European Commission

Study on Fostering Industrial Talents in Research at European Level

Final Report - Annexes

January – 2018

Research and Innovation

EN

Study on Fostering Industrial Talents in Research at European Level - Final Report Annexes

European Commission
Directorate-General for Research and Innovation
Directorate B — Open Innovation and Open Science
Unit B.2 — Open Science and ERA policy
Contact: Fabienne Gautier
E-mail: Fabienne.Gautier@ec.europa.eu
RTD-PUBLICATIONS@ec.europa.eu
European Commission
B-1049 Brussels
Manuscript completed in March 2018

Luxembourg: Publications Office of the European Union, 2018

PDF ISBN 978-92-79-81882-0 doi: 10.2777/076819 KI-01-18-304-EN-N

EUROPEAN COMMISSION

Study on Fostering Industrial Talents in Research at European Level

Final Report - Annexes

Written by:

Lead author:
Mark Whittle, Centre for Strategy & Evaluation Services (CSES)

Core team members:
Mike Coyne, Centre for Strategy & Evaluation Services (CSES)
Paweł Głodek, Office for Economic Policy and Regional Development Ltd. (EPRD)
Andreia Monteiro, INOVA+
Małgorzata Olesiak, Office for Economic Policy and Regional Development Ltd. (EPRD)
Rafał Stawiarz, Office for Economic Policy and Regional Development Ltd. (EPRD)
Stephen Webber, Office for Economic Policy and Regional Development Ltd. (EPRD)
Karen Vandevelde, Office for Economic Policy and Regional Development Ltd. (EPRD)

Directorate-General for Research and Innovation

2018

Contents

A. LIST OF INTERVIEWS

- Excel file (not published)

B. BIBLIOGRAPHY

Country	Title, author(s), year
Policy studies/reports and impact evaluation reports	
Austria	FEMtech Programme Evaluation, Executive Summary, Gabriele Gerhardter, Nicole Warthun, Andrea Löther, Markus Gabriel, Nina Steinweg, Stephan Kupsa, Erich Domke, Martina Süssmayer, May 2011
Belgium	CAREERS OF DOCTORATE HOLDERS SURVEY 2010 - R&D and innovation in Belgium - Research Series, Karl Boosten, Karen Vandevelde, Hanne Derycke, Adriana te Kaat and Ronan Van Rossem - R&D and innovation in Belgium, Research Series, 2014
Belgium	Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility, Iain Cameron, Research Councils UK, Hugo Horta, Technical University of Lisbon, Karen Vandevelde, Ghent University, 2014
Belgium	Studie naar Innovatiegerichtheid en arbeidsmarktpositie van IWT doctorandi, Sarah Botterman (GFK Belgium), for the IWT, 2014
Bulgaria	Innovation Strategy for Smart Specialisation of the Republic of Bulgaria 2014-2020, 2015
Bulgaria	National strategy for development of scientific research in the Republic of Bulgaria 2017 – 2030. Better science for better Bulgaria
Bulgaria	RIO Country Report 2016: Bulgaria, Research and Innovation Observatory country reports series, Todorova, A., Slavcheva, M., 2016
Croatia	RIO Country Report 2016: Croatia, D. Račić, J. Švarc, H. Hristov, 2016
Czech Republic	Final Evaluation Report on the Development, Piloting and Implementation of a Knowledge Transfer Programme for the Czech Republic, Keith Lawrence, KL evaluation, 2012
Czech Republic	Final report on Knowledge Transfer Partnership pilot scheme, Ministry of Industry and Trade, 2016
Czech Republic	Mobility of Researchers (Mobilita výzkumných pracovníků; non-published study in Czech), National Training Fund, 2012
Czech Republic	Overview of approaches to HR development for R&D and innovation in Czech Republic and examples from abroad (Přehled přístupů k rozvojli LZ pro VaVaI v ČR a příklady ze zahraničí; in Czech, non published report), 2012
Czech Republic	Phenomenon Mobility (Fenomén Mobilita; study in Czech), Regional Contact Organisations of ERA, Czech Republic; Ing. Radka Pittnerová, Mgr. Hana Šprtová, Ing. Jitka Vepřková, Jana Kopecká, Doc. Ing. Petra Rydvalová, Ph.D., 2013
Denmark	The Quality and Relevance of the Danish PhD Programme - Compilation of main

	results, 2017
Estonia	Researcher mobility in Estonia and factors that influence mobility, Rein Murakas (Editor), Indrek Soidla, Kairi Kasearu, Irja Toots, Andu Rämmer, Anu Lepik, Signe Reinomägi, Eve Telpt, Hella Suvi, 2007
France	French-American Research Exchange Programs, Office for Science & Technology, Embassy of France in the United States, 2012
France	Soutenir la mobilité des chercheurs - Les Partenariats Hubert Curien, Campus France, 2015
Germany	RIO Report, European Commission, Sofka, W, Sprutacz, M, 2016
Hungary	Evaluation of programmes targeting higher education – Executive summary of the evaluation report, HETFA-REVITA, 2013
Hungary	Investment in the Future, Prof. Dr. Zoltán Cséfalvay, 2013
Hungary	Peer review of the Hungarian Research and Innovation System- Horizon 2020 Policy Support Facility, Annamaria Nemeth, Marnix SURGEON, Román ARJONA, 2016
Hungary	Researchers' Report 2014 Country Profile: Hungary, Deloitte for the European Commission, 2014
Hungary	Status Report on Enterprise RDI 2012, National Research, Development and Innovation Office, 2013
Latvia	Capacity of Latvian scientific institutions and the need for membership in ESFRI European Research insfrastructure. Assessment and recommendations, Ministry of Education and Science, 2012
Latvia	Development of Science and Technology in Latvia, Ministry of Education and Science, 2011
Latvia	Expertise Report on Ministry's of Education and Science Performance Indicators in Education, Dynamic University, 2012
Latvia	Guidelines for Science, Technology Development and Innovation 2014-2020, Ministry of Education and Science, 2013
Latvia	Higher Education Financing in Latvia, World Bank Reimbursable Advisory Service on Higher Education Financing in Latvia, 2014
Latvia	Innovation System Review and Research Assessment Exercise: Final Report, Technopolis group, 2014
Lithuania	RIO COUNTRY REPORT 2015: Lithuania, Agnė Paliokaitė, Pijus Krūminas, Blagoy Stamenov, 2016
Lithuania	RIO COUNTRY REPORT 2016: Lithuania, Paliokaitė, A, González Verdesoto, E, 2017
Poland	Cooperation between science and business, Polish Agency for Enterprise

	Development, 2013
Poland	Higher Education and Science Development Programme for 2015-2030, Ministry of Science and Higher Education, 2015
Poland	Mobility of young Polish researchers, CASE, 2008
Poland	Mobility of scientists in Poland, Ministry of Science and Higher Education, 2007
Poland	Scientist in business, Poznań City, 2012
Romania	National Plan for Research, Development and Innovation 2007-2013, Government of Romania, 2007
Romania	National Plan for Research, Development and Innovation 2014-2020, Government of Romania, 2014
Romania	National Strategy for Competitiveness 2015-2020, Government of Romania, 2015
Romania	National Strategy for Research, Development and Innovation 2007-2013, Government of Romania, 2006
Romania	National Strategy for Research, Development and Innovation 2014-2020, Government of Romania, 2014
Romania	Operational Programme Competitiveness 2014-2020, Government of Romania, 2014
Romania	RIO Country Report 2014: Romania, Radu Gheorghiu, 2015
Romania	RIO Country Report 2015: Romania, Radu Gheorghiu, Liviu Andreescu, Jana Zifciakova, 2016
Romania	RIO Country Report 2016: Romania, Mariana Chioncel, Jana Zifciakova, 2017
Romania	Sectoral Operational Programme Raising Economic Competitiveness, Government of Romania, 2007
Romania	Yearly implementation report of the Sectoral Operational Programme Raising Economic Competitiveness, 2014
Slovenia	RIO Country Report 2016: Slovenia, M. Bučar, E. Gonzalez Verdesoto, 2016
Sweden	First Evaluation of the VINNOVA excellence centres, Douglas Reeve et al., 2007
United Kingdom	The Exchange of Early Career Researchers between Universities and Businesses in the UK. A report to Research Councils UK, Rosa Fernandez with Inga Sileryte, 2015
United Kingdom	Mobility of scientists and the development of international, interdisciplinary and intersectoral networks, Debbie Millard, Bradford University School of Management
United Kingdom	UK National Action Plan. On researcher mobility and careers within the European Research Area, Department for Business Innovation & Skills, 2009

Europe	Analysis of Researchers' Mobility in the Context of the European Research Area, author Dr. Annamária Inzelt, Supporting Expert, Dr. Annamária Inzelt, Supporting Expert, 2010
Europe	Annual Report on European SMEs 2014/2015: SMEs start hiring again. SME Performance Review 2014/2015, Final Report, Patrice Muller et al., November 2015
Europe	Communication 'A Reinforced European Research Area Partnership for Excellence and Growth', 2012
Europe	Comparative Benchmarking of European and US Research Collaboration and Researcher Mobility, Science Europe and Elsevier's SciVal Analytics, 2013
Europe	Deliverable 9.1 First report about information of the existing research mobility initiatives, Cristobal Cobo, Tim Davies, Tom King (OXF), 2012
Europe	Feasibility Study on Researcher Mobility and Innovation, Dr Daniel Schiller for the Commission of Experts for Research and Innovation – EFI, 2013
Europe	Intersectoral mobility and knowledge transfer. Preliminary evidence of the impact of intersectoral mobility policy instruments, EU Joint Research Centre. Hristov, Milena Slavcheva, Koen Jonkers and Katarzyna Szkuta, 2016
Europe	Intersectoral Mobility, Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility, Karen Vandevelde for the European Commission, Brussels, March 26, 2014.
Europe	Intersectoral Mobility Schemes in Science Europe Member Organisations, Science Europe, 2016
Europe	Literature review of employers' needs in enhancing intersectoral mobility, EURAXESS, 2016
Europe	Literature review of Institutional Practice in Promoting the Inter-sectoral Mobility of Researchers, EURAXESS, 2016
Europe	Literature review of researchers' views and experiences of intersectoral mobility, EURAXESS, 2016
Europe	MANUNET II - Impact assessment, 2016
Europe	Mapping the Population, Careers, Mobilities and Impacts of Advanced Degree Graduates in the Social Sciences and Humanities. Policy Report 9. Intersectoral mobility of Social Science and Humanities PhD graduates in Europe, University of Salford, 2014
Europe	Mobility of researchers between academia and industry - 12 practical recommendations, European Commission, Directorate-General for Research, European Research Area, 2006
Europe	New Concepts of Researcher Mobility – a comprehensive approach including combined/part-time positions, European Science Foundation, 2013

Europe	On the intersectoral mobility of researchers, their conditions and their competences, ERA SGHRM working group, 2016
Europe	Open, Transparent and Merit-based Recruitment of Researchers, ERA SGHRM working group, 2015
Europe	Research careers in Europe, Corporate author(s): Directorate-General for Education, Youth, Sport and Culture, Education, Youth, Sport and Culture (European Commission); Personal author(s): INOVA+, PPMI, CARSA, 2016
Europe	Researcher's Report 2014. Final Report, Deloitte for the European Commission, 2014
Europe	Study of business participation and entrepreneurship in Marie Skłodowska-Curie actions (FP7 and Horizon 2020), Corporate author(s): Directorate-General for Education, Youth, Sport and Culture, Education, Youth, Sport and Culture (European Commission); Personal author(s): Optimity Advisors, PPMI Group, Austrian Institute of Technology, 2017
Europe	Study on assessing the contribution of the framework programmes to the development of human research capacity, IDEA Consult, iFQ, PPMI, 2014
Europe	Study on mobility patterns and career paths of EU researchers, IDEA Consult, 2010
Europe	Support for continued data collection and analysis concerning the mobility patterns and career paths of researchers, IDEA Consult, 2013
Europe	Survey on Academia-Industry Relations in the EURAXESS Network, EURAXESS T.O.P II project, 2012
Europe	University-Business Collaborative Research: Goals, Outcomes and New Assessment Tools, The Euima Collaborative Research Project Report, Lidia Borrell-Damian, Rita Morais and John H. Smith, 2014
Albania	ERAWATCH Country Reports 2012: Albania, Zef Preci and Jonida Narazani - JRC Scientific and Policy Reports, 2014
Albania	From University to Employment: Higher Education Provision and Labour Market Needs In the Western Balkans Synthesis Report, European Comission, 2016
Australia	National Innovation and Science Agenda Report, Australian Government, 2015
Brazil	Decreto nº 7642 - Institui o Programa Ciência sem Fronteiras, Brazilian Government, 2011
Brazil	Strategic Forum for International S&T Cooperation SFIC - Approaching Brazil, Fraunhofer-Institute for Production Systems and Design Technology (IPK) Berlin, 2012
Japan	1st Report of Japan Doctoral Human Resource Profiling - FY2012 doctoral graduates cohort, NISTEP (National Institute of Science and Technology Policy), 2015

Montenegro	ERAWATCH Country Reports 2013: Montenegro, Jadranka Kaludjerovic, 2014
Montenegro	Final report on the project EURAXESS Montenegro Montenegrin Researchers' Mobility Network, 2011
Montenegro	PROGRESS REPORT on recent developments regarding research and innovation cooperation in/with Western Balkans. Montenegro (period June 2016-June 2017), Steering Platform on Research and Innovation, EC, 2017
Montenegro	Researchers' Report 2014, Deloitte, 2014
Norway	Strategy for research and innovation cooperation with the EU, Norwegian Ministry of Education and Research, 2014
Russia	Intersectoral Mobility of Researchers in Russia: Trends and Policy Measures, Irina Dezhina, Research Group on Science and Industrial Policy, SkolTech, 2014
Serbia	RESEARCH FOR INNOVATION. Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016 – 2020, Ministry of Education, Science and Technological Development of Republic of Serbia, WB, EC, 2016
South Korea	Brain Korea 21 : Phase II. A New Evaluation Model, Somi Seong, Steven W. Popper, Charles A. Goldman, David K. Evans, 2014
South Korea	Exploring New Policies to Support Career Path Diversification for Postdoctoral Researchers in Science and Engineering, Kyung-Mo Sung, 2016
Turkey	Science, Technology, and Innovation in Turkey, the Scientific and technological Research Council of Turkey, 2012
Ukraine	ERAWATCH COUNTRY REPORTS 2012: Ukraine, 2012
Ukraine	Overview of the internationalisation of Ukraine in RTDI including recent trends and developments, Policy Brief in BILAT-UKR*AINA project, Olena Koval, Vadym Yashenkov et al., 2012
Ukraine	Peer Review of the Ukrainian Research and Innovation System, Directorate-General for Research & Innovation, 2016
The Netherlands - UK	UK universities interacting with industry: patterns of research collaboration and inter-sectoral mobility of academic researchers. Working paper series - working paper no. 14 March 2017, Robert Tijssen, Wout Lamers and Alfredo Yegros, the Centre for Global Higher Education
Norway-Sweden-Denmark-Finland-Iceland	Crossing Borders – Obstacles and incentives to researcher mobility, NordForsk Policy Paper 3, 2014
International	Careers of Doctorate Holders. Analysis of Labour Market and Mobility Indicators,

	L. Auriol et al, OECD STI Working paper, 2013
International	Promoting University-Industry Collaboration in Developing Countries, José Guimón, World Bank, 2013.
International	The toll of short-term contracts, Elisabeth Pain, 2017
Academic papers	
Ackers, L., Moving people and knowledge, the mobility of scientists within the European Union, International Migration, 2005	
Australian Government, Research Skills for an Innovative Future, 2011	
Barroca, A.; Meireles, G. and Neto, A empregabilidade dos Doutorados nas Empresas Portuguesas, C., 2015	
Bekkers, R. and Freitas, I., Catalysts and barriers: Factors that affect the performance of university-industry collaborations, paper to be presented at the International Schumpeter Society Conference 2010, 2012	
Bino, B.; Çabiri, K.; Curraj, E., Mehmeti, I. and Hashani, A., Knowledge-Based Regional Development in Albania and Kosovo - Reducing social and economic disparities through social and economic innovation, The wiiw Balkan Observatory Working Papers, 113, February 2015	
Borell-Damian L., Morais R., Smith J.H., University-Business Collaborative Research: Goals, Outcomes and New Assessment Tools, 2014	
Bujnicki J., Hasiów-Jaroszewska B., Wierzchoń M., Expert opinion on the mobility of Polish scientists, 2015	
Cruz-Castro, L; Jonkers, K. and Sanz-Menéndez, L., International Mobility of Spanish Doctorate Holders, series Science, Technology and Innovation Studies, 2016	
De Filippo, D., Sanz Casado, E., & Gómez, I., Quantitative and qualitative approaches to the study of mobility and scientific performance: A case study of a Spanish university., Research Evaluation, 2009	
De Grande H. et al, From academia to industry: are doctorate holders ready?, , Journal of the Knowledge Economy, 2014	
Delicado A., International mobility of researchers: policies, trends and impacts, 2010	
Edler, J., Fier, H., & Grimpe, C., International scientist mobility and the locus of knowledge and technology transfer, Research Policy, 2011	
Geuna, A. (Ed.), Global Mobility of Research Scientists The Economics of Who Goes Where and Why, 2015	
Gurova E., Angelieva K., Challenges in Front of the Indutry-Academy Cooperation in Europe, Research Policy Analyse, magazine Nauka, Issue 4/2010 Vol. XX, Edition of the Union of Scientists in Bulgaria, 2011	
Gurova E., Antonova A., Fostering industry – academia links, 2008	

Gurova, E., Antonova A., Todorova Y., Industry-academia Collaboration in Bulgaria – the Case of Sofia University, 2009
Gurova E., Knowledge Transfer and Mobility: EURAXESS Role in Europe, 2010
Gurova E., Sanopoulos D., Knowledge transfer and mobility: EURAXESS role in Europe,
Havas, A., Types of knowledge and diversity of business-academia collaborations: Implications for measurement and policy, Triple Helix, 2015
Herrera, L., Muñoz-Doyague, M. E., & Nieto, M., Mobility of public researchers, scientific knowledge transfer, and the firm's innovation process, Journal of Business Research, 2010
Hoffman, D., Changing Academic mobility patterns and international migration—what will academic mobility mean in the 21st Century?, Journal of Studies in International Education, 2009
Horta, H. & Yonezawa, A., Going places: exploring the impact of intra-sectoral mobility on research productivity and communication behaviors in Japanese academia, Asia Pacific Educ. Rev., 2013
Institute for Private Enterprise and Democracy, Stimulating business and science cooperation, 2010
Ivancheva L., Gourova E., Challenges for Career and Mobility of Researchers in Europe, Science and Public Policy, Vol. 38, No. 3, April 2011
Ivanov A., Ivanov I., Stefanov K., Business Model for Successful Public-Private Partnership between ICT Company and University, 2014
Maison D., The future of Polish science, 2016
Perkmann, M., Tartari, V., McKelvey, M. et al., Academic engagement and ommercialisation: A review of the literature on university–industry relations, Research Policy, 2013
Shengelia, K., Cooperation between business community and Academia – striving for sustainable development, 2012
Tijssen R., Lamers W., Yegros A., the Centre for Global Higher Education, UK universities interacting with industry: patterns of research collaboration and inter-sectoral mobility of academic researchers. Working paper series - working paper no. 14, March 2017.
Yonezawa, A., S. Marginson (Ed.), The internationalization of Japanese higher education: Policy debates and realities, Higher education in the Asia-Pacific, higher education dynamics. Springer, 2011

C. COUNTRY OVERVIEW FICHES

Country overview - Austria

1. Number and type of country schemes

In Austria, the Austrian Research Promotion Agency (FFG) has introduced quite a variety of mobility schemes including an Industrial PhD Programme targeted at PhD students, a Young Experts programme targeted at students and young scientists (including post-docs) and a specific programme targeting female researchers (FEMtech Career Paths). The FFG also runs a set of 'COMET' competence centres and Laura Bassi Centres of Expertise across the country, involving temporary transfers of researchers between academia and industry with the latter focusing on supporting women. The country has introduced also two measures aimed at the creation of spin-offs (AplusB - Academia plus Business and Phoenix Award).

In 2011, the Austrian government launched its Strategy for Research, Technology and Innovation (RTI)1 for the next decade. It includes a reference to improving intersectoral mobility and identifies a lack of scientific career options and the low proportion of women in industrial research as challenges to be tackled.

2. Selected examples of ISM schemes.

The Industrial PhD Programme 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 working in a company and enrolled at a university at the same time. The company applies for funding of a project at the FFG, and the student is employed by the company. Thus, the PhD students will not only gain access to industry but work as fully integrated professionals for the duration of the project guaranteeing the swift transfer of scientific results to industry, while at the same time laying the foundation for a research career that might lead to being hired as regular staff after the funding period. In terms of disciplines, the focus lies on Natural Science and Technology - especially information technology, mobility, materials and production, environment and energy. Fifty percent of funding must be dedicated to female students. The programme is sponsored by the National Foundation for Research, Technology and Development.

The Young Experts programme supports cooperation between universities, research institutes and SMEs. It allows young scientists, including Bachelor's and Master's students, junior researchers and post-docs, to join R&D projects in SMEs and firms up to 1000 employees that do not (yet) have a R&D department. The deliverables of the Young Experts to be supported through the programme need to be embedded in a wider project supported by the FFG. The FFG funds up to 80% of post doc expenses so long as these are employed by the enterprise in question.

The COMET competence centres and Laura Bassi Centres of Expertise funds centres of competence involving partners from academia and industry. Researchers physically work in the centres, and often this involves temporary transfers of researchers between the partner organisations. The Laura

[1] https://era.gv.at/directory/158

Bassi Centres focus on supporting women. The mobility element of the programmes consists of researchers joining the centres to form a core team. Each centre has its own legal structure and employs the core team members directly. Centres are owned jointly by the key project partners, typically a combination of universities and businesses. It is within the centres where information exchange takes place. In addition, public (research) institutes are encouraged to cooperate with the centres. Businesses can get reimbursed for both material and human resource expenditure.

FEMtech Career Paths was initiated in 2004 and targets women researchers and to create equal opportunities in industrial research, at non-university research institutions, at universities of applied sciences and in research and technology programmes. Companies wishing to attract more female technicians and scientists and to develop the potential of their female employees may apply for a FEMtech grant. Funding is given to research and technology oriented companies and to non-university research institutions. The FEMtech Programme is being implemented by the Austrian Federal Ministry for Transport, Innovation and Technology (Bundesministerium für Verkehr, Innovation und Technologie – BMVIT). The programme focuses on raising awareness of women's careers in science and supporting these rather than intersectoral mobility.

Apart from the afore-mentioned programmes, two services are worth mentioning in the context of intersectoral mobility schemes:

The Austrian Agency for International Cooperation in Education and Research (OeAD-GmbH) is a LLC that counsels, promotes, and supports international cooperation in education, science, and research. The core business is the exchange of people of any age or educational level; hence, it supports European and worldwide cooperation. The agency's main emphases are also development of cooperation and export and exchange of education.

The Austrian database for scholarships and research grants is the most comprehensive online database in Austria covering all research areas. Intra-Austrian grant options for students, graduates, and researchers as well as incoming (from ... to Austria) and outgoing (from Austria to ...) grants are offered in this database. Moreover, research allowances, prizes, and other funding opportunities can be found. Information provided includes details of application requirements (application deadline and place), as well as duration, allocation, and financing of each grant.

One of the key factors ensuring success of the COMET and Laura Bassi Centres is the long-term perspective provided. This provides flexibility and is a big driver for all parties concerned. The specific research topics of centres can change over the funding period, and new enterprises can join at a later stage, while other firms can leave the project, but the overall configuration remains in place.

3. Demand for PhDs

Austria is becoming a knowledge-based society where the demand for PhDs is set to increase. The Austrian population has a comparatively low share of 39% (compared to an OECD average of 61%) of persons holding a university degree. Providing education opportunities for immigrants is a particular challenge. In life sciences and technical disciplines, the gap is widening between the economy’s demand for skilled workers and the interest among young people in the type of training needed to address this gap. As mentioned further above, a lack of scientific career options dampens the incentive for talented students to pursue a career track that leads into research or university, which

may dampen interest among students in obtaining a PhD despite industry demand. Women are also underrepresented in higher education.

4. Drivers of participation in ISM

The Austrian RTI strategy explicitly seeks to increase mobility and to expand initiatives for strengthening human resources in the area of applied research. The FFG is very active in coordinating and administering a whole suite of programmes aimed at increasing intersectoral mobility, among other goals. Business participation in these schemes has been driven by the opportunity to go beyond what they could usually research and develop in-house. For students, participation in ISM schemes allows them to try out a career outside academia on a temporary basis. The creation of centres of competence may lead to the development of research and industry clusters with positive spill-over effects for wider industry and the competitiveness of the Austrian economy, which is a motivating factor for government to support such projects.

5. Challenges and barriers to participation in ISM

In terms of implementation challenges, in case of the COMET and Laura Bassi Centres, one factor that could potentially put off some organisations is that to form a centre under the programmes requires a strong physical and legal organisation, a condition that is quite binding. Industry actors in particular prefer not to bind themselves with regard to cooperation arrangements and emphasise flexibility over durability. Regulating intellectual property rights (IPR) arising from intersectoral cooperation can also pose a challenge, in particular when international partners are involved (e.g. from the United States of America) which are not familiar with EU state aid rules). The FFG offers different types of schemes suiting different stakeholders' needs. Another common implementation challenge across ISM schemes in Austria is the organisation of training of participants. An adequate HR concept is needed to ensure researchers can successfully develop their career within industry, and vice versa. An implementation challenge identified in case of the Industrial PhD programmes schemes is that individual PhD students who had agreed to participate can be prone to back down last minute, in which case it can be challenging for the firms involved to find a replacement for the same research project. In order to change the topic, the firm in question would have to reapply for funding. Regarding IPR in case of PhD projects, students are advised to sign an agreement with the participating firm before the project launch.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Austria has a diversified funding system that covers everything from indirect funding via tax deductions, open-topic bottom-up funding-upon-application, to top-down programmes for defined topics. However, the focus lies on intervention through dedicated programmes. The Austrian government acknowledges that there may be an overreliance on solving specific problems through programmes, with a potential neglect of creating a conducive environment to R&D overall through measures such as standardisation or regulations affecting taxation and the environment. Existing support instruments need to be better coordinated for Austria to become an innovation leader. Austria has already begun to simplify its system of tax incentives for R&D, and the principle of competition-based funding allocation will be strengthened. The ISM schemes presented here all involve an element of external evaluation of applications.

