of the European Commission's Innovation Union focuses exclusively on researchers' mobility:

> *In 2012, the Commission will propose a European Research Area framework and supporting measures to remove obstacles to mobility and cross-border cooperation, aiming for them to be in force by end 2014. They will notably seek to ensure through a common approach: […] mobility of researchers across countries and sectors, including through open recruitment in public research institutions and comparable research career structures […].* (Innovation Union (2010) Commitment nr 4)[5].

The Commitment to create a European Research Area which invites researchers to move freely between sectors and countries builds on earlier policies encouraging researchers' international and intersectoral mobility. One of these is the European Commission's 2006 recommendations entitled "Mobility of Researchers between Academia and Industry", the outcome of an Expert Group on the subject.

In the introduction to this document, intersectoral mobility is presented as follows:

> *… an instrument that can effectively contribute to eradicating the so-called "European Paradox", i.e. that Europe is unable to sufficiently turn research results into globally competitive products. As such it fits with the Community policy on boosting research and innovation. Intersectoral mobility at the same time adds to the employability of and diverse career development for researchers*.[6]

This description confirms the role of intersectoral mobility outlined above: it increases the impact of scientific research in society and contributes to researchers' career development, both of which are expected to enrich the European Research Area and to boost economic growth. In the recommendations, only two are targeted directly at the intersectoral mobility of researchers in a narrow sense (persons moving between academic and non-academic sectors during their professional careers – i.e. recommendations 4 and 6), while the other ones are closely linked with other 'intersectoral' activities: research collaboration, networking with SME's, and technology

[5] European Commission (2010), Europe 2020 Flagship Initiative Innovation Union. Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions. http://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf

[6] European Commission (2014), Mobility of Researchers between Academia and Industry. 12 Practical Recommendations. http://ec.europa.eu/euraxess/pdf/research_policies/mobility_of_researchers_light.pdf

transfer activities (recommendations 8 & 10). A number of the recommendations play on more than one level of the pyramid. Governments also play a major role as facilitator in breaking down structural barriers, in preparing the right 'fabric' for researchers' mobility (recommendations 7, 9 & 12). Nearly half of the recommendations are related to training researchers (recommendations 1, 2, 3, 5, 11), driven by the realisation that not all researchers will develop careers in the academic sector (this does not suggest that researchers who do establish an academic career would not benefit from such training as well).

2006 recommendations on intersectoral mobility
1. Joint researcher training programmes
2. Employment skills
3. Joint PhD supervision
4. intersectoral mobility: internship, consultancy
5. Appreciation of staff through evaluation criteria
6. Permanent positions for intersectorally mobile staff
7. Remove administrative barriers, esp. in recruitment
8. Align academia-industry interests through framework conditions: co-location, grants, TTO
9. Appreciation of institutions through evaluation criteria/incentives
10. Informal networks SME's-academia
11. Professionalise academic staff
12. Raise awareness: social security, pensions, EU programmes
13. Joint researcher training programmes

Intersectoral mobility plays an important role in the policy mix but is obviously only one of the enablers enhancing innovation. This makes it difficult to measure the actual impact of such intersectoral mobility as it is closely linked to other initiatives supporting knowledge exchange, such as university-industry collaboration.

Unlike the recommendations in the 2006 document, the ERAC Mutual Learning Workshop did not only focus on knowledge exchange with (high-tech) industry. Also collaboration and exchanges with other sectors outside academia, such as government and public sector bodies, the service industry, education, non-profit organisations etc. have been identified as crucial contributors to a knowledge-based society. It is also important to keep in mind that the intersectoral mobility and academic-non-academic partnerships may not always be as straightforward in every sector of the labour market.

Eight years after the intersectoral mobility recommendations were published, the workshop was designed as a re-visit of the 2006 recommendations. Taking some of the recommendations put forward in 2006 as a starting point, the workshop – and as such the current report – compares these with the issues at stake in 2014.

Intersectoral mobility: quantity and quality issues

Policies in 2006

The 2006 recommendations pointed out a lack of appreciation of intersectoral mobility, in particular in recruiting experts into academia with industry experience, and in evaluating research activities directed at other sectors within a university career: "Intersectoral mobility is frequently not taken into account during appraisal, and can in circumstances even have an unfavourable impact. A transparent and fair career appraisal with appropriate feedback should lead to personal and professional development (lifelong training), and facilitate mobility between sectors throughout the career. To this end, large companies can provide many good practices. […] Often specialised skills are missing in a sector, while they exist in the other sector." (recommendations 4 & 5)

Observations in 2014

When taking stock of recent policy changes, initiatives and good practices related to intersectoral mobility, an overwhelming majority of activities are targeted at the R1 and R2 career stages of researchers – the period of training as a doctoral or postdoctoral researcher.[7] Joint training and other forms of partnership are expected to facilitate knowledge exchange as well as researchers' employability, and some of the Marie Curie industrial training funds have strengthened existing partnerships with industry and facilitated the mobility of early stage researchers.

Related to the observation that the focus of intersectoral mobility lies with stage 1 and 2 of a research career, is the fact that many countries seem to have increased their number of Ph.D. degrees (see Innovation Union Scoreboard) or intend to do so (response from Estonia), expecting intersectoral mobility to be the natural outcome when these graduates seek employment.

