

ERA-SGHRM working group

On the intersectoral mobility of researchers, their conditions and their competences

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Content

Summary.....	3
I. Introduction	5
Mandate	5
Intersectoral mobility – stakeholders and definitions.....	5
Working method	6
II. Researchers intersectoral mobility in the ERA – state of play	8
III. Barriers and good practices to intersectoral mobility.....	13
Introduction.....	13
Rules & Regulations	14
Funding & Support.....	16
Training & Development.....	17
Collaboration & Entrepreneurship.....	20
Awareness & Recognition	21
IV. Conclusion.....	25
Annex 1: Good practice from countries	28
Rules & Regulations	28
Funding & Support.....	32
Training & Development.....	36
Collaboration & Entrepreneurship.....	38
Awareness & Recognition	40
Annex 2: Mandate.....	42
Annex 3: Members of the working group.....	46
Annex 4: Survey Questionnaire	47
Annex 5: Responding countries	57
Annex 6: Final Ranking & Themes.....	58

Summary

This report defines the main barriers for researcher mobility between Higher Education Institutions (HEIs) and public research institutes (PRI's) on the one hand and other sectors of the labour market on the other. It proposes recommendations to the main stakeholders as to how the defined barriers may be overcome. The report also refers good practice examples from European countries that may provide ideas for practical solutions on how to overcome the barriers.

The basis for the report is formed by the responses to a questionnaire sent to member states of the Steering Group of Human Resources and Mobility (SGHRM). The respondents were asked to prioritise the main barriers to mobility on the basis of a list provided by the working group. There were 20 countries that responded to the survey and according to their responses, the six most important barriers were defined:

- *Overall lack of R&D development in certain countries/regions*
- *Researchers consider academia the best place to work*
- *Difficult to 'return' to academia after substantial career in business*
- *Regulations / legal framework / administrative barriers*
- *Few opportunities for transferable skills development through practice (learning by doing) (for students and researchers)*
- *Academic staff are not equipped to help/stimulate mobility and transferable skills development*

On the basis of the "top six" barriers, and including also barriers that were ranked as medium important, the working group developed five themes addressing the main stakeholders:

- *Rules & Regulations – EU/government*
- *Funding & Support – EU/government/funding councils*
- *Training & Development – institutions and researchers*
- *Collaboration & Entrepreneurship – institutions, researchers and industry*
- *Awareness & Recognition – institutions, researchers and industry*

Under each theme, the working group provided recommendations to stakeholders on what measures should be taken to increase intersectoral mobility. There are many recommendations to be considered and to help stakeholders take a focused approach to the work; these general recommendations might form a starting point:

The European Commission should:

- *Initiate a dialogue with stakeholders to gather relevant data and define goals concerning intersectoral mobility of researchers, involving all relevant directorates.*
- *Review funding mechanisms and assessment procedures to ensure opportunities for cooperation between universities and industry, skills development, and mobility across sectors.*
- *Continue to draw attention to and implement the principles of Charter and Code (C&C), the Human Resources Strategy for Researchers (HRS4R), the Principles for Innovative Doctoral Training (IDTP) and the EURAXESS network.*

Governments and research funding organisations should:

- *Highlight the value of intersectoral mobility in national policy documents through awareness campaigns, storytelling, success factors, data collection etc.*

- Facilitate through regulations and funding arrangements that students and researchers at all levels may combine their studies/work with entrepreneurial activities or spend some time outside academia doing internships e.g. in industry.

Research performing organisations should:

- Highlight the value of intersectoral mobility in the organisation's policies through awareness campaigns, storytelling, success factors, data collection etc.
- Raise awareness amongst academic researchers of atypical career paths.
- Initiate and facilitate programmes which allow students and researchers to combine their studies/work with entrepreneurial activities or spend some time outside academia doing internships e.g. in industry.
- Adopt criteria for meriting in academia that appreciate other skills, experiences, and achievements than those which are strictly academic.

I. Introduction

Mandate

The working group of Intersectoral Mobility and Competences was established by the Steering Group of Human Resources and Mobility (SGHRM) in the meeting 9 December 2015.

In the mandate, the working group was asked to provide an answer to the following questions:

- *What are the main obstacles for mobility of academic staff in HEIs to other sectors of research?*
- *What may be done to overcome these obstacles, and what could be the role of the European Commission, national research councils, research institutions (HEIs) and potential employers in the private and public sectors?*

By arranging a dialogue with relevant stakeholders, the working group was asked to investigate what factors may facilitate the mobility of researchers between academia and other sectors and also what competences and experiences are important for being mobile, recognising also the importance of the student level.

The mandate states at the outset that “transferable skills” is a significant barrier for jobs in industry and the business sector that is not systematically a part of the training of PhDs and postdocs, and also that the advent of open science and open innovation may pose new challenges. While the work of the group confirmed the importance of transferable skills as an enabler of researchers’ intersectoral mobility, the impact of open science and open innovation is still not sufficiently clear to be included in a meaningful way in the current analysis. Therefore the group has not discussed this issue but acknowledges that this could be an important issue for the future. The complete mandate can be found in Annex 2.

The working group members were selected on the basis of proposals from the SGHRM members and associated countries and comprised representatives from national ministries, research organisations, PhD candidate organisations, research funders and universities. A full list of group members can be found in Annex 3.

The working group has had two meetings on 20 January 2016 and 14 June 2016.

Intersectoral mobility – stakeholders and definitions

According to our mandate, the working group was asked to advise political authorities within the EU and research funding and performing institutions in member and associated states on how to stimulate and remove obstacles to the intersectoral mobility of researchers. In addition to the target groups mentioned in the mandate, the working group has also included governments, which play a crucial role in national policies.

The working group was asked to specifically focus on mobility between Higher Education Institutions (HEIs) and other (research) employment sectors. The working group chose to focus on the research intensive part of the HEI sector, namely the universities. At the same time, we acknowledge that several of our recommendations will also be relevant for other institutions in tertiary education and for public research institutes which in several countries have tasks similar to universities. The (research) employment sectors: included the business, industry and public (research) sector, which we will henceforth collectively refer to as "industry" for simplicity. The mandate also mentions the challenge of mobility from industry and back to universities in later career stages.

At the outset, the group adopted a definition of intersectoral mobility in the broadest sense of the term: Intersectoral mobility refers to all possible bridges that can be built between universities and industry. For this report, we exclude general technology transfer policies but focus on the human resources aspect: physical mobility between sectors, the transferability of skills, HR-regulations and facilities for individual researchers.

There are several forms of employee mobility, including a change of employer, long-term, short-term, and dual positions, virtual mobility, and finally there are also different kinds of intersectoral cooperation. The main focus in this report is the movement of researchers, which primarily includes a change of employer. However, other forms of mobility are also relevant as they may be "good practices" to allow more flexibility for researchers' future choice of employers.

The mandate further states the importance of transferable skills. Employers in industry look for specific skills when recruiting new employees. It is thus important that researchers are provided with such skills to improve their mobility to the non-academic labour market. For PhDs and postdocs, relevant skills courses or intersectoral 'training on the job' opportunities need to be systematically incorporated into their training and development programmes.

According to the description above, the main stakeholders playing a part in overcoming intersectoral mobility barriers are:

- Governments: regional, national and European
- Research performing organisation(RPO's), consisting of Higher Education Institutions (HEI's), Public Research Institutes (PRI's) and private R&D organisations – both in their role as employers and trainers or researchers
- Research funding organisations
- Researchers

Working method

In its first meeting, the working group arranged a brainstorming session to come up with a list of all imaginable obstacles or barriers to intersectoral mobility, both from universities to other sectors and vice versa. On the basis of this list, the working group asked all the SGHRM members what they considered to be the most important barriers in their respective countries, what good practices had been adopted to lower the barriers and finally what recommendations they would provide to strengthen intersectoral mobility.

The working group designed a survey consisting of three questions.

1. The first question concerned whether the intersectoral mobility of researchers was an important political issue in their country. The first question also asked for the availability of figures regarding researchers moving from academia to other sectors, as well as any differences in mobility between men and women and different ethnic groups.

2. The second question was about national data or official statistics concerning skills needed for positions outside academia, recruitment strategies in research intensive sectors, employers' satisfaction with researchers' competences, and researchers' interest in moving from academia to other sectors. The second question finally sought information on networking activities for mobility and evidence for whether professional experience from the private sector is an advantage or a disadvantage for employment in academia.

3. The third question consisted of a form that the respondents needed to fill in. The form was based on the 32 potential barriers defined by the working group in the first meeting. The respondents were

asked to mark in total 6-10 barriers, according to which they considered most important and to share good practices and policy messages for relevant stakeholders. This part of the survey was not based on formal policy and data, but on the judgments of the respondents. For the full survey questions and form, see annex 4.

In total, 20 countries responded to the survey¹. For a list, see annex 5. Of these, 19 responded to the survey questions and 17 filled in the form. There were considerable differences as to how detailed the answers were to question one. A majority of the countries had few or no data to report on question two. The responses indicate in particular that there is a need for more information regarding how employers in industry evaluate the qualifications of researchers in academia in relation to their specific needs.

The aim of this report is, on the basis of the responses, to define the most important barriers to intersectoral mobility in Europe as well as good practices and policy messages regarding how to address them. The report does not, however, have the ambition to provide the full picture regarding conditions for researchers' intersectoral mobility in Europe. As accounted for above, the survey material is somewhat fragmented.

The report is structured in five chapters:

In chapter I, the working group accounts for the mandate and working method. Chapter II presents the state of play regarding intersectoral mobility in the ERA, based on relevant literature. Chapter III presents the situation in member and associated countries, as found in survey question one. Chapter IV analyses the most important barriers for intersectoral mobility based on the responses from the form refers to best practice examples and presents policy recommendations for the EU and for actors at national level, including governments, research performing organisations and research funding institutions. Chapters IV are the Annexes.

¹ We received two late responses that were not fully included in the analyses.

II. Researchers intersectoral mobility in the ERA – state of play

The aim of the European Research Area is to ensure growth and jobs in Europe through innovation and research. Particular importance is given to the interaction between higher education, research, and industry: the so-called ‘knowledge triangle’². A key element in improving the flow of knowledge within the knowledge triangle is inter-sectorally mobile researchers.

According to the EU *Researchers Report 2014*³, in absolute terms, there were 1.63 million FTE⁴ researchers in 2011 in the EU-28 compared to 1.49 million in the United States, 0.66 million in Japan, and 1.32 million in China.⁵ In the same report, it is stated that Europe is facing an innovation gap since only 46% of its researchers work in the business sector compared to 80% in the United States, 62% in China, and 75% in Japan.

Each year the European Union publishes a scoreboard for research and innovation, the European Innovation Union Scoreboard, and according to a pre-defined mix of indicators, EU countries show very different performances in innovation⁶:

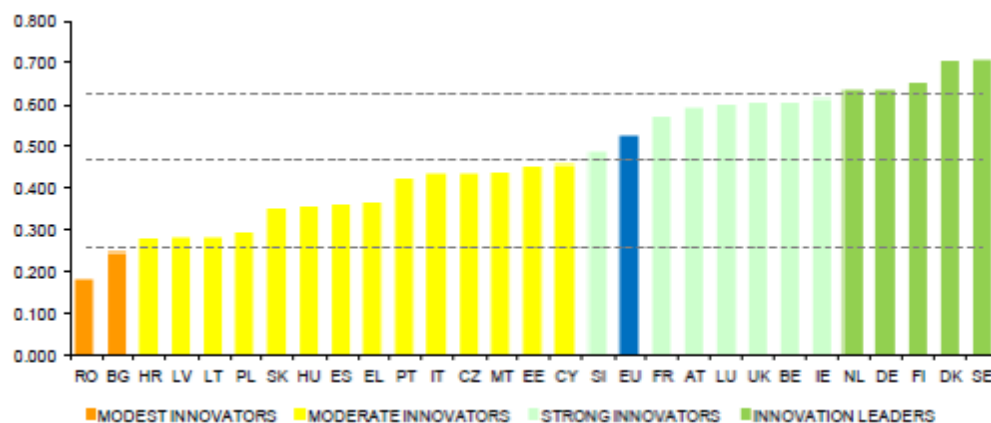


Figure 1: European Innovation Scoreboard 2016: EU Member States' innovation performance.

In 2006, the European Commission published a report *Mobility of Researchers between Academia and Industry – Practical Recommendations*⁷ inviting member states to introduce support measures to enhance researchers' intersectoral mobility, giving good practice examples. These recommendations were revisited in a workshop organised on 26 March 2014, the ERAC mutual learning workshop on Human Resources and Mobility⁸.

Referring to the above Innovation Scoreboard (see Figure 1), the report *Mobility of Researchers between Academia and Industry – Practical Recommendations*⁹ discovered a correlation between countries with high intersectoral mobility and innovation performance and quotes the following similar observations among all EU member countries regarding intersectoral mobility:

² http://ec.europa.eu/education/policy/higher-education/knowledge-innovation-triangle_en.htm

³ http://ec.europa.eu/euraxess/pdf/research_policies/Researchers%20Report%202014_FINAL%20REPORT.pdf

⁴ FTE=full-time equivalent

⁵ See http://ec.europa.eu/euraxess/pdf/research_policies/Researchers%20Report%202014_FINAL%20REPORT.pdf, page b16-17

⁶ http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

⁷ http://ec.europa.eu/euraxess/pdf/research_policies/mobility_of_researchers_light.pdf

⁸ http://ec.europa.eu/euraxess/pdf/research_policies/Report-intersectoral-mobility.pdf

⁹ http://ec.europa.eu/euraxess/pdf/research_policies/mobility_of_researchers_light.pdf

- Many countries are in the process of discussing the required number of researchers in order to meet their R&D targets. As such, many struggle in finding the right balance between increasing the supply of researchers on the one hand and increasing demand for researchers outside the academic sector on the other.
- With the exception of a number of specific R&D intensive sectors in a few countries keenly recruiting highly skilled researchers, many countries have observed a lack of appreciation amongst employers for PhD graduates' research experience.
- 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.
- Many countries have programmes targeted directly at collaboration with SMEs either because their earlier policies focused primarily on large R&D companies or simply because of the lack of large R&D players in the local economy.
- A substantial number of countries, from innovation leaders to innovation followers, have made use of the Marie Curie funds to establish joint doctoral training projects with industry.