Country overview - Belgium

1. Number and type of country schemes

Belgium is a country with distinct system of governance, and this has an impact in the way it promotes and funds its ISM schemes.

It is divided in 3 autonomous regions, each of which has its own schemes. These fund only region-based Universities and companies (or at least those who have an operational office in the region), but the schemes are open to participation of researchers from other regions of the country, or even from other countries.

The regional schemes policy objective seems to be to build connections between local universities and industry, while attracting the brightest students to the region. The focus on an innovation and start-up-friendly environment seems to be clear for all regions that decide to approach it individually (instead of making a national-approach/effort).

2. Selected examples of ISM schemes.

3 main types of ISM schemes were identified in Belgium:

Type of ISM scheme	Name of Scheme	Brief description
PhD in/within industry	**Doctiris**	links research (full PhD) to a specific company – and an intended industrial output (goods/services)
	Baekeland	promote PhDs that are made entirely in and within private companies – from the beginning
	ERCIM	mobility of researchers between consortium partners (can be industry-academy or academy-academy or academy-public sector)
	Team-up	finances collaboration projects between companies and universities
PhD towards a Start-up launch	**Innovation Mandates**	very similar to the Baekeland grant, but for Post-Docs AND there is the possibility of focusing the research towards the creation of a spinoff / start-up.
	Launch	valorises existing research by supporting the creation of a new company (using the results of the research)
PhD made in response to Public Administration request	**Coming back**	funds Belgian researchers to come back to the country and do research/work there;
	BeWare	funds researchers going to other countries or brings developing countries PhDs to Brussels to work in a Belgian university
	VLIR-UOS	connection with developing countries, offered by the Flemish government

All the stakeholders in the process see great benefits in the cooperation.

3. Demand for PhDs

For regional governments in Belgium, demand for PhDs is seen as strategic and part of the overall approach to foster innovation, industry attractiveness and promoting the region as a prestigious and R&D-friendly zone. It also carries an important component of researchers' career development, especially in companies/industry. The fact that all schemes accept PhD holders of any nationality demonstrates the interest to attract talents to the region.

Companies welcome these schemes by either supporting internal staff decision to engage in an industrial PhD, or by actively looking for PhDs that can bring partnerships with universities and R&D breakthroughs through this kind of collaboration.

Universities are also very keen on these schemes as it allows them to diversify their networks, increase industry-relevant publications, and reduce costs with hiring and maintaining PhDs.

4. Drivers of participation in ISM

The main driver for universities to join the ISM schemes in Belgium was the relatively straightforward access to funds and the opportunity of expanding networks, contacts and collaboration with the private sector. Companies appreciate the schemes because it allows them to invest in high-risk R&D and tailor potential future workforce to their needs and working methods. Researchers who find their way into the schemes do it to get first-hand experience with the private sector, and to benefit from the financing provided in order to continue their studies in their field of choice.

5. Challenges and barriers to participation in ISM

The main obstacle identified is the lack of knowledge / misconception that industry and academia have about each other. Researchers' experiences tend to confirm this – both real and perceived – gap between the two distinct worlds: academia sees industry as market/profit–driven only (not accurate according to academia standards, and with much faster working rhythms); and industry looks at academia as a slow mechanism, focused too much on research and not enough on "the real world" – industry also considers hiring a PhD a very high labour cost.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as brain-drain)

Overall, the funding is directed to higher education institutions and/or non-academic organisations to raise their interest and involvement in the ISM schemes. The funding provided is sometimes considered as insufficient (should be increased) but relevant. There was no evidence found of parallel tax incentive schemes to further support HEIs/Industry enrollment in these schemes.

The focus on combating braindrain is an important driver in Belgium – there was (it was discontinued) even a programme called 'coming back,' so called as it specifically targeted expatriated Belgians.

Types of funding:

Funding in Belgium is usually given at 100% rate to academia, and at a 40%-80% to industry (depending on the size of company joining the scheme and topic at hand). Total funding is around €50,000 - €60,000 / year / researcher, for PhDs that can last from 2 to 4 years.

Country overview - Bulgaria

1. Number and type of country schemes

Based on the thorough desk research analysis, nine formal inter-sectoral mobility schemes have been identified for Bulgaria. They are as follows: Science and Business Project (under OP HRD); Support to R&D activities of the company; Support for the Development of Doctoral Students, Postgraduates and Young Scientists; Knowledge transfer vouchers; NIF financed projects for improving the innovative potential and technological level of the enterprises; Projects funded by Operational Programme Science and Education for Smart Growth (OP SESG); Technostart Programme; Scholarships for young scientists who prepare doctoral work in a national company structure; Strengthening Research, Technological Development and Innovation (under OP IC).

Two non-formal ISM schemes can also be identified: ISMs academy-industry and vice-versa; PhD-Free postgraduate studies (industry to academia) often self-paid.

The review of the relevant legal and policy documents and strategies shows that researchers and business organisations in Bulgaria are in general encouraged and supported to take part in different knowledge transfer models and mobility schemes. Furthermore, many strategic documents provide a number of conclusions and recommendations either for companies, or for academia and for individual researchers to take part and to promote inter-sectoral, international and inter-organisational mobility of researchers and academic staff. Thus, researchers are encouraged and expected to take part either as catalysts of knowledge transfer to the companies and to spin-off centres, or as participants in collaborative innovation projects. Specific instruments and tools are provided in some actions and calls in operational programmes to financially support and encourage researchers and companies to take part in mobility schemes.

However, it has to be noted that inter-sectoral mobility of researchers is still not a wide disseminated practice in Bulgaria. Academic staff rarely takes part in officially established schemes for inter-sectoral or inter-organisational forms of mobility. Thus, the empirical data and studies on place reveal that the mobility of researchers is low, and in practice the academic staff is rarely involved in short-term or long-term mobility periods in non-academic organisations – NGOs, public administration and public institutions or business organisations.

2. Selected examples of ISM schemes

INTERNSHIPS AFTER COMPLETING PHD STUDIES

BG051PO001-3.3.05 Science and Business (financed under OP HRD)

Since 2012 under the OP Human Resources Development, young people who have completed their doctoral studies have been encouraged and supported to engage in R&D practice for one-month internships in high-tech R&D and infrastructure centres. OP HRD supports also the setting up and running of structured innovative doctoral training programmes, providing funds for mentoring, research training, and developing entrepreneurial skills.

SCHOLARSHIPS FOR YOUNG SCIENTISTS WHO PREPARE DOCTORAL WORK IN A NATIONAL COMPANY STRUCTURE

The aim of the competition is to stimulate the renewal of the scientific potential by attracting young people to research careers, and by building an effective science-industry link through the active involvement of company structures in the development of a doctoral dissertation.

Actions aimed at opening up the labour market and establishing bridge structures between universities, research organisations and business structures were supported.

Preliminary budget of the competition for 2008 was 102338 EUR; 200 000 BGN;

Minimum grant for the entire programming period - 25585 EUR; 50 000 BGN;

Maximum grant for the entire programming period - 51170 EUR; 100,000 BGN.

Duration of the project - up to 3 years

Conditions for participation: R&D projects are accepted for participation in the competition in all scientific fields.

The competition may include:

- young scientists up to 35 years of age who are not assigned to a full-time doctorate and are not assigned to a main employment contract in higher schools and scientific organisations;
- Young scientists up to 35 years of age working in a company structure

KNOWLEDGE TRANSFER VOUCHERS

For the period 2008-2011 one of the earliest financial schemes of the Ministry of Economy for knowledge transfer was to disburse knowledge transfer vouchers to micro, small and medium enterprises. The scheme supported the transfer of knowledge to businesses from universities and research organisations as "knowledge providers", and enabled businesses to solve certain problems of an applied nature through the acquisition of knowledge related to the innovation of products, processes and services. Another variant is the "Education/Training vouchers for employees as a part of the financial schemes "I can" and "I can do more" (BG05M9OP001-1.016) which has been continued starting from June 2017.

3. Demand for PhDs

The shortage of highly qualified personnel is a global problem. The only established model in the world is a direct link between universities and businesses.

Besides the Bulgarian ICT sector, there is a demand for highly qualified specialists also in sectors with high-tech production.

Some analyses show that a high percentage of the recent PhD applications are by professionals from industry who apply for PhD studies in order to increase their qualification level and their career opportunities within the organisation;

These needs are well understood and for this, the OP Science and Education for Smart Growth (OP SESG) is focused on overcoming them. Several types of complementary activities are envisaged with a special focus on the establishment of distributed pan-European infrastructures, European technology platforms, and European partnership projects and networks in which the involvement of PhDs in the collaboration activities between research and science sectors is among the compulsory requirements.

4. Drivers of participation in ISM

It can be summarised that Bulgaria still does not utilise the competitive advantage of science-business collaboration to the full extent and is not investing sufficiently, or not adequately, in inter-sectoral mobility between the two sectors. The Bulgarian higher education institutions and research centres, for example, produce significant amounts of new knowledge but there is a relatively low number of researchers employed in the business sector, compared with the well-developed countries.

However, the desk research and the interviews carried out show attitudes to achieving inter-sectoral mobility including some drivers:

- to turn research results into competitive products or better services;
- to acquire new skills and competences;
- to share experience with interested target groups;
- a high % of the recent PhD applications are by professionals from industry who apply for PhD in order to increase their qualification and career opportunities within the organisation;
- The main driver is the project topic, the funding scheme and the opportunity the research team to work in a close collaboration with international team;
- For career development opportunities.

5. Challenges and barriers to participation in ISM

- Institutional barriers for research institutions and universities to collaborate with business organisations for joint research projects;
- Lack of institutional mechanisms to recognize research staff mobility between academia and industry;
- Institutional barriers to encourage inter-sectoral mobility of PhD students;
- Cultural barriers toward inter-sectoral mobility;
- Low level of motivation for researchers and companies to take part in knowledge transfer activities;
- Low level of mobility of the research staff;
- Low interest of Industry to collaborate with universities and research institutions;
- All existing schemes at EU level support one-way mobility – from EU-13 to EU-15 (including ERA, EURAXESS. This is a great problem, which would increase the R&I gap in Europe;
- The benefits of the universities or RTO are under question – they cannot retain researchers since the difference in salaries between academia and industry is significant;
- Usually the researchers take their industrial carrier;
- There is a lack of R&D and ICT experts which increases the movement from academia to industry. The movement back is very rare;
- The participation in ISM schemes is useful, but usually the researchers neglect their academic tasks while working in an industrial setting;
- Lack of active communication channels between business/industry and academia. Inter-sectoral mobility scheme (ISM) should focus on mitigating this challenge first and then build active bi-directional collaboration.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as brain drain)

Based on the analysis of the national strategic documents and policy papers, we can outline several approaches to structure national efforts in promoting inter-sectoral mobility of researchers.

The main directions of support for inter-sectoral mobility of researchers are:

- Policies focusing on strengthening the national economy by promoting innovations, R&D activities in companies and industry-academia collaboration (e.g. Innovation Strategy for Smart Specialization 2014-2020; Investment Promotion Act; Operational Programme "Innovation and Competitiveness" 2014-2020);
- Policies for science development, support of research institutions and universities and establishment of research infrastructure (e.g. National Strategy for Development of the Scientific Research 2030; National Roadmap for Research Infrastructure 2017-2023; Strategy for Development of Higher Education in the Republic of Bulgaria for 2014 – 2020; Law on Encouraging Scientific Research; Law on Higher Education)
- Policies for better career development and promotion of researchers and research career path (e.g. Operational Programme "Science and Education for Smart Growth" 2014-2020; Law on the Promotion of the Academic Staff; "Tehnostart - Encouragement of Innovation Activity of Young People in Bulgaria").

Country overview - Croatia

1. Number and type of country schemes

In Croatia no scheme dedicated to physical intersectoral mobility of researchers could be identified. There are a few schemes that support intersectoral mobility as well as mobility between academic institutions, but the vast majority of mobilities within these schemes take place between public research institutions/universities and are as such not intersectoral. Support for industrial PhDs is very limited - the "Young Researchers' Career Development Project - Training of Doctoral Students" programme only provides co-financing for organisations which are officially registered as scientific organisations, among which very few are not a university or a research institute.

Other types of schemes that support cooperation between academia and industry, which may include intersectoral mobility or lead to future intersectoral mobility, are much more common. Such schemes include, among others, support for proof-of-concept research at public universities/research institutes, technology transfer from academic institutions, cooperative projects between industry and academia or contract research.

2. Selected examples of ISM schemes.

The PoC Public scheme (Proof of Concept Programme for Scientists and Researchers), run by the HAMAG-BICRO agency, aims to enable creation of new, knowledge based companies (spin-offs from research institutions), with high potential for growth. It provides support for the first step to this goal by providing co-financing to public universities/research organisations for proof of concept research and other pre-commercialisation activities in product development.

A further step forward towards creation of a new company is provided by the UTT Programme - Programme of Support for Technology Transfer Offices. This scheme provides co-financing for activities of technology transfer offices at public universities/research institutes, which are specifically related to technology transfer, such as expenses for intellectual property protection, market analysis, business plan creation, licencing fees, establishment costs of spin-off/spin-out/start-up companies, product design, product certification, initial production, brand building.

3. Demand for PhDs

In Croatia demand for researchers with a PhD is not very high. This can be attributed to a large extent to insufficient investment of companies into research and development, where Croatia lags behind other EU member states. Increasing involvement of researchers in the business sector is one of the priorities of the Croatian government. To achieve this the government plans to provide different incentives for stimulating R&D activities of companies, which will be financed to a large extent through ESIF.

4. Drivers of participation in ISM

For the researchers a main driver to participate in the ISM schemes is a desire to work in the private sector and/or to use their knowledge/research to solve a practical problem. Researchers participating in the ISM schemes also often come from fields of research, where there is a natural tendency towards cooperation with industry, such as technical sciences, biotechnology, etc.

For universities/research institutions cooperation in schemes related to intersectoral mobility provides a possibility for additional financing of their activities, and for strengthening their cooperation with companies and other private institutions.

Companies see in intersectoral mobility schemes a possibility to get support for engaging additional researchers and in this way for strengthening their research capacity and getting access to new knowledge/competences. In the schemes, which include support for transnational intersectoral mobility, companies also see an opportunity to get access to new knowledge and technology that is not yet widely available in Croatia.

5. Challenges and barriers to participation in ISM

One major challenge that often emerged when projects involved cooperation between universities/research institutions and industry is the question of ownership of intellectual property produced during the mobility/cooperation between partners. This challenge was more pronounced in cases of transnational mobility with certain countries (e.g. the USA), due to differences in legislation between the countries. This challenge can be avoided if ownership and other issues concerning intellectual property rights are predefined in a contract.

Also, in the interviews lack of skills and competences needed for work in companies, which is often the case with young scientists, was mentioned as a barrier to participation in intersectoral mobility.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Prior to 2014 Croatia provided tax incentives for investment into research and development, but starting from 2014 these incentives have been cancelled. However, new legislation is in preparation and it is expected that until the end of 2017 tax incentives for investment into R&D will be reinstated.

State funding for R&D has been steadily decreasing. To counter this the Croatian government has passed measures to allow better absorption of ESIF. The Croatian Smart Specialisation Strategy has been passed in 2016 and since 2016 new programmes providing co-financing of R&D activities from the ESIF have been introduced.

Brain drain is recognised as a problem in Croatia. Croatian government has introduced different measures to retain Croatian scientists in Croatia as well as to convince Croatian scientists from abroad to return to Croatia or establish a cooperation with organisations from Croatia. Some intersectoral mobility schemes (e.g. NEWFELPRO) also aim at bringing Croatian scientists back to Croatia.

Country overview - Cyprus

1. Number and type of country schemes

In Cyprus, there are not any specific intersectoral mobility schemes. The national programmes for research attempt to promote intersectoral mobility of researchers, through specific selection criteria.

2. Selected examples of ISM schemes.

As there are no ISM schemes, we have selected one scheme that specifically promotes ISM in its design. This is the DIDACTOR programme that funds high quality research projects, implemented by a consortium of organisations. In the DIDACTOR programme, priority is given to enterprises that will act as host organisations and will employ a postdoc researcher for the project. The funding of DIDACTOR programme comes from the Programme RESTART 2016-2020 and it is managed by the Research Promotion Foundation in Cyprus. The objective of the DIDACTOR programme is the development of research and innovation in Cyprus, through the repatriation of Cypriot researchers and their integration into the Cypriot R&D system.

3. Demand for PhDs

There is small demand for PhDs from the side of enterprise in Cyprus. Most companies are small and oriented to the services sector. There are no manufacturing companies that would require highly qualified staff, with the exception of a very few large companies in the energy, telecommunications and pharmaceutical sector that do employ PhDs and highly qualified staff and may have their own research departments.

The research and innovation system in Cyprus is rather new: the universities were established in the 1990s and efforts are still focused on establishing the research system and developing a critical mass of researchers, within the universities and the research institutes.

There is no evidence of a demand for PhDs in the public sector and in the third sector.

4. Drivers of participation in ISM

The driver for the participation of companies in potential ISM schemes is the possibility to employ high qualified personnel, funded by the programme. This is an important motivation for companies that do have the need to employ PhDs and have an interest to develop their research profile.

From the side of the individual researchers, the driver would be the funding, the possibility to work on their research area and the career prospects in the country.

5. Challenges and barriers to participation in ISM

The challenges and barriers identified in the interviews were different for the different stakeholders.

According to RPF, there is limited interest among Cypriot companies in research in general and in ISM specifically. The Cypriot companies are small, oriented to services and they have little interest in research and innovation. The university and research sector in Cyprus is rather new, having been established in the 1990s The National Programme RESTART 2016-2020 is oriented to develop the research capacity of Cyprus, by repatriating Cypriot researchers and attracting researchers from other countries.

The company representative interviewed for this study mentioned the institutional framework as a barrier, noting that it is not at all supportive and helpful. There are delays in the projects cycle, the payments are not regular and the companies have to fund themselves the costs of the project until they get the public grant. In addition, apart from the funding for specific research programmes, there are no other incentives to employ PhD holders and researchers.

From the side of individual researchers, the research programmes support the companies to get access to qualified researchers that are called to work in routine work, in addition to their research tasks, for a minimum remuneration.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

R&I governance in Cyprus lacks guidance and vision, as well as a coherent strategy. These shortcomings are compounded by the non-existence of an evaluation culture at the strategic level. Since 2015, the country's Smart Specialisation Strategy guides the national R&I strategy, which is mainly implemented through the 2016- 2020 R&I framework programme "RESTART". The implementation of the smart specialisation strategy might be facilitated by the R&I system's young age, which implies few institutional rigidities.

Business R&D spending is one of the lowest in the EU. The reasons for low private R&I investment and demand lie to a large extent in geography and the structure of the economy (i.e. small and service-oriented economy, absence of high-tech industry) and lengthy procedures of public support programmes co-funded through ESIF. A number of instruments have been put in place or are planned to support SMEs' investment in R&D. The Action Plan accompanying the smart specialisation strategy envisages addressing the low R&D activities of SMEs and the attraction of private sector investments in R&I more generally.

Exploitation of knowledge and research results is weak and science-business cooperation is low. The supply of venture capital or business angel funding, which would be a means to support university spin-offs after their creation, is almost negligible. At the end of 2015, a "National Policy Statement for the Enhancement of the Entrepreneurial Ecosystem in Cyprus" has been formulated. Two of the five priority axes in the statement, "Cultivating the entrepreneurial culture", and "Facilitating access to finance", constitute highly relevant aspects for improving commercialisation of research results. The establishment of a Central Technology Transfer Office (CTTO) is planned, but implementation seems to be evolving rather slowly.

Country overview - Czech Republic

1. Number and type of country schemes

Schemes focused on ISM as their main objective are exceptional in the Czech Republic. Only one scheme of this kind has been identified (Knowledge Transfer Partnership, KTP). Another scheme was planned with a full focus on ISM but its preparation was cancelled due to difficulties in ensuring state assistance. Public support schemes in the R&D sector that focus on academia-company cooperation tend to support non-mobility cooperation activities; when they do focus on mobility their priority is international mobility with a mostly academia-academia focus. Such schemes are funded by EU resources. Public schemes supporting R&D may include ISM activity (it may be eligible) but it is not compulsory and in reality these activities are rare.

2. Selected examples of ISM schemes.

The only ISM scheme identified was the Knowledge Transfer Partnership (KTP), adapted from the similar UK scheme in 2009-10, piloted in 2010-2013 in two calls for proposals within the OP Enterprise and Innovation 2007-13 and expanded in the following programming period 2014-20. Until now 3 calls for proposals have been launched since 2015. The KTP scheme supports junior researchers (Knowledge Transfer Assistants – KTA), often PhD students, who are formally university employees, in working in the company during a 2-3 year project. The KTAs are supervised and supported by the senior researcher and the research team at the university. The objective of the KTA is to assist the company in solving problems or in dealing with research issues to which the university can provide knowledge inputs. The objectives of the KTP programme are to strengthen academia-industry cooperation, to stimulate knowledge transfer from universities and to increase their willingness to cooperate with industry. Process and technology innovation have been the most common topics of the projects due to the specialisation of the Czech industry in these areas, although product innovation has also been dealt with.

There are international mobility schemes in Czech Republic which may include (according the eligibility rules) also mobility from a company abroad to the Czech research organisation or university. But these cases are exceptional. There are 2 such schemes in Czech Republic currently: SoMoPro, a programme for South Moravia region since 2009, co-funded currently from the MSCA COFUND, and the International Mobility of Researchers scheme funded within the OP Research, Development and Education 2014-20.

3. Demand for PhDs

Demand for PhD graduates is not great although demand for MSc. graduates is rather high in all sectors. Some industries, such as biotechnology or precision machinery have higher demand for PhD graduates. The same is true in the case of research centres, public and also private. PhD/post-docs are also needed in some research departments of companies, particularly in case the foreign companies upgrade their activities and establish research centres in the Czech Republic, though these cases have been rare so far. Generally, the demand for PhDs is limited in the Czech Republic. The demand usually does not distinguish much between PhD and MSc. graduates. The demand is much higher for graduates with an engineering background and business/managerial skills, particularly among industrial companies[2]. Clusters, science parks and incubators, though numerous in the Czech Republic, do not create significant demand as they do not always accommodate high-tech companies or high-tech activities. Public sector does not generate demand for PhD graduates; although there is an increasing number of PhDs in the public sector, the reason is not public sector demand.

[2] Csank P., Vozab J., Jovanovič P.: INKA 2014+ Mapping of Innovation Capacities of the Czech Republic, TAČR, Prague, 2015

4. Drivers of participation in ISM

Drivers of participation in ISMs differ among sectors. Although industrial companies do identify problems that require research supported by university teams, the main driver in the private sector is access to university graduates of both MSc and PhD levels. Companies present an opportunity for them to adapt to the company environment and hope they may become permanent employees. The same is in case of mobility between academia and industry (both ways) in general in Czech Republic.

There is limited interest in participation in ISM schemes among higher education and research organisations in Czech Republic. They are not much interested in applied or experimental research and higher levels of technology readiness issues in general. Hence the driver of participation in international programmes is often an interest in cooperation in academia partners abroad, participation in international research teams or research activity. Cooperation with academia is often preferable as it leads more easily to "scientific results" which means publications. Another driver is the financial one. ISM schemes open the opportunity to receive finance for research and the ISM element is just a condition to be fulfilled.

5. Challenges and barriers to participation in ISM

ISM schemes are rather difficult to launch in Czech Republic for several reasons[3]. First, there is a certain distrust and scepticism among companies and public R&D organisations which is difficult to overcome. As embedding researchers in an organisation from another sector is a rather intensive form of cooperation, it requires strong motivation and need on both sides to enter such a kind of collaboration. Second, commercialisation is not an extensive activity of Czech public R&D organisations (incl. universities) in general, therefore they are not keen to establish partnerships with enterprises, including participation in ISM schemes. Third, Czech industry is dominated (in terms of employment, in terms of turnover and in terms of contribution to the GDP) by FDI which locate mostly production facilities here with the R&D being located in mother countries or generally in Western Europe or the USA. Investment in design, development or even research activities and/or facilities of FDI started less than 10 year ago and the development is rather slow. Fourth, Czech endogenous companies, though often more R&D oriented, tend to focus on process or technology innovation or on R&D in this field as their key competitive advantage is usually in process and technology efficiency and effectiveness or in niche, less scalable markets (such as specific precision machinery production) and much less in unique, innovative products on the large, scalable markets. Fifth, there is a mismatch between the academia and industry not only in the timeframe and objectives which is probably common elsewhere, too, but also in the research focus. Academia focus on science and research stressing the basic research or very early stages of applied research while industry, partly because of its nature in the Czech Republic, is much more interested in later stages or applied research, in development and generally in routine, short-term, specific problem-solving research activities.

A strong barrier on both sides is made by the administrative and bureaucratic difficulties and obstacles. Most of the academia-industry cooperation schemes are funded from ESIF which generates rather excessive administrative costs, time and financial uncertainty due to risks of corrections and various decision-making delays at the level of MAs/IBs as well as at university partners in projects. A newly planned ISM scheme was (perhaps finally) cancelled due to State Aid rules.

[3] Csank, P., Vozab, J., Jovanovič, P.: INKA 2014+, Mapping of Innovation Capacities of the Czech Republic, TAČR, Prague, 2015.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

There are no specific conditions for ISM activities. There are numerous publicly funded programmes (incl. ESIF funded ones) supporting various kinds of cooperation among research organisations and companies, yet the ISM activities, though sometimes may be eligible, are usually not part of the projects. There is special tax deduction possibility in case of R&D financed by the company but it is used only reluctantly by companies as it increases their taxation risks (due to varying and inconsistent approach of the tax authorities).

Country overview - Denmark

1. Number and type of country schemes

As a result of major institutional reorganisations affecting the fields of research and innovation in Denmark in recent years, many of the previously existing mobility schemes between academia and industry have now been discontinued, merged or reorganised into two major schemes, the Industrial PhD and the Industrial Postdoc schemes, also jointly known as 'Industrial Researcher'. The two schemes are managed by Innovation Fund Denmark, which was set up in April 2014 as a merger between three previous research and innovation organisations[4] with the aim to create one single entry to invest in innovative ideas with a potential for creating knowledge, growth and employment in Denmark. In addition, some of the universities that are the most active in cooperating with industry arrange ad-hoc mobility between their researchers and interested businesses.

The mobility schemes link in with the national innovation strategy 'Denmark – the Land of Solutions' (*Danmark – løsningernes land)* which sought to improve the Danish R&I systems[5] in line with the European growth strategy, Europe2020. The strategy's vision was to create innovative solutions for the grand global and societal challenges and convert it into growth and employment opportunities focusing on three main points: 1) Societal challenges shall lead to innovation, 2) More knowledge must be converted into value for the private sector, and 3) Education must increase the innovation capacity[6]. A wider internationalisation strategy was also published by Innovation Fund Denmark in July 2017 to promote Danish research and innovation.