Results from the OECD's Careers of Doctorate Holders survey (2010) not only illustrate the diversity of PhD graduates' sector of employment, but also the differences in distribution between countries:

[7] Classification based on the European Framework for Research Careers: http://ec.europa.eu/euraxess/pdf/research_policies/Towards_a_European_Framework_for_Research_Careers_final.pdf

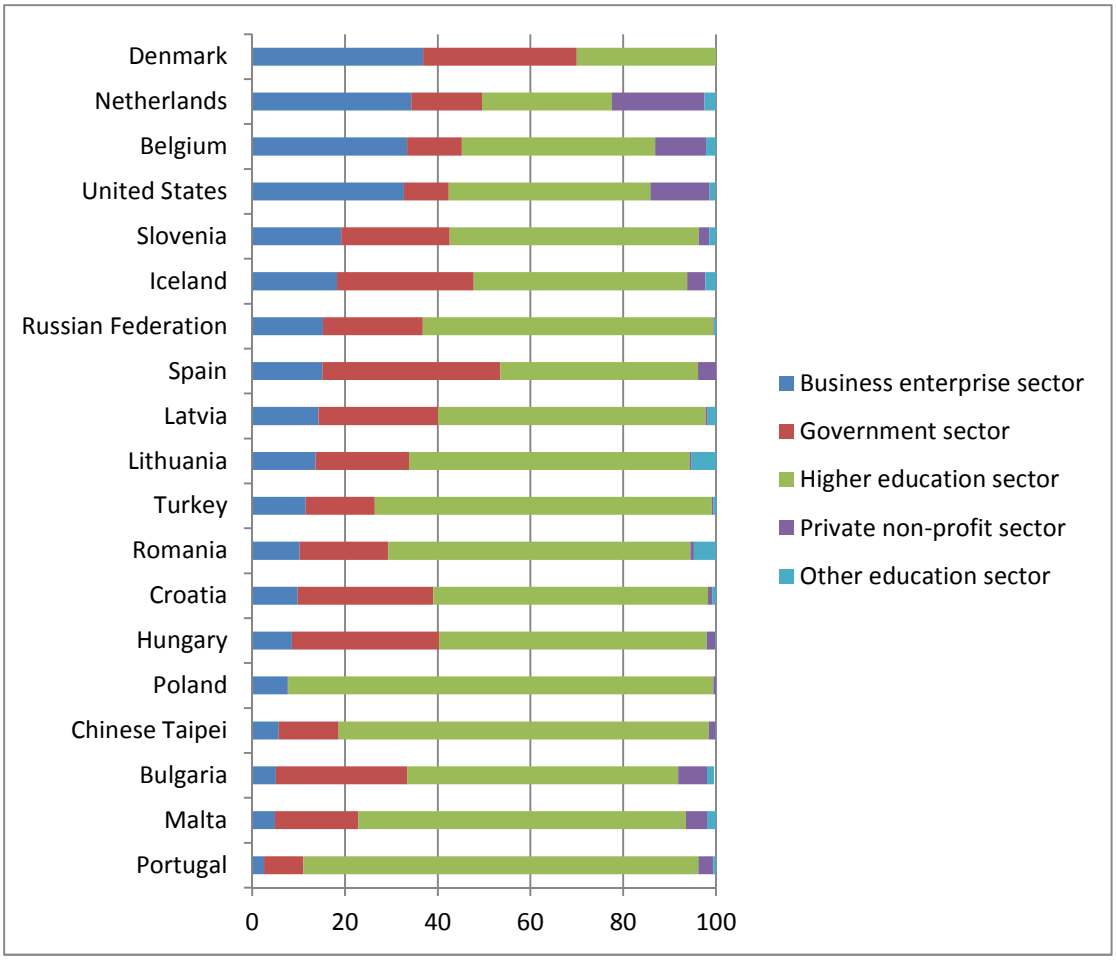

Figure 4: Sectoral distribution of doctorate holders, 2009 (Source: OECD, CDH dataset)[8]

In countries such as Denmark, the Netherlands, Belgium and the US, more than a third of doctorate holders are employed in the business enterprise sector, while in countries such as Poland, Portugal, Chinese Taipei, Malta and Turkey, more than 70% of Ph.D. graduates remain employed in university. To some extent, this is a supply/demand issue: a major demand for academics in some countries may retain graduates for careers within university; limited career positions in academia in other countries may create a spill-over effect into other sectors of the labour market; or a huge demand in the external labour market may pull researchers away from academic positions. Upon further investigation, the situation is a little more complex and is often tied in with policies aimed at transforming the economy and the labour market. The observation that many PhD graduates "find employment outside academia" does not guarantee they actually contribute to Europe's innovation strategy. However, increasing the number of research-trained graduates working in various sectors of the economy has the potential to change the structure of the economy and the labour market.