The same report *Mobility of Researchers between Academia and Industry – Practical Recommendations*¹⁰ illustrates the way in which intersectoral mobility is dependent on, but also influences several other factors in the education, research and innovation system. The knowledge base and funding conditions for research and development are fundamental. Physical mobility is closely interwoven with the many elements of knowledge exchange, with research collaboration at its centre, e.g. training and development designed to make researchers better suited to the challenges of the current labour market. This encompasses the factors which are preconditions for intersectoral mobility (upward arrow) or which can directly enhance its impact (downward arrow): “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.”

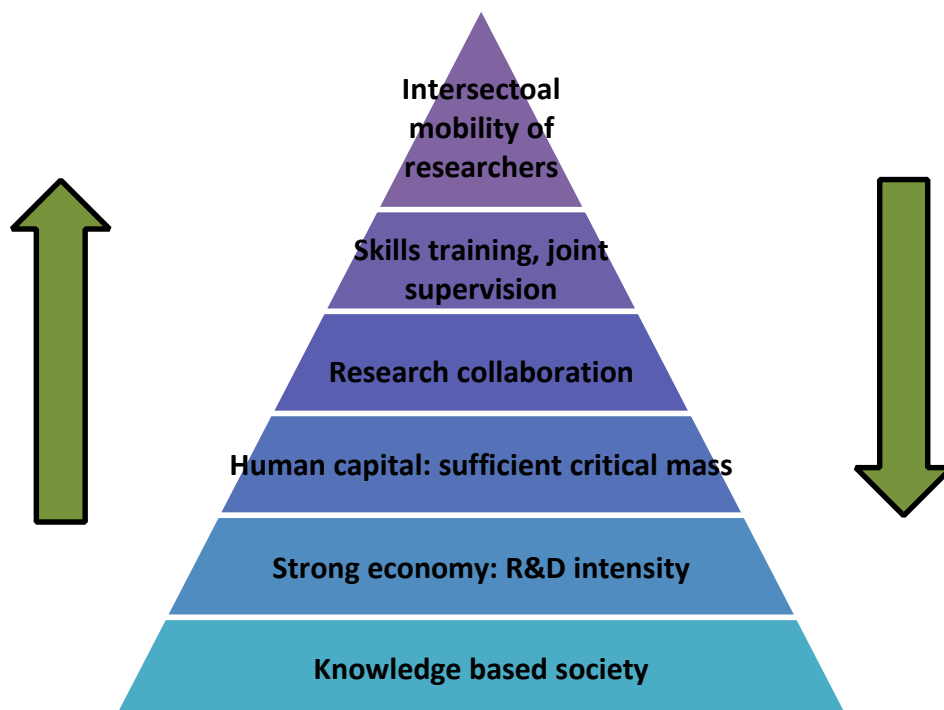


Figure 2: the role of intersectoral mobility in the knowledge transfer pyramid. Source: Mutual Learning Seminar on Human Resources and Mobility – 26/3/2014.

¹⁰ http://ec.europa.eu/euraxess/pdf/research_policies/mobility_of_researchers_light.pdf

Between 2009 and 2012, the European University Association (EUA) carried out the Doc-Careers II project, analysing the situation of industry-academia collaboration among EUA Universities in different European regions¹¹. Doc-Careers II results underlined the importance of joint activities between academia and industry, in order to build trust and long-term relationships between industry and academia, and to enable doctoral training and collaborative research activities to develop.

Another major European study that should be mentioned in this context is the MORE2 Study, which focused on international mobility as well as including some aspects of intersectoral and interdisciplinary mobility.¹² According to the MORE 2 survey results published in 2013, 23% of European researchers in the PhD stage and 30% of researchers in the post-PhD stage in Europe have been intersectorally mobile.

The following table 1 from the MORE 2 study indicates that intersectoral mobility is relatively less frequent in nearly all European countries from higher education to private industry or the non-profit private sector than it is to the public or government sector¹³.

	Intersectoral mobility	To public/government sector	To private not-for-profit sector	To private industry
Austria	33%	16%	10%	12%
Belgium	29%	12%	8%	13%
Bulgaria	50%	32%	22%	16%
Switzerland	33%	14%	5%	15%
Cyprus	38%	13%	18%	16%
Czech Republic	37%	22%	8%	12%
Germany	33%	18%	8%	11%
Denmark	38%	25%	9%	13%
Estonia	28%	14%	6%	11%
Spain	28%	15%	6%	12%
Finland	30%	16%	4%	12%
France	17%	4%	3%	10%
Greece	42%	23%	13%	16%
Croatia	33%	19%	7%	14%
Hungary	44%	28%	14%	18%
Ireland	31%	12%	8%	16%
Iceland	49%	34%	6%	23%
Italy	24%	15%	9%	6%
Lithuania	42%	25%	14%	10%
Luxembourg	38%	18%	9%	15%
Latvia	45%	29%	12%	14%
Macedonia (FYROM)	47%	24%	23%	19%
Malta	34%	20%	12%	12%
Netherlands	38%	20%	12%	12%
Norway	32%	19%	8%	10%
Poland	40%	23%	8%	15%
Portugal	24%	12%	11%	6%
Romania	31%	17%	12%	11%
Sweden	30%	20%	3%	11%
Slovenia	37%	19%	10%	14%
Slovakia	28%	17%	9%	9%
Turkey	25%	18%	7%	5%
United Kingdom	30%	13%	6%	14%
EU27	30%	15%	7%	12%

Source: MORE2 Higher Education Survey (2012)

Note: - Percentage of researchers who have been intersectorally mobile (to one of the destination sectors). (n=1,999)
 - With >3 month mobility during PhD only for R1 doctoral candidates and R2 (post-doctoral or equivalent) doctorate holders and post-PhD only for R2 (post-doctoral or equivalent), R3 (established) or R4 (leading) researchers.
 - Multiple destination sectors per respondent are possible.

¹¹ <http://www.eua.be/eua-work-and-policy-area/research-and-innovation/doctoral-education/doc-careers-ii.aspx>

¹² MORE 2 final report, see http://ec.europa.eu/euraxess/pdf/research_policies/more2/Final%20report.pdf

¹³ MORE 2 final report, see http://ec.europa.eu/euraxess/pdf/research_policies/more2/Final%20report.pdf, page 143

Figure 2: Intersectoral mobility per country and destination sector.

The MORE 2 study confirms:

that university researchers are less likely to move to non-academic research positions the older they are or, more precisely, the longer they are working at the university. Those researchers who struggled through the tough competition and became top level university researchers (i.e. full professors) are often not willing to give up their positions. If university professors move they most often take over management positions or become members of the advisory board or similar. Moreover, university researchers would most often need additional education in management or business activities in order to be able to move to companies. Researchers who start their career in a company at a relatively early age are able to take over management tasks more easily, as they have a better knowledge about the business environment¹⁴.

The study concludes that specific training needs to be provided by the academic sector to enable researchers to better interact and remain employable with the private sector. Our working group survey results seem to confirm this.

The above figures and analyses demonstrate there are significant differences among countries regarding the number of researchers who have been mobile across sectors and to what sector they move. There are also differences with regard to innovation intensity. Although we do not discuss the issue within this report, we acknowledge that there are significant differences among countries when it comes to their funding base.

European countries also have different research and innovation environments. In some countries, the research environment is centered primarily on universities. In other EU member states, research is organised around major research organisations. Such conditions have a real impact on mobility. In addition, other settings, such as the national legal framework, the pension system, and specific incentive programmes, which have a substantial impact on intersectoral mobility, differ from one country to another. To cope with the different conditions across the EU, it seems that member states and associated countries are designing different policies and implementing different strategies.

This is confirmed in the survey responses, although the material does not allow an analysis between policy on intersectoral mobility and the other factors mentioned. Half of the respondents in our survey replied that intersectoral mobility was an important issue in national policies in their countries. A majority of these referred to political documents on R&D that particularly addressed intersectoral mobility, usually in a broader context of R&D policy. A few respondents stated that intersectoral mobility was a political issue in their countries, but was not prioritised in practice.

The other half of the respondents did not have a national policy for intersectoral mobility of researchers as such, but rather focused on the importance of cooperation between universities, research performing organisations, and industry. This position was most clearly stated by Germany. Switzerland interestingly sees the universities of applied sciences as the link between applied research and industry.

Our survey corresponds well with the survey that Science Europe carried out on intersectoral mobility in 2014-2015¹⁵ among its 50 members who are the research funders and performers in Europe. Out of the 30 member organisations that replied, 25 had support measures for intersectoral mobility in place. However, only nine of the Science Europe member organisations considered that intersectoral

¹⁴ MORE 2 final report, see http://ec.europa.eu/euraxess/pdf/research_policies/more2/Final%20report.pdf, page 116

¹⁵ Science Europe publication forthcoming in December 2016, but preliminary results were reported by Science Europe representatives in the working groups

mobility as a strategic priority in their organisation. Most of the schemes or support measures in place were recent and many of the tools that research organisations in Europe have developed are tailor-made for their national ecosystems.

Taking into account the knowledge triangle and the differences in human research capital, innovation intensity, research structure, funding base, and national policy priorities, it must be noted that conditions for intersectoral mobility are clearly linked to country specific innovation ecosystems. These are not necessarily transferable, since these ecosystems might have specific regional or national features. That said, there are also important challenges and good practices to address these challenges that all, or a majority of the countries, share. This will be further explored in the next chapter.

III. Barriers and good practices to intersectoral mobility

Introduction

The working group adopted a method of ranking the barriers reported by the survey respondents and concentrated its work on the barriers that the respondents considered the most important. For the exact ranking methods, see annex 6. The six barriers that were considered most important were:

- *Overall lack of R&D development in certain countries/regions (14)*
- *Researchers consider academia the best place to work (12)*
- *Difficult to 'return' to academia after substantial career in business (12)*
- *Regulations / legal framework / administrative barriers (11)*
- *Few opportunities for transferable skills development through practice (learning by doing) (for students and researchers) (11)*
- *Academic staff are not equipped to help/stimulate mobility and transferable skills development (10)*

This ranking must be interpreted with some caution. The general barrier on rules, legal framework, and administration is a complex issue that could comprise various barriers. Other more specific barriers are closely linked, such as different barriers related to funding, so that the scores are spread across them. We also see that respondents, to a certain extent, mark different barriers for what could be the same goal. As stated earlier, countries will also differ according to which barriers they deem important. In some countries the main barrier might be regulations, legal framework and administration, while in other countries the main obstacles might be funding structures or the academic culture.

On the basis of the "top six" barriers (scores 10-14), and taking the twelve barriers ranked medium (scores 7-9) in mind, the working group distinguished five categories of barriers in order to thematically group the barriers and offer policy advice to the main stakeholders:

- *Rules & Regulations – EU/government*
- *Funding & Support – EU/government/funding councils*
- *Training & Development – institutions and researchers*
- *Collaboration & Entrepreneurship – institutions, researchers, and industry*
- *Awareness & Recognition – institutions, researchers, and industry*

This is a rough classification. Most of the stakeholders have a role in all of the groups and the working group has provided recommendations for all stakeholders in all groups. There is also overlap between categories, with many barriers possibly falling into several groups. We placed each barrier in the group with which they were most thematically associated.

In the recommendations, the European Commission is addressed separately, while the recommendations to actors on the national level are addressed collectively. The reason for this is mainly that the individual actors' responsibility varies among countries and also that there are many areas of shared responsibility among national stakeholders.

Some of the good practice examples from survey respondents are referred as examples under each group. A complete description of these examples and a comprehensive list of good practices can be found in annex 1.

Rules & Regulations

Regulations, legal framework and administration were among the three barriers that the respondents in the survey considered most important¹⁶. The most important factors here are laws and regulations on a national/regional level, however there are also regulations and procedures set by the individual institutions and finally also on the EU level. Most types of activities relevant for intersectoral mobility are defined by rules and regulations, which determine the framework for funding opportunities, training, collaboration and recognition. These in turn affect collaboration among institutions and also the opportunities for individuals to be mobile across institutions and sectors (inter)nationally.

It is apparent that the respondents to the survey have defined a wide variety of barriers associated to some extent with rules and regulations, such as different types of funding arrangements and PhD programmes. Although these measures possess characteristics for rules and regulations, we will discuss these under the categories of Funding & Support and Training & Development and concentrate here specifically on barriers where rules and regulations represent the main challenge.

An evident challenge for intersectoral mobility of researchers is that lowering, and even removing, barriers mostly depends on cooperation between several actors within bureaucratic structures. On EU level, there are different directorates responsible for students, for research, and for working life. In countries, there are several ministries involved. There is also a need for coordination of policy measures and regulations between EU and the national level. Several initiatives have been taken to make policies compatible across EU member countries, but most of these are "soft measures", and not within a legal framework. RESAVER, the pan-European pension plan initiated by the European Commission¹⁷, is not a regulation enforced on member states, but it still demands adaption of national legislation in many countries.

The organisations that are involved in intersectoral mobility - higher education institutions, research performing organisations, and industry - are in many countries subject to different regulations, which severely hamper the mobility of researchers between them. Examples might be labour laws, including wages, social security and pension rights.

While many countries have unified higher education systems, several countries also have binary systems, distinguishing between universities and universities of applied sciences. These categories of institutions will have different opportunities and challenges regarding intersectoral mobility of academic staff.

The opportunities of individual researchers depend on general labour laws, but also on regulations concerning their particular position. Early stage researchers, particularly stage R1 and R2 (doctoral and postdoctoral level) are vulnerable in that they most often are in fixed term positions, if they even have a position and that they need support and opportunities to build a career that goes beyond their present position. For many of them, particularly the PhDs, the challenge is to continue their career outside academia. It is important that this is recognised and facilitated in national regulations and by the employer. The *European Charter for Researchers and Code of Conduct for the Recruitment of Researchers* (Charter and Code) is a key tool in securing the rights and opportunities of individual researchers, and the *Human Resource Strategy for Researchers* (HRS4R) provides a framework for recognising these rights.

¹⁶ This must however be modified, since respondents defined several issues to this barrier, that the WG has assigned to other barriers.

¹⁷ <http://ec.europa.eu/euraxess/index.cfm/rights/resaver>

Regulations regarding appointment and merits in academic positions are in many countries a variable mixture of national and institutional regulations. Such regulations often define what qualifications are the minimum requirement for a particular position and also the appointment process. Open, transparent, and merit-based recruitment (OTM-R) is important to support mobility in general¹⁸, and this is a priority in the ERA roadmap. To promote intersectoral mobility, it is a prerequisite that competences gained from other sectors are recognised in appointment processes.