2. Selected examples of ISM schemes.

Although it fits perfectly the current innovation strategy, the Industrial PhD Programme is in fact an old scheme that was first created in 1971 by the Polytechnic university (*Polyteknisk Læreanstalt*). The responsibility for the scheme has subsequently moved around different organisational structures as these were reorganised, until finally it went to Innovation Fund Denmark in 2014, when this organisation was set up.

This PhD programme aims to offer doctoral training in cooperation with the industry sector. It is a three-year research project and research training programme with an industrial focus conducted jointly by a private company, an industrial PhD student and a public research organisation, typically a university/Higher Education Institution. The Programmes accepts universities and students of all nationalities, but the company has to be Danish. The student is employed by the company and enrolled at the university.

Since 2010, it has also been possible for public sector organisations, institutions and companies to get involved in an Industrial PhD or Postdoc project in cooperation with a university/research organisation, as long as the project lives up to the general requirements of the programme. Since this was introduced, there has been considerable interest from public sector institutions and around 20% of all participating 'companies' are now from the public sector, which testifies to the programme's success.

The purpose of Industrial Researcher in the public sector is to 1) support innovation and development in the public sector through focused and application-oriented research projects, 2) develop researchers with knowledge about research and development in the public sector, and 3)

[4] The Strategic Research Council (*Strategisk Forskningsråd (DSF*), the Council for Technology and Innovation ((*Rådet for Teknologi og Innovation (RTI*) and the Fund for Advanced Technology (*Højteknologifonden (HTF).*

[5] http://ufm.dk/publikationer/2012/danmark-losningernes-land

[6] Regeringen (2012) Danmark – Løsningernes Land

build networks and support knowledge exchange between public sector organisations and research institutions.

Nearly **2**,000 PhD students have participated in the Industrial PhD programme so far. Approximately 20-25% of these have been from abroad (compared with around 30-35% of foreigners among 'normal' PhD students in Denmark). In contrast, only 2-3% of the participating universities/research organisations have been from abroad. One of the foreign universities that continues to participate is Lund University in Sweden (geographically quite close).

Apart from Danish companies, foreign subsidiaries based in Denmark may also take part. The participating companies usually have research as the basis of their business model. They have to contribute financially to the scheme themselves, usually 25-45% of total expenditure, as EU state aid rules sets a ceiling for the amount of public support that companies are able to receive.

Public research organisations/universities, on the other hand, are allowed to receive 100% of their expenditure. The same applies to the participating researchers, although they do have to cover their own transport costs. They can apply to have some of these costs to be covered by the state.

The Industrial PhD programme used to include an initial training course for participating candidates, which has been inactive for the past couple of years. However, Innovation Fund Denmark is in the process of planning a new preparatory training component. They see the preparation of candidates as an important element in making a success of their individual projects and they also consider it essential that participating researchers get a chance to meet each other and create networks. The new course will be launched in 2018 and will include elements like commercialisation, project management, self-management, etc. It will last a month and will correspond to 5 ECTs.

There are two deadlines for applications each year and they tend to concentrate on a specific sector or specialisation. Each of these calls involve budgets of around DKK 10 million. (€1.35m).

In connection with each intake of new researchers joining the programme, a one-day kick-off meeting is organised with the researchers and all company and university supervisors to prepare them for a positive collaboration, to present the opportunity to network across projects, and to introduce Innovation Fund Denmark to the projects they have invested in.

There have been several evaluations of this programme over the years, although none very recently, and some statistics of overall participation exist.

The Industrial Postdoc Programme started in 2011 under the Advanced Technology Fund (*Højteknologifonden*) with a view to co-financing the development of new products and technologies in order to strengthen Denmark's competitiveness globally and create new jobs. When this fund was merged with two other councils to form Innovation Fund Denmark in April 2014, they made certain changes and a new programme was set up as of 2015. The programme aims to educate and develop researchers into industrial researchers in order to contribute to the country's industrial innovation and development and to reinforce the collaboration between Danish companies and public research institutions in Denmark and abroad.

The Industrial Postdocs are employed full-time by a private company which pays their salary, but they continue to collaborate with a public research institute/university on an industrial/commercial research project. The project should serve to further develop the company in question and must offer them the possibility of solving specific research issues that will create growth and employment. It is the host company that applies for funding for the joint project which can run from 1 to 3 years. A mentor will be appointed both within the company and the research institute.

The researchers have to have obtained their PhD within the past 5 years and would typically not have been employed in the private sector to any significant extent beforehand. The researcher and

the research institute can be foreign, but the company has to be based in Denmark and has to be financially independent from the research institution.

The regular Industrial Postdoc programme is for private sector enterprises. But organisations not categorised as part of the private sector according to the Fund's guidelines might apply for public the sector Industrial Postdoc. Normally funding is not available for these projects, which means that public sector organisations have to defray all project expenses themselves. However, a special deadline was organised in October 2017 where DKK 10 million in subsidies were made available for Industrial Postdoc and Industrial PhD projects in the public sector.

Application deadlines take place quarterly[7], with separate deadlines for the Industrial Postdoc and the public sector Industrial Postdoc. The calls concentrate on different sectors or specialisations and the budget for the private sector Industrial Postdoc is typically around DKK 10 million (€1.35m).

As mentioned above, the purpose of involving the public sector in the Industrial Researcher schemes is to promote innovation and development in the public sector, to attract researchers to this sector and to build networks and support knowledge exchange between public sector organisations and research institutions.

So far, some 120-130 Postdocs have gone through the programme, but since the scheme was opened up to public sector research institutions and companies, there have been more applications.

This programme has not yet been the subject of any structured analysis and there are no evaluations or any substantial statistical evidence on their performance available as yet. However, recent changes in the project guidelines mean that instead of a single status meeting with Innovation Fund Denmark at the end of a project, the project parties now have to evaluate the results, impact and collaboration process of the project when the project is finished.

The flagship programme of Innovation Fund Denmark in terms of funding is the Grand Solutions scheme. As the name suggests, the programme focuses on creating innovative solutions and results of value to society that respond to concrete challenges and innovation needs that have been identified, both in the private and public spheres. In order to ensure that project goals are achieved, the scheme has a very high ambition level that requires excellent research and very strong teams with the necessary competences to make a difference.

There is no shortage of PhD candidates for this programme – it is seen as a clear advantage to get involved, and company and researchers are able tie themselves for a shorter period than for the Industrial PhD programme (1-3 years). However, there is no demand for the Postdoc side of this scheme – possibly it is not sufficiently well known by young researchers.

In addition to the formal mobility programmes operated by Innovation Fund Denmark, some of the Danish universities that are especially known for close links with industry also organise various types of collaboration between their researchers and local/regional businesses or other interested companies.

The Technical University of Denmark (DTU) is probably the university with the highest number of participants in the Industrial PhD scheme[8], but in parallel with this scheme, they also organise their own funding for PhDs wanting to work with industry 'Co-funding a PhD student' (*Samfinanasiering af en ph.d. studerende*).

There are different ways in which this can be organised depending on whether the PhD student is employed by the company or by the DTU. In the first case the company has the first right of refusal

[7] https://innovationsfonden.dk/en/application/industrial-postdoc

[8] Between 30-40 participants each year, corresponding to 25-30% of all Industrial PhD students.

to license the project results. If DTU is the employer, the rights belong to DTU, but the company might be allowed an option to the rights within a defined field. In both cases, the company and DTU share the cost of the 3-year period with around 50% each. The standard price for a PhD education in Denmark is estimated to be approx. DKK 150.000/year (+/- €20,000) of which the State finances DKK 120.000. In both cases, the student has to be based around half their time at the DTU. All PhD co-funding agreements include an obligatory internship or study period abroad for 3 to 6 months to enable students to make foreign contacts. There are no specific conditions regarding the sectors involved in these independently arranged collaboration agreements but they all involve what is known as 'wet research fields' (laboratory-based research, as opposed to computer or management-based research). On an annual basis, the number of DTU's own PhD co-funding agreements involve around 35 PhD students (more or less the same as the formal Industrial PhD scheme).

A difference compared with the Industrial PhD scheme is that there are no restrictions regarding the nationality of the companies, nor of the students. Around 50% of all PhD students at the DTU are foreign[9] and all teaching is carried out in English.

Aalborg university is another Danish HEI that is known for extensive collaboration with industry. As part of their engineering courses at both Bachelor's and Master's levels, students are expected to work closely with industry in creating new knowledge and solutions to actual problems and they spend at least a whole semester (0.5 year) and often more in industry. All students are taught according to the PBL principle (Problem-based learning) which builds on the principle of 'learning by doing' through group work and cooperation with business. This develops their project-related and collaboration competences and teaches them to communicate and organise effectively. It also gives them practical experience and a network of contacts that will help them build their career subsequently.

Like DTU, Aalborg university (AAU) has a system of co-financing PhD students whereby it allows interested companies to engage in a collaboration with one of their doctoral schools for the 3-year PhD study period. The AAU co-financing only applies to fields of interest to the PhD Faculty and they propose to co-finance the salary for the PhD student for 1 year, whereas the company will pay the rest. This is organised on an ad-hoc basis depending on interest from the private sector, typically companies in the region of Northern and Mid-Jutland, and does not currently amount to a fully-fledged scheme.

3. Demand for PhDs

The demand for industry-oriented PhDs is on the increase in Denmark, especially from the public sector. That said, only 4% of all PhD students get involved in the programmes, in spite of regular information being provided to the universities about the schemes. Innovation Fund Denmark is accordingly currently trying to work out how well known the scheme actually is among students and what the reasons might be for not opting for it.

In terms of the demand from industry, the Industrial Researcher schemes are an attractive solution given the opportunity, at a very reasonable price, to get a competent researcher involved in a high-quality research project that can potentially solve concrete research or development challenges and bring commercial gain. At the same time they will reinforce their relations within academia/the world of research. The scientific fields in which most use has been made of the Industrial PhD scheme over time is technological sciences (40-43% of all projects), natural sciences and health-related sciences, with the latter being on the increase with 20% in 2014 and 2015.

[9] In connection with the financial crisis there was a considerable intake of Greek and Italian students.

Businesses appear to prefer the PhD programme, probably because it is considered to involve a more peripheral, long-term strategic planning than is the case for the Postdoc. However, projects tend to spring out of existing relations which then in turn lead to additional new projects.

4. Drivers of participation in ISM

The Industrial PhD and Postdoc schemes are both perceived by researchers to be extremely useful and participation in these schemes is acknowledged to have a considerable impact on their future career prospects. Getting an industry-oriented education, combined with 3 years' practical industry experience, will give them a much better career basis than traditional PhDs have, especially given the very limited number of research posts available at Danish universities. Furthermore, the fact of having their research used in practice, acts as a very motivating factor.

Several evaluations of the PhD scheme have shown very positive outcomes for participants in terms of high employment rates (95-99%) and higher incomes: in 2010 the average annual income was DKK 636,000 (€86,000), compared with conventional PhDs whose average annual income was DKK 38,800 lower (€5,250 or 6%)[10]. Industrial PhDs with a degree in social sciences/law earned up to €106,000 on average. Some 80% of Industrial PhDs are employed in the private sector, but if they are employed in the public sector, incomes are the same!

In the view of participating host companies they get a highly qualified collaborator very cheaply whom they are able to choose themselves from a pool of PhD students. It allows them to carry out a research project of very high quality and typically they would involve the candidate as a sparring partner in major operational and strategic decisions. However, they tend to get employed as specialised experts and rarely hold management positions. Postdocs get a unique set of competences through the combination of research and business experience that will seriously boost their career development. The company gets a competent researcher very cheaply who will carry out a high-quality research project that can solve concrete research/development challenges and is likely to bring commercial gain. At the same time they will reinforce their relations within academia/the world of research.

The universities/research organisations get funding and an insight into how industry uses research. they get funding and reinforce their relations with industry which will in turn create the breeding ground for new research.

5. Challenges and barriers to participation in ISM

Potential barriers for mobility schemes in Denmark include the constraints resulting from state aid rules, which mean that companies have to contribute with 25-45% of total expenditure themselves due to the ceiling for public support that private companies are able to receive.

In terms of intellectual property rights, there is also potential for conflict between the wish of PhD candidates to publish their work as widely as possible and the hosting company's potential wish to keep quiet about new developments for reasons of competitive advantage. It is an area that needs genuine consideration and discussion in advance of a project going ahead and all applications have to include a publication plan. This element is specifically dealt with at the project meetings that are organised for all new researchers under the two programmes.

Other obstacles on the side of industry have been identified, especially to do with the length of time that they commit themselves for and the consistency that is required with regard to the funded

10 Danish Agency for Science, Technology and Innovation: The Effect of the Industrial PhD Programme on Employment and Income, December 2012. Oxford Research A/S
https://innovationsfonden.dk/sites/default/files/the_effect_of_the_industrial_phd_programme_on_employment_and_income_v4_1.pdf

project; many businesses change strategy quite regularly and it is difficult to find projects that will remain unchanged for a period of 3 years, if the overall strategies shift. Businesses appear to prefer the PhD programme, probably because it is considered to involve a more peripheral, long-term strategic planning than is the case for the Postdoc. However, projects tend to spring out of existing relations which then in turn lead to additional new projects.

In spite of the popularity of the Industrial PhD scheme, the participation only corresponds to 4% of all PhD students, although information is regular being provided to the universities about the ISM programme. Innovation Fund Denmark is therefore currently examining how well known their scheme actually is among students and what the reasons might be for not opting for it. They already know that many candidates are reluctant to sign themselves up for 3 years and prefer to do a traditional PhD, where they are more free to arrange their commitments as they want. Another hindrance is that many candidates have not previously had any significant links with industry and therefore are somewhat nervous about it.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Framework conditions for doing business in Denmark are good with the World Bank ranking Denmark as the 6th best country to do business in its 2015 report. Public support for R&I is generally strong and has been growing from 2009 onwards. However, the government which came into power in 2015 reduced the funds allocated to research, leading to substantial criticism from universities and the opposition. Over the last couple of years, there has been a significant focus on the relations between the supply and demand side of research and innovation measures, accompanied by legislative amendments to reduce bureaucracy within industry and free up time for innovation.

It is also significant that higher education is still free in Denmark, which as mentioned above had led to a considerable influx of foreign students and PhD students. However, the rate of mobility and brain drain out of Denmark appears to be limited. Few Industrial PhDs leave the country after graduation. In the period 2004-2012 only 24 people (7%) emigrated without returning.

Country overview - Estonia

1. Number and type of country schemes

In Estonia, there are only a small number of intersectoral mobility schemes reflecting the small size of the country. The research identified a greater focus overall on international mobility schemes compared with those involving intersectoral mobility. A new strategy for the internationalisation of the Estonian Higher Education System in the 2006–2015 period was approved by the Minister for Education and Research in 2007. Following this, a number of mobility schemes have been set up and supported.

The few ISM schemes that exist tend to be public sector driven. The EU's Structural Funds, combined with national co-financing play a major funding role (see examples below).

2. Selected examples of ISM schemes.

There have been two consecutive industrial PhDs programmes schemes in Estonia to promote ISM:

- 2008-2015 - the Doctoral Studies and Internationalisation Programme "DoRa"[11]; and
- 2016 – 2022 - the Smart Specialisation scholarship scheme for PhD students[12].

Both schemes were designed and implemented by the Archimedes Foundation (Centre for Higher Education Development), a private independent institution set up by the Ministry for Education and Research with responsibility for implementing Erasmus+ and administering several national and international scholarship schemes to improve mobility.

The DoRa programme was initially implemented as a pilot scheme, but subsequently became a fully-fledged programme to promote internationalisation at the doctoral level. The scheme was funded through the Structural Funds (ESF), complemented by national co-funding. The scheme was supported through the Estonian Operational Programme of Human Resources Development 2007-2013[13]. The programme supported many different types of activities including national and international researcher mobility, and a specific intersectoral mobility component. Activity 3 is designed to foster R&D cooperation between universities and businesses, and thereby to increase the R&D&I intensity of businesses. The sectoral priority areas targeted were: ICT and health, biotech, energy, materials technology and environmental technology.

The scheme involved the award of a double scholarship in which the ESF-financed scholarship provided additional funding alongside the modest standard funding available under Estonia's national PhD scholarship scheme. The scheme combines elements of both international and intersectoral mobility, since all PhD students are guaranteed the opportunity to study abroad for a period of a minimum 5 months. Participants were required to already have an employment contract within industry for the 4-year duration of their PhD and typically spend the majority of their time working at their company, with only limited time spent at an Estonian university. It was emphasised that a key success factor in ISM schemes is to keep the scheme as flexible as possible and not having overly prescriptive rules. Only very basic rules have been introduced - e.g. a requirement for PhD scholar to be working in one of six priority sectors, the type of business (must have been established for a minimum 3 years, and have at least 11 people working there).

[11] https://www.ut.ee/sites/default/files/www_ut/oppimine/dora_eng_2010.pdf
[12] http://haridus.archimedes.ee/node/366
[13] Measure "Facilitating internationalisation and fostering doctoral studies" of the priority area "Development of human resources in R&D"

Some 52 new PhD places were funded through the programme, whose total budget was €32 million for the total programme, only part of which was for the industrial PhD part of the mobility programme. The researchers had to be employed by businesses in eligible sectors throughout their studies.

An evaluation of the programme's implementation was carried out and found that overall the scheme had been very successful, but there are a few ways in which it could be improved, such as through involving more companies that have not previously participated in EU funding schemes or cooperated closely with universities before. A further key finding from the evaluation was that universities and industry differ in terms of their expectations from schemes. Some instances were identified where academic and industry supervisors never met, and others where they met and coordinated on a very regular basis. There may be a link between effectiveness and the extent of cooperation between supervisors. Sometimes there is less interest from supervisors from universities than from industry.

There was a challenge in respect of successful implementation of the scheme linked to the gender dimension, since whilst 45% of students were female and 55% male, less than 9% of female PhD students managed to graduate within the stipulated 4-year timeframe to complete the PhD for which the ESF funding for participants remained eligible. The lack of flexibility in the timeframe to complete a PhD proved problematic for female PhD students.

The second scheme, Smart specialisation scholarships for PhD students, which commenced in September 2016, and has a programme budget of €3 million. Under the scheme, €422 per month (equal to the doctoral grant paid by the government) is paid to PhD students of Estonian universities who conduct research related to the smart specialisation growth areas. The objectives are to: support cooperation between R&D institutions and companies, to diversify the career prospects of PhD graduates, and to contribute to capacity-building in research-intensive industry sectors. Preference is given to applicants conducting their doctoral research that is responsive to industry needs, addressing the practical problems of specific sector/company or contribute directly to implementation of research findings in everyday industry practice (industrial PhD).

Among the differences between the new ERDF-funded Smart Specialisation scheme and the ESF-funded DoRa are the focus on Smart Specialisation sectors which is new in the 2014-2020 period, and the fact that there are comparatively major budget constraints. Consequently, there is no extra dedicated funding to fund teaching activities relating to the ISM element and funding must come from the overall teaching budget. However, universities have earmarked some research funding to promote cooperation with businesses, and to develop practical applied research projects with industry and this scheme could be a useful mechanism for achieving this.

In terms of implementation challenges, a problem common to both DoRa and the Smart Specialisation PhD scholarships scheme is that project-based funding under the Structural Funds rules has to adhere to the timing strictures of the programme implementation cycle linked to the different EU financial perspectives (i.e. 2007-2013, 2014-2020). Since an industrial PhD takes 4 years from the outset to graduation, this has effectively meant that even though a successor programme has been put in place, there has been a gap in funding for new PhD enrolments of 6 years between the end of acceptance of new PhD students under DoRa (2011, given a 2015 PhD completion date) and September 2017, when the first new PhDs will be accepted. A second challenge was that whilst it has been relatively easy to attract companies that already work very closely with universities to participate, it has been difficult to attract newcomer companies. A further issue in relation to both schemes is that whilst there was a desire on the part of the scheme manager to allow PhD students working for start-ups to take part in principle, in practice, given EU ESIFs funding, there are considerations relating to the future sustainability of the firm and risk management, given the 4-year

duration of the PhD, which requires stability at the firm (whereas innovative start-ups have low survival rates in the first five years). Whilst start-ups were excluded under DoRa, under the new Smart Specialisation scheme, they will be allowed to participate in some instances. However, flexibility was seen as being key in helping students that want to work with start-ups to do so but with rigorous risk assessment to assess firm viability.

Two supervisors were appointed under both programmes, one from industry and one from a university. In both DoRa and the Smart Specialisation PhD scholarships, supervisors from industry to oversee the PhD have been funded through the programme. This guaranteed access to industry resources to ensure that PhD students' participation is monitored. The role is often a practical, advisory role. However, under DoRa, there were difficulties in ensuring that the approach to supervision was consistent across different firms and universities. A key finding from the evaluation of DoRa was that universities and industry differ in their expectations of participating in ISM schemes. Examples were identified where academic and industry supervisors had never met during a four year period, whereas other examples were identified where the supervisors from different contexts had met and coordinated on a regular basis. There may be a link between effectiveness and the extent of cooperation between supervisors. Sometimes there was found to be less active interest from supervisors from universities in the progression of PhD students than from supervisors in industry, possibly because the employer was from industry.

A mid-term evaluation of the new Smart specialisation scholarships scheme programme's implementation is envisaged for 2018.

Interestingly, a Smart specialisation scholarships scheme[14] for BA and MA students is also being supported. Among the participating higher education institutions are the same HEIs and research institutes taking part in the Smart specialisation PhD scholarship programme.

The Estonian Research Council also provides support to promote ISM and international researcher mobility, for example through the Mobilitas Pluss Programme[15]. However, the interview with the ERC found that unfortunately, there have been difficulties to date in persuading Estonian companies and international companies with R&D branches in Estonia to participate in the programme.

3. Demand for PhDs

There are a number of sectors where there is some demand for PhDs and post-doctoral researchers (e.g. the bio-tech sector, ICT especially in new and emerging areas e.g. blockchain, software development, high-end electronics, physical sciences). However, in many industries, demand for post-doctoral research is relatively limited and there is rather a need to recruit bright Master's and PhD graduates to work on company-specific challenges. There is also a need for practical problem-solving skills and for Master's level graduates with an engineering background compared with demand for researchers to undertake scientific research.

There may in future be demand from firms for PhDs and post-doctoral level researchers stemming from the small, but growing number of university high-tech spin-offs. In addition, a Technology Development Centre has been established as a Joint Venture between Tallinn University of Technology and several companies. Since the companies involved are all very science-oriented and in future, spin-offs could be created within these centres, this may create additional demand for PhD level and doctoral training opportunities within companies.

[14] http://haridus.archimedes.ee/en/smart-scholarships-BA-MA
[15] http://www.etag.ee/en/funding/programmes/mobilitas-pluss/

4. Drivers of participation in ISM

There is limited interest among Estonian companies in ISM, but also in recruiting researchers from academia generally. This was attributed to the fact that many Estonian companies are export oriented and there is a low level of Research, Development and Innovation (R&D&I) intensity among many SMEs. However, Estonia also has many innovative start-ups and high-tech firms relative to its size, and interest among these firms in ISM should in theory increase over time as it becomes harder to recruit highly qualified researchers due to braindrain and population reduction.

5. Challenges and barriers to participation in ISM

A number of barriers were identified by the Estonian Research Council in relation to promoting interest among industry in participating in mobility schemes to attract PhD and post-doctoral level researchers.

The Estonian Electronics Industry Association pointed out that there may be a reluctance among some universities to risk losing their leading researchers. There are challenges in getting people back to academia after they have spent time in industry to raise levels of teaching to the next level to make it better tailored to industry needs. There are not so many PhD holders working in Estonian industry – more often people working in industry hold a Master's degree and would like to undertake mobility to academia but they cannot since PhDs are often required.

A further observation made by an interviewee was that there is something of a disconnect between EU funding programmes and cooperation between industry and academia. For example, EU funding for researchers and scientists is accessible through Marie-Curie but rarely involves industry participation at least in Estonia. With regard to participation in the FPs, there has been lots of participation by Estonian entities, but no real connectedness between companies and academia.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

The RIO report 2016 for Estonia notes that Estonia's RD&I policies "have been focused on generic framework conditions and supply side mechanisms, i.e. there has been hardly any steering of specialisations". However, the Smart Specialisation strategy has helped in strengthening sectoral prioritisation. This includes a strong focus on ICT, e-health and health research, the integration of innovation into manufacturing & industrial processes, biotechnology, nanotechnology & engineering, materials technologies, and knowledge-based construction.

In terms of weaknesses and threats, braindrain is a particularly significant problem in Estonia and measures have been put in place to tackle the problem. There is also a lack of ICT specialists at all levels, which requires a major effort to address by the universities.

Country overview - Finland

1. Number and type of country schemes

There are a number of intersectoral mobility schemes offered by Finnish funding agencies. With regards to R&I generally, Finland has a long-standing good reputation along with its Nordic neighbours, however the recent performance of the Finnish innovation system is merely among the EU average level. The latest RIO report suggested there is a need to strengthen Finnish leading-edge research and also a need to promote internationalisation of R&I better.

While overall the inputs to the science base remain strong, the scientific performance of Finnish research, measured by bibliometrics, including citation indicators, has remained flat since 2000. Despite high R&D investments and shares of new doctoral graduates, it is not matched with high quality scientific output. One explanation is that specialisations in key or strategic fields have not been sufficiently pursued, resulting in low numbers of researchers at the top of their field. Furthermore, the internationalisation of STI is relatively weak, affecting both public and private sectors, with low international mobility of research (in particular the mobility of researchers and the utilisation of international funding opportunities).[16]

On the political level, Finnish innovation and research policy is increasingly connected with societal issues (for example, globalisation, ageing, the environment and public health) that pose a challenge to growth and well-being. The challenges are increasingly tackled with public sector innovation, public procurement, growth entrepreneurship, service innovation as well as user and demand driven innovation. This policy framework also aims to support collaboration and engagement between the public and private sectors.[17]

In September 2013, the Government of Finland adopted a resolution on the comprehensive reform of research institutes and research funding. The resolution specifies the set of measures to be taken to implement the reform and identifies the ministry responsible for each measure. The Prime Minister's Office coordinates and monitors the implementation process. The measures will include structural reforms, reforms of research funding instruments, and the implementation and follow-up of the reforms. The overall reform will be implemented in 2014–2017.