A large number of PhD graduates employed in a wide range of jobs may have a knock-on effect that goes much further than 'knowledge transfer': provided they are granted working conditions that nurture their innovative potential, these PhD graduates can become ambassadors of research in the widest possible sense, for example in promoting evidence-based policies in government, adopting adequate statistics in journalism, motivating school children with an interest in science and

[8] For full dataset and further information, see www.oecd.org/sti/cdh

promoting creativity within organizations. For this purpose, it may be useful to develop a joint vocabulary shared between academia and other sectors of society to define (and perhaps further refine) the research-based skills and innovation potential of intersectorally mobile researchers.

Many countries have deliberately created a 'surplus' of doctoral graduates that the academic sector cannot absorb – or at least perceive this surplus as an opportunity for their innovation objectives – in order to enhance mobility towards other sectors of employment (Estonia, Belgium, Ireland & others[9]). Without sufficient Ph.D. graduates to fill job positions outside academia, this particular type of intersectoral mobility cannot happen. For a number of Ph.D. graduates, moving out of academia might initially be perceived as a 'second choice', but evidence suggests that once the transition has been made, many graduates feel very satisfied about their new career opportunities.[10]

The discussions during the Mutual Learning Workshop suggested that although it may not be the objective from a broader policy perspective, in practice intersectoral research mobility seems to take place most often – and most easily – at the early stage of one's career (R1 and R2), and mainly in the direction from university towards non-academic sectors. This one-way movement of researchers trained at university making careers in industry is merely one specific type of mobility, but it may very well be the type of mobility occurring most often in European member states.

Quite some work still needs to be done on the appraisal of research experience outside academia. Many employers do not (yet) recognize the value of research experience or a Ph.D. degree, and do not provide researchers with jobs that allow them to capitalize on their research skills, their creativity and their levels of autonomy. In some countries, appointment strategies in the public sector grant civil servants with a doctorate degree higher salary scales or higher entry level positions (Belgium, France, Slovenia); France also intends to force such recognition in other sectors of employment through collective agreements. While this policy action aims to enhance the value of a Ph.D. degree outside academia, it does not come without risks. As long as employers do not experience the Ph.D. degree as an added value and are reluctant to exploit Ph.D. graduates' innovative potential, being forced to pay them more than other employees may have the opposite effect on their chances of being hired and reaffirm negative stereotypes of researchers. Needless to say, if Ph.D. graduates' skills do not match those expected in other sectors of the labour market, gaining appraisal from employers for their mobility will be a target that is hard to meet (see further). All stakeholders need to speak the same language and tune their horizon of expectations.

Mobility initiatives targeted at R3 or R4 researchers, and recommendations related to the appreciation of industry experience when recruiting for academic posts, have not been the focus of attention in most countries. Apart from a few notable exceptions (associate professors attracted to university on a part-time and/or temporary basis to contribute specific research or teaching expertise in Norway, France and some other countries), universities have not started to value the non-

[9] Admittedly this does not always mean that employers are keen to utilize this potential, illustrating a incongruity between policy ambitions and workplace reality. This would suggest that the situation is more complex than just finding the right balance between supply and demand of researchers; it is also about transforming job contents and innovation intensity so that highly skilled employees and entrepreneurs are able to capitalize on their knowledge and skills.

[10] See for example Karl Boosten & Karen Vandevelde, eds. (2014) *Careers of Doctorate Holders Survey 2010.* R&D and Innovation in Belgium series nr 13. Also the Vitae Researcher Career Stories on https://www.vitae.ac.uk/researcher-careers/researcher-career-stories provide interesting case studies.

academic experience more since the European Commission formulated this recommendation in 2006. Particularly problematic are the measurements of 'excellence': an abundance of quantitative and qualitative measures have been developed over the last few decades to assess academic excellence, but excellence criteria measuring social or economic impact are still being treated with suspicion in many universities, or are surrounded with an air of particularism and subjectivity. Nevertheless, such activities perfectly fit into the universities' so-called "third mission": service to society. The workshop discussions indicated that little has been achieved in this area since the recommendations of 2006. Deliberate action has to be taken to appreciate and recognize knowledge transfer and innovation activities generated in different sectors of society when recruiting academic staff at universities and leading to different forms of innovation excellence than purely academic.

RECOMMENDATIONS

- Many countries need to **train more researchers** at R1 and R2 level in order to meet their R&D targets, and in order to support intersectoral mobility. More graduates can be attracted into Ph.D. research by treating them as professionals, by providing them with adequate scholarships, and by presenting them with interesting career opportunities.
- R1 and R2 researchers are the target group most easily reached when promoting intersectoral mobility
- Employers who already have doctorate holders amongst their staff, tend to judge their added value more favourably than those who do not. Highlighting good experiences in this area and developing a joint vocabulary between academia and other sectors of society related to "research-based skills" may contribute to **changing the perception of the value of research experience**.
- Employers in other sectors of the labour market and academics need to **learn to speak the same language and appreciate each other's focus and strengths**. This is a process in which taking small steps can be very effective.
- By maintaining a limited set of research performance criteria when hiring R3 and R4 stage researchers, universities miss out on great opportunities to take on board researchers with experience in other sectors of employment. Better **recognition of activities related to the universities' "third mission"** (service to society, including the societal and economic impact of research) will help to bridge the gap between university and other sectors of employment.