Based on the replies received from respondents, Intellectual Property Regulations (IPR) and Pensions do not rank highly on the list of barriers. Possibly, the link between these elements and intersectoral mobility is not sufficiently obvious. Nevertheless, they do define the (career) choices made by researchers and institutions in the R&D landscape. The survey from Science Europe¹⁹ reveals that only a few of its member organisations that responded operated funding schemes specifically regulating IPR. It also seemed like the private sector showed most interest in the funding schemes that regulate IPR. IPR is important for stimulating trust and facilitating agreements that meet both parties' interests. IPR, understood as the rights or limitations to bring one's intellectual property along when moving, may define the "value" of a researcher on the labour market.

Differences in pension rights when moving between the public and private sector, which may include the loss of a pension or the duty of a new employer to take on pension obligations, might form a definitive barrier, particularly for researchers already firmly established in their careers. RESAVER, however, may contribute to removing this barrier, provided that both academic and non-academic employers participate in the scheme.

Good practices – possible solutions

Our survey reveals that countries such as Ireland, Spain, and Austria, have progressively adopted new legal frameworks which enable intersectoral mobility. In Greece, the government has established a position of **Assistant Minister of Education and Religious Affairs entrusted with research and innovation**. In Austria, the University Act 2002 led the universities over to autonomy. In 2009, collective legislative agreements on labour were set for universities. The Academy of Finland has adopted a policy that applicants for Postdoctoral Researcher and Academy Research Fellow posts will be **required to have work experience from different research organisations**. In the Netherlands, the Professional PhD Programme allows PhDs to **do paid (part-time) work for 3-6 months at a company** alongside their PhD to gain work experience and build a professional network. Ireland has established **National IP Protocol** to make the process of engagement between business and the research base in Ireland more straightforward.

Many of the countries surveyed in our study highlighted their concern with the **national pension system** set in their countries. They consider it a key issue to mobility. Some member states, like Austria and Germany, have introduced fundamental reforms in their pension systems.

Policy recommendations

The European Commission should:

- Increase collaboration between DG RTD, EAC, and Growth & Employment to develop a policy on intersectoral mobility of students and researchers
- Collect and analyse data on intersectoral mobility at European level based on national data
- Disseminate good practices to support intersectoral mobility across countries
- Stimulate developments of IPR frameworks that support cooperation across sectors

¹⁸ ERA SGHRM Working Group on Open, Transparent and Merit-Based Recruitment of Researchers (OTM-R) 9 July 2015

¹⁹ Science Europe publication forthcoming in December 2016

- Consider requesting and co-funding national action plans to enhance cooperation across sectors that fit the countries' and regions' needs

Governments and research funding organisations should:

- Consult the research community regarding experienced barriers to intersectoral mobility and collaborate with ministries and other national actors to remove them
- Adopt regulations that recognise intersectoral mobility and practice in recruitment and promotion of researchers
- Adopt regulations that facilitate (paid) part-time internships for young researchers outside academia during their (post)doctoral programmes
- Adjust national regulations to allow introduction of RESAVER and actively promote its benefits to relevant actors
- Reassess pension and IPR differences between sectors which are detrimental to mobility (e.g. loss of pension rights or IPR)

Funding & Support

The highest ranked barrier in the survey was *overall lack of R&D development in certain countries/regions* and additionally there were two medium ranked barriers, *overall lack of funding and funding for university/industry tailor-made cooperation*. This clearly states that lack of funding is considered the main problem. It is worth noting that the countries indicating an overall lack of funding as a barrier are more often countries that suffer from a general funding deficit at country level. Funding for university/industry tailor-made cooperation is indicated as a barrier by respondents belonging to the group of European countries suffering less from public debt. For this group, funding and support as such is less an issue than a coherent approach that addresses particular needs in a given context to stimulate more intersectoral mobility.

Many EU countries have a multitude of direct and indirect funding sources available to support research and researchers in the public and private sectors. Fiscal policies should not be underestimated in this context, since they indirectly stimulate intersectoral mobility, although the targets of these policies are broader. These policies need to be carefully designed to be efficient. The alignment of the different public sector instruments and their strategic fit will probably play a more important role for funders and governments in the future. In its recently published *Business and Finance Outlook 2016*²⁰, the OECD states that “*Fiscal incentives, including tax policies, should be directed at specific barriers, impediments or synergies to facilitate the desired level of investment in R&D and innovations. Without careful design, policies can have unintended consequences.*” The OECD states in the same report that R&D tax policy needs to be considered in the context of the country's general tax policies, its broader innovation policy mix, and its other R&D support policies.

In most countries, ministries of higher education and research tend to support research in higher education institutions and the public sector. In many countries, other ministries are also engaged, such as ministries of economic affairs, ministries of health and ministries of trade & industry. Joining forces and stimulating a holistic approach, taking into account other aspects than funding, is important to increase the impact of funding on innovation and economic growth, and as a part of this, also on the exchange of knowledge and mobility of researchers between sectors.

The Science Europe survey²¹ also revealed that in many countries the responsibility for funding either basic or applied research is spread across different organisations, with funders focusing on both streams representing a minority.

²⁰ http://www.oecd-ilibrary.org/finance-and-investment/oecd-business-and-finance-outlook-2016_9789264257573-en

²¹ Science Europe publication forthcoming in December 2016

Good practices – possible solutions

Good practices in this area are **targeted funding programmes** that in different ways support intersectoral mobility of researchers at different stages of their career, but also **programmes supporting intersectoral cooperation in general**. Norway has an arrangement of **combined/part-time positions** between universities and other sectors. Ghent University in Belgium has a **postdoc innovation fellowship** which provides opportunities to prepare a spin-off company based on the PhD/postdoc research. Several countries, e.g Luxembourg, Austria, Ireland and the Netherlands, have **specific programmes, often tailor-made, to support partnership between academia and industry**. The survey reveals that all governments across the EU provide different schemes which promote **tech-transfer projects, collaborative research, and financial support for spinoffs and startups**.

Policy recommendations

The European Commission should:

- Create/extend specific funding programmes, also considering MSCA, for intersectoral mobility, considering options for internships and work experience for students and early stage researchers (R1/R2)
- Ensure that peer review evaluation panels value intersectoral mobility in assessing projects and researchers' CVs

Governments and research funding organisations should:

- Increase funding for doctoral training (R1) offered by universities in structured programmes with industry, ensuring co-funding by industrial partners
 - Allocate funding for full-time or part-time/combined positions, internships, and other opportunities for mobility that integrate industry experience into academia
 - Support the creation of platforms for university-industry funded instruments to increase their visibility
 - Stimulate indirect support to intersectoral mobility through government policies such as tax benefits and attraction of multinational companies to promote industry related R&D
 - Coordinate the use of COFUND and structural funds in the framework of the RIS3 regional strategies among stakeholders
- Ensure that peer review evaluation panels value intersectoral mobility in assessing projects and researchers' CVs

Research performing organisations should:

- Ensure that peer review evaluation panels value intersectoral mobility in assessing projects and researchers' CVs

Training & Development

The barrier related to *few opportunities for transferable skills development through practice* was ranked among the top six barriers along with the barrier that *academic staff are not equipped to help/stimulate mobility and transferable skills training*. There were also other barriers which were ranked medium important and which are closely linked to these, namely *few opportunities for transferable skills training courses* and *lack of preparation for non-academic careers in HEIs*.

These barriers are in line with previous recommendations on intersectoral mobility in 2006²² and 2014²³, which highlight a recurring need for improving and providing adequate training and development for researchers, particularly early stage researchers, with a focus on the non-academic labour market.

The training and development of researchers involves the acquisition of skills needed for researchers to develop themselves professionally and be intersectorally mobile. While “training” focuses on the short-term attainment of specific skills, “development” refers to the long-term accumulation of skills and increased professionalisation of researchers. The Charter and Code recognises the importance of mobility and advises employers and funders to include career strategy and mobility experience in their career development programmes.²⁴ Mobility skills are furthermore integral to the *New Skills Agenda for Europe* and the *Open Science* agenda.

One of the most important barriers to intersectoral mobility is that there are few opportunities for transferable skills practice, which is closely related to the barrier noting a lack of preparation for non-academic careers. ‘Learning by doing’ is a practical and active way to gain knowledge, which simultaneously applies acquired skills in the setting for which they were designed and makes researchers aware of the skills that they have required. Respondents note a clear need for practice opportunities in industry, particularly for early stage researchers, and collaboration with professionals from the public/private sector. Such direct experience is highly valued by the labour market and was one of the main recommendations in *Transferable Skills and Employability for Doctoral Graduates*²⁵.

The barrier that there are few opportunities for transferable skills courses is also related to the perceived lack of preparation for non-academic careers. This barrier is only medium ranked by the respondents, which might be explained in different ways. One reason may be that the availability of structured training, particularly at PhD level, varies considerably among countries, and that there are limits as for how much formal training can be put into PhD or postdoc periods.

That said, there are also a number of respondents highlighting the need for more transferable skills courses for early stage researchers which are structurally integrated into (post)doctoral programmes. These courses should not be restricted to academic skills, but should also focus on skills relevant for non-academic positions. This necessity corresponds with the general lack of non-academic training and the fact that only 50% of early stage researchers receive structured training, as revealed in the MORE 2 report.²⁶

The preceding three barriers focus on the acquisition and application of skills by researchers and overlap with some of the Principles for Innovative Doctoral Training as identified in the *Report of Mapping Exercise on Doctoral Training in Europe*.²⁷ The need for transferable skills training, both for courses and practices, clearly also reflects a need to highlight career opportunities and career paths to help young researchers, already from the student level, see what their opportunities are, how they may work, what choices they have to make to build their career, and what types of skills to acquire.

It is remarkable, and somewhat worrying, that the barrier that academic staff is not equipped to help/stimulate mobility of transferable skills development is among the six highest ranked barriers. In other words, academics are perceived as not qualified to provide the skill courses relevant to stimulate intersectoral mobility. The recent increase in the awareness and importance of transferable skills and intersectoral mobility means that not all academic staff has had the opportunity to be adequately trained or qualified in these areas themselves. Academic staff may also not have relevant experience

²² http://ec.europa.eu/euraxess/pdf/research_policies/mobility_of_researchers_light.pdf

²³ http://ec.europa.eu/euraxess/pdf/research_policies/Report-intersectoral-mobility.pdf

²⁴ <http://ec.europa.eu/euraxess/index.cfm/rights/whatIsAResearcher>

²⁵ http://www.euraxess-cfwb.be/doc/news/Report_Research_employers.pdf

²⁶ http://ec.europa.eu/euraxess/pdf/research_policies/more2/Final%20report.pdf

²⁷ http://ec.europa.eu/euraxess/pdf/research_policies/Report_of_Mapping_Exercise_on_Doctoral_Training_FINAL.pdf

or contacts in the public/private sector that they could engage to provide successful skills courses. They may furthermore simply not have the actual financial means to pay for external course providers. Respondents request the further training and development of academic staff, with a focus on the non-academic labour market, as well as involving industry professionals in the process. Respondents also ask for further development of the EURAXESS Service Network.

Good practices - possible solutions

Good practices to increase opportunities for and improve transferable skills practice give students and early stage researchers the chance to **engage with industry professionals** during their programmes and be intersectorally mobile. This involves stimulating **networking and partnerships between HEI's and industry** such as the partnerships in research in Austria and the VRI programme in Norway. **Temporary paid internships**, such as the Professional PhD Programme from PNN in the Netherlands, help early stage researchers to apply acquired transferable skills, gain insight into careers and network in the public/private sector during their (post)doctoral programmes. **Industrial doctorates** cement long-term partnerships between HEIs and industry by employing PhD candidates in industry to work on joint research projects, as is the case with industrial PhD programmes in the Netherlands and Spain. **Industry sabbaticals** offer later stage researchers the chance to spend their sabbatical collaborating or working in industry such as in Israel.

Many member states are actively creating opportunities for and improving transferable skills courses. In Ireland, the PhD Graduate Skills Statement aims to **identify the skills needed to develop and manage researcher careers across employment sectors**. Some governments **structurally fund transferable skills courses** such as the Thales and Archimedes III programmes in Greece. Many member state institutions **offer a wide variety of skills courses with an emphasis on non-academic positions**, such as scientific presentation, time and self-management, interpersonal skills, networking, career planning, intellectual property and entrepreneurship. Some institutions place an even greater importance on training and development and **structurally integrate transferable skills courses and career development into student and doctoral programmes**, as at the University of Ghent in Belgium and the Institute of Science and Technology in Austria. Some states lastly **set up specialised career development centers with career counsellors** as in Belgium and Serbia.

The Researcher Career Skills for Career Development (PIPERS) was a European project led by the British Council and the EURAXESS Service Network which aimed to **fund initiatives supporting researcher career training and development**. An important focus of the project was the non-academic labour market. One of the working packages involved **train-the-trainer workshops to further professionalise researcher career and development staff**. Academic staff can also be supported by other members of internal staff and external staff. The **involvement of supervisors and industry professionals via mentoring schemes**, one of the tasks of the Innovation and Liaison Offices in Greece, is an excellent way to support both researchers and academic staff. In Norway, the Professor II programme aims to **employ industry professionals as part-time professors at universities**, and stimulate knowledge transfer, networking, and research collaboration.

An important part of academic training and development is that **researchers are made aware of the limited career possibilities in academia and of the opportunities and added values of intersectoral mobility**. Programmes should also aim to **identify individual talents and encourage and strengthen personal skills** rather than trying to train all researchers with the same skills. The focus should, lastly, not solely be on transitioning as an employee to the labour market but should also be to **stimulate independence and entrepreneurship and encourage risk-taking ventures**.

Policy recommendations

The European Commission should:

- Develop EURAXESS activities in transferable skills and career development and in the further professionalisation of academic staff
- Disseminate good practices from countries and stimulate new initiatives related to transferable skills and career development
- Fund and support national and institutional projects on transferable skills and career development for researchers and academic staff

Research performing organisations should:

- Provide adequate skills and career development practice and courses which involve industry and are integrated into student and researcher programmes
- Develop a policy on the role of non-academic internships for doctoral and postdoctoral candidates (R1/R2) during their programmes
- (Re)train and further professionalise academic staff in skills and career development with an emphasis on the transition to non-academic labour market
- Recruit part-time or full-time staff with experience from other employment sectors in teaching and training in HEIs
- Design a checklist to test all individual scholarships/fellowships for early stage researchers in order to identify barriers and facilitate that these: may be combined with entrepreneurial activities or with part-time work; allow spending some of the research time outside academia; allow interruption of the research term in order to take on an internship/work experience opportunity elsewhere.