One part of this reform was to launch a process to deepen cooperation between research institutes and universities, which is to span several years. Under this process, research institutes and universities were gradually to develop genuine clusters of expertise (agreement-based consortia). Within the consortia, higher education institutions and research institutes were to form common regional campus areas, with common functions (e.g. joint use of physical resources and research infrastructure). Deepening cooperation is thought to provide synergy benefits to both higher education institutions and research institutes, while strengthening the Finnish research and innovation system as a whole. It was also expected to significantly contribute to the competitiveness of Finnish expertise and research conducted in the service of society.[18]

2. Selected examples of ISM schemes.

Selected examples of ISM schemes include:

Post Docs in Companies – the PoDoCo programme – is a joint initiative of Finnish universities, industry and foundations. The aim of the programme is to promote academic research supporting long-term competitiveness and strategic renewal of Finnish companies, and the employment of

[16] RIO Country Report Finland 2016
[17] RIO Country Report Finland 2016
[18] http://vnk.fi/en/comprehensive-reform-of-state-research-institutes-and-research-funding

young doctors in industry. PoDoCo facilitates novel meetings and matches of postdocs and companies and offers young scholars funding from one source for academic research having strategic importance for Finnish companies. PoDoCo is designed for young researchers who have recently completed or will soon complete their doctoral degree. There are no limitations regarding the branch of science or branch of industry. Instead PoDoCo is aimed for all branches of industries and all disciplines, e.g. natural sciences, engineering and technology, medical and health sciences, agricultural sciences, social sciences and humanities.1 PoDoCo is funded by the PoDoCo foundation pool and companies participating in the programme. For a PoDoCo researcher the programme offers a research period followed by a targeted research period lasting in total 1-2 years. The PoDoCo foundation pool offers research grants for the research period. After the research period the company hires the postdoc to deepen the research results and to create company specific insight. The aim is a win-win situation where academic research is supporting the long-term competitiveness and strategic renewal of Finnish companies and young doctors get industrial experience.19

The Tampere University of Technology established a Doctoral school of industry innovations in 2014, which the university manages in collaboration with industry.20 The purpose is to provide industry and business communities with trained doctoral graduates with the ability to apply scientific knowledge in real-life business contexts and to foster their communication skills and networks of contacts.

The Academy of Finland (AKA) used to have a specific support programme for intersectoral mobility, however this has been discontinued. Instead, the current funding enables working, for instance, in industry, whenever that is deemed necessary in the successful applicants' research plan. There are currently some on-going discussions on academy-industry collaboration within the Academy however no concrete plans are available to share with outsiders at this stage.

Although there is no specific current funding stream for ISM specifically, the AKA developed National Guidelines for Doctoral Training in 2012. These provide advice to HEIs for developing the graduate school system and organising doctoral training with the aim of improving the transparency, predictability and quality of education. All universities have reformed their doctoral education according to the guidelines. As an example, the University of Turku Graduate School (UTUGS) consists of local and national Doctoral Programmes which cover all disciplines and Doctoral Candidates of the University. Together with the Doctoral Programmes the Graduate School provides systematic and high quality doctoral training on academic topics as well as on transferable skills and career planning. Each Doctoral Candidate has a personal supervisor and the progress of the doctoral dissertation is followed regularly. The aim is to complete the degree in four years net time. To meet the needs of the society, public and private sectors, the University of Turku Graduate School aims to train highly qualified experts with the skills required for both professional career in research and other positions of expertise. UTUGS offers courses in transferable skills both in English and Finnish.

More recently, AKA has also developed guidelines on mobility post-PhD completion. As of September 2016, all applicants for funding for research posts as AKA Postdoctoral Researcher and Academy Research Fellow are required to apply for funding for a post in a research environment other than the one in which they worked while completing their doctoral thesis. Here, 'research environment' refers to the local research community or group in which the researcher works.

The following cases are regarded as working somewhere else:

[19] http://www.podoco.fi/pages/about
[20] http://www.tut.fi/dsii

- All research work that has been performed in an organisation other than the one at which the applicants worked on their doctoral thesis
- Work that has been performed in an organisation other than a research organisation and that supports the applicant's research.

Similar to AKA, Tekes – the Finnish Innovation Agency – does not have a dedicated ISM programme but fund projects, which require collaboration between different types of organisations. Tekes has also put specific efforts in encouraging industry participation in H2020's MSCA programme.

3. Demand for PhDs

PhD education in Finnish universities has gone through several changes in the past decades. The latest development is that, since 2012, national resources have been allocated directly to individual universities for organising their own doctoral programmes, instead of national-level graduate schools, which were established in the mid-1990s. Thus, each university is responsible for the organisation, quality and development of PhD education.21

However there is also a clear top-down element as Finnish higher education policy makers perceive internationalisation of higher education as a crucial aim and process to improve the quality of Finnish higher education – and the competitiveness of Finnish society. Within the overarching internationalisation strategy, Finnish HEIs are expected to have a strategic approach to planning their international activities. From early 1990s to current time, these internationalisation strategies have shifted from sending Finnish students abroad to receiving international students in Finland International cooperation in the 1990s corresponded to Finland joining the EU and resulted in more domestic students studying in other European countries. The main motive was academic and cultural. At the turn of the century, however, the national perspective changed and the Finnish borders opened up to receive more international students.22

4. Drivers of participation in ISM

ISM – and mobility in general – are considered to be priorities in Finland, however mobility drivers are seemingly 'horizontal' (i.e. encouraged as part of individual or collaborative projects and as part of wider internationalisation strategy of the Finnish state, which also highly values collaborative research) and not promoted through a wide range of mobility-specific grants (although these also exist as evidenced in Section 1). For example, in some RTOs the costs for mobility is covered under the normal assignment policy – which means there are no specific rules to deter mobility.

Support for mobility is visible both at policy and funding level as well as at the institutional level. For example, at the Research Organisation VTT, outbound mobility is supported through the RTO's Mobility team (set up within the HR Department). According to VTT, this enables the RTO to gather information about the best practices and support researcher mobility from both an employer point of view as well as considering the employee point of views related to mobility.

The Euraxess portal is an important tool for promoting mobility opportunities.

5. Challenges and barriers to participation in ISM

Selected key factors deterring researchers to undertake any mobility period domestically or abroad include:

[21] Lavonen et al (2014) Recent trends in PhD education in science and mathematics education research: Back to university-level organisation. See https://www.journals.uio.no/index.php/nordina/article/viewFile/828/869

[22] Välimaa, Jussi; Weimer, Leasa (2014) The trends of internationalization in Finnish higher education Zeitschrift für Pädagogik 60 (2014) 5, S. 696-709. See http://www.pedocs.de/volltexte/2017/14678/pdf/ZfPaed_2014_5_Vaelimaa_Weimer_The_trends_of_internationalization_in_Finnish_higher_education.pdf

- Compensation and sufficient budget – based on the experience of VTT, the mobility experience needs to be budgeted and compensation needs to be at an adequate level. A potential way of solving this is to involve relevant parties into the planning process (researcher, line manager, project finance and HR).
- Family concerns – in Finland most families have two working adults, so undertaking assignments can be seen as a financial risk.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Finland's economic success during the last decade can be traced back to a significant extent to its effective and efficient R&I System and related framework conditions. This system has served as a benchmark and best practice for a number of other countries. But at the same time, Finnish policy makers as well as other relevant stakeholders recognise the challenge to maintain this position.23

The latest RIO report identifies three R&I challenges in Finland:

1. Harnessing knowledge and competence to boost innovation for societal and economic renewal: aligning R&I priorities and investments with measures should aim to boost productivity. Coordinated and effective R&I policies are needed to better harness innovation although recent policy reforms and plans equally signal a commitment to innovation.
2. A new growth mode for public and private R&I investments: the declining trend in investment in R&I could have immediate and long-term impacts on outputs and the economy. Central government and business R&D outputs have declined since 2010. Innovative measures have been adopted in 2016, but their impact in the light of significant funding cuts is according to RIO not clear.
3. Strengthening the quality and relevance of the science base and increasing internationalisation of R&I: measures aim to improve the quality and focus of research efforts. There is steady progress in internationalisation but there is scope to measure the relevance of research, and develop better incentives.

Although mobility and braindrain are not directly mentioned, clearly effective collaboration and internationalisation (as well as sufficient funding) are areas of concern which also affect attitudes to mobility and ISM.

[23] Private Sector Interaction in the Decision Making Processes of Public Research Policies Country Profile: Finland. See http://ec.europa.eu/invest-in-research/pdf/download_en/psi_countryprofile_finland.pdf

Country overview - France

1. Number and type of country schemes

Intro note: despite the fact that this initial assessment was made based on a small number of interviews (5), the interviewees included the main fund granting organisation in France (ANRT) and a NGO focused on promoting precisely ISM in the country and throughout Europe, which brings very rich inputs to the entire exercise and has resulted in a robust document – as can be seen below.

France is fairly advanced in the political support given by the institutions to ISM. Importantly, there is a main government agency – ANRT – that runs a well-known and well-used scheme – CIFRE – to support researchers' mobility into industry, complemented by a fiscal incentive given to companies that invest in R&D. This drastically reduces companies' costs in conducting research and engaging PhD into their ranks, and many take advantage of it. The state also tends to stay away from IPR-related negotiations – but requiring that there is such agreement before any funds are disbursed.

Nonetheless, in terms of education, France seems to have a system that leads some studies towards academic jobs and some others (engineers, etc.) towards more practical roles. This makes many PhD holders end up in social support before they turn onto the private sector, something that could be tackled. At the same time, there is a perceived tendency of HEIs of orienting their PhDs towards a career in academia, which does not always materialise. This seems to be a EU-wide phenomenon though, not specific to France.

We have also found an open support given to NGOs working around the same issues, with a simplification process for partnerships and active invitations for their participation and inputs in several events and initiatives of ARNT.

2. Selected example of ISM schemes

Type of ISM scheme	Name of Scheme	Brief description
Industrial PhD	**CIFRE**	CIFRE: allows PhD to make their thesis in a public lab (university or research institute) or within industry. - The scheme is funded by the *Ministère de la Recherche* in France; - typically lasts 3 years; - can be combined with research credits (tax credits for companies conducting R&D); - there is no mobility obligation – while researchers are advised to spend at least 20% of their time in each involved irg, this is not mandatory

3. Demand for PhDs

France is an advanced country in terms of fostering intersectoral mobility. The state seems to see this as a priority and it funnels funds and support mainly through the ANRT (*Association Nationale de la Recherche et de la Technologie*), to support industry embrace of R&D efforts.

This means PhDs are valued and brought into industry with relative ease. The focus is given on companies, creating the conditions for them to be able to attract researchers, offering them good work conditions, career advancement and the possibility of an industrial experience, at a fraction of the cost. PhDs seem to be aware of this and are supported towards this "awareness" by several organisations that work outside of the state system but with the support of the French State.

4. Drivers of participation in ISM

The main identified drivers for participation in this scheme was to obtain industrial experience (researchers), access academic state-of-the-art knowledge and funds (industry). Industry has also revealed an interest in having their reputation and credibility enhanced by the recruitment of PhDs and consequent publication of relevant papers and scientific pieces that directly relate to their sector. Furthermore, this type of scheme is a good way of recruiting skilled talent for a fraction of the price and still access R&D-related tax breaks.

5. Challenges and barriers to participation in ISM

Several obstacles were uncovered with the first phase of interviews:

- Different application procedures in different EU countries is time-consuming and hampers international mobility;
- Many companies still seem not to operate in English internally, which increases the difficulty in hiring foreign researchers (whose common language is often English);
- Differences in work cultures between academia and industry also hampers more involvement of both "realms" in the ISM schemes available;
- The time needed to submit a funding proposal (1-2months) has also been indicated as a time-consuming effort that turns companies off, especially as industry timings are often more pressing;
    - On the same note, industry has revealed that the time needed to fully operationalise a PhD student is often lengthy and demotivating
    - At the same time, the process of agreeing on a research matter can be demoralizing as well, as it has to be a compromise between industry, universities and researcher interests – sometimes this leads to dropping the process all together;
- There is also some "resistance" from HEIs to direct their researchers towards a more industry-focused PhD – apparently for lack of knowledge of opportunities and/or working ethics and culture on the private sector;
- Finally, there was a market reference to the difficulty to getting visas for foreign PhDs, which makes it difficult to recruit the brightest and the best for Europe.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as brain-drain)

France offers a cumulative support for companies to engage in R&I. It offers direct financial support to industry and allows it to cumulate that with tax breaks for engaging in R&I, resulting in a significant reduction of the costs of engaging in R&I.

Types of funding:

For example, in CIFRE, the grant is given directly to the company:

- €14,000/year, for 3 years.
- With this grant, the industry must pay the researcher a minimum salary of €23,484/year. This makes research much cheaper for companies.
- This fund allocation can be combined with tax breaks that the state issues to companies developing R&D activities, lowering even more the cost of conducting research in France.

Suggestions made by interviewees:

- More information on advantages of working with the "other" should be promoted;
- More funding is always interesting;
- Would like to see more networking and ice-breaking opportunities, to foster human connections and exchange opportunities;
- More attention should be given to support to PhD supervisors, for them to grow their awareness of the possibilities outside academia – and advise their students on it
- There has been the suggestion to include both coaching and industrial approaches overviews to PhD's *curricula*, in order to increase awareness of opportunities and promote personal planning and positioning in terms of leaving the PhD studies and get a job;
- Sharing of best practices among EU countries;
- Create a special EU-status for the figure of a PhD researcher in industry ("Industrial PhD" status) – this could include special contracts, conditions, visa procedures and even collective bargaining;
- Harmonising the financial mechanisms in the EU was also mentioned;
- There was also a focus on lowering administrative/bureaucratic barriers to international double PhDs (increasing co-*tutelage*), to promote international mobility ;
- Finally, offering support and training to HEIs Technology Transfer Office(r)s was also mentioned as a worth-while tactic to increase ISM.

Country overview - Germany

1. Number and type of country schemes

In Germany, there are comparatively few specific ISM schemes run by either public or private sector organisations. Instead, there seems to be a reliance on EU programmes, notably the Marie Curie Actions, and on organic cooperation between universities, research institutes, and firms through well-established networks. A few public and private sector measures and programmes were identified that contain elements of intersectoral mobility. These are further described below.

2. Selected examples of ISM schemes.

KOWi is a consulting service for EU programmes funded by the DFG (Germany Research Association). KOWi's services cover the review of project proposals, advice, assistance in managing and accounting from project lunch until closure. It supports the participation of German entities and individuals in two ISM schemes:

RISE (Research and Innovation Staff Exchange), which in turn is funded by the Marie Curie Action, supports research institutions with funding to set up networks involving at least one university or research institution and one non-academic partner, typically from industry. Partners need to come from at least three different Member States. The actual physical mobility of researchers takes place in so-called "exchange months". For instance, a researcher may work at a non-academic organisation for three months. The focus lies on information exchange rather than training, but early-stage researchers are strongly encouraged to participate. The support goes to existing personnel, meaning that no funding is provided to hire new researchers.

The second scheme supported by KOWi are EID – European Industrial PhD candidates. Partners from at least two different Member States and with at least one non-academic institution involved create a network. Funding supports the exchange and education of PhD candidates. Professors need to apply on behalf of their institution to include certain PhD candidates in a network.

The German Research Society, DFG, operates two schemes that contain elements of ISM even if this is not the focus of the schemes.

The first case concerns so-called transfer projects which help researchers supported by DFG to bring their findings in basic research closer to the market. Indirectly, there is an ISM element since in many transfer projects, especially in the engineering sciences, researchers need to have worked in industry for a period. Transfer projects can also support professorships where professors work half the time in industry and half the time at a university. But this is driven by the participants and not a requirement or indeed goal of the scheme. The ISM element is unusual in that it may include cases where individuals transfer from industry to academia, whereas most ISM schemes mapped for this study focus on the opposite direction.

The other scheme concerns graduate colleges, and supports individuals (as opposed to the transfer projects). Here, trainee programmes support PhD students of which a majority ends up working outside academia, either in the public or in the private sector, after finishing their PhD. The programme includes soft skills training which may facilitate the transition to the non-academic sector. Industry partners are involved by providing internships. Typically, these are offered in the subjects of engineering and medicine.

Apart from these two, the only area where the DFG explicitly support ISM is in case of clinical studies where they are developing a specific programme at the present time.

The Fraunhofer Institute runs a Shared Professorship Programme. This programme targets university professors. As part of the programme, professors spend 50% of their time undertaking research with one of the many Fraunhofer Institutes and 50% of their time working directly in industry. Fraunhofer also runs a separate 'Attract' programme targeting leading researcher talents from industry. Participants work in one of the Fraunhofer Institutes. Approved scientific projects receive funding from the institute in question. The researcher must be interested in industry-related research, career and leadership. The creative research idea must have the potential for application-oriented development. Successful applicants are awarded €2.5 million in research funding for 5 years. The research idea must fit in well with the R&D portfolio of the research institute to which the external scientist (PhD or professor) applies. Generally, projects should bring a prototype to commercialisation.

In the private sector, Volkswagen is a long-term sponsor of ISM. They provide scientists and researchers with professional researcher development opportunities through graduate education programmes which include internship opportunities as part of a module of the study programme. Earlier in 2017, they organised internships from social sciences into private companies. The Volkswagen foundation operates a scheme for PhD students named "Science and professional practice in graduate education – research colleges and practice modules / Wissenschaft und berufliche Praxis in der Graduiertenausbildung – Forschungskollegs und Praxismodule". The aim of the scheme is to strengthen practical orientation of PhD programmes. According to VW, the majority of beneficiaries of the scheme take up employment outside universities after completing their PhD – either in business or by becoming self-employed. Particular support is provided to students of the humanities and cultural studies where employment opportunities outside university and teaching are not always easy to find. The level of funding to individuals depends on the funding stream. Funding stream 1 covers human resources expenses (65-100% of the salary of PhD students), travel expenses, and material costs. Funding stream 2 pays a lumpsum of € 1,000 per month to students for at least 6 and up to 12 months.

3. Demand for PhDs

Germany is becoming a knowledge-based society where the demand for PhDs is set to increase. The German population has a comparatively low share of 31% for 25-34-year-olds (compared to an OECD average of 43%) with a university degree. Improving education of immigrants is a particular challenge. In engineering and technical disciplines, the gap is widening between the economy's demand for skilled workers and the youths' interest in respective training.

4. Drivers of participation in ISM

The German RTI strategy does not explicitly address intersectoral mobility. The 2016 annual report of the Ministry of Research and Education merely states that the government intends to make career paths for young researchers easier to plan and more transparent.

Germany's research policy is guided by the High-Tech Strategy24 which includes a reference to improving the transfer of scientific knowledge into the economy without explicitly mentioning the role of intersectoral (physical) mobility of researchers. The separate Pact for Research and Innovation is currently undergoing an update which should include a stronger emphasis on exchanges between industry and society on the one side, and science and research organisations on the other.

As mentioned above, ISM schemes do not play a prominent role in Germany. Rather, research institute networks such as the Max Planck Societies, Fraunhofer Institutes, and the Helmholtz

[24] https://era.gv.at/directory/158

Society play a key role in bridging the gap between academia and industry and facilitating knowledge transfer. Thus, the German innovation ecosystem is characterised by close cooperation between the scientific community and industry, driven in part by universities. Arguably, this means there is less of a need for publicly supported or funded ISM schemes to stimulate such cooperation. Another reason may be that, following the financial crisis, many countries reduced funding for research and focused on projects with a societal impact and practical application. This was not the case in Germany where overall funding for research actually went up after the crisis. This meant that there was more funding available for basic research meaning that commercialisation and bridging the gap to the market are less dominant in the German research support landscape compared to other countries. Moreover, culturally, research support in Germany often is still guided by the principle of 'freedom of research' meaning that practical research cannot be preferred over basic research.

5. Challenges and barriers to participation in ISM

An interview respondent pointed to a range of implementation challenges, in the context of the schemes they operate. One practical concern is that in Germany, once university graduates and scientists have transferred to industry, it is very difficult to return to an academic career afterwards. Universities tend to give the limited number of professorship to those with a classic academic career. This may deter some researchers from 'trying out' a career outside academia since.

Intellectual property rights can be an issue in the implementation of some schemes, and interview partners stress the importance of project partners agreeing on how to handle this at the onset. Conflicting goals need to be reconciled where academic partners and researchers prefer for project results to be publish results since they thrive on the exchange of information, whereas industry prefers to capitalise on results alone to gain a market advantage.

In case of the RISE programme, administrative requirements are quite strict, leading to some challenges. In case of the EID programme, the requirement to finish the PhD thesis in three years can be challenging since most candidates in Germany take more time. They then risk not being funded after a three-year-period for which the programme can provide funding. Different problems also occur with firms of different size. For instance, large firms with lots of departments, including legal departments concerned about IPR, may find it difficult to coordinate activities, whereas small firms may not be able to support a PhD candidate for an entire three-year-period.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Germany has a research-intensive economy, and R&D spending accounts for 3% of GDP. A diversified funding system covers everything from indirect funding via tax deductions, open-topic bottom-up funding-upon-application, to top-down programmes for defined topics. However, public support focuses on supporting the founding of businesses and spin-offs out of university and technology transfer. Internationalisation of regional innovation clusters is another focus. Tax credits for R&D have so far not been put in place, but are being debated at national level right now. An earlier braindrain of scientists to the US and Switzerland seems to have come to an end.

Country overview - Greece

1. Number and type of country schemes

In Greece, the competent body for managing research funds and programmes is the General Secretariat for Research and Technology (GRST). GRST announces and funds actions for research projects that may involve in their design intersectoral mobility, however there are no public programmes, explicit for ISM. In this sense, ISM can be an activity within a research project.

The competent body for scholarships (IKY) manages different schemes of scholarships and some specific schemes for PhD and postdoc positions, encouraging industrial research. However, there are no specific scholarships for ISM.

2. Selected examples of ISM schemes.

There is one new scheme specifically designed for ISM:

- Industrial Research Fellowship Programme at NCSR Demokritos

The scheme is funded by the Stavros Niarchos Foundation and aims to fight unemployment of high qualified personnel and minimise the braindrain.

The ISM scheme is very new in Greece and it has some innovative elements that are unique for the Greek situation: the compulsory character of the participation of a company and the funding of the researcher salary by the company.

3. Demand for PhDs

Greece, with 7.3 doctorates per thousand economically active population, was placed 9th out of 22 countries participating in the International Survey on Careers of Doctorate Holders – (CDH)(EKT, 2015).

PhDs face unemployment and Greece is suffering from braindrain. There are sectors that have a demand for PhDs, in disciplines of pharmaceuticals, IT, new materials etc. Public and public funded organisations like innovation centres, managing authorities of ESIF, business incubators etc. also employ qualified scientists. The numbers of start-ups and university spin-offs is increasing and this also creates demand for PhDs. Nevertheless, the economic crisis and the high taxes pose an obstacle to private sector companies to employ qualified staff, unless there is some type of funding.

4. Drivers of participation in ISM

The companies are willing to participate in research programmes in cooperation with the universities and research institutions, if they secure funding. There is a preference to European funded schemes, as they require less bureaucracy and they are easier to implement. There are obstacles to the participation in national funded schemes, as the funding may not be regular and the delays maybe significant.

Although there is no evaluation yet of the ISM scheme, it seems that there are companies that are interested to join ISM schemes on the condition that the results will lead to new products and services that they can commercially benefit from. Given the fact that the companies co-fund one year the salary of the employed researcher, they see these research projects as an investment and they want to gain specific results.

5. Challenges and barriers to participation in ISM

The first obstacle was to persuade the industry to cooperate and co-fund the ISM scheme. Industry was very reluctant to fund their own part of the project, as they do not trust the public sector. Another obstacle was the issue of the IPR, as large companies want to retain IPR and the rights for

exploitation of research outputs, therefore they pose their own conditions to participate in ISM schemes and they require prior agreements for the exploitation of the products.

The institutional framework is also not supportive for ISM. As Greece is still in recession, the economic environment is unstable and some parameters like salaries and taxes change often and create obstacles for project planning. The procedure for the agreement between the research institute and the company can also be improved, as it is very lengthy.

Regarding transnational intersectoral mobility, there have been additional challenges of institutional nature, as the difficulty to get a work permit, residence permit etc. These obstacles are settled now, although it took a lot of time. Euraxess centres support the logistic aspects of transnational ISM, however they suffer from lack of permanent staff.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

The national public budget, supported by the European Structural and Investment Funds (ESIF), has been and continues to be the main funding source for R&D activities. Despite the increase of 11.3% in the business expenditure for R&D in 2015, Greece had the fifth-lowest BERD intensity among the EU-28 (0.32% GDP).

Budgetary cuts in the scientific research funding, significant decrease in the salaries and the high rate of unemployment have led graduates and researchers to search and find job opportunities abroad. Additional funds for R&D have been secured within the framework of the implementation of the agreement, signed in July 2016 between the Greek Government and the European Investment Bank (EIB).

Greece lacks a well thought-out R&I strategy focusing on a limited number of areas of national strength. In the past, the R&I system often followed the general priorities of the EU Framework Programmes, which were not always related to the needs of the country. Despite the adoption of the smart specialisation approach, the number of national research priorities appears to be quite broad.

The continuous increase in taxes, the reduced business revenues due to the crisis, the insufficient support provided by the banking sector (i.e. limited business loans) and the administrative bureaucracy in the management of publicly funded programmes, make it difficult for the business sector to engage in RDI activities.

Country overview - Hungary

1. Number and type of country schemes

In Hungary, there are a number of intersectoral mobility schemes. Although the private sector`s role in funding public science is higher than the EU average, currently the level of human resources of science and technology (HRST) is still lagging behind the EU average. While the importance of partnerships between universities, the Institutes of the Hungarian Academy of Sciences and business enterprises at regional, national and international levels is recognised, the references to inter-sectoral R&D and collaborations were characterised as limited.

Supporting cooperation between business and academia has been a high priority of the STI policy in Hungary that resulted in a number of positive developments in new ISM schemes, such as the growing number of corporate research centres and Open R&D labs (e.g. EIT ICT Budapest Doctoral Training Centre of ICT Innovation in Budapest).

There is a high expectation from the restructured National Research, Development and Innovation Office to improve the approach to science-industry cooperation in the key policy documents and across the entire legislative framework which is crucial for building a sustainable R&I ecosystem and more sustainable public funded ISM schemes in Hungary.

The Euraxess Network, as the most important European network for Mobility and Carrier Development for Researchers in 39 countries in Europe and beyond, is coordinated in Hungary by Bay Zoltan Nonprofit Ltd for Applied Research between 2015-2018. This channel offers a smart environment by their skilled staff to facilitate researcher mobility by providing key practical information and qualified hands-on assistance.