Preparing researchers for diverse careers through broader training at university

Policies in 2006

The 2006 recommendations on intersectoral mobility stated: "Training is often not adequate for working in industry. Future researchers are generally trained for a career in academia and do not always possess the necessary skills to find a job in the other sector. Researchers in academia also need skills to work efficiently with industry. […] Unilateral supervision from academic supervisors may lead to one-side view of research. Supervisors should also be trained to be more effective." (recommendation 1 & 2)

The recommendations tackling these issues, including supporting joint training, developing entrepreneurship and providing broader skills training for researchers in 2006, may have sounded like a novelty in many countries, but have since become a part of the doctoral training programme in many EU countries. Not just in-depth knowledge but also the skills to transfer this knowledge and experience into different work contexts, are the focus of many doctoral training programmes today, as recommended by the European Commission's "Principles for Innovative Doctoral Training".[11]

Within the ERA Steering Group on Human Resources and Mobility, one working group continues to work on the implementation of these issues. Therefore the ERAC Mutual Learning Workshop limited the discussion of this topic to the way in which new approaches to researcher development can facilitate the intersectoral mobility of researchers.

Observations in 2014

In most countries, legislation, national guidelines or government funding have enabled and continue to support innovative doctoral training at universities (Belgium, Estonia, Finland, France, Moldova reporting specifically on such initiatives). According to the ERAC workshop participants, the recommendation to introduce changes in the doctoral training programme so that it better matches the expectations of future employers and goes beyond doctoral candidates' specific research expertise, has been a feasible, rewarding and relatively low-cost initiative, fostering university-industry partnerships as well as enabling researchers' employability outside academia.

In addition, some countries highlight specific joint training programmes between university and industry, such as in Austria, Belgium, Czech Republic, Ireland and Spain, where supervisors from academia and other sectors share the responsibility for introducing early stage researchers into a research career. In particular the Marie Curie funding scheme has accelerated the interest in and appraisal for university-industry collaborative research training.

Not only the quality of the doctoral training programme has changed. A number of countries have also increased their funding for Ph.D. research, or have set targets for extra Ph.D. graduates or timely completions, in order to increase their stock of researchers (Ireland, Estonia, Flanders, Finland, amongst others). Without a sufficiently large pool of researchers, there can be no mobility – intersectoral or otherwise. Without highly trained staff, investments in R&D activities are doomed to fail.

Allowing Ph.D. researchers to do consultancy work for employers outside academia (e.g. France), or involving such employers as co-supervisors for their research (e.g. Marie Curie programme), enhances not only the doctoral researcher's employability, but also the employer's perception of the added value of research experience.

Only one of the countries, however, reported that "preparing researchers with a wider range of skills beyond research skills" went without a problem (Denmark). Skills training remains an issue that is currently being addressed, fine-tuned and regularly reviewed, and is reported to be a particular problem in the Czech Republic, Estonia and Greece. Matching researchers' broader skills to the expectations of employers, is still an issue (UK); and many countries probably also struggle with convincing Ph.D. supervisors that time spent on skills training is not research time being wasted.

[11] European Commission (2011) Principles for Innovative Doctoral Training. EC, DG Research & Innovation. http://ec.europa.eu/euraxess/pdf/research_policies/Principles_for_Innovative_Doctoral_Training.pdf

The long term outcomes of skills development can be difficult to grasp as they are not very tangible (yet), which might make it difficult to convince all stakeholders involved that the effort is worthwhile. Some monitoring systems are in place in some countries (e.g. OECD's Careers of Doctorate Holders' survey, CEREQ in France, Vitae in the UK) but they need to be developed further to take into account researchers' employability and employers' appreciation.

RECOMMENDATIONS

- The **principles of innovative doctoral training** continue to deserve attention. These principles, developed by the ERA Steering Group for Human Resources and Mobility for the European Commission, can play a significant role in focusing the attention on intersectoral mobility. Member states must be prepared to invest time and funding in the implementation of these principles.
- During the doctoral training programme, doctoral researchers need more **exposure to other sectors of the labour market**. This can be achieved through e.g. joint supervision, collaboration with the public/private sector, or internships. This generates benefits for the doctoral researchers (employability skills) as well for the employer/organization (appreciation of research experience) as for the academic environment (networking, collaboration).
- The impact of broader research training on intersectoral mobility and on a more intensive circulation of knowledge are not easy to measure as the outcomes are long-term. Adequate **monitoring systems** need to be developed.

Administrative and legal barriers to intersectoral mobility

Policies in 2006

The 2006 recommendations highlighted the role governments could play in addressing limitations to intersectoral mobility in the field of administration, pensions, funding and IP: "Administrative barriers hamper academia from undertaking the above mentioned actions, especially with regard to recruitments. […] When appraising institutions, collaboration between academia and industry is not always positively evaluated by the competent authorities. […] Academia-industry partnerships can only materialize when interests are aligned between the two (favour co-location and co-funding). […] Many EU relevant instruments ease obstacles to inter-sectoral mobility. These instruments are often not fully exploited." (recommendations 6, 7, 8 and 11).