Collaboration & Entrepreneurship

Compared to the other four categories, relatively few barriers were identified by member states relating to collaboration and entrepreneurship. These barriers concerned *few incentives for risk-taking entrepreneurship* and *lack of cross-sectoral collaboration*. One of the reasons for this may be that the focus on collaboration among respondents is more on the HEI and RPO side, in providing adequate skills and experience for researchers in the form of training collaboration and thus is more applicable within Training & Development.

Most higher education institutes and public research institutes today have networks linking them with local and international businesses, non-profit agencies, and other organisations – not in the least through BA, MA and PhD graduates developing their further career in these organisations. The key question, however, is the extent to which universities and organisations use this network effectively in order to encourage effective research collaboration and intersectoral mobility. If there is little intersectoral collaboration, the “physical” mobility of researchers will also be also limited.

Long-term university-industry partnerships build a relationship of trust, which in turn can set in motion a wide range of recommendations made in this report, such as increasing levels of R&D development, involving non-academic experts in skills training, in career development, and in mentoring. Closer collaboration will also have an impact on issues of awareness and recognition, discussed below, as well as facilitate a return to academia for researchers who have spent a substantial part of their career in business R&D. Collaboration fosters familiarity and trust, which are key conditions for intersectoral mobility.

A closer collaboration with business R&D can also foster a culture of entrepreneurship in academia that may counteract the barrier on the lack of incentives for risk-taking entrepreneurship, as such

perpetuating the distance between two research cultures. With a culture of risk-taking, a university's potential for intersectoral mobility of researchers could be improved. This recommendation by no means suggests universities should reduce basic research in favour of applied research - on the contrary. However, universities could embrace more of their innovation potential rather than simply "outsource" it to industry.

Good practices – possible solutions

Collaboration between university and other sectors is facilitated in many different ways, depending on the university's structure and profile. Some involve **industrial staff members on the Board of their Doctoral Schools** or in their **mentoring programmes**, for example as respectively at Antwerp University and Ghent University in Belgium. Norwegian universities foster collaboration through their **part-time Professor II positions**. In Austria, **networking events** bring academic and non-academic partners together. In Israel, the Ministry of Economy funds a wide range of **collaborative projects**.

Ireland and Greece both report that their national framework and/or funding channel actively support the inclusion of **entrepreneurship training** in researcher development.

Universities and research performing organisations with **incubators** address both of the barriers highlighted in this section. Not only do they provide incentives for young researchers to become risk-taking entrepreneurs, but they also foster collaboration with existing and future companies.

Policy recommendations

The European Commission should:

- Ensure that there are attractive programmes and incentives that support cooperation between universities and other sectors, lowering the barriers between them
- Create more incentives for risk-taking and entrepreneurship for promising researchers and entrepreneurs

Governments and research funding organisations should:

- Create more incentives for risk-taking and entrepreneurship for promising researchers and entrepreneurs, including funding of start-ups
- Develop a national employer, students, and graduates survey in order to assess the effects of investments in entrepreneurship skills among the enterprise community

Research performing organisations should:

- Promote entrepreneurship amongst early-career (R1/R2) researchers and provide entrepreneurship training in order to nurture a new category of researcher: the "entrepreneurial academic" (R3/R4) Encourage researchers to spend a sabbatical working in industry, and/or provide funding for doctoral graduates to work 1-2 years in industry.

Awareness & Recognition

Two of the six barriers that the respondents rated the highest can be linked, directly or indirectly, to elements of perception. The most highly ranked barriers in this area are that *researchers consider academia the best place to work*, and that it is perceived to be *difficult to return to academia after a substantial career in business*. Medium ranked barriers are *"applied" knowledge from industry is not recognised in academia*; *lack of awareness in other sectors of academic researchers' potential contribution*; *difference in performance criteria*; *value system and timing between academia and*

other sectors; a lack of tradition for recruiting academics with non-traditional career paths to university; lack of awareness; lack of information (in academia) on opportunities in other sectors; and finally, lack of appreciation for innovation activities in academic career progress. It is remarkable that despite the large number of barriers formulated in this area, this has not led to a "crowding out" of the individual barriers, but rather to a strong statement that awareness and recognition are crucial to stimulating intersectoral mobility.

At its most extreme, research in academia is perceived to be slow, thorough, and dedicated to push the boundaries of research in the long term. At the other end of the scale, research in the private sector needs to be fast, useful, and commercially viable in the short term. And outside of a research context, members of the public tend to have little exposure to the achievements and challenges of researchers. Luckily, the time when these worlds were separate entities is far behind us. Nevertheless, the bridges between them are still fragile, and the bridges are unevenly spread across disciplines.

A large number of member states have signaled the difficulty of returning to academia at the level of postdoc or professor after a substantial career in industry. This barrier is closely related to another much-signaled problem: respective performance value systems are very different. Academics are expected to publish in high-impact journals or engage in innovative teaching in order to demonstrate their merit, while the performance criteria for researchers in industry lie rather in patent development, research applications and less tangible skills such as successful project management or teamwork. Making a successful career in one sector is no guarantee for a successful career in another. The academic sector is particularly competitive internally and therefore rather reluctant to appreciate the value of non-academic work experience or applied research. Once outside academia, it is almost impossible to return as an academic at senior level. As such, the academia world risks missing out on opportunities to build bridges with the non-academic sector.

An additional consequence of the lack of bridges between the academic and non-academic sector is that university researchers have very little familiarity with their environment and consider academia the best place to work. Many doctoral candidates are "socialised" towards an academic career during their training, strengthening their identity as academics. As a result, little thought is given to employment outside of academia, and certainly not to employment in the industry sector.²⁸

Being passionate about research and teaching at third level, many researchers close their eyes to opportunities outside academia. Researchers in an academic context identify with their immediate research environment, their host institution, and their discipline. This has two significant results: first, they unconsciously adopt this value system; second, they are reluctant to associate themselves with environments outside of this identity. Furthermore, many researchers in university are so dedicated to their academic work that they have little appreciation for activities or work experience outside academia.²⁹

When PhD graduates acquire higher ranks in academia and become supervisors, this lack of awareness and lack of information on opportunities in other sectors is passed on to the next generation. When PhD graduates seek opportunities elsewhere, their initial focus on academia as the best place to work may give rise to frustration and disappointment.

However, having made the career switch to non-academic environments and having gone through this transition, many PhD graduates and postdocs discover aspects in their new professional environments they never realised they might get excited about, as documented in quite a number of studies³⁰. In

²⁸ H. De Grande, K. De Boyser, K. Vandeveldel and R. Van Rossem (2014) From academia to industry: are doctorate holders ready? JOURNAL OF THE KNOWLEDGE ECONOMY 5(3) p.538-561. <http://hdl.handle.net/1854/LU-4338165>

²⁹ De Grande et al, 2014.

³⁰ Vitae 2013 report "What do researchers do?" <https://www.vitae.ac.uk/vitae-publications/reports/what-do-researchers-do-early-career-progression-2013.pdf/view>; De Grande et al, 2014.

fact, in terms of mobility, the non-academic careers of doctorate holders are the most prevalent examples of successful intersectoral mobility. The knowledge economy increasingly relies on highly skilled individuals. Some sectors of employment, in particular those with high R&D intensity (such as pharmacy, IT, or chemistry) often value the specialist knowledge of PhD graduates and postdoctoral researchers. Once accepted in this new environment, most of them continue to thrive in their professional career.

This transition, unfortunately, is not smooth in all sectors of the labour market, particularly not in the less R&D intensive sectors. Many HR managers or CEOs lack awareness of researchers' potential contribution. That potential contribution may not always lie in the researcher's discipline-specific expertise, but rather in his or her overall cognitive ability, analytical and problem-solving skills, or in the level of independence and determination acquired when performing high-level research.

PhD graduates seeking employment outside of their area of expertise may first have to overcome prejudices against their academic background before they get the chance to demonstrate these less tangible skills. Alternatively, they may find themselves in jobs such as education, journalism, or government administration that could be the perfect environment to capitalise on their research experience and the skills acquired during their doctoral studies.

The issues of equal opportunities, gender and ethnic background, and also work-life balance as a challenge to intersectoral mobility, have not been prioritised by the respondents. Nevertheless, this is an integral part of ERA policy through the priorities on open recruitment and gender in the ERA roadmap and should be considered in all policy measures.

One additional barrier signaled by a number of member states is the very different traditions between academia and industry on intellectual property. For an academic, making research results public is an essential part of the research system. For a commercial company, keeping research results secret until brought to market is key to their survival. Usually, the type and source of funding will decide which of these forces the stronger one is (privately funded versus publically funded). Experience and exposure to academic and non-academic environments are essential to appreciate the complexity of this negotiation, so that neither party feels they have lost out.

Good practices – possible solutions

A number of governments have published **policy papers** encouraging academic researchers to **consider careers outside academia**, as is the case in Norway, Ireland, and the Netherlands. Researchers' skills and their potential contribution to the knowledge economy play an important role in these.

Storytelling, mentoring, and involving alumni in the academic environment are tools adopted in, for example, Flanders, Greece, and Austria, in order to stimulate an appreciation of “difference” and close the gap between academia, industry, and the non-profit sector.

A formal recognition of industry experience in the university's performance framework, such as patent applications, the establishment of spin-off companies, or contract research with industry, is not only a reward for past experience but also encourages academic researchers to continue pursuing such activities. This is the case in Serbia and is a well-known incentive in many technical universities.

Many countries and institutions have invested in **career centers for researchers**, realising that “acquiring skills” is not enough and that researchers need to learn to recognise one's own potential contribution to non-academic environments. Austria, Norway, Flanders, Serbia, Greece, and Luxemburg are only a few of many other examples reporting a major investment in **skills development**, career centers and skills awareness campaigns.

Norway also reported that STEM faculties are currently discussing **how to modify performance criteria within university**, in order to promote an appreciation of industry experience within academia.

Policy recommendations

The European Commission should:

- Highlight the value of intersectoral mobility in policy documents and monitoring exercises at all levels, e.g. awareness campaign, storytelling, success factors, and data collection
- Continue to draw attention to the implementation of the principles of Charter and Code, the innovative doctoral training principles, and the EURAXESS network
- Set up/engage in events where academia and non-academic partners are equally present so that experiences can be shared

Governments, research funding organisations should:

- Highlight the value of intersectoral mobility in policy documents and monitoring exercises at all levels, e.g. awareness campaign, storytelling, success factors, and data collection
- Provide incentives to universities for hiring scientists who return to academia after a career in other employment sectors, e.g. financial benefits and fellowships
- Promote the relevance/value of academic research to industry networks, and from industry research to academia, through an effective communication strategy

Research performing organisations should:

- Implement the principles of the Charter and Code
- Create a competency profile for PhD researchers, postdocs, and professors, which can help to make non-academic stakeholders appreciate these skills
- Involve non-academic stakeholders in defining skills required for research and entrepreneurship in various job sectors
- Involve alumni in the design of programmes and training activities at PhD level as well as investing in “storytelling”
- Ensure that the topics of equal opportunities, gender, ethnicity, and work-life balance are addressed in all policy related to intersectoral mobility

IV. Conclusion

Intersectoral mobility, particularly between universities and industry, is perceived as an important prerequisite for the innovation union. The level of intersectoral mobility in Europe varies among countries. It also varies to what extent the individual countries have explicit policies to stimulate intersectoral mobility.

In order to structure the debate, the working group has summarised the most important barriers to intersectoral mobility under the following five categories: Rules & Regulations, Funding & Support, Training & Development, Cooperation & Entrepreneurship, and Awareness & Recognition. Taking into account some of the limitations of the scope of this study, we still think it provides a basis to make some final reflections.

It is important to recognise that the individual barriers to intersectoral mobility are in most cases interrelated. Acknowledging also that the environment for intersectoral mobility differs among countries, the barriers and opportunities of individual measures will also often be different. One example is the opportunity of practice for PhD students in industry. In one country, the main barrier could be on rules and regulations, while in other countries the main barriers could be funding arrangements or the academic culture.

The analyses reveals that among the themes defined by the working group, Awareness & Recognition is the area that is considered most important, in the respect that two of the barriers defined are among the top six, and several others are ranked of medium importance. To overcome these barriers, there is a need for cooperation and interaction among researchers from different sectors, to learn about the opportunities, and to recognise competences of researchers from other sectors. This is a question of a deliberate and systematic development of culture and traditions.

These barriers clearly include elements of Rules & Regulations, particularly concerning procedures for advertising, appointment, and meriting for positions. Openness regarding advertising and appointment has already been put on the agenda with the Charter and Code and the ERA roadmap, but also points forward to looking at the system of merit.

Acknowledging that barriers of culture and recognition are considered a major problem by the respondents, it is also important to note that there might be natural causes for some of these differences. Competences regarding basic and groundbreaking research have features that are different from most research in industry – and vice versa.

Funding & Support is also considered very important, with one barrier that received the top score, and two other barriers received medium score. Funding opportunities should support the development of competences and skills, and arenas for cooperation between sectors. Such arenas are a prerequisite also for reducing the barriers linked to culture. Funding is always scarce; however, these barriers might represent the biggest differences as for opportunities among countries, due to different funding situations. There is a challenge to consider the whole set of funding mechanisms, both at the EU-, the national- and regional levels, to safeguard that measures for intersectoral mobility are sufficiently included, and to optimise the effects of the measures.

Rules & Regulations only comprised one barrier, which was rated among the top six by respondents. Rules & Regulations are complex structures, involving actors in several directorates at EU level and several ministries at national level and also often regional actors on national level. The need for agreeing on common goals, defining the obstacles and raising the discussion among these actors on how to overcome them is urgent.

Several barriers related to the Training and Development of researchers were rated important by respondents. Two barriers were ranked in the top six most important barriers. Respondents cite a clear

need for the practical acquisition and application of skills through work experience and internships in industry. This 'learning by doing' should, in the case of young researchers, be incorporated into (post)doctoral programmes. Respondents also note a clear need to further professionalise academic staff so that they are equipped with the skills and network to adequately stimulate intersectoral mobility. The focus for improvement lies thus not solely on the researchers but also on the trainers themselves.

The barrier 'few opportunities for transferable skills training through courses' was ranked of medium importance, which may reflect the already widespread availability of transferable skills in many countries. Nevertheless, there is an apparent need to (further) develop skills courses and with respondents also citing a 'lack of preparation for non-academic careers in universities', such courses need to be tailored more towards mobility to the public and private sector. Such preparation should not only start early in the student phase but should also involve industry professionals and the target market in the development process.