2. Selected examples of ISM schemes.

Involving PhD students into industry initiated software-engineering projects (Ericsson, NOKIA Siemens, - ELTE- BME): One example for ISM is the EIT ICT Budapest Doctoral Training Centre of ICT Innovation for PhD students. The Centre was established by the Budapest Associate Partner Group (Nokia Siemens Networks Hungary, CISCO, Telekom Hungary) in connection to the European Institute of Innovation and Technology (EIT) ICT Labs - Knowledge and Innovation Community (KIC) in Budapest. The programme was started in 1990 by the partnership between Ericsson Hungary and 2 Hungarian HEIs, faculties and labs of ELTE University of Budapest Technical University (BME) in the field of communication software and system performance. Ericsson offered internships, where PhD students are contracted for a period of time, and they worked closely together with Ericsson researchers, mostly on Ericsson-internal or EU projects.

The EIT ICT Labs Budapest Doctoral Training Centre (started in 2013) aims to stimulate the integration of academic education and business. By building on the high level technical knowledge and scientific results of the doctoral schools of highly renowned universities, companies have the potential to acquire more easily new technologies as well as highly skilled employees. The students are encouraged to launch their own start-up companies, and to put their new knowledge and expertise in practice.

3. Demand for PhDs

It is important to understand the knowledge flow and mobility of special segments of the qualified manpower like university graduates, researchers, and holders of PhD degrees in Hungary. The interviews made with the representatives of different types of organisations, both from academia and industry, highlighted the reason why the demand for PhD holders is the very low. The deep

changes in the structure of the economy is not necessarily advantageous for the highly educated people. The rather poor level of technical and product innovation, the lack of the market demand and entrepreneurship oriented curricula in the higher education, and its declining quality, the backwardness of open R+D infrastructure for testbeds and experimentations are the facts which have been addressed to the policy and decision makers. The worsening standard of living of people working in education and research could draw their attention also to those very important social problems.

Any ISM scheme focused on the micro-research tasks and/or ad-hoc tasks and which would involve some support to pay at least partially a competitive salary of a Researcher (PhD holder) would be welcomed by industry.

4. Drivers of participation in ISM

Analysis carried out in the industry sector indicate that in the last decades intersectoral mobility in Hungary has been characterised by ad-hoc support. Some good examples indicate that the researchers and PhD students were thankful for the support of the industrial partners to allow them to progress with their own researches and/or doctoral thesis.

The main impacts of intersectoral mobility on the careers of researchers are mostly quoted by intangible effects such as knowledge transfer. As the main tangible impact, the contribution to a higher number of start-up companies was mentioned in the interviews.

A majority of the interviewees indicated that their organisation formed part of a 'smart specialisation' strategy. They believe that the first-hand experience of the innovation ecosystems and high focus on the changed labour skills should be reflected in the new mobility schemes.

The representative of the NRDI Office underlined that the outcomes of the newly started programmes (like R&D competitiveness and excellence cooperation programmes: GINOP-2.2.1-15; NVKP[25]_16; VEKOP-2.2.1-16, Competitiveness and excellence cooperation programmes: VKE_17[26], Research infrastructure development of Higher Education and Industry Cooperation Centres GINOP-2.3.4-15; FIEK_16[27]) will be taken into account when designing new ISM models.

The key element of such ecosystems is the attraction of highly skilled staff to the knowledge and innovation process, and this is essential to adapt a demand-oriented policy in the higher education in Hungary.

5. Challenges and barriers to participation in ISM

The small domestic companies lack their own funding for RDI and often wait for EU or national tenders and public support in order to launch new RDI projects and train their employees in RDI. In general, SMEs try to avoid taking risk and rarely invest in RDI activities or employing highly- skilled researchers. Therefore it has been a high priority of the government to boost business R&D in the last decade through tax incentives and direct measures supporting business R&D for technology-intensive SMEs.

Research results have limited value if they are not exploited. Interaction with the private sector is therefore critical. However, moving out of public sector research into the private sector for a short period during doctoral studies or thereafter is still very rare, even though it is perceived as potentially beneficial for a researcher's career, access to funding and the exploitation of research

[25] NVKP (Nemzeti Versenyképességi és Kiválósági Program) means: The National Competitiveness and Excellence Program
[26] VKE (K+F Versenyképességi és Kiválósági Együttműködések) means: R & D competitiveness and excellence co-operations
[27] FIEK (Felsőoktatási és Ipari Együttműködési Központok) means: Higher Education and Industrial Cooperation Centers

results. Researchers appear to be held back by lack of preparation in the areas of intellectual property and knowledge transfer. As a result, levels of co-publication between the public and private sector are much lower than the EU average.

The challenges in Hungary for intersectoral mobility include: the introduction of transparent and adequate incentives including adequate appointment and promotion criteria in the public sector to recognise the value of business exposure for researchers; the involvement of private sector representatives in the governance of public sector R&I performers; and the promotion of knowledge transfer programmes at institutional and system level.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

The R&D tax incentives are still playing an important element in the Hungarian public support policy for R&D. The direct costs of the R&D could be deductible from the tax base of the corporate tax, sole proprietor's income tax, local business tax and innovation contribution in the private companies. A new and potentially significant allowance was introduced in 2016: local governments may decide at their discretion that enterprises can reduce the sum of their local business tax by 10% of the direct costs of R&D.

A new National Programme in Brain Sciences launched by National Research, Development and Innovation Office aims to strengthen research centres and institutes belonging to the international front line with €20.6m and turn back brain-drain by inviting and employing researchers working abroad with a total budget of €18.1M.

Country overview - Ireland

1. Number and type of country schemes

In Ireland, there are a range of intersectoral mobility schemes offered by the main agencies that implement research and innovation policy. However, the schemes are generally seen as components of broader strategies both to promote better interaction between the research community and industry and to help Ireland's research base expand and internationalise. Consequently, both intersectoral and international mobility schemes are accompanied by other measures promoting collaboration between academic researchers and industry or other sectors where research can be applied, such as the health and voluntary sectors.

The current overall strategy for Ireland is set out in a document entitled 'Innovation 2020' that was jointly published by the Department of Jobs, Enterprise and Innovation and the Department of Education and Skills in December 2015. This presented a five-year strategy on research and development, science and technology, covering the period 2016-2020.

2. Selected examples of ISM schemes.

One of the main agencies promoting intersectoral mobility is the Irish Research Council, whose Enterprise Partnership Scheme offers a Postdoctoral Fellowship and a Postgraduate Scheme. The latter is open to scholars at Master's or PhD level.

The Enterprise Partnership Scheme Postdoctoral Fellowship awards Fellowships to highly promising early career postdoctoral researchers, to enable them to work closely with an Enterprise Partner and thus benefit from an enhanced research experience and learn key transferable skills relevant to their career and professional development. The Enterprise Partner on this Programme can be a business, a company, a registered charity, a social, cultural or not-for-profit civic organisation, a semi-state commercial organisation or an eligible public body. Eligible public bodies must have 'specific scientific or cultural infrastructure that is integral to the conduct and completion of the proposed research'. The Enterprise Partner can be based anywhere in the world and the project is agreed between the researcher, the host Irish Higher Education Institution (HEI) and the Enterprise Partner.

The more specialised IRC 'New Foundations' scheme aims to communicate the outcomes and values of academic research in a wide range of practice areas in Ireland and beyond. Under strand 1 of a recent call, there is support for small, discrete collaborative projects between postdoctoral or senior researchers and a community/voluntary organisation (CVO) or NGO. The civic society partner has to be a registered charity.

No evaluations of IRC schemes in this area have yet been undertaken, but they are all monitored and applications are subject to an international peer review. The IRC publishes open invitations for nominations of suitably qualified national and international experts to take part in this process. In 2016, the IRC Annual Report states that 277 out of 1202 applications for Postdoctoral Fellowships were awarded. 53 of these awards were for the Enterprise Partnership Scheme, with a budget of €4.5 million.

Science Foundation Ireland (SFI) is an agency of the Department of Jobs, Enterprise and Innovation and thus ultimately aims to promote growth and employment. It offers Industry Fellowships that facilitate the mobility/transfer of people at all levels between academia in Ireland and Industry in Ireland and abroad. Fellowships can be between three and twelve months if full-time, or between six and twenty four months if part-time. However, the Fellowships are part of a broader strategy linking academia and industry and other instruments promote inter-action and mobility, especially over the longer term. In fact, SFI has a target of having 50% of the academics supported transferring to industry by 2020. Currently the rate is 32% across all programmes. A notable instrument in this

context is the SFI Research Centres, which aim to become world-leading, large-scale centres of excellence that will provide a major economic impact. 12 of have been established, with a public an investment of €355 million and a further €190 million from industry collaborators, and an additional 4 have been approved. Research Centres focus on particular sectoral and research agendas, such as Advanced Materials and Bio-engineering, Applied Geosciences, Medical Devices, Data Analytics and Future Networks and Communications. They link scientists and engineers in partnerships across academia and industry to address crucial research questions, foster the development of new and existing Irish-based technology companies; attract industry that could make an important contribution to Ireland's economy and expand educational and career opportunities in science and engineering. As part of the collaboration between academics (at post-doctoral level) and industry there is some intersectoral mobility, depending on the circumstances of particular research projects, but there is also a significant degree of transfer subsequently, in that academics are often employed by the enterprises with which they have worked in Research Centre projects. In this way the Centres help to build confidence and experience in industry in making use of highly-qualified researchers.

Detailed monitoring of awards is undertaken, with annual reports required and a final report just after the end of an award.

Of particular interest to SMEs is the FUSION Programme of InterTradeIreland, an organisation that exists to promote economic links between Northern and southern Ireland. FUSION provides technology support for product development and innovation in SMEs by helping to fund the employment of a high calibre science, engineering or technology graduate and partnering the firm with a third level institution with specific expertise. The graduate is based in the firm throughout a 12 - 18 month project with mentoring from the academic partner and an InterTradeIreland FUSION consultant. The 18!month support package, typically in the area of new product/service development, is worth up to £44,250/€58,700, while the 12-month support project, typically in the area of process improvement, is worth £31,000/€41,100.

Other specialised agencies also contribute to intersectoral mobility and some of these are significant in practice areas other than industry. Among the schemes operated by the Health Research Board, the Interdisciplinary Capacity Enhancement Awards provide postdoctoral fellowships, with the aim of building partnerships between researchers, practitioners and decision makers in health policy and health service delivery. Existing or newly formed Interdisciplinary teams of senior established researchers can apply for one to three postdoctoral fellows to join their team to add value through expertise and insight.

In terms of implementation challenges, one specific problem that has arisen is the reluctance of post-doctoral supervisors to release their staff to take advantage of industry placements. They fear that this will set back their own work programme. This is a particular instance of a more general cultural problem in the academic sector, where involvement in industry can be perceived to be a distraction from the pursuit of an academic career. However, the situation in Ireland has improved in this respect, especially since the increased emphasis in public policy since the recession on building links between academia and industry and the growing evidence of the fruitfulness of this approach from all perspectives.

On the industry side, there is also an issue of confidence and the agencies have to devote a considerable amount of their time in informing enterprises of the possibilities and the potential benefits. Ireland particularly relies on its indigenous SME sector, since its larger companies are often multinationals which conduct their research elsewhere, so this process of confidence-building poses particular challenges there, but again the growing experience of enterprises that have participated in mobility schemes and have built relationships with academic institutions more generally is helping to

resolve some of these problems. After a slow start a Linked-in Group linking industry and academics and helping to build confidence is beginning to take off.

3. Demand for PhDs

Given that Ireland aims to strengthen and develop its knowledge economy, and that manufacturing has generally been underdeveloped in the past, the demand for PhDs and post-doctoral researchers is primarily in new technology sectors - bio-tech, pharmaceuticals and medicine more generally, electronic and optical products, ICT and software development, applied geosciences and renewable energy. However, because the indigenous industrial base is largely composed of SMEs, the demand for post-doctoral research has been relatively limited and often confined to university spin-outs. However, the various programmes described above are gradually increasing the take-up among a broadening group of enterprises – a process that is assisted by the favourable economic conditions – Irish GDP growth rates are among the highest in Europe.

4. Drivers of participation in ISM

Public policy has been a major driver of the development of relations between academia and industry in Ireland over the last decade or so, especially since the financial crisis. ISM is a significant component in these relations, though, as explained above, it is regarded as only part of the more general strategy. The increasing number of those with a PhD or post-doctoral experience entering into employment by enterprises is confirming the power of this driver and ISM schemes are playing an important part in facilitating this outcome.

The relatively high level of educational attainment in Ireland is also a consideration, since although the capacity of research institutions is being increased, the well-qualifications population, especially among the younger age cohorts, together with an active policy of encouraging researchers from elsewhere in the world to locate in the country, means that competition for research-based work is intense and the growing opportunities to conduct research, while employed by industry and other practice sectors is seen as being attractive.

While traditionally young people in Ireland have gone abroad to pursue their careers, the return to economic growth is offering greater opportunities at home, and the brain drain is decreasing. At the same time, Ireland has actively encouraged researchers from elsewhere around the world to locate in Ireland, as part of its internationalisation strategy. Consequently the brain drain is not all in one direction.

5. Challenges and barriers to participation in ISM

Barriers to participation in ISM identified by the Irish agencies, included constraints on the design of programmes resulting from state aid rules, which were thought to inhibit the range of funding support that can be made available and the IPR regime operated in Ireland. In fact, this can be flexible, but the starting point is that IPR generated by research supported by state funds should belong to the sponsoring university and this tends to put enterprises off, even though other arrangements can be negotiated. SME start-ups in particular are sensitive to this issue.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Ireland has an established tax credit system which drives much of business investment in R&I (BERD was 1.14% of GDP in 2014) The RIO report 2016 for Ireland points to improving the performance and take-up of R&D by indigenous enterprises as being one of the major challenges, along with encouraging FDI firms to increase their research activity in Ireland. Having research capacity in Ireland and being able to attract researchers from around the world is a significant element in the strategies to address these challenges, along with the ongoing efforts to improve business-academia

collaboration and knowledge transfer, which was also mentioned in the RIO report with the further comment that Ireland would benefit from the rationalisation of the wide range of small scale grant-based schemes.

The return of the Irish economy to strong growth in the last few years provides an important stimulus and also the means for a restoration of some of the funding cuts that were made during the crisis.

Country overview - Italy

1. Number and type of country schemes

In Italy there are a range of intersectoral mobility schemes offered by the central and regional authorities. The schemes promote interaction between the research community and the industry sector, and are used to help the research base to expand and internationalise.

Intersectoral mobility schemes have traditionally not been implemented through a coordinated approach. The schemes are usually ad-hoc measures implemented as part of wider policy programmes. As a result, the system is fragmented and the funding available varies significantly across regions.

The creation of a strategy related to intersectoral mobility schemes could be triggered by the EU policy. For example, in 2016 the Ministry of Education launched the innovative PhD scheme as part of the wider National Smart Specialisation Strategy 2014-2020. The scheme is partly funded through the human capital axis of the FSE structural fund and takes a coordinated approach to avoid overlapping between measures.

Other interesting policy developments include the reform of the PhD system. The reform aimed to enhance collaboration between academic and private sector. A number of ISM schemes have been implemented, including the so-called PhD executive and apprenticeship contracts for high-level research. Both schemes are regulated by law and require the participants to spend time both at university and in the company.

The increasing interest towards these types of schemes is however not followed by the number of available placements. The overall offer of intersectoral mobility schemes is still lower compared to the demand. For example, in 2017 the number of grants available through the "PhD innovative scheme" is 123, representing a total funding of € 13m.28 The mismatch between demand and supply is also related to the reduction of PhD offers, as a result of the public cuts.

Selected examples of ISM schemes.

One of the most important institutions promoting intersectoral mobility is the Conference of Italian University Rectors (CRUI). The CRUI manages a three-year pilot project called PhD Talents in partnership with an employer organisation (Confindustria). The total cost of the scheme was €16m, of which €11m were provided through national funds and the rest by the private companies. The project aim is to facilitate connections between universities and private sector companies, by supporting the inclusion of PhD students in companies to carry out highly innovative projects. This scheme co-finances for three years the employment contract of the PhD students involved in the project. This support is provided as follows: during the first year the financial support represents 80% of the employment cost, during the second year the financial support is 60% and in the third year the scheme funds half of the employment costs.

Another interesting example is the ISM scheme developed by the Corimav Consortium. Since 2001, thanks to an agreement between the University of Milano-Bicocca and Pirelli Company, the Corimav Consortium for research on materials funds three scholarships per year for the industrial curriculum of the doctorate in Materials Science. Such Ph.D. positions often foster research activities related to

[28] http://www.ponrec.it/ponri/notizie/2017/dottorati/

tyres, but also more general topics such as nanotechnology and simulations of materials. Pirelli Company's experts lecture on management and intellectual properties at the Ph.D. school of Science and present seminars on specialised topics.

The Banca of Italy offers annually research fellowships for economists in its Directorate General for Economics, Statistics and Research in Rome. The fellowships are for twelve months, renewable for another twelve, and provide fellows with a monthly salary of €4,000 before tax. Usually the fellowships are announced in October each year, and applications can be accepted through November. Winners carry out the research project they propose in one of the fields listed in the notice of competition. When the project is concluded, the fellows may be invited to take part in a competition for a permanent position with the Bank at the entry level of the managerial career stream.

2. Demand for PhDs

According to the Association of Italian PhD researchers in the last ten years the number of PhD positions available every year has experienced a dramatic drop, from about 16,000 to just over 8,500.[29] Available positions are also concentrated in the richest areas of the country, with an increase in the North and a reduction in the South. The main drivers of this drop are the legislative reforms implemented in 2013 and the steady reduction of investment in R&D experienced in Italy.

Demand for PhDs seems to be concentrated in the so-called technical sectors, e.g. material science, pharmaceutical sector, rather than in the humanities.

In Italy there is a clear gap in the demand for PhDs between SMEs and large companies. Large companies tend to recognise the value of PhD and look for people with a PhD, conversely SMEs are less interested in recruiting people holding a PhD.

3. Drivers of participation in ISM

In the past, starting a PhD or a post-doc fellowship were considered the first steps to start a career in academia. Nowadays, researchers are increasingly aware careers in universities are restricted and therefore higher education is considered an investment in human capital to enhance skills and competencies that can be attractive for the labour market. In this context ISM schemes are perceived as a significant component to enhance the collaboration between academia and industry and to align skills and competencies.

4. Challenges and barriers to participation in ISM

A number of barriers were identified in relation to enhancing the collaboration between academia and industry through intersectoral mobility schemes. The challenges and barriers to participation in ISM include:

- Difficulties in offering doctorates designed by the academia in collaboration with the private sector. This challenge is mainly due to the way doctorates are evaluated by the Italian National Agency for the Evaluation of the University and Research System (Anvur). This evaluation, carried out every 5 years, takes into account indicators that are tailored to the academia rather than the industry sector. Examples of indicators considered are: number of publications, number of seminars attended. This inconsistency of the legislative framework hampers the development of collaborations in the design of doctorate schemes.

[29] https://dottorato.it/content/vi-indagine-adi-su-dottorato-e-post-doc

- There is a lack of intermediate structures, such as laboratories, where people working in the private sector and people working in universities can meet. These intermediate bodies should be physical places where people can meet, exchange ideas and start projects. In some countries, such as in Germany, such intermediate bodies already exist and are particularly effective.
- A survey carried out by the Conference of Italian University Rectors (CRUI) highlights that the limited demand for PhDs is partly due to a lack of formal recognition. In Italy PhDs are not as well recognised as in other countries.
- In Italy there is a lack of a strategic approach in developing ISM schemes. The lack of coordination has produced regional differences in terms of type of doctorate courses offered and funding available.

5. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

In Italy the evolution of the R&I system in Italy has been deeply affected by the financial crisis, with a reduction of public expenditure associated with austerity programmes and a decline in private sector R&D investment. The R&D intensity in 2013 was below the EU-28 average, i.e. 1.31% of GDP compared to slightly more than 2%, and the R&D target identified at national level, i.e. 1.53% of the GDP, remains particularly challenging to achieve. As a result, a gap with the EU-28 average is likely to persist in the short and medium term. The degree of public-private cooperation is low as indicated by the Italian 2012 CIS survey. The level of Italian business enterprise (BES)-funded public R&D expenditure as a percentage of GERD increased from 2005 to 2006, and then decreased constantly between 2006 (1.07%) and 2010 (0.97%), after which it returned to a growing path in 2011 and 2012. The indicator declined again in 2013, going below 1% of GERD, at 0.95% of GDP. The result of the challenges is a significant braindrain experienced in the last years. A significant share of highly educated young people (including researchers) have moved abroad.

The framework business investment in R&I is characterised by indirect incentives as well as the implementation of specific measures for SMEs. A R&D tax credit scheme, available for the period 2015-2019 allows a 25% tax credit for incremental investments in R&D, up to a maximum annual amount of EUR 5m for each beneficiary. For costs related to highly qualified personnel employed in R&D and the costs of the research performed in collaboration with universities, research organisations or other companies (including start-ups), the tax credit is increased to 50%. The foregone tax revenues have been estimated at nearly EUR 2.5b for the whole period 2015-2019, which is the highest amount allocated in the last 10 years. Italy also introduced a patent box, allowing deductions of 50% on the revenues from direct/indirect use of intellectual property (patents, trademarks, industrial design and models).

Progress have also been made in improving the legal framework to promote innovation. In particular, Italy has taken steps to improve legal certainty, for instance, by establishing the legal definitions of innovative start-ups (2013) and innovative SMEs (2015). They can benefit from reduced red tape, tailor-made labour law, tax relief, the possibility of raising investments through equity crowdfunding, etc. Since 2011, government policies have encouraged patenting and the use of other IPRs by Italian firms, in particular SMEs. These initiatives are managed by MISE and have the intent to stimulate patent applications to the national and international patent offices.

Country overview - Latvia

1. Number and type of country schemes

In Latvia, there is small number of intersectoral mobility schemes. The ISM is possible within other programmes in science or higher education, but not compulsory and almost never used. Most of ISM or other related programmes are either EU funded, or at least promoted by EU policies. The Ministry of Education and Science is now developing a new programme for academic personnel development, which will include an ISM element – 900 academic representatives (lecturers, professors, researchers and others) will be involved in 6-month mobility to industry (internships). Regarding other programmes, the Ministry of Education and Science is considering to change mobility to a compulsory instead of an optional element. Some of the ISM related programmes started only recently, within this planning period (2014 – 2020), e.g., postdoctoral research, industrial doctorates. Other cooperative programmes have been implemented since 2007, e.g. Technology Transfer Centres, Competence Centres, Clusters, and others.

2. Selected examples of ISM schemes.

There are diverse programmes that support cooperation between academia, research / science institutions and industry representatives and cover different stages of innovation development:

- Research - programmes supporting applied research, feasibility studies, industrial research, experimental development, and other;
- Commercialisation - within business incubators, competence centres, clusters and technology transfer centres, as well as individually at the business site, including licencing and property right establishment.

Most of the programmes are focused on knowledge and technology transfer through cooperative actions, but direct intersectoral mobility (e.g. internships or other physical mobility) have not been performed so far. This will be changed by implementing the Academic Personal Development Programme by the Ministry of Education and Science, which will include internships in industry for academic personnel.

Applied research programmes (performed in scientific groups) are most commonly undertaken by academic and research / scientific institution participants but industry is most involved in competence centres and clusters, where research organisations and higher education institutions are their partners. In the previous planning period 2007 - 2013 there were 6 competence centres, introducing 180 new products and creating 455 working places. In this planning period 8 competence centres are supported and more than 700 researchers are currently involved. From April 2012 to December 2014, more than 350 SMEs, HEIs, research organisations, NGOs and municipalities were involved in cluster programmes of the previous period, employing more than 21 000 workers in 2014 (it is an increase of 2,500 workers since 2011). There were 11 clusters in the previous planning period and 14 clusters are supported within current planning period, starting their activities since 2017.

All of the mentioned programmes are focused on the smart specialisation areas identified in Latvia.

3. Demand for PhDs

Knowledge intense research organisations (e.g. in biomedicine, chemicals, material science, physical science and other sectors) as Latvian Biomedical Research and Study Centre are recruiting the

highest share of researchers in the corresponding sector and a relatively small share of the Latvian PhDs and postdoctoral researchers in these sectors are employed by industry.

This can be explained by:

- relatively small industry,
- low added-value generating industry,
- earlier recruitments in industry (already after undergraduate or graduate studies) that are not focused on knowledge intense scientific work.

In sectors like IT and the social sciences (management, marketing etc.) PhD and postdoctoral studies are not found to be in that level of importance. Industry is recruiting students at their early stage of studies and investing in their further development. However, the most innovative enterprises support employees in their later PhD and postdoctoral studies, which complement to the internal learnings and leads to further knowledge transfer. These companies are more likely to take part in different EU funded programmes (including ISM) and R&D projects, and work closely together with partners from academy in their daily business.

There is no extraordinary need for PhDs in the public or third sector, clusters or competence centres. PhD holders are employed according to their knowledge – in some sectors a doctoral level is more important than in other sectors. Research is usually performed based on the agreement between two (or more) parties, where the academia or scientific institution involves researchers of all levels. Research performed internally in industry is common among larger companies, but in the public or third sector it is less common (except in institutions and organisations, which are research-focused).

Both academy and industry think that the activity of new researchers could be increased by supporting start-ups, spin-offs and other entrepreneurial incentives. This is reflected also in the RIO report, mentioning that in Latvia there are sub-optimal framework conditions for entrepreneurship and access to finance for (innovative) enterprises.

4. Drivers of participation in ISM

Companies are willing to participate in cooperative research programmes to increase their innovation capacity. Only large companies have internal R&D divisions. Therefore, EU funding is more needed for research at SME level. On a daily basis the company is busy with its main business focus; the participation in the ISM (or other) scheme helps to expand the innovation capacity and working area. Participation is not primarily related to PhDs employment or similar, the main focus is on the innovations. EU or other funding is a mechanism that can help to cover the risks of failure. Learning is always a result of the project both for industry and researchers that leads to new ideas, cooperation, researches and new products.

Academic and research organisations are highly interested in participation in both national and international ISMs. Nationally it gives access to industry's "problems to be solved" that can be analysed and studied by students and researchers leading to new solutions and products in industry. Internationally an important driver is the international network – firstly, possibility to work on most topical issues with other research organisations (when locally there is not available capacity to conduct large-scale research) and, secondly, to exploit the latest technologies and laboratory equipment, and significantly increase knowledge. External funding for research organisations during projects in Latvia is directed at (a) improvements in research equipment or (b) pay for researchers.