Observations in 2014

The role of governments in supporting intersectoral mobility is, according to the workshop's participants, quite varied. A small number of initiatives are targeted directly at the 'top level' of the pyramid, such as providing funding for joint doctoral programmes (e.g. in Belgium, Slovenia, Switzerland, UK, Ireland). Quite a few countries mentioned internships as an initiative being actively promoted by the governments, and it seems to work very effectively in Denmark, France, the UK and Switzerland.

Substantial efforts have been made to strengthen the 'middle level' of the triangle, the level of research collaboration. In particular bottom-up support in niche areas or targeted at a specific group of SME's (e.g. in Austria, Czech Republic, Moldova, Slovenia, Switzerland, UK) were provided as

illustrations for small-scale, specialized interventions, indirectly contributing to the intersectoral mobility of researchers. However, also impressive large-scale schemes to support co-location and co-funding through competency clusters (Denmark, Finland, Austria), embracing multiple levels of the knowledge transfer pyramid, were presented as a more integrated approach towards fostering knowledge exchange.

In some countries, governments have introduced major reforms in universities in order to better deal with new challenges in knowledge creation and knowledge transfer (e.g. Greece seeking new ways to promote excellence in research in public institutions, and Finland recovering from the IT bubble and adopting a more holistic view of the R&D system – see also further).

Finally, a number of countries have tax incentives in place for companies employing researchers (Belgium, France, Greece) and France also drew attention to recent national legislation aimed at improving the value of the Ph.D. degree outside academia through sector-specific collective agreements with the government.

During the workshop, it became clear that possible legal barriers (e.g. insurance, IP) and practical barriers (e.g. payment, pensions, funding) had far less impact on intersectoral mobility activities than appraisal barriers (pressure on academic research performance rather than intersectoral experience within universities; or low demand on employer side). It is important to keep in mind that government representatives may experience the impact of these barriers less heavily than the individual researchers (not) considering employment or temporary research experience in other sectors than where they currently work.

Another element related to the role of governments is the impact of the economic crisis. Countries with a robust R&D system seem to have been better able to recover from the blow (e.g. Ireland, Finland), while governments in other countries see a lot of their former, small scale efforts wiped away (e.g. Greece, Estonia). This aspect will be addressed in more detail below.

RECOMMENDATIONS

- In most countries, legal and administrative measures are in place to facilitate the intersectoral mobility of researchers. Governments should **consult regularly with the research community** whether any such barriers may need to be addressed further.
- **Governments are able to trigger large impacts with small-scale initiatives**, such as establishing partnerships with SME-clusters, focusing on niche areas of strengths, and adopting European Structural Funds & European Social Funds in order to support intersectoral mobility
- **Internships for researchers** – i.e. a limited period of time spent in other sectors in order to gain sector-specific experience and share research experience – are inexpensive, bottom-up initiatives that potentially have long-lasting effects on researchers' employability, employers' perception and long-term collaborative initiatives. Governments can play a role in facilitating, promoting and funding such internships.

- **Government initiatives to support colocation** of university and industry, or to develop **competency clusters** fostering collaboration between university and other sectors on a particular topic, provide a more integrated approach to advancing knowledge exchange.

Similar concerns but different measures, in correlation with innovation performance levels

All European countries progress towards a knowledge intensive society at different speeds and by different means. Nevertheless, many countries participating in the workshop report surprisingly similar concerns regarding intersectoral mobility:

- Many countries are in the process of discussing the **required number of researchers** in order to meet their R&D targets. As such, many also struggle in finding the right balance between increasing the supply of researchers on the one hand and increasing the demand for researchers outside the academic sector on the other.
- With the exception of a number of specific R&D intense sectors in a few countries keenly recruiting highly skilled researchers, many countries have observed a **lack of appreciation amongst employers for Ph.D. graduates' research experience**. Also in countries with high innovation performance levels, appreciation for research skills in the social sciences and humanities continues to be a problem.
- Almost every country has introduced **changes in doctoral programmes** introducing a focus on skills development, broader training and employability.
- Every country promotes **collaboration between university and industry**, and in many cases also collaboration between university and other employment sectors (e.g. public sector, service sector, private non-profit, education).
- Many countries have programmes targeted directly at **collaboration with SME's**, either because their earlier policies focused primarily on large R&D companies (Belgium, Ireland), or simply because of a lack of large R&D players in the local economy (Greece, Moldova, Slovenia).
- A substantial number of countries, from innovation leaders to innovation followers, have made use of **Marie Curie Funds** to establish joint doctoral training projects with industry.