The two barriers associated with the theme Collaboration & Entrepreneurship were ranked of medium importance by respondents. These barriers focused on few incentives for risk-taking entrepreneurship and a lack of cross-sectoral collaboration. The seeming lack of importance for this theme by respondents may stem from the fact that they focused more on the researchers and providing them with the skills and experience needed for intersectoral mobility in the form of training and development. In fact, many of the other barriers are closely linked to and involve collaboration and entrepreneurship. Overcoming these other barriers will thus impact positively on this theme.

Although there are many differences across countries, none of the countries are entirely free from barriers to intersectoral mobility. This report highly recommends every country to bring together all relevant stakeholders in the research system in order to perform a thorough self-assessment exercise. The overview of barriers described in this report can be a useful guideline. The good practices mentioned further on, can inspire the design of further action plans.

Final recommendations

The European Commission should:

- Initiate a dialogue with stakeholders to gather relevant data and define goals concerning intersectoral mobility of researchers, involving all relevant directorates
- Review funding mechanisms and assessment procedures to ensure opportunities for cooperation between universities and industry, skills development and mobility across sectors
- Continue to draw attention to and implement the principles of Charter and Code, the Human Resources Strategy for Researchers, the Principles for Innovative Doctoral Training and the EURAXESS network

Governments and research funding organisations should:

- Highlight the value of intersectoral mobility in national policy documents through awareness campaigns, storytelling, success factors, data collection etc.
- Facilitate through regulations and funding arrangements that students and researchers at all levels may combine their studies/work with entrepreneurial activities or spend some time outside academia doing internships e.g. in industry

Research performing organisations should:

- Highlight the value of intersectoral mobility in the organisation's policies through awareness campaigns, storytelling, success factors, data collection etc.
- Raise awareness amongst academic researchers of atypical career paths

- Initiate and facilitate programmes which allow students and researchers to combine their studies/work with entrepreneurial activities or spend some time outside academia doing internships e.g. in industry
- Adopt criteria for meriting in academia that appreciate other skills, experiences, and achievements than those which are strictly academic

Annex 1: Good practice from countries

Below are examples of good practices for intersectoral mobility in countries. The examples are organised thematically, according to the themes in the report. To avoid repetition examples are only referred once, although most of them could have been organised under more than one heading. This means that in the search for good practices, the readers are advised to check several places. For example good practices regarding skills development may be found both under the theme "Funding & Support" and "Training & Development" depending on what is considered to be the most important characteristic of the good practice example.

The list of good practices is based on examples submitted by various member states and is designed to inspire other countries. It does not claim to be representative nor comprehensive.

Rules & Regulations

Austria

Modification of labour laws in universities

In Austria the legal reforms began in 2002, when the Austrian government enabled the establishment of universities as independent bodies from the federal administrative control. This move allowed substantial changes in the entire academic system which enhanced collaborative research activities and tech-transfer projects, which in turn resulted in Intersectoral mobility. Additionally, the RTI strategy³¹ adopted by the Austrian federal government in 2011 represents the central frame of reference for the formulation of Austrian policy. In this new policy, great focus is put on cooperation between science and industry as well as the establishment of infrastructure of entrepreneurial activities. University scientists are since 2004 no longer civil servants. Universities have the same labour law as in the private sector. From the point of view of HEI this seems to have made intersectoral mobility easier.

Estonia

Estonian Research and Development and Innovation Strategy 2014-2020

(https://www.hm.ee/sites/default/files/estonian_rdi_strategy_2014-2020.pdf)

The current strategy aims to exploit the established potential for the benefit of Estonia's development and economic growth. This includes issues related to researcher intersectoral mobility, such as:

- Develop a career model which supports cooperation with enterprises.
- Increase researcher mobility, including from enterprises.
- Encourage the mobility of researchers between the academic, public and private sectors. Placing value on the time worked in other sectors and the results achieved there, as well as cooperation with enterprises.
- Continue supporting doctoral studies that are provided in cooperation with universities and enterprises.
- Support the development of entrepreneurship studies and new forms of acquisition of entrepreneurship experience by involving more enterprises as lecturers, practice providers, etc.
- Support enterprises in the development of products and services of high added value in cooperation with universities and R&D institutions.
- Ensure an increase in the research capacity of research institutions in the public sector and an infrastructure for the development of business cooperation.

Finland

³¹ <http://www.bka.gv.at/docview.axd?cobld=53215>

Academy of Finland has decided that applicants for funding for research posts will in future be required to have work experience from different research organisations. The change concerns applicants for funding for research posts as Postdoctoral Researcher and Academy Research Fellow.

A ‘Postdoctoral Researcher’ funded by the Academy of Finland is a talented researcher who has recently completed his or her doctorate. The funding provides the researchers with an opportunity to increase their qualifications for important researcher or expert positions. Postdoctoral Researchers have established effective national or international collaborative networks.

An ‘Academy Research Fellow’ funded by the Academy of Finland works on a research plan of a high scientific quality. Academy Research Fellows have built extensive research networks and the funding allows them to develop their skills of academic leadership and to establish themselves as independent researchers. As of the September 2016 call, applicants for funding for research posts as Postdoctoral Researcher or Academy Research Fellow must meet one of the following two requirements:

- They are applying for funding for a research post at a research unit other than the one at which they worked on their doctoral thesis.
- They have at least six months of research or research-related experience from some other organisation since PhD completion.

France

France uses tax incentives to stimulate recruitment of researchers in companies (CIR), which have proved to be very good to stimulate recruitment of researchers.

Greece

Two major governance changes are envisaged to improve coordination of the design and implementation of research and innovation policies: One by the new National Strategy for Research, Technological Development and Innovation (ESETAK) for national coordination and one by the new Law on Research, Technological Development and Innovation (Law 4310/2014) regarding national-regional R&I coordination. The creation by the new elected government of the position of Assistant Minister of Education and Religious Affairs entrusted with research and innovation.

RTDI Law 4310/2014

The new RTDI Law 4310/2014 sets up specific conditions for the enhancement of research and innovation and adopts the new national RTDI strategy (ESETAK). It includes issues related to supporting intersectoral mobility such as

- Authorising research of up to 3 years (unpaid) to researchers for the commercialisation of their research ideas (Greece)
- Introducing the framework for the commercialisation of research output through the participation in R&D start-ups, research collaborations, participation in activities of high business risks.

Germany

“Altersgeld” old age pension

- One of the main limitations for moving from academic positions to industry is traditionally related to old-age pension scheme of civil servants, where this change could imply important losses. The introduction of the so-called “Altersgeld” for civil servants with at least 7 years of public service has improved this situation so the loss of pension is not a barrier.

Ireland

Innovation 2020 (<https://www.djei.ie/en/Publications/Publication-files/Innovation-2020.pdf>)

Innovation 2020 is Ireland’s five year strategy for research and development, science and technology and includes the commitment to creating opportunities for improving research international and

intersectoral mobility. The strategy also includes the commitment to establish and improve a system-wide tracking of researcher mobility into industry.

National IP Protocol:

The Department of Jobs, Enterprise and Innovation (DJEI) published a document called 'Putting public research to work for Ireland', also known as The National IP Protocol 2012. This was developed by the DJEI working with other Government departments and drew on the knowledge of a dedicated group of experts from industry, the venture capital community, technology transfer offices, research performing organisations, the Irish Universities Association and State research funders. The Protocol was developed with the aim of providing 'an exemplary innovation ecosystem that creates economic and societal benefits, especially sustainable jobs. The new Protocol builds on the previous iteration that was designed and delivered to create clarity, consistency and quality for companies working with Ireland's higher education institutes (HEIs) and other state-funded research organisations. It is consistent with pre-existing policy while introducing some practical additions to speed up negotiation between industry and research performing organisations (RPOs) - that is the process of knowledge transfer.

[-www.knowledgetransferireland.com/About_KTI/Knowledge-Transfer-Framework/#sthash.Rwjvdpyt.dpuf](http://www.knowledgetransferireland.com/About_KTI/Knowledge-Transfer-Framework/#sthash.Rwjvdpyt.dpuf)

Israel

Tax incentives for multinational R&D presence

The government provides tax benefits and grants to have multinationals installing their R&D centres in Israel. Currently over 250 R&D centers of multinational companies that provide great opportunities for young researchers to further develop their career and training.

Lithuania

A new version of the Law on Higher Education and Research has been adopted at the beginning of July 2016 provides better conditions for business to participate in the process of doctoral studies.

Within the 2014-2020 EU support period the Ministry of Education and Science has committed to allocate funds for ensuring the continuity of the project activities. The project (programme) "Development of doctoral studies" started in 2016 as continuation of programme „Improvement of training of high qualification specialist for the development of research-intensive economic sub-sectors – NKPDOKT" (which was implemented in 2011 – 2105).

Within the 2014-2020 EU support period the Ministry of Education and Science has committed to allocate funds for ensuring the continuity of the project activities. Both projects (programmes) were designed for training of high qualification specialists (doctor's degree students) in all research fields especially in biomedical, technological and physical sciences because the demand for specialists has been growing in view of the rapid development of biotechnologies, material science and nanotechnologies. Themes for doctoral dissertations are selected in competition which is open to scientists from academic and non-academic sectors.

The aims of the new project (programme) are:

- to ensure development of the Lithuanian R&D sector and its orientation towards high-level and internationally competitive research;
- to attract young researchers from abroad to study in Lithuanian;
- to create conditions for the development of science and innovations through the enhancement of intersectoral and international researcher mobility.

Luxembourg

Common IPR Framework

The FNR is currently developing IPR guidelines for its instruments, to set-up a clearly defined framework for collaboration with industry. Most Luxembourg institutions have defined recently their IPR frameworks which now need to be communicated and agreed with industry. The past absence of such frameworks was one of the main barriers for public private research collaborations in Luxembourg.

Malta

National Research and Innovation Strategy 2020

Both, the current National Research and Innovation Strategy 2020 and the National Research and Innovation Action Plan 2020, emphasise the importance of linking business and academia to foster knowledge transfer and to support innovation.

<http://www.mcst.gov.mt/Policy/NationalResearch.aspx>

Serbia

Strategy for Scientific and Technological Development of the Republic of Serbia from 2016 to 2020 – Research for Innovation

In this strategy is clearly stated: “Improving mobility between science and industry will be an integral part of systemic measures for greater cooperation on joint development and innovation projects, with the aim of resolving the current problems and tasks in the economy and society as a whole and create new products and services.”

Slovenia

Ministry of Education, Science and Sports industrial PhD funding programmes

The Slovenian government has had programmes fostering intersectoral mobility of researchers since 2001:

- The Young Researchers for Industry/Economy Programme (2001 to 2010)
- The Innovative Doctorate Programme (2010 to 2013).
- Researchers in the Initial Phase of their Scientific Careers since 2013

Considering the limitation of resources, efforts are done to coordinate with European Structural Funds (KROP).

Spain

Science, Technology and Innovation Act 14/2011; Spanish Strategy on Science, Technology and Innovation 2013-2020

The basic legal framework Science, Technology and Innovation Act 14/2011 recognises intersectoral mobility (together with geographical and interdisciplinary mobility) as a right of the research staff, and public R&D organisms are endorsed to support it. Furthermore, the current Spanish Strategy on Science, Technology and Innovation 2013-2020 has a one of its priority lines Transfer and Management of Knowledge, which includes promoting relations between R&D centres, researchers and businesses and stimulating the mobility of researchers, technologists and technicians, as well as stable public-private collaboration.

Fiscal benefits to boost innovation in the private sector

Spain has implemented a number of tax incentives to facilitate companies to invest in R&D&I activities, including the collaboration with academia and the recruitment of research staff. This includes:

- A tax reduction of up to 42% of the direct costs executed in R&D or technological innovation projects in private companies.

- A bonus of 40% of the companies' share payment of the social security of their research staff.
- A reduction of the tax base applicable over the incomes of a company derived from knowledge transfer (i.e., incomes due to assigning the use of patent or a certain know-how developed by the company).

Also, to facilitate the access to the instruments (as well as other benefits, such as particular models of loans or favourable conditions in processes of public innovation purchases), SMEs can be recognised as “Innovative SMEs” (sello de PYME Innovadora).

Switzerland

Doctorates from Universities of Applied Sciences (UAS)

Intersectoral mobility is particularly fostered at the UAS. These offer a wide range of study programmes in engineering, business, design, health, social work and art. Universities of applied sciences offer Bachelor's and Master's degree programmes that qualify graduates to carry out specific professions and provide direct access to the labour market, although they initially are not allowed to assign doctorate degrees. However, doctoral candidates at UAS can obtain their doctorate in cooperation with a university.

Funding & Support

Austria

Christian Doppler Research Association, CDG (<https://www.cdg.ac.at/en/about-us/>)

The CDG is considered a pioneer in Austria for successful cooperations between science and the private sector. The form of the cooperation funded by the CDG usually has the following appearance: a research group elaborates fundamental knowledge that flows into the development of new products and processes at commercial partners. This generates a brisk exchange of knowledge, experience and questions between the partners.

The CDG realises its objectives through:

- Christian Doppler Laboratories (CD Labs) established at universities and non-university research institutions (<https://www.cdg.ac.at/en/funding-models/the-cd-model/>)
- or Josef Ressel Centres (JR Centres) established in universities of applied sciences (<https://www.cdg.ac.at/en/funding-models/the-jr-model/>)
- “Partnership in Research” (PiR) Programme (<https://www.cdg.ac.at/en/funding-models/partnership-in-research/>): The CDG, in cooperation with the Austrian Science Fund (FWF) has also launched a one-off programme with 1 million euro budget for research designed to encourage new partnerships between science/research and the business world. These may lead to the establishment of CD Labs or JR Centres, or other cooperation projects.

Belgium

“Special” PhD scholarship (<http://www.fwo.be/nl/mandaten-financiering/predoctorale-mandaten/bijzondere-doctoraatsbeurs/>)

This scholarship supports individuals that are employed outside of a research function and want to obtain a PhD within one year. As such, it is an example of mobility from e.g. R&D research, education or policy towards academia.

The Flemish Government drew specific attention in its Policy Document 2014-2019 to the development of a strategy that supports career development of young researchers and intersectoral mobility. Since 2011, the Flemish government has allocated an annual amount of €4M to the Junior

Researchers Support Platform (OJO). The budget is divided between the five Flemish universities and is aiming at providing young researchers with guidance and soft skills needed for his/her career.³²

Germany

Programme "Forschung zum Wissenschaftlichen Nachwuchs", FoWiN

The programme FoWiN (Research on Young Researchers) of the Federal Ministry of Education and Research has recently commissioned 9 research projects to shed light over career decisions and recruiting patterns in young researchers, as well as competences and skills.