5. Challenges and barriers to participation in ISM

In companies that have internal R&D divisions or that perform research on a regular basis the administrative burden of participation is higher than cost of direct recruitment of researchers or expense of external research. Administrative burden was mentioned in all interviews, however, the representative of industry mentioned that, as the administrative burden is the same for all, there are no competitive disadvantages to comply with it and compete among participants, so it cannot be named as the main barrier.

Industry representatives mentioned the limited capacity of scientists as a challenge in cooperative projects, along with the lack of common understanding between parties. But the problem has deep roots, and industry has recognized that the level of knowledge in schools has lowered that affects the results of students and so forth.

Representatives of academy think that

- time of waiting when project proposal is submitted and while project is developed (and approved in the middle-terms) is not suitable for business environment; and
- in rare cases industry avoids to become partners in projects because of bureaucracy, administrative burdens, and even more, because the State Revenue Service and other state institutions could start more investigations and examinations of the company.

For academic and research organisations an important challenge is the pay for personnel. If the project is state co-funded, the pay is regulated - [maximum] 20 euros for leading researcher, 16 euros for researcher and 14 euros for assistant (hourly rate, gross). It is not a competitive advantage. This also is a curse for issues like braindrain.

Academia has a challenging experience of unstable business environment. There are several cases when the business has changed the owner, so the priorities changed and they are not continuing the projects, or are liquidated. Representatives of industry have also emphasised loyalty as an important aspect in finding the right partners.

An obstacle (also mentioned by academic representatives) in national regulation is the difference in procurement and accounting principles between public and private sectors. These kind of administrative procedures should be more balanced.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Funding is provided through EU funds (mostly ERDF) and nationally (limited funding). The problem with financing is also the fragmentation – (representatives of industry mentioned that in the interview) there are too many smart specialisation areas defined nationally, which divides the funding among too many parties leading to low-budget projects with sub-optimal results and impact on economy.

Limitations mentioned in RIO report[30] are:

- Low development of human capital for innovation both in business and public sector,
- Fragmentation of the public research and education system and low quality of the science base,

[30] https://rio.jrc.ec.europa.eu/en/country-analysis/

- Sub-optimal framework conditions for entrepreneurship and access to finance to (innovative) enterprises.

Braindrain is a particularly significant problem in Latvia because of (a) small and/or low added-value industry in knowledge intense research areas and (b) very limited pay for researchers in HEIs or research organisations. Braindrain is ongoing at two levels:

1. From academia and science to industry with better-paid working places (it leads to lost potential and limitations with regard to the development of the scientific base of universities and research institutions),
2. From Latvia - abroad (which has a negative effect on the overall economic situation, incl. innovation).

Country overview - Lithuania

1. Number and type of country schemes

In Lithuania, there are quite a few intersectoral mobility schemes. However, the mapping of schemes showed that there is a great focus on schemes promoting commercialisation of research results, especially by establishing start-up/spin-off companies by researchers. At the same time there are very few schemes promoting direct mobility of researchers to private sector/industries, while the participation rates in those few existing schemes is very low. The existing ISM schemes tend to be publicly funded, mostly by the EU funds.

2. Selected examples of ISM schemes.

The typical ISM scheme in Lithuania is "Commercialisation of R&D projects", which aims at promoting innovative product, technologies or services commercialisation process and its transfer to the market by supporting the establishment of innovative new companies by teams of researchers. The activities supported under this measure include the R&D activities corresponding to the TRL levels 7-9, as well as activities related to commercialisation/market application of the prototypes and technologies developed. The beneficiaries funded under this scheme include Lithuanian science and education institutions, university spin-offs, researchers and students. The scheme is funded from the EU Structural Funds and it is managed by the Agency for Science, Innovation and Technology (MITA). Maximum project size is 23,579 EUR.

Another example is the "Technology development projects funding measure" that aims at creating favourable conditions for the country's technological development and promoting scientific research targeted at productive innovations in public and private sectors. Under this measure, each project has to have a project coordinator - a research and education institution and a partner - a business organisation (an SME). The expected result of the project must be a technology/prototype corresponding to the TRL level 5 or above. The possible project costs covered by the measure include salary costs for staff (other possible costs being the project costs related to infrastructure, tools, materials, services etc.), including those of research staff employed in the company to cope with the project activities. The measure co-funds up to 100% project costs for a research or education institution, up to 80% for very small company, up to 70% - for a small company, up to 60% for medium size company. Maximum available funding is 100,000 EUR for a project. The measure is managed by MITA.

3. Demand for PhDs

There are a number of emerging sectors where there is some demand for PhDs and post-doctoral researchers (e.g. biotechnology, laser physics, etc.). At the same time, however, some of the business interviewees indicated that in their companies and fields of work (ICT), having lower than PhD degree was rather an advantage. PhD level knowledge is needed in disciplines like biochemistry, whereas in some fields companies do not search for a very narrow but deep knowledge, but rather a broader view and creativity. Therefore Bachelor's and MSc degree researchers were the most important for such companies.

There is also demand for PhDs in science parks and incubators, as the evidence points that in some of such parks there is enough of research infrastructure but a lack of scientific personnel to use it. There is lack of data on the demand of PhDs in the public sector/NGOs.

4. Drivers of participation in ISM

There are several key drivers fostering the participation of researchers, companies and HEIs in ISMs. From the perspective of researchers the main driver to participate in ISM schemes is the opportunity to achieve commercial profit from their research work by commercialising it. For some researchers it

gives an opportunity to switch the direction of their career from academic to business sector. In addition, some schemes help overcoming the bureaucratic and legal issues, which would be encountered while trying to commercialise their research results in a university environment. From the perspective of HEIs, the key driver is to popularise their brand (in case the university name stands behind a very successful research-intensive company). In addition, the universities expect to get their share of commercial success through IPRs. From the perspective of a company, the ISM schemes give additional funds, which would help them expanding their activities and reaching new markets.

5. Challenges and barriers to participation in ISM

The beneficiaries and managers of ISM schemes identified a number of barriers to the participation of researchers in ISM scheme (promoting establishment of innovative companies by researchers).

The Lithuanian Agency for Science, Innovation and Technology (MITA) and some of the beneficiaries of schemes pointed out that incomplete and weak composition of the project teams was one of the main challenges to the successful participation in the schemes. The researchers usually lack managerial and entrepreneurship skills. Similarly, sometimes the researchers lack the responsibility related to project administration (the reports are often provided late, with significant mistakes etc.).

In addition, some of the researchers and companies already established noted that there were some regulation/legal difficulties related to the requirements posed by national authorities to the newly established innovative companies (e.g. regulations posed by the National Food and Veterinary Agency). As they noted, some of these regulations were too strict and posed significant administrative burdens for the participants. Also for some companies, the funding received was too small to expand its activities.

Finally, some HEIs pointed that some of the legal regulations used in EU structural funds pose barriers to their participation in ISM schemes. For example, there are de minimis requirements, which set the limit on the number of projects for one beneficiary institution.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Lack of funding in public HEIs and research institutes was identified as a positive framework condition, which motivates researchers to switch to the industry/private sector. In addition, brain-drain and emigration of researchers is another significant issue in the Lithuanian R&I system.

Country overview - Luxembourg

1. Selected examples of ISM schemes.

Luxembourg due its size and central location in Europe has very unique aspects with regards to ISM Schemes.

These types of schemes are mainly domestic, but they can be held with partners from outside Luxembourg in collaborative research. However, it is quite common for researchers to spend periods outside of the country, because the country is small, and many companies have divisions and departments abroad.

It is common for other institutions, apart from universities, to act as partners (contracting partners), with researchers coming from the universities and going for those companies and the other way around, researchers from the companies going to the universities' research group.

The countries involved in ISM Schemes in Luxembourg are Central European countries mainly; UK, Germany, Belgium, Netherlands and France. Additionally, there are diverse type of institutions (industry) - heavy industry, Delphi, Goodyear, Satellite technology companies, and more recently, companies like KPMG, law companies, Deloite (companies from IT, material sciences, law and economics) that started to apply for this type of schemes.

2. Selected example of ISM schemes.

PRIDE Program

Through the PRIDE programme, research institutions are supported by receiving a block of PhD grants to a consortium of supervisors united around a coherent and competitive research programme and offering excellent structures for PhD training.

The attraction of high potential PhD candidates to Luxembourg is one of the key aspirations of the PRIDE programme. PRIDE confers flexibility to research institutions to carefully select and recruit the most promising PhD candidates. Candidates recruited under PRIDE are offered a full 4-year PhD grant (based on employment contract), which constitutes a major asset in the competition for the best candidates in Europe and worldwide.

The PRIDE programme will be one of the central instruments to implement National Research Fund's (FNR) strategy. The key objectives of the programme are:

- to provide more specific support for research teams that demonstrate good quality work over time, in order to achieve critical mass in a limited number of fields of excellence,
- to support Luxembourg-based research institutions in their efforts to attract and recruit outstanding PhD candidates that pursue internationally competitive research,
- to support institutions to offering attractive working conditions to PhD candidates and to training them to become highly skilled professionals, able to respond to the needs of research, society and economy.

The programme targets research teams that have already a certain track record in doctoral training and wish to consolidate and develop long-term doctoral training programmes around strong research priorities.

Eligibility for funding is provided to public institutions and non-profit associations and foundations performing research activities based in Luxembourg.

Funds provided by the FNR in the framework of PRIDE are aimed at Doctoral Training Units (DTU).

AFR

It is a strategic priority of the National Research Fund (FNR) to support industry-informed research reinforcing co-operation between public research and innovative industries, and by facilitating the commercial exploitation of research results. The aim of the AFR PPP programme is to foster the cooperation between Luxembourg based companies active in R&D and public research institutions in Luxembourg and/or abroad.

The specific objectives of the programme are to:

- Prepare young scientists not only for an academic career, but also help in acquiring the necessary skills and competences for the private job market;
- Support knowledge transfer between higher education institutions and Luxembourg based companies active in R&D;
- Promote the development of industrial research capacity in Luxembourg through the recruitment of early stage researchers and the concomitant implementation of partnerships between companies and public research organisations.

The duration is: 1+3 years; and the full grant duration of up to 4 years will only be granted based on a positive assessment of the beneficiary at the end of the first year. AFR PPP grants are aimed at Host Institutions to employ AFR PPP beneficiaries to conduct their research studies. Fellowships abroad may only be granted under specific circumstances and upon special request.

In order to support knowledge transfer and to enhance the training in both sectors, AFR PPP candidates should not spend less than 25% of their time in the company. For post-doc grants, the time spend in the company could be increased of up to 90%.

The FNR pays to the Host Institution a maximum contribution to the annual salary costs.

- AFR PPP Post-doctoral grants 63,723 € /year
- AFR PPP PhD grants 45,130 € /year

The FNR strongly encourages complementing basic academic training with additional training targeting skills development to increase the employability and career prospects of researchers. A specific budget for scientific and non-scientific training of up to 4,000 € / AFR PPP Postdoc grant and up to 6,000 € / AFR PPP PhD grant is available to cover additional costs (e.g. travel to scientific conferences, conference registration fees).

3. Demand for PhDs

There are some fields where we can find some demand of researchers to be part of companies' teams, the direct benefits are substantial justifying their integration. The competition requires academics with scientific knowledge inside the companies. These will bring better solutions achieved through research and different approach to the market with more quality and good results. Moreover, in the country, PhD candidates in these projects have a higher salary and they have the chance to work directly with the industry in international collaboration.

Additionally, the national stakeholders (public authorities) follow a general strategy of promoting collaboration between universities and researchers and companies.

One indicator of this demand is that more people and companies apply for the "Fonds National de la Recherche" every year for these types of PhD. Additionally, an increasing number of young researchers are staying on in the research departments, which are growing in size each year thanks

to a decisive contribution from this type of schemes. More than 50% of the researchers on these schemes stays in the companies or in the industrial sector.

4. Drivers of participation in ISM

More than 50% of the researchers on these schemes stay in the companies or in the industrial sector.

Between the reasons for being involved in these schemes identified are:

- For researchers to gain a considerable international reputation,
- To receive recognition of their experience, after working in a reference company, the collaboration with the industry is a good way to train employees and future employees to be able to operate in the market.

This allow us to conclude that it is definitely a good way for someone who wants to move to the industry.

These kind of schemes is something that tends to increase each year. More people and more companies apply every year reaching the institutions concerned. Additionally, more people stay in the research departments of the companies, with these research departments getting bigger every year with a decisive contribution from this type of schemes.

5. Challenges and barriers to participation in ISM

It was identified as well that some researchers are very well integrated in the company, although others do not have the necessary support for different reasons (they do not have access todata, enough resources, etc.). There are cases of companies that do not have functions, research, critical subjects or work for them to perform.

Moreover, many companies are not aware of what is going on. Some do not have sufficient information of how they can benefit from the ISM schemes. Many SMEs do not even know what type of work needs to be done. It could be useful to have some guidance for them to be able to receive researchers and be involved in the ISM schemes, less administrative burden for small companies, more promotion and dissemination of information to explain how R&D could help them, examples of successful partnerships (how research has brought advantages to the companies).

The typical obstacles are concerned with IP issues; how to exploit what has been generated as an outcome. This leads to some disputes between universities and companies.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as brain-drain)

Il the country there is €6.5 M per year for PhDs and Post-doctorates; 45k per year for PhD; and 63k per year for Post-doctorates, while€500 000 per year has been allocated for PPP. However, the authorities established 15% as the part of funding from Public authorities; more would have a negative impact. With higher rates of funding companies would apply with “fake” applications to get funding for hiring purposes. With 15% they are committed to the programmes.

After the co-funding is agreed upon a promotional agency in Luxembourg works on the rest, bringing companies together. The funding is the main driver. The fact that Luxembourg is a small country makes the matchmaking easy.

Although, some strict regulation, bureaucracy, administrative burdens bring some obstacles, such as: establishing contracts.

Country overview - Malta

1. Number and type of country schemes

ISM in Malta is largely informal and unidirectional, with individual researchers using their personal networks to move into industry. Government funding is used to promote collaboration between industry and academia. In certain instances, this may involve physical mobility – with representatives from industry basing themselves temporarily at the University of Malta for the duration of a particular research project.

2. Selected examples of ISM schemes.

It is hard to identify clear cut ISM schemes in Malta, however all nationally funded projects contain an element of intersectoral collaboration which often leads to some form of mobility. There is also significant informal intersectoral mobility, particularly amongst university professors who choose to spend their sabbaticals working in industry.

The Malta Council for Science and Technology (MCST) runs the Diffusion R&I scheme, which funds collaborations between research and academia. The University of Malta, for example, received €180k for a technology research project where a number of private sector employees were based in the university labs while the project was running. This led to technological transfer from industry to the university as the industrial representative sitting in the labs was a software developer and was able to teach PhDs, MAs and Professors to produce code of industrial grade.

Another example of a collaboration with some elements of ISM is the Microsoft Innovation Centre (MIC), which provides support for early stage start-ups. As well as acting as an incubator, MIC provides support to students for a future in industry. This is done through training, help with developing their CVs, access to free software and tools, and access to the start-ups using the space.

3. Demand for PhDs

Demand for PhDs is relatively low, due to the island's small population, the limited availability of PhD spaces (these are only offered by the University of Malta) and a shortage of jobs with a requirement for PhDs.

4. Drivers of participation in ISM

The Malta Council for Science and Technology (MCST) is the key public (administrative) body in charge of RTDI in Malta. MCST was established by the Government in 1988 and sits within the Office of the Prime Minister. Part of their research strategy involves bringing industry and academia together, which provides routes for formal intersectoral collaboration. All national research and innovation projects funded by MCST require an industry and an academic partner, usually from the University of Malta or Malta College of Arts, Science and Technology. This has been a fundamental funding criteria the national research programme began in 2004. This often leads to informal mobility (for example, professors at the University of Malta often request sabbaticals to spend some time working in industry, a connection which is often made during the projects funded by MCST).

The University of Malta is also increased resources into international collaboration and knowledge transfer, particularly through trying to work with the best students to create spin out companies. There are very good inventions happening at the University of Malta but there are no industries currently trying to pick them up. In general it would be beneficial to strengthen the whole ecosystem which (especially if the industry part were strengthened) would help to reverse brain drain amongst former students.

5. Challenges and barriers to participation in ISM

There is a very strong interest in ISM within Malta, especially from students studying at the University. However, there is less interest at industry level and very little opportunity for PhDs to find work within industry. One of the problems is that a significant proportion of industry investment comes from abroad, and the focus of spending is more on manufacturing than research. It would be broadly beneficial to have much more dynamism between industry and academia and also to draw more attention to R&I in Malta.

According to the MCST, it is hard to make a political argument for stronger investment in ISM within the current environment. More needs to be done to interest industrial partners in order for this equation to change. The main problems identified are the size and maturity of the R&I system, and the physical size of Malta. These are both limiting factors on the research pool, making it hard to create a critical mass of R&I. Significant improvements have been made in recent years, and it is hoped that as the R&I system develops, opportunities for further industrial involvement will develop.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

In the last decade – despite the economic crisis – Malta has set out to maintain its R&D investments. The public expenditure target for 2020 is to reach an R&D intensity of 2%. Judging by 2013 figures, this goal is not on track, as R&D intensity measured 0.85% of GDP (below the EU-28 average at 2.01%).[31] Notwithstanding, the Maltese government has boosted the allocation for the national R&I funding programme from €0.7 million in 2010 to €1.1 million in 2011 and again to €1.6 million in 2012. Government funding of R&D has increased steadily between 2007 and 2012 at an average annual real growth rate of 8.2%.[32]

[31] European Commission Horizon 2020 (2015) Malta Country Profile and Featured projects. See http://ec.europa.eu/research/horizon2020/pdf/country-profiles/mt_country_profile_and_featured_projects.pdf

[32] European Commission Directorate-General for Research and Innovation (2014) Research and Innovation performance in Malta Country Profile 2014

Country overview - Netherlands

1. Number and type of country schemes

Netherlands has several ISM Schemes promoted by the industry/companies and universities. We can find a mature ecosystem of cooperation between these two types of stakeholders with a strong participation of the government. PhDs in Netherlands are made under the umbrella of graduate and/or research schools. In the latter research is generally conducted in close collaboration with other institutions. This type of PhD embodies the type of ISM scheme that we are studying.

In these Research Schools we can find schemes where researchers come from academia to industry but it is more common to find situations of researchers coming from companies to the universities.

There are several motivating factors for such mobility:

- to gain knowledge and experience; they see the way that industry works. PhD students are in touch with the market while learning critical issues in the day-by-day. They become more aware of what they can do with the knowledge achieved along their studies.
- Collaborative research - people to work directly with the other partners (collocated), people from the company and from the universities working together, exchanging ideas, debating, etc... in the same place sharing facilities, questions and challenges. This will lead them to approach the problems under different points of view and following different critical needs.
- effective tool for recruitment – it is possible to observe how potential workers react to work situations, making it easier to reduce the risk when hiring future professionals to work.
- ensure a stable professional situation - some of them will work in the future in the area where they are doing the programme/scheme (PhD ISM). The doctoral programmes stimulate researchers towards specific activities leading to deeper knowledge and proper skills for a future job.

In general, the answers received allow us to conclude that these programmes between universities and companies put PhDs in real situations, with real problems forcing them to learn in the field, where they are in touch with decisions and problems making them experienced people in dealing with real world issues and bestowing them a more practical knowledge.

The Dutch government has incited research groups to work with companies, and members of research groups from universities to be inserted in research groups of companies and vice-versa.

Additionally, the use of these schemes to fight unemployment and guarantee a good-quality recruitment seems to be well-developed and standardised. Besides, having this people in labs allow companies to see whether people fit in the company culture.

<u>There are some strategic reasons:</u>

- To keep and nurture good relations between industry and academia because they are potential clients of each other (e.g. hospitals and image technology providers; technical software and data mining companies);
- Different research activities complementing each other – the interaction between institutions that may complement their own research, or because companies have already found a new solution, but need some testing, or companies cannot afford to go further than the basic research and more research is needed;
- Synergies resulting from the combination of both sides where all can benefit;

- Researchers are valuable to companies because they can bring knowledge, ideas and critical thinking to the company, and some of these do not have sufficient funding to keep these permanently assuring their payroll;
- One common aspect shared by both central stakeholders are the senior researchers working part-time between academic institutions and industry. They are excellent bridges, points of contact that help to establish good connections, understand what is pertinent to focus and they know how to deal with the young researchers, etc.

2. Selected examples of ISM schemes.

Professional Doctorate and Engineering Programme

The Professional Doctorate in Engineering (PDEng) is a practically oriented professional doctorate in engineering which is better suited to the direct needs of industry than a PhD programme that focuses on scientific research. It has the duration of 2 years and the researcher is engaged with the professional field through the holding of a contract with a company. The aim is to develop students' capabilities to work within a professional context. These programmes focus on applied techniques and design, in their respective engineering fields. The technological PDEng programs were initiated at the request of the Dutch high-tech industry.

It is a programme of advanced training which, whilst adhering to the university criteria for the award of a doctorate, is designed to meet specific needs of a professional group external to the university.

The programmes are certified by the Dutch Certification Committee for Technological Design Programs (CCTO or Dutch: Nederlandse Certificatiecommissie voor Opleidingen tot Technologisch Ontwerper), which represents the interests of the organisation of Netherlands Industry Entrepreneurs and Employers (VNO-NCW/MKB Netherlands) and the Royal Netherlands Society of Engineers (Dutch: Koninklijk Instituut Van Ingenieurs - KIVI). The CCTO's main goal is to ensure that such degrees maintain the high standards established by both academia and industry. The committee reviews these degree programmes every five years to ensure continued standards compliance.

The common programme is established together by the university and the company; they jointly set the agenda, share the ambition, try to achieve things together, merge points of view. They comment, monitor and evaluate independently. The company pays 25%, the university 25% and the government 50%. Researchers are allowed to publish IP but the IP is the company's property.

Flagship Data Science

In the context of the Flagship's specific research & innovation programs there is a close collaboration between several research groups at Royal Philips Research and a number of research groups of various departments of TU/e, including the Department of Mathematics & Computer Science, the Department of Electrical Engineering and the Department of Industrial Engineering & Innovation Sciences. This cooperation is focused on research and innovation and is larger in scale than usual academic-industrial partnerships, because it is not only scoped over a longer time frame, but also goes beyond the typical interaction having programmes for various sections of the health value chain.

Based on a long-term strategic research & innovation agenda, the Flagship basically is a portfolio of related, coherent programs. These programmes consist of interrelated projects covering the full range of descriptive analytics, predictive analytics and prescriptive analytics of people (not necessarily patients), processes and equipment.

Within the flagship there are four programs:

- Data-Driven Value Proposition: investigates the opportunities for learning from data gathered from products, consumers and their interaction;
- Healthcare Smart Maintenance: investigates how to use event data to predict and optimise condition-based maintenance policies for complex machines;
- Optimising Healthcare Workflows: combines process mining and visualisation techniques to optimise pathology but also radiology workflows;
- Continuous Personal Health: investigates how to empower people to gain insights in their physical health status and adopt habits that reduce health risks and promote good health.

A specific challenge is that to keep programmes alive, the research must be renovated, updated, it must be proved that it is worthy, that it is focused on areas of economic interest for society, ecological, valuable sectors.

Examples: Data Science for Lighting, Data science for Health, Data science for Light Nanomaterial

3. Demand for PhDs

With PhD students the companies are able to leverage their research achieving solutions and good results and achieving innovation.

The strategic ambition of universities to be important players leads them to promote these schemes and place themselves as relevant providers of knowledge for the economy and private sector.

The PhDs and the schemes contribute to a broader plan to supportregional development of different regions with the assistance of universities, with the aim of building regional specialisations. This is based in companies with advanced technology and in recruitment of skilled people (researchers' participants of the schemes) - Industrial regional partners and their desire to support research.

Other reason is that companies can get a researcher working for a lower price with a high rentability, additionally they have the possibility to observe and hire the best PhD for the companies.

4. Drivers of participation in ISM

- For Researchers – they are aware of what to do with their knowledge, how to apply what they have learned in the market while solving problems. They will be more capable to approach marketing issues, to do some business casing. They spend time in industry and they get a better feeling of what is like to work in there. They get acquainted with the work facing the market.
- Universities help their graduates to find jobs and gain experience
- Exposing professors to what is happening in industry

5. Challenges and barriers to participation in ISM

- Different interests/priorities of the company and of the university. Companies (work done, products, processes and services ready)/Universities (proper access to data, good scientific work, papers with quality and research recognized)
- IP issues (between universities and industry); Disclosure of information while writing papers, companies prefer not to do it (for privacy reasons) and universities need to do it (to publish papers)
- Administrative burdens.

Some Risk management measure were identified in Netherlands

Some programmes are managed under professional procedures. Some of these procedures were defined and applied jointly with some consultancy companies, similar to what is done in private organisations.

- KPI's scheme definition
- constant roadmaps update
- database management and dashboards production for performances evaluation
- revision and examination of the outcomes of the programs often to guarantee funding to continue research.
- portfolio management of researchers to promote their work and attract investors and companies to invest/funding future research.
- critical analyses of potential patents and their value.
- promotion of patents, best paper awards, and the recruitment of people by companies
- frequent delivering of reports to the steering committee.

They make available a general management, legal support and project managers to support scientists.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as brain-drain)

Companies and universities in the Netherlands are extremely open to adapting and redefining existing rules or creating new rules for new schemes, as a result of negotiation. Netherlands is a country where you find different type of ISM mobility schemes.

Several respondents stated that the lack of funding was becoming a major challenge, although more funding is in fact being prepared for this kind of schemes.

One other feature to have in mind is the salaries in universities, which are lower compared to ones in companies. This causes an exodus of researchers from universities to companies and jeopardises the knowledge that could come from the industry for academia. There is a lack of people coming in the opposite direction. There is a need of measures to attract the researchers for academia, such as: academics have a career path, that includes training and recognition.

IP issues related to the will of companies to keep as secret as possible the research and the need of researchers and universities to publish scientific articles/papers was never resolved properly. The state seems unable to deliver a solution for this.

Country overview - Poland

1. Number and type of country schemes

Actions to support intersectoral mobility of researchers have been widespread over the period 2007-2013 and have been funded under EU funds (Human Capital Operational Programme – ESF funded, Innovative Economy Operational Programme – ERDF funded). Such mobility was not of a large scale and consisted of internships in companies financed by the EU (usually under doctoral or post-doctoral degrees). There were initiatives indirectly supporting ISM implemented under the financial period 2007-2014. It is worth mentioning Measure 3.1 under the Operational Program Innovative Economy (ERDF), which supported over 750 initiatives aimed at launching enterprises based on innovative solutions. In part, the supported enterprises were academic spin-offs founded by researchers.