A country's ability to address these concerns however depends to a large extent on the availability of funding for R&D initiatives. In countries identified as "modest" or "moderate" innovators, investment in R&D is often perceived as a luxury outcome of economic prosperity, not a prerequisite in order to generate economic progress. As a result, the type of difficulties experienced, and the type of solutions/incentives recently introduced, seem to correlate with the level of innovation as described in the Innovation Union Scoreboard[12]:

[12] European Commission (2014), Innovation Union Scoreboard 2014. http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf

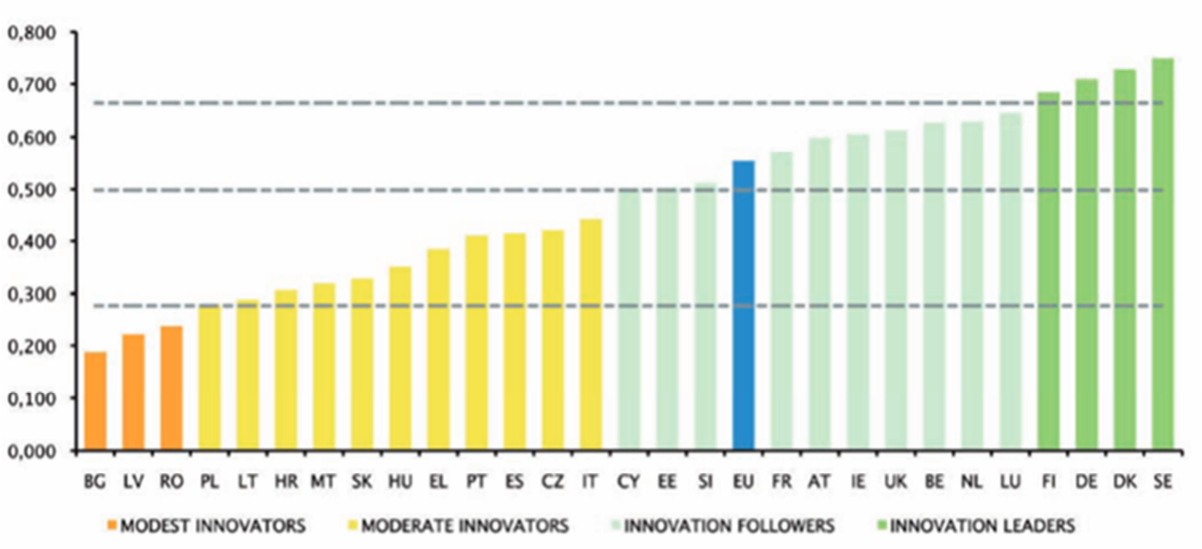

Figure 5: EU member states' innovation performance. Source: Innovation Union Scoreboard 2014.

The higher the country's innovation performance, the more funding is available to combine intersectoral mobility-targets with other innovation-focused initiatives. The countries belonging to the group of *innovation leaders and innovation followers*, more often report long-term structured schemes supporting intersectoral mobility, usually relying on substantial government funds (Austria); skills training programmes at Ph.D. level (Belgium), and sufficient demand for MA- and PhD-level researchers outside academia (Switzerland, Austria, UK, Finland). Countries belonging to the group of *modest and moderate innovators* more often report short-term/small-scale/specialised projects aimed at promoting university-industry partnerships (Greece), a creative use of European programmes (business job section in EURAXESS in Estonia & Ireland) and European funds (European Structural Funds, European Social Fund, Cofund-Marie Curie).

Many of the modest and moderate innovators have recently introduced legislation and/or policy initiatives highlighting the importance of doctoral training (Estonia) and knowledge transfer (Czech Republic, Spain), with the understanding that the effect of such measures may take some time to become visible. These are initiatives similar to the ones many innovation leaders and innovation followers have taken a number of years earlier. As such, they can be expected to act as powerful engines towards more structural, all-encompassing measures that characterize the policies of Europe's innovation leaders.

RECOMMENDATIONS

- Although **intersectoral mobility** takes up only a small area of the knowledge transfer pyramid, it provides **a highly relevant focus** to recognise weak elements in a country's knowledge transfer system and identify appropriate measures for improvement.
- As many countries experience similar concerns in supporting intersectoral mobility, further **opportunities to exchange experiences and good practices** will help to accelerate the introduction of effective measures towards better knowledge exchange
- Not all good practices would operate as effective enablers in every country. In countries with limited R&D budgets and limited R&D performance levels – modest and moderate innovators

– activities addressing the intersectoral mobility of researchers tend to be **project-based rather than structural**, to be reliant on **external funding rather than national funding**, and to focus on **one particular layer** of the knowledge transfer pyramid rather than encompass multiple layers in an **integrated approach**.

Annex 1: Country responses to the questionnaires

Annex 2: Case studies

Annex 1: Summary of questionnaires - ERAC Mutual Learning Workshop on Human Resources and Mobility: INTERSECTORAL MOBILITY

Do any of the following pose a difficulty in your country? (Never/not at all) (Sometimes / in some cases) (Very often/very much)

(countries that did not submit their questionnaire, are not included in this overview)

	Never/not at all	**Sometimes / in some cases**	**Very often/very much**
- Gaining acceptance from academics that employment outside academia is a valuable outcome from doctoral training	Slovenia, Switzerland	Austria, Belgium, Estonia, Finland, Moldova, Spain, UK, Ireland, Denmark	Czech Republic, Greece, Netherlands
- Having sufficient demand for researchers outside academia	Austria, Switzerland UK	Belgium, Czech Republic, Estonia, Finland, Moldova, Netherlands, Slovenia, Spain, Ireland, Denmark	Greece
- Having sufficient demand for people below doctoral level in research-related jobs outside academia	Austria, Finland, Switzerland	Belgium, Czech Republic, Moldova, Netherlands, Slovenia, Spain, UK, Ireland, Denmark	Estonia, Greece
- Preparing researchers with a wider range of skills beyond research skills	Denmark	Austria, Belgium, Finland, Moldova, Netherlands, Slovenia, Spain, Switzerland, UK, Ireland	Czech Republic, Estonia, Greece
- Creating the opportunity for doctoral candidates and postdocs to undertake meaningful (i.e. 3 months or longer) placements/internships	Moldova, Switzerland, Denmark	Austria, Belgium, Estonia, Finland, Netherlands, UK, Ireland	Czech Republic, Greece Slovenia, Spain