Greece

National funding programmes

Several funding programmes are potentially aimed at reinforcing intersectoral mobility

- Thales (2009-2015) for the support of research teams in Greek universities through the funding of interdisciplinary and inter-institutional research projects(€ 120 million);
- Archimedes III (2009-2015) for the support of research initiatives in Technical Education Institutions (TEI) (budget € 21 million), post-doctorate research (€ 30 million) and research projects implemented by a primary investigator (€60 million);
- Collaboration programme (2009-2015) for the support of collaborative research by private companies and public research organisations (about €230 million);
- Cooperation 2011 – Partnerships between businesses and research bodies in specific research and technological sectors (ongoing).

The specific objectives of the Cooperation 2011 Programme are:

- Enhance collaboration between businesses and research bodies through common implementation of research and technological projects;
- Foster green development, competitiveness and outward orientation of Greek businesses;
- Improve Greek citizens' quality of life;
- Strengthen and upgrade the skills of the research workforce; and
- Establish international cooperation through networking and collaboration with entities from European and other countries.

Support for R&D in groups of small and medium-sized enterprises (SMEs)' (2009-2015) for the financing of research projects implemented by groups of SMEs, public research organisations, technology transfer organisations and technology suppliers (€ 10.7 million).

Supporting businesses with the aim of employing highly qualified scientific personnel (under the Human Resources Development Operational Programme) (2007- 2013) to implement specific proposals for research activities. Under this action, proposals for research activities can be submitted by private sector undertakings and/or from any sector of the economy and irrespective of size. The total budget is EUR 15 million.

Ireland

Science Foundation Ireland, SFI

The SFI has two programmes which support intersectoral mobility of researchers.

- Industry Fellowship Programme: Aimed at enhancing industry-academia collaborations through the funding of collaborative industry-academia research projects, and to stimulate excellence through knowledge transfer and training of researchers. Fellowships can be awarded to staff and

³² <http://www.iwt.be/>

postdoctoral academic researchers based in Ireland, wishing to spend time in industry worldwide (“Academia to Industry” Fellowships), and to individuals from industry anywhere in the world (including Ireland) wishing to spend time in an eligible Irish academic or research institution (“Industry to Academia” Fellowships) (<http://www.sfi.ie/funding/funding-calls/open-calls/industry-fellowship-programme-2016.html>).

- Research Professorship Programme: Aimed at supporting national strategic priorities by assisting research bodies in the recruitment of world-leading researchers for Professorial Chairs, or similar research leadership positions, including the recruitment of individuals who possess a strong industry background (<http://www.sfi.ie/funding/funding-calls/open-calls/sfi-research-professorship-programme.html>)

Irish Research Council, IRC

The IRC has two initiatives which should foster intersectoral mobility.

- Enterprise Partnership Scheme: Through this scheme, IRC in partnership with private enterprises and public bodies, awards co-funded postgraduate scholarships and postdoctoral fellowships to the most promising researchers in Ireland. By working closely with an Enterprise Partner, researchers benefit from an enhanced research experience as well as having the opportunity to learn key transferable skills relevant to career/professional development (<http://www.research.ie/scheme/enterprise-partnership-scheme>).

Employment Based Programme: This programme provides students in all disciplines an opportunity to work in a co-educational environment involving a higher education institution and an employment partner. An eligible employment partner on this programme is a business, a company, a registered charity, a social, cultural or not-for-profit organisation, or a commercial semi-state organisation with a physical operational base located in Ireland that will employ the Scholar for the duration of the award.

Israel

Funding mechanisms of the Office of the Chief Scientist of the Ministry of Economy (<http://www.matimop.org.il/ocs.html>)

In general, most of funding mechanism provided by the state foster intersectoral collaboration and mobility:

- MAGNET: Collaborative research
- MAGNETON: 'one on one' technology transfer
- NOFAR: Proof of concept projects

Lithuania

Implementation of post-doctoral fellowship

The project (programme) “Postdoctoral Fellowship Implementation in Lithuania” was implemented during the period 2009-2015 under the implementation measure “Promotion of scientists and other researches mobility and students scientific research” of the Operation Programme for Human Resources Development for 2007-2013. The aims of the project (programme):

- Providing possibilities for young scholars to pursue independent research, upgrade their scholarly qualifications and academic management skills, enhance their continuous personal development, acquisition of new knowledge and skills, as well as to enable them to initiate their own research themes and scientific projects,
- Creating conditions for the development of science and innovations through the enhancement of inter-sectoral, inter-institutional, inter-field and international researcher mobility. Inter-sectoral, inter-institutional, inter-field and international mobility of researchers allows for the exchange of good practice, knowledge and methodologies, in such a way leading to the solution of scientific problems, as well as introducing innovative and significant research themes.

- Attracting young researchers from abroad to apply for postdoctoral fellowships in Lithuanian research centres;

More than 10,068 million euro was allocated for the Post-doctoral fellowships scheme: the budget of a project, dependently on the research area, was not smaller than 43.400 euro and did not exceed 56.144 euro. The 225 postdoctoral fellowships were funded during the period 2009-2015.

This project was more successful for interdisciplinary mobility than for inter-sectoral mobility.

At the moment the RCL is preparing legislative documents to continue Post-doctoral fellowships scheme under the European Structural and Investment Funds for 2014-2020.

Luxembourg

National Research Fund (FNR)

FNR is the main funder of research activities in Luxembourg, and among its schemes it includes several aimed at enhancing public-private collaboration and intersectoral mobility (<http://fnr.lu/innovation-industry-partnerships/opportunities-for-researchers/>):

- Proof of Concept (PoC): Financial support to make innovative research ideas from public research institutions in Luxembourg more attractive to potential investors. Two deadlines per year, in April and November.
- KITS: Knowledge and innovation transfer support. Provides competitive funding for public research institutions in Luxembourg, enabling them to attract and integrate Knowledge Transfer Officers (TTO). Annual call with deadline in November.
- CORE-PPP: Short to mid-term (1 – 3 years) collaborative research projects between researchers employed at a public research institution in Luxembourg and a company based either in Luxembourg or abroad. Two deadlines per year, in March and September.
- AFR-PPP: PhD or Postdoc grants with research carried out in collaboration with a Luxembourg-based industry partner. Two deadlines per year, in March and September.

IPBG: Industrial Partnership Block Grant. Block allocation of PhD and/or Postdoc grants for industrial partnerships between research institutions and industry partners in Luxembourg. Pilot Call launched with a deadline of 15 September 2016.

Norway

Programme for Regional R&D and Innovation, VRI (http://www.forskningsradet.no/prognett-vri/Home_page/1224529235237)

VRI is a Research Council of Norway initiative, targeted toward research and innovation at the regional level in Norway. One of the aims is supporting mobility of personnel between industry and R&D institutions (including HEIs): researchers from R&D institutions to industry, students collaborating with companies. Also personnel from industry are funded to work in a R&D institutions. This includes VRI Professorship for Regional Innovation, which specifically offers funding for industrial leaders to contribute in teaching, innovation and research to improve the relevance for industry.

Spain

National funding programmes fostering intersectoral mobility and public-private collaboration

Several programmes from the ministry (Ministerio de Economía y Competitividad) supports the recruitment of research staff in the private sector:

- The Torres Quevedo funding programme (TQP) supports the recruitment of PhDs in the private sector with the aim of reinforcing a stable professional career for researchers and fostering R&D activities in industry. This programme currently has a 15 million euro annual budget.
- The Industrial PhD programme reinforces the TQP by funding the development of doctoral theses in industry. This way, successful candidates would become eligible for the TQP programme upon completing the PhD. This programme currently has a 3 million euro annual budget.

- Emplea programme (National Programme for the Promotion of Talent and its Employability) supports the recruitment of staff for R&D activities and capacity building actions to improve R&D management in industry. This programme has a 100 million euro budget for loans.

Training & Development

Austria

The Industrial PhD Programme (<https://www.ffg.at/en/research-partnerships>)

The programme is sponsored by the National Foundation for Research, Technology and Development (Nationalstiftung für Forschung, Technologie und Entwicklung) and aims at the systematic build-up and further qualification of research and innovation staff in companies and non-university research institutions. An Industrial PhD project is a three-year industrially focused PhD project where the student is hired by a company and enrolled at a university at the same time. The company applies for a project funding from the The Austrian Research Promotion Agency (FFG), and the student is employed by the company.

The Institute of Science and Technology Austria, IST Austria (<https://ist.ac.at/about-ist-austria/>)

IST Austria has several activities which should foster intersectoral mobility:

- TWIST programme supports researchers interested in the commercial development and use of their research results. With a range of measures, results are to be translated into product ideas, which the institute intends to commercialise through licensing and the support of start-ups. TWIST facilitates the exchange with industry, works with founders, and helps students make career decisions (<https://ist.ac.at/about-ist-austria/administration/technology-transfer/twist/>).
- The ISTScholar PhD Programme is complete an innovative interdisciplinary training program consisting of both research and taught elements, plus close mentoring by world-class faculty from different disciplines (<https://ist.ac.at/graduate-school/phd-program/>).
- The Post Doc Association offers career planning seminars to postdocs (<https://ist.ac.at/research/postdoc-association/>)
- R&D Competences for Industry Programme (<https://www.ffg.at/en/rd-competences-industry>)

This initiative of the Federal Ministry of Science, Research and Economy (BMWF) supports measures in companies (particularly SMEs) for the systematic development and qualification of their research and innovation staff. The programme also aims to promote cooperation between companies and tertiary education and research institutions as well as to enhance the integration of industrially relevant research fields.

There are three programme lines, which are scaled according to their target groups, their R&D competences and duration:

- Expertise increase: Qualification seminars. Short-term; customised training of employees in Austrian companies; focus on SME; enabling access to new technology fields.
- Expertise development: Qualification networks. Medium-term; networks providing customised training for Austrian companies with universities, universities of applied sciences and other educational and research institutions located in Austria; increase innovation skills of companies in future relevant technology.
- Expertise enhancement in applied research: Tertiary level courses. Long-term; customised training networks between companies and universities, universities of applied sciences and other educational and research institutions located in Austria; emphasise industry driven topics at a high scientific level.

Belgium

“Junior Researchers Support Platform” (OJO) funding

Starting in 2011, the Flemish Government allocated a yearly amount of 4 Mio euro to be divided between the five Flemish universities. These means are to be used to support young researchers in term of career guidance, transferable skills, entrepreneurship, intersectoral mobility, etc., and are used in the universities through action of the Doctoral Schools and the Doctoral Training programme.

Ghent University

Ghent University has several programmes and initiatives designed to foster intersectoral mobility:

- Industry Liaison Network (<http://www.ugent.be/techtransfer/en/support-for-academics/industrialiaisonnetwork.htm>)
- Mentoring Programme for postdocs by PhD-graduates from outside the university (<http://www.ugent.be/doctoralschools/en/menta.htm>)

Career Coaching programmes:

- For PhD candidates as part of the doctoral training programme (<http://www.ugent.be/doctoralschools/en/careersupport>)
- For postdocs (<http://www.ugent.be/en/work/career/postdoc-talent-management/phdcareercoaching.htm>)
- Transferable skills programme as part of the doctoral training (<http://www.ugent.be/doctoralschools/en/doctoraltraining/programme/transferableskills.htm>)

Denmark

Industrial PhD project

An Industrial PhD project is a three-year industrially focused PhD project where the student is hired by a company and enrolled in a university at the same time. The company receives a monthly wage subsidy of (currently) DKK 14,500 (approx. €2,000) while the university has its expenses for supervising etc. covered. The PhD student works full time on the project and divides his or her time equally between the company and the university. There are additional subsidies available for project-relevant stays abroad.

A 2011 evaluation of the industrial PhD programme can be summarised as follows: Industrial PhD earn approx. 7-10 percent higher wages than both regular PhDs and university graduates. They are more likely to be found at the top levels of their organisations' hierarchies compared to regular PhDs and more likely to be found in positions requiring high-level specialist knowledge than regular university graduates. Companies which host Industrial PhD projects see on average increasing patenting activity in association with hosting the projects. They are characterised by high growth in gross profit (value creation) and employment.

Germany

External doctoral training

Most PhD candidates can potentially spend their time in the company where they are confronted with practical technical issues that can be solved with the help of research. The doctoral thesis is defended in the university and the degree awarded by the university. This is particularly common in some specific fields of knowledge (e.g., engineering subjects)

Lithuania

Training of high qualification specialists (doctor's degree students) in competition-based doctor's degree studies

The project (programme) “Improvement of training of high qualification specialist for the development of research-intensive economic sub-sectors – NKPDOKT” was implemented during the period 2011-2015 under the implementation measure “Strengthening of capacities of researchers” of

the Operation Programme for Human Resources Development for 2007-2013. The aims of the project (programme):

The demand for specialists in the fields concerned has been growing in view of the rapid development of biotechnologies, material science and nanotechnologies. With a view to ensuring the growth and competitiveness of the national economy, efficiency and international competitiveness of companies, it is of utmost importance to train specialists able to address the most burning issues in breakthrough research areas and apply the knowledge acquired for business purposes.

The project (programme) was implemented together with 17 partners – Lithuanian research and studies institutions. 216 doctoral students participated in the project since its outset. The project activities were allocated a support of more than EUR 6.509.000 of which EUR 4.643.000 were allocated from the EU funds. At the end of 2014, 63 out of 86 doctoral students admitted in the first year of the project implementation successfully graduated from their doctor's degree studies, were prepared to or have defended their doctor's degree theses.

Netherlands

Professional PhD Programme (<http://www.hetpnn.nl/en/ppp/>)

This is an initiative from the PhD Candidates Network of the Netherlands (PNN) to improve the transition of to a career outside of academia. PhDs do paid (part-time) work for 3-6 months at a company alongside their PhD to gain work experience and already build a professional network.

Norway

Post-Crisis Legitimacy of the European Union (PLATO) European Training Network. ARENA Centre for European Studies, University of Oslo

(<http://www.sv.uio.no/arena/english/research/news-and-events/news/2016/phd-network-h2020-plato.html>)

This new MSCA-funded research school (ETN) has inter-sectoral mobility as a key aspect of the network.

Collaboration & Entrepreneurship

Austria

Universities of Applied Sciences (UAS)

UAS are connector between research and innovation, making the link between science and industry. The limitation is that UAS cannot offer self-contained doctoral programmes.

Belgium

Baekeland mandates (<http://www.iwt.be/english/funding/subsidy/BM>)

The aim is to support basic research that – if successful – has clear economic objectives and offers added value to the company involved in the project. Research should be directed towards achieving a doctorate (PhD) diploma and meet the accepted criteria for doctoral research.