Currently, ISM measures have been complemented by support to basic research and research that has the potential to be implemented. Programmes are attended by representatives of science and industry, the place of implementation of research is often not clearly defined. The Top500 Innovators programme is the largest government programme to support innovation in science and thus intersectoral mobility of researchers. A new instrument to support ISM is the Industrial PhD programme, launched in 2017.

In conclusion, the scale of mobility support activities is not great in Poland, but because of the awareness of importance of science-business cooperation, including ISM both for science and the industry, such activities are widely disseminated and the catalogue of instruments supporting this process is increasing.

2. Selected examples of ISM schemes.

Support to ISM was implemented at regional level under EU funded Operational Programmes implemented over the period 2007-2013. These activities were funded under Human Capital Operational Programme – ESF funded, Innovative Economy Operational Programme – ERDF funded. Currently, initiatives implemented at regional level are not identified.

An example of this type of project is "Green Light to Innovation" (implemented in the period 2013-2015), which was the final project from a series of initiatives on researchers' internships in companies and representatives of companies in universities. These projects were implemented by an intermediary institution: Małopolska Regional Development Agency S.A. In the first stage of the project, participants took part in a series of trainings on the implementation of innovations and new technologies. The second element of the project was temporary employment of highly qualified staff in SMEs.

This project is an example of many similar initiatives implemented over the period 2007-2013, financed by EU funds (ESF). These projects were based on the scheme of mobility of researchers to business on an internship basis, however, particular projects implemented under this scheme differed in details such as: intellectual property rights, the possibility of simultaneous involvement in the company and the university, etc.

ISM schemes at the national level are implemented / managed by the Ministry of Science and Higher Education and special agencies set up for the development of science performance and R&D: the National Research and Development Centre, the National Science Centre and the Foundation for Polish Science.

An example of the latest scheme implemented by the Ministry of Science and Higher Education is the procedure for obtaining a PhD degree through Industrial Doctorate, introduced in 2017.

The programme consists of financing full-time doctoral studies in which the training will take place in cooperation with the doctoral student's employer. The funds are intended for co-financing the costs of using the research infrastructure to carry out research conducted by a PhD student as well as financing of a doctoral scholarship during the PhD studies.

3. Demand for PhDs

There are no studies that would indicate the level of demand for PhDs in industry. The information obtained during the interviews, however, suggests that such demand exists in specific sectors (e.g. ICT, some engineering fields, etc.). This kind of entity need specialists in narrow fields. Dealing with the specific subject in university gives necessary skills and knowledge. It is important to the companies to hire the person who will be skilled and efficient in the subject from the beginning, which is important in particular during short term cooperation. PhDs' transfer to industry is also connected with cooperation between the university and companies. The firms look for opportunity to use the appropriate research equipment (which is in possession of HEIs) and need researchers who are able to use it.

One respondent indicated that in their opinion, about 20-30% of scientists are going to business and 5-10% have their own business. There is therefore a human potential for the transfer of workers between academia and industry. There are a large number of young doctors and doctoral students who would be willing to take part in a project bringing them closer to private sector.

4. Drivers of participation in ISM

Drivers of participation in ISM are different for particular actors of this process.

For companies it is mainly the possibility to gain necessary know-how in narrow specialisations and need to conduct research and development work. Participation in ISM schemes, where the researcher's work is paid under the programme, is often a way of financing research in the company - it is particularly important for small businesses for which research funding is a big challenge. In Poland there are also tax reliefs related to the costs of research and development, which also include the remuneration of employees hired to carry out R&D activities.

For researchers the drivers are gaining know-how and understanding how the company work. ISM allows them to start new fields of activity and R&D cooperation. Researchers value this participation, widen their knowledge, range of expertise, this is also beneficial from financial point of view. Many researchers as their important motivation to participate in ISM indicated that it will help them in their scientific work or help to prepare a publication.

There are no particular incentives for HEI sector to participate in ISM.

5. Challenges and barriers to participation in ISM

From a researcher's perspective, there are no systemic incentives to engage in cooperation with industry during their work in university. Researchers are not rated for that but for writing scientific publications. There is also some insecurity, leaving the steady environment of the University and functioning in a different sector for some time.

Representatives of academia indicate that the possible leaving of university by ISM participants could be an obstacle in engaging HEI in ISM. Also from the point of view of didactics, the absence of lecturer is a challenge. Matching scientific expertise to the needs of a company is also a challenge, as

there may be cases when the competencies, the supply and demand diverge. There are also ambiguities on how to share intellectual property rights.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Significant factors influencing the functioning of the ISM in Poland are financial issues of cooperation between science and business. The costs of cooperation between the university and the company are much higher (cost for HEI) for a company than engaging the researcher directly. As an effect of such regulations, researchers bypass the official paths of cooperation. HEIs are still not ready to use the potential of researchers in expert works (researchers acting on behalf of HEI), so this is a factor conducive to individual cooperation of researchers with companies. This is a paradox that may foster this individual mobility.

Another issue is the ambiguity associated with the provisions on intellectual property rights. According to the rules governing this matter, the university has rights to intellectual property developed by its employee at the university. However, it is not clear and easy to ascertain to what extent the results of the work produced by the researcher's collaboration with the company (e.g. during the ISM) relate to the researcher's work at the university and, to what extent, those rights belong to the university. This problem is particularly evident in the context of a systematic co-operation between researcher and company that takes place during the implementation of an Industrial Doctorate.

The general problem of academia-industry cooperation in Poland is also that science and business function separately, do not penetrate each other, because they do not have interest to do so. Researchers are paid for lecturing and doing research at HEI and researchers' engagement with business is not taken into account.

Country overview - Portugal

1. Number and type of country schemes

In Portugal, most ISM activity arises from partnerships between the Portuguese Government and universities from the United States of America. At this level, it was possible to identify 3 main ISM schemes, all managed by the Portuguese national funding agency for science, research and technology (FCT – Fundação para a Ciência e Tecnologia): MIT Portugal Program, Carnegie Mellon Portugal Program and UT Austin-Portugal Program. These are transnational mobility programmes between universities, in which PhD students or researchers from Portuguese universities can benefit from financial support to develop a research project in American companies, actively cooperating with American universities, in this case MIT, Canergie Mellon and UT Austin. Additionally, one National ISM was also identified by desk research and interviews: Studentships - PhD Studentships in Industry. Also managed by the Portuguese National funding agency for science, research and technology, this programme allows workers from industries to invest in PhD degrees recognised by Portuguese universities, by performing research projects in their companies. Besides being a National programme it is also an ISM from industry to university.

2. Selected examples of ISM schemes.

Two main ISM schemes should be highlighted: UT Austin Portugal program and Studentships - PhD Studentships in Industry.

UT Austin Portugal program exists since 2007 and arose from an agreement between the Portuguese Government and the University of Austin. It includes the mobility of researchers between Portuguese Universities and the University of Austin, and US companies cooperating with it[33]. The programme is funded by FCT, from the Portuguese State's Budget, and is aimed at teams of researchers from public and private institutions (e.g. Higher Education Institutions, State Laboratories, International Laboratories with headquarters in Portugal, among others), active in R&D projects. The program finances exploratory projects in I&D in two main fields: emerging technologies ("CoLab") and in scientific areas identified as priorities by the Atlantic International Research Centre (AIR Centre). The funding is provided to the universities and PhD student/researcher.

The Studentships - PhD Studentships in Industry is a National programme, funded by the State Budget, that allows workers from different sectors to invest and be involved in PhD studies by combining advance training/specialisation in a university with their research work in the company. The scheme is also funded by FCT. The project requires the establishment of agreement between the university and company, but the PhD candidate (who is also an employee of the company) is the only party benefiting from the funding. This program allows the combination of the best of two worlds: expertise and knowledge from the HEI with the needs/problems of companies, essential to promote applied research in a specific field.

3. Demand for PhDs

In Portugal, there are some sectors for which PhD graduation is seen as being strategic from the perspectives of the government, HEIs or companies. Based on national strategic documents, the ISMs identified by the current study, and information collected by interviews it is possible to identify the following sectors as having a demand for PhDs:

- Sustainable and data driven urban systems;

[33] In USA there is a natural bound between Universities and companies and many of the research made or is made in companies or is made based in real needs/problems of the companies. This means that when a PhD student or University researcher goes to an American University, he/she usually works in or to a company.

- New industrial concepts and smart factories;
- Bio & Medical Devices;
- Sustainable Transportation Systems;
- Data Science and Engineering;
- Computer Science;
- Electrical and Computer Engineering;
- Applied Mathematics;
- Technology, Management and Policy.
- Colab Emerging Technologies Research (e.g. Digital Media, Advanced Computing, Applied Mathematics, Nanotechnology).

For the programmes with American Universities and companies are also relevant the Scientific Areas defined in the context of AIR Centre, including: Space Science, Clean Tech Energy, Environment, Atmospheric Science and Climate Change, Ocean Science, Data Science, Cyber Infrastructure and e-Science.

4. Drivers of participation in ISM

It is clear that at policy level there is a large interest from public institutions to provide support and programmes focused on the promotion of intersectoral mobility of researchers between universities and from academia to non-academic organisations. Most of the programmes identified arise from partnerships between the Portuguese government and American Universities (including MIT University, UT Austin and Canergie Mellon University). This indicates a clear interest of the Portuguese government in strengthening the partnership and cooperation between Portuguese universities and the research ecosystem existent in USA, which is clearly different from the Portuguese one: while in the USA research ecosystem there is a natural bound and cooperation between research organisations and non-academic organisations, in Portugal these two worlds operate independently.

At university or academic level, especially in higher education institutions with strengths in ICT, R&I&D, Engineering and other emergent areas (the areas mentioned above), there is an increased interest in taking part and benefit from programmes promoting intersectoral mobility of researchers or PhD students. Overall, universities note the benefits of providing a differential and high-quality training to their PhD students and/or researchers, as these programmes allow them to: i) cooperate with top universities and companies operating in their area of study; ii) have access to equipment and tools that they don't have in their universities; iii) perform applied research, with real impact in the economic sector and based on real needs and problems of the companies.

At the company level, especially with regard to studentships, the PhD Studentships in Industry programme is recognised by companies as being relevant, mostly because: i) is a strategic way of motivating their workers, providing them a specialisation/advanced training at the university, allowing them to have a career development in the company; ii) is a way for the company and its workers to benefit from the research expertise, know-how and equipment available at the universities, essential for the development of new products and iii) is a strategy that allow companies to keep innovating and developing high-technology products and services, according to the market needs.

5. Challenges and barriers to participation in ISM

It depends on the programmes and perspectives of stakeholders. Regarding the transnational programmes arising from the cooperation between the Portuguese government and American Universities and companies, the biggest challenges and barriers identified by the universities are: i) The programmes are organised in calls, which sometimes is not in line with the calendars of the

universities or with the company's needs. Some universities and researchers mentioned the need of having a call open at any moment, as one aspect to be improved. ii) The bureaucracy associated to the calls, especially with regard to the time of selection of the projects. Sometimes the selection of projects takes more time than the previewed one, and the projects submitted for funding need to be adapted or changed to the new reality. iii) The financial support needs to be reviewed, it should have more funding and make it available earlier.

Regarding PhD Studentships in Industry, from the perspective of the companies, the biggest challenges and barriers are related to the role and focus of the universities: Universities are still very focused on publications, articles and on sharing knowledge as an open resource and sometimes this is not in line with the need of confidentiality of the company.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

In a small country like Portugal, characterised for having mostly small and medium enterprises, it seems that the transnational intersectoral mobility schemes are more interesting for universities and PhD students/researchers than national schemes. This is even more relevant when the programmes allow universities and research teams to cooperate with universities that have a natural bond and cooperation with the private sector (e.g. industries, laboratories, among other non-academic organisations), which is the case of the programmes with American universities and companies.

At the national level it seems that the idea of having PhD programmes aimed to workers of companies has also added value to the R&I&D ecosystem of the country, making it possible to: i) promote the number of PhD graduates in R&I&D companies; ii) increase the level and quality of the cooperation and communication between academic and non-academic organisations; iii) guarantee the innovation and R&I&D development of the company and its products/services, according to the requirements of the market; iv) promote an alternative to the PhD graduated careers. It seems that this programme is suitable to be implemented in medium and large companies, to which innovation and technology are critical to their success and sustainability.

The braindrain is a major issue in Portugal, a country that is assisting to the mobility of high qualified workers to other countries in the last 3 years.

Country overview - Romania

1. Number and type of country schemes

Apart from participation in schemes initiated at the European level (especially RISE within ”Marie Curie” Actions), intersectoral mobility schemes are rare in Romania. Most employers are not interested in cooperation with R&D centres, unless their profile is based on innovation, while universities and research institutes tend to favour mobility schemes at European/international level, research and university personnel going to foreign research centres or universities. However, within a number of different schemes based on cooperation between research and industry ISM activities are included. National policies encourage this kind of cooperation, with specific objectives to that end defined in national strategies related to scientific research and economic competiveness support. Private initiatives from industry sector for establishing systematic cooperation with research centres and/or higher education are rare, but they do exist, e.g. those of Renault Technologies Roumanie.

2. Selected examples of ISM schemes.

Romania actively participated in schemes funded by European institutions, like RISE or MANUNET. MANUNET II and III are particularly interesting, even if they are not dedicated specifically to ISM but to increased cooperation between national and regional entities promoting integrated research solutions to manufacturing processes. The schemes are based on voluntary participation, being funded mainly from money provided by the participating agencies, that also decide on the details of the calls.

Schemes funded from private sources are rare in Romania, this is why the two initiated by Renault Technologie Roumanie are good practice examples. Even if target groups are different (Master’s degree students and employees of Renault and associates), both include teams integrating scholars and practitioners, addressing complex problems and needs of the company, with high-quality training results for future specialists oriented towards innovation.

3. Demand for PhDs

An important part of the industry sector in Romania is mainly interested in production of tested products. Innovation and research are outsourced, thus the general demand for PhDs is very low, remaining mainly related to universities and research centres, most of them being public institutions. Nevertheless, in recent years, the interest in innovation has increased, following the establishment of a growing number of companies in high-tech domains (IT, electronics, bio-technologies) and also of private excellence centres, especially in the health domain. This interest may not be immediately translated into a much higher demand for PhDs, since doctoral studies are perceived as mainly linked to theoretical/academic objectives, the PhD being still understood as a personal achievement of the specialist and not as a predictor of the success of the company. This may be a reason why the cooperation between Renault and four Romanian universities described before was centered on Master’s degree students and not on PhD students.

The demand for PhDs in the public sector (in other areas, separate from higher education and research) is undermined by the numerous scandals on fake PhDs and high level of corruption in certain doctoral schools, now under severe evaluation, with very strict rules antiplagiarism being applied. At the same time, the public administration has modified the salary system, the former 15% bonus for public servants and public administration employees having a PhD degree was interrupted in 2015, being maintained only for educational and research staff.

4. Drivers of participation in ISM

The main drivers for the participation and take up of ISM are related to the innovation potential of the research applied in real production conditions and challenges, considering all specific requirements and constraints of the market. The experience of the workplace organisation and the innovation philosophy is important for the actual orientation of the researchers, usually isolated in their specific environment.

5. Challenges and barriers to participation in ISM

The main challenges and barriers to participation in ISM are identified in the extremely heavy bureaucracy of the publicly funded schemes, especially in the operational programmes based on European funds. Other problems are related to frequent interruptions in cash flows, sometimes for large periods of time that cannot be covered by smaller entities, and to some specific rules that prevent companies from being funded from public sources. At the same time, universities are less prepared to orient themselves more towards applied research, considering the market requirements and the production needs as less important than fundamental scientific aspects of the domain.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

The framework conditions for encouraging innovation were improved in the last years by numerous measures: adoption of national strategies promoting cooperation between industry and research, establishment of technological transfer centres both in universities and in trade and industry chambers, application of a tax exemption for research activities (that remains still unclear in certain aspects until the definition of methodological norms). A new component in the 3rd National Plan for Scientific Research is expected to generate more ISM activities: ”Bridge Grants”. Nevertheless, the major delays in accessing European funds in the operational programmes in Romania are important disadvantages, especially because of the lack of predictability, essential for the industry.

Country overview - Slovakia

1. Number and type of country schemes

Schemes with explicit ISM objectives are not currently in place in Slovakia. There are several international mobility schemes that include ISM activity among eligible activities but these activities are not often implemented in the projects and no record is available. There are companies and higher education institutions participating in MSCA programmes.

Two OPs have specified needs to promote intersectoral mobility but the schemes have not been launched yet. Preparation of the scheme within OP Research and Innovation was cancelled.

2. Selected examples of ISM schemes.

Several bilateral international mobility schemes have been launched annually in Slovakia since 2007 by the Slovak Research and Development Agency. Although they focus on different countries the schemes are more or less the same. These mobility schemes have been small international mobility grants provided to research teams who have intended "… to (i) develop common international projects, (ii) prepare common publications or other outputs of international cooperation, (iii) participate (in an active way) in conferences or organise common scientific events, (iv) use utilities and equipment of both participants in a reciprocal or joint manner, (v) collect research materials, samples, etc…, (vi) involve PhD students or junior researchers (up to 35 years) into common research. The schemes are implemented in cooperation with other countries. They usually have no sectoral focus or specific target groups other than researchers/research organisations intending to establish cooperation with their foreign counterparts.

The ISM element is built in these schemes in a way that the partner (in the foreign country) may also be a researcher from a private research organisation, but these cases are exceptional.

3. Demand for PhDs

Specific demand for PhD graduates is limited although there is an increasing demand for university graduates of PhD or MSc levels. Some industries, such as biotechnology, have a higher demand for PhD graduates. The same is the case of research centres, public and also private ones. Public sector as well as innovation infrastructure organisations (ST Parks, innovation incubators, clusters, etc..) do not generate demand for PhD graduates.

4. Drivers of participation in ISM

As there are no Slovak national ISM schemes, the drivers are difficult to assess. Nevertheless there are few Slovak companies participating in the MSCA programmes and their interest is in getting access to specific knowledge which they need in order either to solve their particular problems or, more likely, to develop/improve their technology and products. University/academia organisations prevail in Slovakia in the MSCA programme, and their interest in participating is mainly in becoming partners (or leaders) in wider international research teams, to get better access and to establish contacts with the international scientific community. Research funding/financial reasons are also among the drivers in the academia sector. The drivers for participation in the international mobility schemes are similar as above.

5. Challenges and barriers to participation in ISM

The challenges to participation are perceived as not much significant by the researchers whose organisations participated in the mobility schemes. The benefits of participating in the international and intersectoral mobility projects funded by the MSCA prevail, so the challenges and possible obstacles are perceived as minor ones.

Companie demonstrate less interest in ISM activities, and more generally in cooperation with academia. First, they are not fully convinced about the benefits they may get from cooperation with academia, partly because of the different institutional culture and time scales of implementing activities, but also because of the different focus of research. Companies are more often interested in later stages of applied research while public research organisations engage in basic research or early stages of applied research.

The MSCA programme has also been considered as administratively complicated and as generating too much additional workload comparing the expected results the company may get from the project. Legal/IPR difficulties may be an issue but it is not generally regarded as an obstacle. There was also the case of lower cooperation of the industrial partner in the project of MSCA since the company did not get financial compensation in the project and was reluctant to provide enough capacity of its researchers in due time.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

There are no specific conditions for ISM activities. Publicly funded programmes (including ESIF ones) support various forms of cooperation among research organisations and companies, but no specific framework conditions are in place. Now support and motivation activities, except common publicity measures, are undertaken in order to promote participation in these programmes or to promote their (likely) ISM elements.

ESIF OPs, OP Human Resources (OP HR) and OP Research and Innovation (OP R&I) may be considered as a policy framework. OP HR stipulates in priority axis “Education” a specific objective to “Increase the quality of tertiary education and development of human resources in the area of research and development with a view to establishing a link between tertiary education and the needs of the labour market”. This objective is broader than intersectoral mobility and includes a wide array of activities beyond even intersectoral cooperation, but three “example activities” are relevant for ISM: (i) professional internships of university teachers and researchers in the employment sector, (ii) mobility activities between research and development organisations and the business sector, and (iii) involvement of experts from other sectors in the educational process. Similarly to the previous programme the OP R&I has got much wider aims in supporting industry/business and R&D cooperation, which include also intersectoral mobility in two priority axes and relevant specific objectives, one for Bratislava region and one for the rest of Slovakia. Specific objectives (1.2.2. and 2.2.2.) “Growth of research and development capacities in industry and services” include “intersectoral partnership and cooperation” which also lists intersectoral mobility in its description. Nevertheless there is no ISM activity or scheme operational or planned in Slovakia currently, neither in the framework of the ESIF OPs nor in the framework of the national programmes.

Country overview - Slovenia

1. Number and type of country schemes

Currently there are very few schemes in Slovenia explicitly supporting intersectoral mobility. There were more such schemes in the past. Investment of companies in research and innovation, and cooperation between companies and research institutions (which all led to greater engagement of PhD level researchers in the business sector), are now mostly stimulated through tax incentives, financial support for newly established innovative companies, different initiatives joining industry and research sector (government initiated (e.g. Strategic Research and Innovation Partnerships in the fields determined by the Slovenian Smart Specialisation Strategy, joining companies, research organisations and governmental institutions), or privately initiated (e.g. Slovenian Innovation Hub)).

In Slovenia, domestic schemes are much more popular than transnational schemes, although some companies also regularly apply for transnational ISM schemes (2-3 companies regularly apply for the Marie Sklodowska-Curie funds).

All current domestic schemes support mobility from research institutions to industry (including industrial PhDs). No schemes supporting mobility from industry to research institutions (e.g. engagement of researchers from industry at universities) have been identified.

2. Selected examples of ISM schemes.

One type of scheme is the “Strengthening of Development Departments in Companies” (KROP), run by the Ministry of Economic Development and Technology and co-financed by the European Social Fund. The scheme provides companies with financing for employment of researchers with a PhD or PhD students (industrial PhDs) with the aim of improving and expanding R&D through the expansion of existing R&D departments in companies or establishing new ones. Companies apply for funding with specific projects.

Another type of scheme is the “Stimulating researchers at the beginning of career 2.0” scheme, run by the Ministry of Education, Science and Sport and co-financed by the European Regional Development Fund. This scheme provides financing for researchers at the beginning of their career, who are employed by public universities or research institutions, to conduct research seen as valuable by a partner company, in cooperation with the company, partly in its facilities. Research results are published and stay in the public domain. The aims of the scheme are to provide researchers with initial funding to enable them to develop their research career, increase cooperation between companies and research institutions, increase employment of researchers in companies and stimulate applied research. In the first edition of this scheme, around 20% of researchers received employment in the partner company after the end of mobility.

3. Demand for PhDs

In Slovenia there are no companies with big research and innovation departments that would need a large number of researchers with a PhD (an exception being, to some extent, the pharmacy sector with the companies Krka and Lek). Consequently, the capacity of the industry to “absorb” PhDs is not high.

However, there is a growing need for PhDs in many fields, especially among innovative high-technology SMEs from different fields (e.g. physics, chemistry, ICT, life sciences (e.g. biotechnology), energetic sector (e.g. electric motor development, green energy), …). Many of these companies have been established by researchers on the basis of their work at public research institutions or universities. With the growth of these companies and the support environment (technological parks, innovation hubs, …) the need for PhDs is expected to rise in the future.

4. Drivers of participation in ISM

According to interviewees, among companies the main drivers for participation in ISM are the decision to improve/expand research and innovation activities through establishing or expanding R&D departments, and the opportunity to get access to highly qualified, high quality research staff.

Research institutions (including universities) see in the ISM schemes an opportunity to obtain additional funding for their operation (state funding of research organisations has diminished greatly in the last 10 years), as well as to improve research and innovation, acquire new PhD students and make new connections and strengthen cooperation with companies.

For researchers, ISM schemes present an opportunity to obtain a PhD, find funding to be able to work in research, find employment, as well as an opportunity to acquire new knowledge, skills and experience.

5. Challenges and barriers to participation in ISM

A major barrier encountered by companies, research institutions and researchers engaged in ISM, is presented by the question of patents and publication of results. While it is in the interest of researchers and research institutions to publish the results of research, as this contributes to development of science and is needed by researchers to build a scientific career, the companies are often reserved towards publication, as they do not want to disclose their research to competitors and want to patent the results.

Excessive administration requirements in government ISM schemes were also often mentioned as a factor that deters companies from participating in such schemes.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Currently, in Slovenia (profitable) companies are entitled to 100% tax credit on expenses for investment into research and development, which is expected to lead to higher needs of industry for PhD level researchers and thus higher ISM rate. In the following years, additional funding by the government for intersectoral mobility is planned. However, a major detrimental factor for researchers who would be prepared to move to industry persists – on the one hand conditions for conducting research in research institutions and at universities are better than in industry and academic research also enables one to build an academic research career, while on the other hand there is no major difference in salaries between the industrial and public research sectors.

Brain drain of university graduates and PhD level researchers is currently not yet a big problem, but may, according to interviews, become such in the next years. Better work (research) conditions abroad are the main reason for leaving of researchers. The government is trying to attract the researchers who live and work abroad back to Slovenia and some of the ISM schemes (e.g. Stimulating Researchers at the Beginning of Career scheme, KROP scheme) also aim at this.

Detrimental conditions, which also influence ISM, are also presented by legislation - the current legislation prevents public universities and research institutions from establishing spin-off companies, which has a significant negative effect on the number of spin-offs established (establishing of spin-outs is allowed).

Country overview - Spain

In the recent years, Spain has implemented quite relevant national-level actions boosting the improvement of intersectoral mobility in the country. It started with the recognition, in 2011, of the relevance of intersectoral mobility (together with geographical and interdisciplinary mobility) to researchers and R&D organisations, stated in the basic legal framework of Science, Technology and Innovation Act 14/2011, which was followed by additional actions as follows:

2011	Creation of the first Doctoral School in Spain in the region of Cantabria. The Doctoral School of the University of Cantabria (EDUC) was launched to provide to doctorate candidates, an offer combining the training and skills development in a specific field of research (in Universities) with opportunities of developing research in real context (in companies).
2012	Release of the Spanish Strategy on Science, Technology and Innovation 2013-2020, defining the Transfer and Management of Knowledge as one of the priorities of the country. This transfer includes, among other aspects, the establishment and promotion of cooperation between &D centres, researchers and businesses, stimulating the mobility of researchers, technologists and technicians and stable public-private collaboration.
2012	Launch of the first edition of the Torres Quevedo funding programme (TQP), a programme prepared to support the recruitment of PhDs to the private sector, aiming at reinforcing their career opportunities in industry and fostering e R&D activities in industry.
2014	Launch of the Spanish Industrial Doctorates programme by the Central Government (Ayudas para la Formación de doctores en empresas – Doctorates Industriales), a programme that allows to PhD students to develop their PhD graduation in an industrial context (company/enterprise). Is common to combine this programme with the Torres Quevedo funding programme.
2015	Creation of the Spanish State Research Agency to foster the research and the development of innovation in Spain. Among other aspects, this Agency is responsible for the evaluation and assigning of resources to R&D projects and also for the assessment of the impact of the research at National level.
2016	Launch of the Emplea programme (National Programme for the Promotion of Talent and its Employability), structured to support the recruitment of staff for R&D activities and capacity-building actions to improve the R&D management in industry.