- Encouraging doctoral graduates/researchers to actively look outside academia for career opportunities	Austria, Slovenia, Ireland, Denmark	Belgium, Czech Republic, Estonia, Finland, Moldova, Spain, Switzerland, UK	Greece , Netherlands
- Persuading employers in R&D intensive sectors to appreciate the added value of a doctoral degree	Austria, Slovenia, Ireland, Denmark	Belgium Finland, Moldova, Switzerland, UK	Czech Republic,, Estonia, Greece, Netherlands Spain
- Persuading employers in SMEs & different sectors of the economy to appreciate the added value of a doctoral degree		Austria, Estonia, Finland, Moldova, Netherlands Slovenia, Spain, Switzerland, UK	Belgium Czech Republic, Greece, Ireland, Denmark

Annex 2: Case studies

FRANCE: Government initiative to recognise the PhD as a specific qualification: the Fridenson task

One of the priorities of the French Ministry of Higher Education and research is the recognition of the PhD degree, in order to develop research and to encourage 'vocations' into research careers. In 2010-2011, PhDs represented an annual flow of 12,100 graduates of all disciplines for about 65,000 doctoral trainees in 2011-2012. More than 40% of doctoral trainees in France are foreign, illustrating a very international population of researchers.

The new Law on Higher Education and Research of July 22, 2013 affirms the place of PhDs in public and private sectors. Recognition of PhDs in all State, local and hospital civil services is implemented in order to facilitate access of Doctors to senior civil service bodies (articles78 and 79 of the Law). Similarly, in order to improve the employability of PhDs in business, the law stipulates that their employment in the private sector should be facilitated by the recognition of their diploma in collective agreements, in accordance with the provisions of Article 82 of the Law of 22 July 2013, which states that the doctorate is a professional research experience to be recognized before January 2016 in collective agreements.

To carry out this work, the historian Patrick Fridenson has been commissioned by the Minister to implement the Law of July 22 regarding PhDs. His task is to prepare and initiate new legislation for doctoral development.

The wish of the Ministry is to pursue and intensify actions for PhDs and Doctors , in particular facilitate their employability and shorten their time access to employment, which in France is still quite long in the case of permanent positions (permanent contracts and civil servant positions).

Contact: Marina Govoroff, Policy officer, Human resources strategy in research and higher education, Ministry of higher education and research, France.

ESTONIA: increasing the number of PhD graduates and improving their training

The number of full-time researchers has been increasing every year since the year 2000 (from 1,900 to 4,570). The largest increase during this period has taken place in the private sector and now it forms about 1/3 of total researchers. Although the number of researchers with a (master's or) doctoral degree has increased in recent years, researchers in private sectors still lack the PhD-s and show some decline. The RD&I Strategy 2014-2020 sets a target of 300 PhD graduates per year by 2020. Based on the analysis, half of them should continue their careers in the private sector. Despite an increase in the number of PhDs awarded and in the number of researchers, the impact of doctoral studies has not been sufficient to make changes to the structure of the economy.

Even though there is no big visible demand for specialists with a doctoral degree (the doctoral degree was recognised and reason for motivation by the Civil Service Act till 2012!), there is a mutual understanding that the labour market needs graduates who have deeper entrepreneurial and practical skills than they have today. As ERAC Peer-Review 2012 also pointed out: student choices do not match employers' needs. More effective coordination of skills and priorities, forecasting labour market needs and more dialogue between employers and the parties providing educational services are needed. Smart Specialisation Strategy as an ex-ante conditionality for using Structural Funds in 2014-2020, is one of the opportunities to affect the structure of the economy, as is the focused support of carefully selected RDI fields and activities.

Many doctoral candidates work outside academia or in the university in positions that are not related to their doctoral studies. Main reason is that the doctoral fellowship is very low compared to average salaries and does not allow doctoral candidates to focus on their studies and to finish on time without interruption. Although since 2012 the position of an early-stage researcher has been open to doctoral candidates as part of the researcher's career model, only few work in those positions because of the modest financing. The Ministry of Education & Research continues to make attempts to raise the raise doctoral students' income and grant it with full social security.

Several initiatives have been taken to support doctoral education and to encourage doctoral students to think more about researcher's career in private sector there are taken. The new RD&I strategy sets doctoral education as one of the main priorities as well.