Innovation Postdoctoral scholarship (<http://www.iwt.be/subsidies/innovatiemandaten>)

These mandates are targeting postdoctoral researchers that want to valorise their research at a Flemish enterprise or within their own spin-off company. The projects are strategic basic research oriented (with potential of economic valorisation) but are at the time too high risk to be executed with the R&D department of a company. As such, there is still strong input from the academic side, but the valorisation aspect is the responsibility of the industrial partner.

Denmark

20 percent professorships at Aalborg University

Aalborg University is strengthening strategic partnerships with enterprises and organisations through a scheme of part-time professorships, where researchers are employed both at the university and at a company. High-profile business profiles from the likes of B&O and the Nokia Siemens Network have been employed as contract researchers through the scheme, where a set amount of their working hours, e.g. 20 percent, are spent at the university. The model has contributed to attract company divisions to Aalborg and opened up the opportunities of involving students in the collaboration with the specific enterprises.

Ireland

Directory of Innovation Supports, Research Centres and Technology Centres 2016

(<https://www.djei.ie/en/Publications/Directory-of-Innovation-Supports-Research-Centres-and-Technology-Centres-2016.html>)

The Directory sets out the key financial supports for innovation available to companies from the State, as well as information on the key national research centres of scale.

Serbia

Strategic basic research scholarships ([http://www.fwo.be/nl/mandaten-financiering/predoctorale-mandaten/doctorsbeurs-strategisch-basisonderzoek-\(sb\)/](http://www.fwo.be/nl/mandaten-financiering/predoctorale-mandaten/doctorsbeurs-strategisch-basisonderzoek-(sb)/))

During this scholarship, focused on research that could lead in the long term and in case of success, to economic valorisation, PhD students are allowed to spend up to half of their PhD duration at a Flemish enterprise.

Israel

Incubating system

The incubating system is rather developed with over 25 governmental funded incubators that in many cases support the career development of young researchers. Young researchers can also leverage their academic achievement via the establishment of new start-ups. Newly established start-ups get 50% support for R&D projects. Newly established start-ups led by co-founders from minority groups will receive 85% support. In the two cases, the process of getting a project funded takes around 12-18 weeks and most of the applicants can prepare and submit a proposal without the assistance of consultants.

Malta

FUSION funding programme (http://www.mcst.gov.mt/R_A_I/Fusion.aspx)

National R&I Funding Programme Fusion requires project consortia to be composed of both academia and industry partners.

NORWAY

The FORNY Student entrepreneurship

(<http://www.forskningsradet.no/no/Utlysning/FORNY2020/1049265096545>)

The FORNY Student entrepreneurship scheme aims at increasing the number of successful start-up companies based on ideas from students in HEIs and strengthen the culture of entrepreneurship among students. The target group is master students in the final phase of their study and candidates who have recently completed their degrees. The maximum amount is one million NOK, for a period of up to 12 months, and may cover salary as well as development costs.

Awareness & Recognition

Germany

Universities of Applied Sciences (“Fachhochschulen”)

Those intending a professorship with a “Fachhochschule” must be able to prove that they have work experience of at least 5 years, 3 of which outside university. So this shows the strong link between “Fachhochschulen” and industry.

Ireland

Irish Universities’ PhD Graduate Skills Statement (<http://www.iua.ie/publication/view/iua-graduate-skills-statement-brochure-2015/>)

In 2015, the Irish Universities Association (IUA) developed a PHD Graduate Skills Statement in collaboration with stakeholders. The Statement aims to identify the skills necessary to develop and manage PHD Graduates’ careers across a broad range of employment sectors, including academia.

Enterprise Ireland, Innovation Showcase. The national Innovation Showcase is a networking opportunity for companies in Ireland that want to learn more about collaborative research, development and innovation. This is an annual gathering, in one location, of all State-supported research centres and technology centres of scale. Representatives from each of the 38 centres are joined by officials from State agencies and Higher Education Institutes that can facilitate and fund innovation in companies.

Netherlands

Industrial Partnership Programme (IPP) of NWO/FOM/STW

(http://www.fom.nl/live/english/research/research_grants/ipp/ipp.pag)

An IPP is a funding instrument to build a bridge between fundamental research and application-oriented research from industry. Academic knowledge is then linked to industrial ambitions by carrying out high-quality research in collaboration with companies. In an IPP, academic researchers come into close contact with company researchers in areas with good innovation potential and challenging scientific questions. This joint approach can lead to ground-breaking innovations and is a best practice of tailor-made innovative intersectoral research in the Netherlands.

Norway

Norwegian Professor II scheme

The Norwegian Professor II is a combined/part-time (20 %+) position scheme is an add-on and well-established in Norway. Full professor academic merit is required, and typically employees in industry, hospitals, research institute etc. may have a 20 %+ position in a university as an add-on. The position can also be in another university, same or different field, across institutions, sector and countries. The position is effective for knowledge transfer, networking and research collaboration and can be attractive for frontline researchers who want to collaborate, but don’t want to leave their main position.

Norwegian Association for Higher Education Institutions (UHR) career policy for academic personnel (<http://www.uhr.no/ressurser/temasider/karrierepolitikk>)

UHR has launched a strategy for a holistic career policy for academic personnel at Norwegian HEIs. Here much emphasis is laid on aligning the motivation for incoming PhDs and Postdocs to regard alternative career paths as attractive as well, given that many of the Postdocs and most of the PhDs

will work outside academia after completion. STEM faculties in Norway are currently considering a broader set of competences in appointments and appraisals.

Serbia

Ministry for Education, Science and Technological Development. Approaching research results and industry.

Serbian Ministry for Education, Science and Technological Development recognizes patents, and innovative technical solutions as scientific results (not only papers). It also finances the presentation of the research project's results at fairs and other events. This is perfect opportunity to connect researchers with interested industry.

Annex 2: Mandate

ERA-SGHRM WG on intersectoral mobility of researchers, conditions and competences

Background

The aims of the Innovation Union demand more researchers, particularly in the business sector. A main challenge is therefore to building of research competence in the business sector, but also in the public sector. It is important to stimulate the exchange and cross fertilisation of knowledge between sectors. To achieve this goal, Europe is investing in research, increasing the number of PhD candidates and in many countries also post-doctoral positions in academia.

Although only a small share (varying by country) of PhD candidates and post docs may pursue their career in the HEI sector, many of them have high expectations to do so. We may note a growing concern from academic staff in fixed term positions, and also from other stakeholders, that their prospects for the future is unsecure because of the lack of tenured positions within the HEI system.

On this background there is a political challenge to bridge the gap between academia and the business- and public sector. There is a need that the research candidates, and also other academic staff working in the HEIs, see the opportunity to pursue careers outside academia. The real bottleneck in academic career progression is the transition from dependent to independent researcher (R2 to R3). As a part of this, it is also important that they have the opportunity to return from the private sector back to academia at a later stage, in another country if they wish.

Objective

The objective is therefore to identify barriers for mobility of researchers across sectors, and to discuss how they may be overcome. One significant barrier is transferable skills, which are often requested from industry and business, but not a regular part of training of PhDs and post docs. The advent of Open Science and Open Innovation is highly relevant. Both advocate the advancement of knowledge and innovation through a collaborative approach.

Outcome

The SGHRM has previously conducted work on Innovative doctoral training, skills development and careers for researchers. On the basis of analyses and recommendations from previous SGHRM working groups, other EU/commission groups, the OECD and other stakeholders, the working group will explore the following issues:

- What are the main obstacles for mobility of academic staff in HEIs to other sectors of research?
- What may be done to overcome these obstacles, and what could be the role of the European Commission, national research councils, research institutions (HEIs) and potential employers in the private and public sectors?

Working method and timeframe

The working group should, by arranging a dialogue with relevant stakeholders, investigate what factors may facilitate the mobility of researchers between academia and other sectors, and also what factors may facilitate the mobility between academia and other sectors, what competences and experiences that are important for being mobile, recognising also the importance of the student level. The WG will meet on the 20th of January 2016 and in June 2016 (date tbc).

Members and stakeholders profile – WG composition

The membership of the Working Group should be drawn from the SGHRM and their expert nominees. The WG will be chaired by Norway and at least be composed of two other SGHRM members, DG EAC and DG EMPL and key stakeholder organisations, including ERA stakeholders,

industry networks and representative bodies especially for SME's and startups. The WG is composed of maximum 15 people, on a first come first serve basis.

Relevant literature to be consulted by the WG as background readings

The European Charter for researchers and also **The Code of Conduct for the Recruitment of Researchers**, launched in 2005, consist of general principles as for working conditions, training, career development and requirements that should be followed by employers and/or funders when appointing or recruiting researchers. The C&C constitutes a basis for the development of researchers' careers and mobility.

ERA SGHRM Working Group on Skills "Professional Development of Researchers - Provisions for the Future" 31st May 2012. The WG noted that professional development comes in many forms and is not confined to well-defined courses and professional accreditations. At senior level, it may come through collaborations with academics in other countries on supervision, for example. There are skills acquired through dedicated Teaching & Learning courses (including classroom, workshop and online). There are also skills acquired through on the job experience or learning by doing (e.g. teaching skills through running tutorials, supervising laboratory sessions and lecturing).

Skills training is mainly set up by individual institutions although certain types of skills courses are offered by many institutions and may therefore be considered available on a national basis.

There is no single skills policy for all four-researcher categories. One can clearly identify strategies for PhD candidates (R1) as a distinct grouping from the other three. The R2 has some overlap with R1 in terms of skills but R3 and R4 are completely separate. The existing opportunities primarily focus on the academic career (e.g. teaching, mentoring and securing research funding).

There is a transition point at the end of R1 with a sharp decrease in professional development provision. From Recognised Researcher (R2) through Established Researcher (R3) to Leading Researcher (R4), training is dominated by academic career skills. The real bottleneck in academic career progression is the transition from dependent to independent researcher (R2 to R3).

Recommendation 1

There needs to be a greater focus on providing opportunities for researchers to pursue multiple career paths supported by professional development provision. While there is common recognition among policy makers, funders and universities that professional development provision is an integral part of career development:

- The European Commission should encourage that all researchers funded under its various modalities have access to professional development provision
- National funding agencies should collaborate with universities to ensure that all researchers have access to professional development provision
- Researchers should take responsibility for their own career development recognising the limited opportunities in academia and maximise their multiple career opportunities in the wider economy through professional development provision.

Recommendation 2

There is significant variation in professional development provision for different researcher categories and domains. There should be close cooperation between all stakeholders to ensure that professional development provision is appropriate for each domain and category. The European Commission should undertake a broad study to identify the relevant professional development provision across all researcher categories (R1-R4).

Recommendation 3

Researchers enter a wide range of careers in addition to research in academia. A key part of the development of the knowledge economy is to introduce research in a non-research environment and benefit from the ability of researchers to analyse complex problems. As a consequence training researchers just to be researchers in academia is no longer appropriate. Therefore the academic paradigm must change recognizing in full that the majority of researchers trained will pursue careers outside the university and academics need to be more engaged in knowledge exchange and innovation.

- Universities should ensure that there is a balanced professional development provision for researchers at all levels to optimise their employment opportunities
- Universities should explore opportunities for researchers to experience placements in other sectors.

Report of the 2014 SGHRM WG on Professional development of Researchers provides an overview of the situation regarding the existence and use of professional development framework for researchers in HEIs and PROs based on a questionnaire to stakeholders. The report concludes that few frameworks exist, that many countries do not have or utilise any type of framework. The report concludes that the European Commission should develop a framework for professional development of researchers that could be used by different stakeholder groups.

More 2: Report on the support for continued data collection and analysis concerning mobility patterns and career paths of researchers. The aim of the project was to “provide internationally comparable data, indicators and analysis in order to support further evidence-based policy development on the research profession at European and national level.” As part of the study, two large-scale surveys and two case studies were carried out between November 2011 and May 2013. The final report provides a comparative, policy-focused analysis concerning mobility patterns and career paths of researchers.

European Science Foundation: Career Tracking of Doctorate Holders assesses the careers of doctorate holders funded by the research funding organisations participating in the project. The report analyses the overall working condition of young researchers based on questionnaires, to which a total 1100 persons were invited to respond, and 499 responded. On the basis of the responses, the report concludes that "Tenure or the increasing lack of it is a major issue causing instability at structural, professional and personal levels", and that "those on permanent contracts were more productive than those on temporary contracts in key areas"³³. Further that "The preference of doctorate holders is usually a career in academia despite the challenge involved in securing tenured positions", and finally that "there is a strong geographical movement from the Southern or peripheral countries to the Northern European countries."

"Supporting Early Career Researchers in Higher Education in Europe: The Role of Employers and Trade Unions", is a report on a joint project between the Universities and Colleges Employers Association (UCEA) in the UK, the European Federation of Education Employers (EFEE) and the European Trade Union Committee for Education (ETUCE). The report is based on a literature review, six country case studies (Cyprus, Finland, Germany, Italy, Romania, UK) and feedback from a conference held in London on 21 November 2014. The report concludes with a Joint Declaration on Supporting Early Career Researchers which the organisations hope will encourage practical national or local measures and reinvigorate the principals set out in the Charter and Code for Researchers.

Transferable Skills Training for Researchers: Supporting Career Development and Research OECD publishing, 2012: The report is based on a survey to governments and research institutions in OECD countries and associated countries. Around one third of responding governments had strategies on transferable skills, compared to two thirds of universities and three quarters of research

³³ Is this really so, or is it because tenure staff is older and more experienced?

institutions. Training mostly targeted PhD candidate, post-docs and early-stage researchers, with practical work experience an important complement to training programmes. The report concludes that governments could consider the following:

- Boosting the monitoring and evaluation of transferable skills training
- Explore the way of facilitating dialogue between academia and industry on training needs and opportunities
- Encourage the provision of industrial PhD options as a complement to formal training courses in universities
- How their general policies on collaborative research can be leverage to support transferable skills training opportunities for researchers.

Skills for Innovation and Research OECD publishing 2011: The report seeks to provide an overview of the literature, the data and the evidence in order to clarify to some extent the links between skills and innovation. Though many skills may be needed, individuals, firms and industries may draw on different skill mixes at different times, depending on the stage of innovation, the type of innovation and the industry structure. Many skills will be relevant across the innovation spectrum. While the business and enterprise sector employs more than half of the researcher population within the OECD area, doctorate holders are mostly employed in the public sector and in higher education institutions. The report states that the most important policy approach may involve the creation of an environment that enables individuals to choose and acquire appropriate skills and supports the optimal use of these skills at work.

OECD Mobility trends 2015 - Which factors influence the international mobility of research scientists? : This paper investigates the factors that influence the international mobility of research scientists using a new measure of mobility derived from changes in affiliations reported by publishing scientists in a major global index of scholarly publications over the period 1996-2011. Scientific collaboration appears to be a major factor associated with the mobility of scientists. The analysis shows that the mobility of scientists particularly relies on flows of tertiary-level students in the opposite direction, from destination to origin country. This provides strong evidence that brain circulation is a complex and multi-directional phenomenon. The mobility of scientists is generally better described by commensurate knowledge flows in both directions, rather than one dominating the other. The analysis also shows that mobility can be positively influenced by convergence in economic conditions and resources dedicated to R&D, as well as reduced visa-related restrictions.

Annex 3: Members of the working group

Jana Weidemann	- (NO) Ministry of Education and Research (chair)
Dolores Cahill	- (IE) University College Dublin
Ana Mafalda Dourado	- (PT) National funding agency for science, R&T (FCT)
Xavier Eekhout	- (ES) Foundation of Science and Technology (FECYT)
Sébastien Huber	- (EU) Science Europe
Patrizia Jankovic	- (AT) Federal Min. of Science, Research and Economy (BMWFW)
Ulrike Kohl	- (LUX) National Research Fund
Gareth O'Neill	- (NL) Leiden University, PhD Network of the Netherlands (PNN)
Ágnes Reiter	- (HU) Nat. Research, Development and Innovation Office (NRDI)
David Shem Tov	- (ISL) Technion, Israel Institute of Technology
Karen Vandavelde	- (BE) Department of Research Affairs, Ghent University

Annex 4: Survey Questionnaire

SGHRM 2016 Survey on Intersectoral Mobility of Researchers

Definition: “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. For this report, we exclude general technology transfer policies but focus on the human resources aspect in building these bridges: physical mobility between sectors, the transferability of skills, HR-regulations, and facilities for individual researchers.”

Taken into account the above definition, please answer the following questions:

1. State of play

- Is increased intersectoral mobility of researchers an important political issue in your country? Please refer to major policies or recent reforms.
- Are there any national regional/sectoral figures available about researchers’ moves from academia to other sectors, for ex. after the doctorate, the postdoctorate, or later (for ex. career tracking studies) and could you eventually refer some of their most important findings? Are there any figures on differences in intersectoral mobility between men and women? Ethnic groups within the country?

2. Competences and skills

Is there any study, data or official statistics available in your country concerning one of the following issues:

- Competences/skills needed for positions outside academia after the PhD/Postdoc period (scientific/non-scientific skills)?
- Recruitment strategies of the most research intensive sectors which employ doctorate holders, postdocs or researchers from HEIs?
- Satisfaction by employers with researchers’ competences?
- Interest of researchers in HEIs (at different levels of their career, but particularly PhD or postdoc level) to move across sectors? Are there any difference in interest between men and women?
- Successful networking activities facilitating the mobility between sectors?
- Evidence as for whether professional experience from the private sector is an advantage or a disadvantage for employment in academia?

3. Factors hindering intersectoral mobility and good practice or policy challenges to overcome them (answers to be provided in the attached form)

Based on the attached list of barriers, good practices and policy messages developed by the working group:

- Mark the 6-10 most important barriers listed in annex or add new factors which in your opinion are most important.
- Describe some good/best practice examples you are aware of (considering also the student level)
- Policy message: Challenges/recommendations for institutions, national authorities and the EU.

REONDENT'S NAME AND FUNCTION:
INSTITUTION:
COUNTRY:

See examples of answers in yellow cells

BARRIERS 		GOOD/BEST PRACTICES 	POLICY MESSAGE
	<p>Please mark 6-10 of the barriers:</p> <p>X: Important</p> <p>XX: Very important</p>	<p><i>Indicate whether national, institutional or EU level</i></p>	<p><i>Challenges at national, institutional or EU levels</i></p>
Rules & structures			

. Regulations / legal framework / administrative barriers	X	National: We have a programme (Professional PhD Program) in the Netherlands where PhDs do paid (part-time) work for 3-6 months at a company alongside their PhD to gain work experience and already build a professional network.	National: However, this can involve adjusting and extending the PhD's contract with the university and this sometimes leads to problems with the university. Support for this programme from government/labour agreements would be very helpful. All levels: Evaluate where regulatory frameworks pose obstacles EU level: More collaboration needed between DG RTD, EAC, Grow & Employment (involvement in initiatives, topics, working groups)
. Additional barriers or comments:			

FUNDING			
BARRIERS		GOOD/BEST PRACTICES	POLICY MESSAGE
. Overall lack of funding			. All levels: Include more <i>intersectoral mobility</i> in funding programmes

<p>. Funding for university/industry for tailor-made collaboration and partnership is not widespread</p>			
<p>. Complexity of grant applications is particularly deterrent for SMEs</p>			
<p>. Overall lack of R&D development in certain countries / regions</p>			
<p>. MSCA: combination of international & intersectoral mobility is complicated</p>			
<p>. Additional barriers or comments: </p>			

CAREER DEVELOPMENT – RESEARCHERS PERSPECTIVE			
BARRIERS		GOOD/BEST PRACTICES	POLICY MESSAGE
. Researchers consider academia the best place to work			
. Career opportunities are unknown			
. Difficult to ‘return’ to academia after substantial career in business			
. Lack of appreciation for innovation activities in academic career progress			
. Tenure hampers broader perspective in research practice (innovation)			
. Gender role stereotypes in assessing who is best suited for intersectoral mobility			

. Additional barriers or comments:			
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COMPETENCES/SKILLS – INSTITUTIONAL PERSPECTIVE			
BARRIERS		GOOD/BEST PRACTICES	POLICY MESSAGE
. Few opportunities for transferable skills development through practice (learning by doing) (for students and researchers)			
. Few opportunities for transferable skills training (courses) (for students and researchers)			. EU level: Put pressure on governments to provide skills training & career training
. Academic staff not equipped to help/stimulate mobility and transferable skills development			
. Few incentives for risk-taking entrepreneurship			

. "Applied" knowledge from industry not recognised in academia			
. Lack of broader/transferable competencies hampers mobility to industry			
. Few opportunities for mentoring through university-industry partnership			
. Career development opportunities are scarce			
. University-industry collaboration/partnership is less developed			
. Lack of tradition for recruiting academics with non-traditional career paths to university			
. Lack of career management opportunities towards a very transient PhD-community			

. Additional barriers or comments:			
A CLASH OF CULTURES, AS SEEN FROM COMPANIES AND INSTITUTIONS			
BARRIERS		GOOD/BEST PRACTICES	POLICY MESSAGE
. Lack of awareness amongst other sectors of researchers' potential contribution			. All levels: More importance to intersectoral mobility in policy documents, monitoring & indicators; Example: Awareness campaign, storytelling, success factors
. Differences in performance criteria (publications vs applications), value system (excellent vs useful, academic freedom vs market expectations) & timing (slow vs fast development of research/innovation)			
. Different traditions regarding intellectual property (ownership, publication vs protection)			

. Open science is not valued in industry			
. Competing interests & benefits			
. Lack of cross-sectoral collaboration limits “physical” mobility of researchers			
. Additional barriers or comments:			

A CLASH OF CULTURES, AS SEEN FROM RESEARCHERS

A CLASH OF CULTURES, AS SEEN FROM RESEARCHERS			
BARRIERS		GOOD/BEST PRACTICES	POLICY MESSAGE
. Lack of awareness, lack of information on opportunities in other sectors			
. Lack of preparation for non-academic careers at universities			

. Reduced possibility of work-life balance for men and women			
. Additional barriers or comments:			

Annex 5: Responding countries

Country	Survey questions	Form
Austria	X	X
Belgium FL	X	X
Belgium	X	X
Denmark	X	
Estonia	X	X
Finland	X	X
Germany	X	
Greece	X	X
Ireland	X	X
Israel		X
Italy	X	X
Latvia	X	
Lithuania		(X)
Luxembourg	X	X
Malta	X	X
Netherlands	X	X
Norway	X	X
Serbia	X	X
Slovenia	X	X
Spain	X	X
Sweden	X	X
Switzerland	X	X

Annex 6: Final Ranking & Themes

Building upon previous work on intersectoral mobility, the WG identified a wide range of 32 barriers to intersectoral mobility, which were grouped under 6 headings: Rules and Structures; Funding; Career Development - Researchers' Perspective; Competences/Skills - Institutional Perspective; A Clash of Cultures, as Seen from Companies and Institutions; A Clash of Cultures, as Seen from Researchers. Each SGHRM member state was sent a short survey inquiring about current policy, research on competences/skills, and important barriers/solutions for intersectoral mobility. The member states were asked to rank the 6-10 most important barriers identified by the WG in a separate form by placing X for 'important' or XX for 'very important' beside the relevant barrier.³⁴ The form also asked for any good practices for marked barriers and suggestions for policy messages at an institutional/national/EU level. Additional barriers or comments were also asked to be noted.

The barriers were ranked by adding the total number of Xs for a given barrier, whereby X 'important' counted as 1 and XX 'very important' counted double as 2. The barriers were then divided into three score-based categories: Score >10; Score 7-9; Score <8 as in Table 1³⁵

Table 1: Ranking of Barriers to Intersectoral Mobility from Respondents

Barriers with Score >10		# Xs	# XXs	Quotes	Score
(B1)	Overall lack of R&D development in certain countries/regions	2	6	8	14
(B2a)	Researchers consider academia the best place to work	10	1	11	12
(B2b)	Difficult to 'return' to academia after substantial career in business	8	2	10	12
(B3a)	Regulations / legal framework / administrative barriers	9	1	10	11
(B3b)	Few opportunities for transferable skills development through practice (learning by doing) (for students and researchers)	5	3	8	11
(B4)	Academic staff are not equipped to help/stimulate mobility and transferable skills development	6	2	8	10
Barriers with Score 7-9		# Xs	# XXs	Quotes	Score
(B5a)	Overall lack of funding	3	3	6	9
(B5b)	Funding for university/industry for tailor-made collaboration and partnership is not widespread	7	1	8	9
(B5c)	Lack of appreciation for innovation activities in academic career progress	3	3	6	9
(B5d)	Few opportunities for transferable skills training (courses) (for students and researchers)	3	3	6	9
(B5e)	Few incentives for risk-taking entrepreneurship	7	1	8	9

³⁴17 form respondents = AT, BE, CH, EE, EL, ES, FI, IE, IL, IT, LU, MT, NL, NO, RS, SE, SI.

³⁵Scores and boundaries = 14 12 12 11 11 10 | 9 9 9 9 9 9 8 7 7 7 | 6 6 5 5 5 5 5 4 3 1 1 1 0.

(B5f)	'Applied' knowledge from industry not recognised in academia	3	3	6	9
(B5g)	Lack of awareness amongst other sectors of researchers' potential contribution	5	2	7	9
(B5h)	Differences in performance criteria, value system & timing	7	1	8	9
(B6)	Lack of tradition for recruiting academics with non-traditional career paths to university	4	2	6	8
(B7a)	Lack of cross-sectoral collaboration limits 'physical' mobility of researchers	1	3	4	7
(B7b)	Lack of awareness, lack of information on opportunities in other sectors	3	2	5	7
(B7c)	Lack of preparation for non-academic careers in universities	3	2	5	7
Barriers with Score <7		# Xs	# XXs	Quotes	Score
(B8a)	Few opportunities for mentoring through university-industry partnership	4	1	5	6
(B8b)	University-industry collaboration/partnership is less developed	2	2	4	6
(B9a)	Complexity of grant applications is particularly deterrent for SMEs	3	1	4	5
(B9b)	MSCA: combination of international & intersectoral mobility is complicated	3	1	4	5
(B9c)	Career opportunities are unknown	5	0	5	5
(B9d)	Lack of broader/transferable competencies hampers mobility to industry	1	2	3	5
(B9e)	Career development opportunities are scarce	1	2	3	5
(B9f)	Different traditions regarding intellectual property	3	1	4	5
(B10)	Competing interests & benefits	2	1	3	4
(B11)	Open science is not valued in industry	1	1	2	3
(B12a)	Tenure hampers broader perspective in research practice (innovation)	1	0	1	1
(B12b)	Gender role stereotypes in assessing who is best suited for intersectoral mobility	1	0	1	1
(B12c)	Reduced possibility of work-life balance for men and women	1	0	1	1
(B13)	Lack of career management opportunities towards a very transient PhD community	0	0	0	0

On the basis of the most important barriers from the first category (Score >10), and taking the barriers

from the second (Score 7-9) and third (Score <7) categories into account, five broad thematically related themes were proposed to capture the main barriers and to structure the report: (1) Rules and Regulations (2) Funding & Support (3) Training & Development (4) Collaboration & Entrepreneurship (5) Awareness & Recognition. These themes capture the barriers from the first two categories, whereby overlap between barriers is possible as in Table 2.³⁶

Table 2: Most Important Barriers to Intersectoral Mobility per Theme

(1)	Rules & Regulations	(B3a) Regulations / legal framework / administrative barriers (12)
(2)	Funding & Support	(B1) Overall lack of R&D development in certain countries/regions (14) (B5a) Overall lack of funding (9) (B5b) Funding for university/industry for tailor-made collaboration and partnership is not widespread (9)
(3)	Training & Development	(B3b) Few opportunities for transferable skills development through practice (learning by doing) (for students and researchers) (11) (B4) Academic staff are not equipped to help/stimulate mobility and transferable skills development (10) (B5d) Few opportunities for transferable skills training (courses) (for students and researchers) (9) (B7c) Lack of preparation for non-academic careers in universities (7)
(4)	Collaboration & Entrepreneurship	(B5e) Few incentives for risk-taking entrepreneurship (9) (B7a) Lack of cross-sectoral collaboration limits 'physical' mobility of researchers (7)
(5)	Awareness & Recognition	(B2a) Researchers consider academia the best place to work (12) (B2b) Difficult to 'return' to academia after substantial career in business (12) (B5c) Lack of appreciation for innovation activities in academic career progress (9) (B5f) 'Applied' knowledge from industry not recognised in academia (9) (B5g) Lack of awareness amongst other sectors of researchers' potential contribution (9) (B5h) Differences in performance criteria, value system & timing (9) (B6) Lack of tradition for recruiting academics with non-traditional career paths to university (8) (B7b) Lack of awareness, lack of information on opportunities in other sectors (7)

³⁶In Table 2: The colours blue/red show Score >10/Score 7-9.