The DoRa Doctoral Studies and Internationalisation Programme[13], activity 3: "**Training doctoral students in cooperation with businesses**" (2008-2015). In order to be admitted to the programme as a partner, businesses must be engaged in a development activity with solid application prospects. In addition, companies must be willing to draw up an employment contract with the doctoral student while paying at least the legal minimum wage. Innovative companies therefore actively assist in this programme by funding the creation of doctoral student places. Partner universities must find a suitable partner and are responsible for the quality and progress of the studies. Eligible expenditures include the student's tuition fees, a monthly stipend and the remuneration of the student's co-supervisor at the company; study places are funded on the same terms for government-funded provision of higher education. The programme fosters development in the priority areas specified in Estonia's national RD&I strategy. The programme is funded by European Structural Fund; total budget 33.5 million euros.

[13] More information: http://archimedes.ee/stipendiumid/en/programm-dora/

Doctoral Schools[14] were set up in 2005 and in 2009, 13 new Doctoral Schools were selected for the period 2009-15. Their aim is to improve the quality of doctoral candidate tutoring and to increase the efficiency of doctoral studies in Estonia through interdisciplinary, international and national cooperation. Apart from mobility opportunities, winter and summer schools and study programmes, doctoral schools propose transferable and social skills training to promote interdisciplinary research and enhance cooperation between universities and the private sector. From 2010, students who have interrupted their doctoral studies are welcome to continue and finish their studies. Doctoral Schools are project-based and are funded by the European Social Fund; total budget 16.9 million euros.

Contact: Ursula Tubli, Ministry of Education and Research, Estonia.

[14] List of Doctoral School 2009-2015 http://www.hm.ee/index.php?1512875

NORWAY: monitoring programme to support evidence-based innovation policy

In 2014 the Norwegian Ministry of Education and Research conducted a monitoring exercise covering different aspects of researcher mobility in Norway. The main data used in this exercise are from the Norwegian Research Personnel Register (NRPR) and the Doctoral Degrees Register in Norway (DDRN) (http://www.nifu.no/en/statistikk/doktorgrader/), as well as other sources such as MORE II and SIM-ReC projects and OECD. The results from this monitoring exercise are presented as a focus theme in the Research Barometer 2014. The Norwegian Research Barometer is an annual publication analyzing the status of Norwegian research compared to peer countries. The focus themes in the Barometer vary from year to year.

The NRPR is an important source of data for the analysis of R&D human resources in the public R&D system in Norway. The register is developed and regularly updated by NIFU, a research institute located in Norway (see http://www.nifu.no/en/statistikk/). The register is a database of all research staff at universities, colleges, hospitals, research institutes and other institutions with R&D in Norway. Data are obtained primarily directly from the research-performing units. The register does not include researchers in business, with the exception of those professors who also have an employment affiliation in industry (professor II scheme). The register is part of the national R&D statistics and was established in 1965. Data are available for 1965 and each year until 1970. After this there are data for 1972, 1974 and 1977. From 1977 to 2007 the register has been updated every two years, and from 2007 updated annually.

The NRPR enable recruitment analyses, analyses of human resources in various disciplines and sectors, studies of international and sectoral mobility, gender studies, age structure, educational background etc. For the analytical needs of the Research Barometer 2014, data from NRPR was linked in 2013 to Norwegian administrative data for the period 2007-2012. These data permit drawing a more accurate picture of the incoming international mobility into the public R&D system in Norway, as well as of the sectoral mobility from the public R&D system to other sectors in the economy.

More information about the Barometer:

http://www.regjeringen.no/nb/dep/kd/kampanjer/forskningsbarometeret.html?id=635788

Contact: Aris Kaloudis, Senior adviser, Norwegian Ministry of Education and Research, Department of Research

FINLAND: Reform of the Public Research Institutes

The preparation and implementation of social policies, and the related decision-making, should be based on well-researched information. To achieve this goal, a systematic operating model is needed, to ensure the creation of a strong and horizontal knowledge base in support of societal decision-making and measures.

Enhanced use of research, foresight, monitoring and assessment data, and data generated by external auditing, will strengthen the knowledge base underlying decision-making, leading to improvements in its quality and effectiveness. The aim is to focus on the better and more extensive use of research data in decision-making within the government and other bodies. The reform of public research institutes adopted a more holistic view of the R&D system, taking the Danish model as an example: fostering multidisciplinarity in research, valuing the social relevance of research and establishing innovation clusters between academia and industry constitute some of the key elements in this reform.

In September 2013, the Government of Finland adopted a resolution on the comprehensive reform of research institutes and research funding. The measures includes structural reforms, reforms of research funding instruments, and the implementation and follow-up of the reforms. The overall reform will be implemented in 2014–2017.

One part of this reform is to launch a process to deepen co-operation between research institutes and universities, which is to span several years. Under this process, research institutes and universities will gradually develop genuine clusters of expertise (agreement-based consortiums). Within the consortiums, higher education institutions and research institutes will form common regional campus areas, with common functions (e.g. joint use of physical resources and research infrastructure). Deepening cooperation will provide synergy benefits to both higher education institutions and research institutes, while strengthening the Finnish research and innovation system as a whole. It will also bring major boost to the competitiveness of Finnish expertise and research conducted in the service of society.

More information:

http://vnk.fi/hankkeet/Valtion_tutkimuslaitosten_ja_tutkimusrahoituksen_kokonaisuudistus/en.jsp

Contact: Eeva Kaunismaa, Ministry of Education and Culture, Finland