Alongside with these national measures it is also possible to identify some actions prepared and implemented at the regional level, usually launched by the regional governments to be implemented at regional level.

1. Number and type of country schemes

During the desk research and interviews, it was possible to identify four main intersectoral mobility schemes: two launched by the central government and to be implemented at national level and other two launched by regional governments and that are being implemented at regional level. These intersectoral mobility schemes are described below.

2. Selected examples of ISM schemes

National level

The State Research Agency of Spain has two main programmes fostering the establishment and strengthen of the cooperation between academia and industry:

- 2012 – to date=> Torres Quevedo funding programme (TQP): National programme that exists since 2012. The programme allows companies to hire PhDs to be integrated in the departments of innovation and development of the companies for at least 3 years. The main goal of the programme is to contribute to an increase in the number of PhDs working in companies and thereby increasecompanies' capacity for innovation and competitiveness, and career opportunities for PhD holders . The programme is managed by the State Research Agency of Spain, an institution that operating in the country since 2015.
- **2014 – date => Support for the training of doctors in companies – Spanish Industrial Doctorates** (Ayudas para la Formación de doctores en empresas – Doctorates Industriales): This is a programme available to Spanish companies willing to integrate a PhD student in the company for the development of a research project of 3 years, while studying in parallel for their PhD degree. The request for funding is made by the company, and the PhD Director (supervisor) is a worker of the company with a PhD degree as well (this is mandatory). Due to this fact, is possible to companies combine this programme with the TQP to guarantee the presence of a PhD worker to supervise the PhD student. This Industrial Doctorates aims to promote the integration of researchers in the companies, increasing the innovation and competitiveness of the company, for one hand, and the career development of PhD students in companies.

Regional level

At regional level is possible to identify two programmes launched by two Autonomous Communities of Spain, identified below:

- **2013 – date => Industrial Doctorates Plan of the Government of Catalonia**: In line with the European and National strategy for the development and promotion of the quality in Science, Technology and Innovation, this programme was conceived to be implemented at regional level and fostering the establishment and strengthen the cooperation and work between academia and non-academic organisations and professionals. This initiative was launched by the Government of Catalonia in partnership with the Catalan university and research system and it was the was the first Industrial Doctorate programme to be implemented in Spain. Aiming at boosting the competitiveness and internationalisation of Catalan industry, retaining home-grown talent and attract international talent and giving doctoral students the opportunity to work on R&D&I projects with companies, this plan was designed based on two other successful initiatives: CIFRE - Conventions Industrielles de Formation par la Recherche from France and the Industrial PhD Programme from Denmark.
    - **2014 – date => Industrial Doctorates programme from the region of Cantabria:** The programme started 3 years ago, based on the experience from European University and from Universities of Catalonia. The programme allows to PhD students to have their PhD degree in a specific field of research available at the university, by integrating a company to implement a research project of 3 or 5 years.

3. Demand for PhDs

At national and regional levels, the demand for PhDs is mostly recognised and identified as being strategic by the central and regional governments. At this level, the governments mention that the promotion of the intersectoral mobility schemes is strategic for the: economic development of the country/region; sustainability of the universities as a key provider of research; competitiveness, innovation and internationalisation of companies and careers' development of researchers, especially in companies/industry.

Is clear that universities also recognise the relevance of the intersectoral mobility schemes, especially in the fields of engineering, computing and technology and in the last years, in the areas related to social sciences. From the perspective of universities, intersectoral mobility has different benefits, allowing them to: be more open to local communities and companies; achieve results/products with high impact; to be sustainable, once they can benefit from an additional funding. This idea of generating high impact on local communities and companies and held research based on the needs and problems identified by companies is also recognised as an added value of these schemes by researchers.

From the perspective of companies or non-academic organisations the interest for participating in these schemes has increased in the last years. However, it remains unclear for some companies how research and PhD workers can benefit them. Several initiatives are being held by governments and universities to approach companies and involve them in these schemes with interesting results and impact. However, efforts need to be made to increase the interest and participation of companies in this kind of programmes.

4. Drivers of participation in ISM

The first steps to promote the intersectoral mobility of researchers in Spain started in 2010-2011, years in which the central Government started to work on the country Strategy on Science, Technology and Innovation, and on developments in the PhD training sphere as well. Since then, several drivers to participate in ISM have been identified by different stakeholders, namely the:

- political framework at European, national and regional levels, that is increasingly more oriented to the creation of funding programmes and opportunities to strengthen the cooperation between academia and non-academic organisations;
- enlarge and growth of the community of I&D with enough skills to deal and manage the economic challenges;
- growing recognition of the relevance and impact of doctoral education in the private and profit sector (mostly by Governments and non-academic organisations);
- possibility of promoting applied research, focused in the needs/problems of companies (in the perspective of the Universities, researchers and PhD students);
- possibility of offering a specialisation to PhD candidates, combining learning and training in an academic context and the possibility of holding a research in a real context of work (in the perspective of researchers and PhD students).

5. Challenges and barriers to participation in ISM

Despite these developments and the investments made at policy and academic levels, some challenges and barriers still exist in Spain regarding the promotion of/participation in ISM:

- the fact that most companies in Spain are small and medium enterprises, without qualified managers or workers (with PhD degrees) to support and supervise researchers and PhD students during the research project implementation;
- the need of adapting and investing in programmes suitable to be applied in fields related to social sciences (commonly these programmes are applied to the fields of engineering, computing and technology);
- the need of adapting these programmes and funding schemes fostering the involvement of non-profit organisations in these schemes;
- the fact that some companies do not recognise the relevance of research inputs to their business or activity, making it difficult their involvement in these schemes;
- the differences of expectations, interests and vocations between HEIs and non-academic organisations, which sometimes represents a challenge in communication and cooperation the two parties;
- the lack of interest of researchers in having a professional career in non-academic organisations.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as brain drain)

National and regional Governments of Spain are actively involved in the creation of programmes and opportunities to: i) increase the level of cooperation and partnership between HEIs and companies; ii) promote a higher number of PhD graduates in companies and other non-academic organisations; iii) enhance the career opportunities of researchers in non-academic organisations (and by this way avoid the brain drain). These goals are clearly defined in the different documents and programmes structured and in implementation in the country at National and Regional levels, as mentioned above.

Overall, the programmes provide funding support to HEIs and/or non-academic organisations as a strategy to raise their interest and involvement in the intersectoral mobility schemes. The funding provided is considered, by some of the stakeholders, as a small support that could and should be enlarged, but an important one.

Country overview - Sweden

1. Number and type of country schemes

There are a number of intersectoral mobility schemes offered by the Swedish Research Council, VINNOVA (the Swedish Innovation Agency) and the Foundation for Strategic Research (among others). The schemes tend to share a common rationale - which is to strengthen a wider portfolio of measures aiming at stimulating research with wider societal relevance and to support internationalisation in R&I more generally.

The current overall direction for R&I in Sweden is set out in the Research and Innovation Government Bill 2012/13:30.[34] One of the key messages of the bill is that although Swedish research is extensive by international comparison, Swedish research is also "losing ground in terms of quality compared with other countries." As a result the government is tasking its agencies to set in place a number of measures should be taken to create the conditions for long-term positive development of the quality, efficiency and effectiveness of Swedish research.

The bulk of the Swedish public research budget is allocated to the universities and university colleges. They are the main public research performing actors in the R&I system. There has been a consistent policy focus since the 1990s on measures that would promote university collaboration with other sectors, primarily business and public sector actors. In addition, a handful of initiatives were launched to promote university collaboration with civil society. This general trend of promoting collaboration continues and has been further strengthened in the latest R&I bill. There are a number of ongoing initiatives intended to increase the intensity of cross-sectoral mobility focusing primarily on getting university researchers to spend time in the public sector or in firms performing specific collaborative projects.[35]

2. Selected examples of ISM schemes

VINNOVA's Mobility for Growth programme is implemented by partnerships of universities, research institutions, research infrastructures, businesses, SMEs and other socio-economic actors from different countries across Europe and beyond. Individual institutions which can provide the same environment as the aforementioned institutions may also apply. The programme duration is from 2012 to at least 2017 and there is currently an overall budget of EUR 35 million, of which EUR 10 million is co-funding from Marie Skłodowska-Curie Actions (European Commission).

The rationale behind the programme is that a long-term goal for VINNOVA is to support the universities to develop their own strategies to better link their activities to the needs of society and industry. Moreover, in the Research Bill 2012 VINNOVA was appointed to develop and validate a model for appropriations based on assessment of collaboration. The programme Mobility for Growth links to this work and the programme support the demand from universities to increase mobility.

The programme targets experienced researchers who have a doctorate or at least four years' full-time equivalent research experience, and who are interested in mobility as a career development option. Actions will be open to training and career development activities within all research and innovation domains.

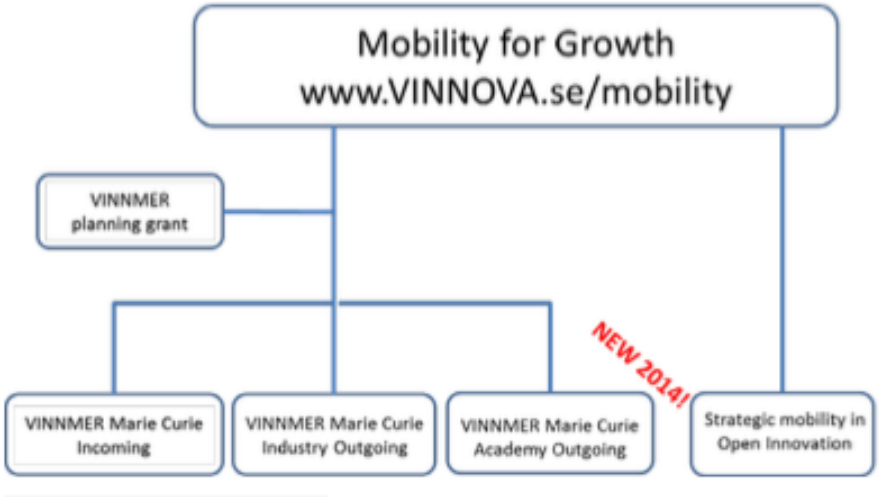
The overall objectives of the programme relate to:

[34] http://www.government.se/4a556d/contentassets/9131b15c802a44b9b196d442b498afdb/research-and-innovation---a-summary-of-government-bill-2012_13_30.pdf
[35] RIO Country Report Sweden 2016

- Intersectorial mobility – Promoting mobility between the private and public sectors.
- Transnational mobility – Promoting researcher mobility and developing attractive careers.
- Qualified future leaders in R&I – Advancing training and skills demand by enhanced human resource management in highly competitive environments.
- Equal opportunities – Advocating and promoting a better work/life and gender balance through flexible working arrangements under full employment contracts.
- Supporting mobility as a merit – A mobile career should be a strong future merit in all sectors conducting R&I.

The programme Mobility for Growth aims to address the increased demand of highly skilled workforce, but not only the quantity of highly qualified researchers but also the quality of their skills and their relevance to the private sector. The programme is expected to result in the presence of significantly more research-qualified individuals who can become future leaders in public and private R&I organisations.

VINNOVA views Mobility for Growth as an umbrella for all activities and programmes supporting individual career development. This umbrella could also include programmes organised in collaboration with other funding institutions.



Source: VINNOA programme material

The Swedish Foundation for Strategic Research36 manages the Strategic Mobility Grant for personal mobility between academia and industry. This aims to increase personal mobility and cross-fertilization between academia and industry. The guest researcher may carry out research, research-based activities or technical development within one of the foundation's areas of responsibility: natural science, engineering and medicine.

By financing the payroll cost of the researcher, the programme simplifies the transition from industry to academia or vice-versa. This funding opportunity is a directed grant for individual investigators. The duration of the project shall be equivalent to four to 12 months working full-

[36] SSF was established in 1994 and was tasked with funding research to promote Sweden's long-term competitiveness. The Foundation was given an initial capital of SEK6bn and had awarded SEK10.9bn in grants by the end of 2013, but still had SEK10.1bn left in assets at that time. Funding has been around SEK500m per annum during the last decade, with universities as the main beneficiaries.

time. The exchange may be divided into different periods, and the grant holder may also work part-time during their stay, but not more than for a period of two years. In the case of university researchers who will do exchange service in industry, part of the grant can be used for repatriation upon their return to academia. The repatriation grant may only be applied by university researchers who intend to do an exchange programme in industry for at least 12 consecutive months at least 80 per cent of full-time. A repatriation grant may be applied for including overheads, but no more than SEK 500,000 (EUR 52,000).

Riksbankens Jubileumsfond37 (RJ) runs a postdoctoral initiative known as Flexit. It was established in 2009. The main purpose of the programmes is to strengthen the ties between Humanities and Social Sciences research and the private sector, which is commonly regarded as the weakest link in the 'knowledge triangle'. Flexit, a project that seeks new, flexible solutions designed to spread research and researchers outside higher education institutions, has two main purposes:

1. Building bridges between research in the humanities and social sciences, on the one hand, and organisations outside academia on the other.
2. Facilitating knowledge transfer and encouraging contacts to enable more organisations outside academia to perceive and profit from the expertise of humanities and social sciences PhD graduates, and vice versa.

Through the programme, RJ also aims to present alternative career opportunities for researchers in humanities and social sciences. In the long term, by means of the Flexit initiative, RJ aims to influence the academic merit system so that HEIs value experience from the business world more, and vice versa.

The positions are for a maximum of three years, and consist of 75% research and 25% service in the host establishment. Each position is tied to the latter for the first two years and to an academic department, where contacts with the host establishment continue, for the third. RJ will fund salary costs and other expenses relating to the research, while the host establishment pays the salary for the remainder of the position, the cost of office workspace, the customary office infrastructure, an Internet connection and use of various benefits at the workplace. The host establishment is the employer, and appoints a contact person for the researcher, who works on the premises as an in-house researcher but is also expected to retain and develop contacts with academia.

RJ's experience to date has been very good, both for the companies and organisations involved and for researchers. Future aims include involving academic institutions more deeply in the programme and in building bridges. After an evaluation of the Flexit pilot project, RJ is now opening the programme to senior researchers as well, and splitting the positions so that each researcher is employed at a company or organisation (the 'host establishment') for two years, and then for a further year at an HEI. Accordingly, applicants need to establish affiliations to their chosen academic departments by the time they apply.

3. Demand for PhDs

Sweden has a relatively high proportion of R&D jobs and is generally in a good position to recruit PhD talent.[38] The Swedish Research Bill highlights that the recruitment of talented students and doctoral students to higher education institutions is a prerequisite for Sweden's position as a successful knowledge-based nation. The government considers that it is important to strengthen the competitiveness of doctoral studies by improving student welfare conditions for doctoral students

[37] **(RJ)** is an independent foundation with the goal of promoting and supporting research in the Humanities and Social Sciences. In 1962, the Riksdag approved a donation from Riksbanken (the Swedish Central Bank), aimed at celebrating Riksbanken's 300th anniversary in 1968 and, simultaneously, supporting an important national objective

[38] Dr. Annamária Inzelt Analysis of Researchers' Mobility in the Context of the European Research Area

on training grants or scholarships, who have less of a welfare safety net than doctoral students who are employed. Doctoral students should be employed at an earlier stage, and those on scholarships should be covered by insurance.[39]

4. Drivers of participation in ISM

Swedish R&I policy is increasingly promoting collaboration among actors, including public private cooperation. ISM is a significant part of this drive, but is not a policy in its own right (rather an important means to an end).

From R&I performing actors' perspective, ISM is increasingly seen as an important opportunity to develop competences, build networks, and improve participants' understanding of other R&I actors needs and motivations ("variato delectate").

5. Challenges and barriers to participation in ISM

According to a Swedish Research Council report, Sweden has a lower degree of mobility when compared to a selection of successful research countries. The report's opinion is that weak career systems and shortcomings in the recruitment process appear to be some of the most important obstacles to mobility, perhaps mainly among researchers who are in the career development stage. For established researchers, the difficulties mainly consist of freeing up time from teaching and administration.[40]

A major challenge for businesses is that they are always looking towards the next business quarter and therefore lack flexibility. Most often, the top management of enterprises recognises the advantages of mobility and collaboration more generally, but they are too high level. You also need operational management to see the advantages and to be prepared to invest in these kinds of programmes.

From the individual industry researcher's point of view, participation in a programme comes down to logistics and personal views. A stay abroad is likely to involve a spouse and/or children.

6. Framework conditions and R&I system (e.g. R&D tax credits, funding availability for schemes, macro factors such as braindrain)

Over the past two decades there have been substantial efforts focused on incremental industrial restructuring to reduce dependence on a few large actors by supporting growth in high-tech firms and improving framework conditions for SMEs. In 2014, the previous government introduced a limited tax incentive scheme for small businesses hiring R&D staff as part of an effort to increase BERD. Swedish governments still prefer to avoid the introduction of a broader tax credit scheme. Policy action has also been taken with regard to improved financing conditions for start-ups and SMEs in 2016. It remains to be seen to what extent this improvement in the supply of public venture capital will leverage private investments and business sector spending on R&D.41

[39] http://www.government.se/4a556d/contentassets/9131b15c802a44b9b196d442b498afdb/research-and-innovation---a-summary-of-government-bill-2012_13_30.pdf
[40] FORSKNINGENS FRAMTID! SVENSKA FORSKARES MOBILITET – en kunskapsöversikt
[41] RIO Country Report Sweden 2016

Country overview - UK

1. Number and type of country schemes

The UK is among the countries with the highest number of schemes to promote intersectoral mobility. This reflects the fact that there is longstanding recognition of the importance of strengthening the business-university axis. There is a longer tendency of pursuing commercialisation within UK universities than in many other EU countries. For instance, according to a 2017 study42, which examines the nature and extent of cooperation between business, universities and policy-makers, in 2015 there was progress in respect of key metrics relating to the commercialisation of applied research.

- 4,908 licenses were issued by universities to business (+19%), which continued an upward trend
- Income from licensing (excluding IP income coming from sale of spin-offs) grew by 21% from £73.9m to £89.5m, above the five-year average of £69m and is the biggest increase across the indicators for 2015.
- The number of spin-offs, which survive three years and more, grew by 4% from 970 to 1013.
- However, there was a reduction in the number of patents granted to UK universities, which fell towards the five-year average of 893, with 953 patents granted, from 976 a year before.

Some 15+ schemes have been identified through the basic scheme mapping. However, it is difficult to quantify the total number of schemes, since compared with other EU countries, there are many schemes overall. For example, there are several different schemes operated by dedicated organisations that promote science and research across different disciplines at national level, such as several ISM schemes operated by the Royal Society, schemes managed by the Royal Academy of Engineering and further schemes administered by private research foundations (e.g. the Wellcome Trust runs several schemes with an ISM period for PhDs built-in to the programme design).

In addition, several UK Research Councils are involved in operating ISM schemes, (e.g. the BBSRC's Industrial CASE Partnerships (ICP) which operated from 2014-2017 and the Collaborative Training Partnerships programme, which warded a block allocation of 4-year studentships covering the academic years 2017-18, 2018-19 and 2019-20).

Several schemes were identified of considerable duration, such as the Industry Fellowships (IF) scheme being implemented by the Royal Society, which has operated for about 20 years and the Industrial Fellowships scheme (previously "Industrial Secondments"), being implemented by the Royal Academy of Engineering.

2. Selected examples of ISM schemes.

There are many varied different types of ISM schemes in the UK. Selected examples are provided below:

- The Industry Fellowships scheme, the Royal Society

The scheme is for academic scientists who want to work on a collaborative project with industry, and for scientists in industry who want to work on a collaborative project with an academic organisation. The scheme is targeted at researchers with a well-established academic career or career in industry. In terms of eligibility, the scheme covers academic disciplines across life and physical sciences,

[42] State of the Relationship Report, National Centre for Universities and Business, 2017.

including engineering, but excluding clinical medicine. There are two rounds / year with 5-6 fellows / round. At any one time, there are approximately 35-40 industry fellows in post. The scheme duration is either 2 years full-time or 50% part-time for 4 years. The scheme therefore mainly attracts interest from larger firms since SMEs are not able to manage without key staff for such a long period of time. The Royal Society is therefore setting up schemes of shorter duration that will facilitate the participation of SMEs.

An interesting aspect of the scheme is that following the securing of some new funding by the Royal Society, more flexible fellowships are being offered on a pilot basis to PhD and undergraduate/ Master's students who have been assigned to provide research support to Industry Fellows. They are commonly based within academic but their role is to provide research support and to help evaluate the commercial potential of academic-industry transfer.

- Policy Secondment Programme, the Royal Society.

The programme is a newly established pilot which provides early-stage researchers with the opportunity of undertaking a secondment of either 3 months (full-time), or 6 months (part-time) within a science policy environment in government. The scheme was modelled partly on a well-known scheme operated by the NIH in the US. The objective is to recruit university research associates, typically early-stage researchers and to provide them with a secondment opportunity to work as a policy associate in government.

- Industrial Fellowships scheme, the Royal Academy of Engineering

The IF scheme provides support from early stage researchers through to mid-career academics who have the opportunity to spend between 6-12 months in industry. Industrial Fellowships provide an opportunity for successful applicants to undertake a collaborative research project in an industrial environment. The scheme aims to strengthen the strategic relationship between the university and industry host by providing an opportunity to establish new or enhance existing collaborative research between the two parties. The Fellowship facilitates knowledge transfer between industry and academia and enables awardees to gain first-hand experience of working in an industrial environment and knowledge of current industry practices, thereby enabling the secondee to improve the quality and industrial relevance of their teaching. The scheme is open to engineers from all disciplines and provides funding to cover the salary cost of the applicant, paid pro-rata against the amount of time to be spent at the industry host. Awards can be held up to six months full-time or part time up to 12 months. Upon returning to the university, the awardee will use their industrial experience and knowledge of current industry practices to enhance both their teaching and student learning. The Academy contributes up to a maximum of £30,000 towards the salary costs (excluding overheads) of the applicant paid pro-rata against the amount of time to be spent at the industry host. In its previous incarnation as "Industrial Secondments", the scheme has been running since at least 1995.

- The Knowledge Economy Skills Scholarships (KESS) scheme I and II, Bangor University

KESS is an ESF-funded European Convergence programme led by Bangor University on behalf of the Welsh higher education sector. The KESSII Programme (2015-2020) is a continuation of KESS I (2009-14). KESS offers collaborative research projects (Research Masters and PhD) linked with a local company partner, with scholarships supported by ESF funding. All Welsh Universities are involved. KESS achieved 230 PhD and 223 Research Masters projects across Wales and KESS closed at the end of September 2015. In the KESS 2 scheme, it is estimated that over 500 businesses will be partnered with academics and postgraduate research students to develop innovative research projects aimed at driving business growth. External partners have to be based in the West Wales and Valleys Convergence region, and all types of organisations are eligible (micro, small, medium, large

companies, and third sector), but it is expected that the portfolio of projects will be weighted towards collaboration with SMEs. Partners are required to make a cash contribution of £3,500-5,000 per year (depending on company size). 645 scholarships will be provided over the course of six years. Each project is specifically designed to meet the company's participant needs. The project is then carried out by a dedicated student at MRes, MPhil or PhD level, who is supported by both the company and relevant University.

Observations can be made in respect of the commonalities and differences in the characteristics of the schemes identified and analysed. For instance, in terms of the types of researchers being targeted, a distinction can be made between those schemes that target mid-late stage career researchers with a well-established academic career or a long track record in industry (e.g. Industry Fellowships scheme by the Royal Society) and schemes targeting early-stage or young researchers (e.g. Policy Secondment Programme, the Royal Society, the Knowledge Economy Skills Scholarships (KESS) scheme, Wales).

In terms of the outcomes of participation in ISM, some studies have been undertaken to assess the impact of PhD Graduates in the UK and career choices and destinations. For instance, a stocktaking study undertaken for the ESRC found that "doctoral graduates have a major impact across a wide range of sectors, with low levels of unemployment, high employability over time, and a major contribution in terms of high level skills and knowledge"[43]: With regard to the economic impact of PhDs, there are two main dimensions, economic studies of the value of a PhD in terms of wage premium and the overall return on investment. Among the findings relating to economic impacts were that there is a PhD wage premium compared to graduate researchers that have only undertaken a First Degree and a Masters. Based on data on the rate of return from the period 1994 - 2002, a study by O'Leary and Sloane mentioned in the stocktaking exercise notes that "at the PhD level, the wage premium is at its greatest between men and women PhDs. Compared with workers with 2 or more A levels, women PhDs can command a wage premium of 60% while men PhDs have a premium of 31.4%".

An article in the Economist notes that "PhD graduates earn more than those with a bachelor's degree"[44]. A study in the Journal of Higher Education Policy and Management by Bernard Casey has shown that "British men with a bachelor's degree earn 14% more than those who could have gone to university but chose not to. The earnings premium for a PhD is 26%. But the premium for a master's degree, which can be accomplished in as little as one year, is almost as high, at 23%. In some subjects the premium for a PhD vanishes entirely. PhDs in maths and computing, social sciences and languages earn no more than those with master's degrees". The premium for a PhD is smaller than for a master's in engineering and technology, architecture and education. Only in medicine, other sciences, and business and financial studies is it high enough to be worthwhile.

In relation to the wages of Industrial Doctoral Graduates PhDs, the report notes that "those who are working in industry are likely to earn much higher 'market rates'. Although intersectoral mobility wasn't a specific focus, it can be inferred that PhDs that have been closely engaged with industry during their PhD (and/ or undertaken part or all of the PhD in a company setting) are likely to benefit from enhanced employability and higher pay. Whilst the synthesis of existing studies noted that there are pay differentials between the University Sector and the Private Sector, equally the longitudinal data on which this finding is based is somewhat outdated.

[43] Career Choices and Impact of PhD Graduates in the UK: A Synthesis Review Report prepared for the Economic and Social Research Council (ESRC) "Science in Society" Team and the Research Councils UK (RCUK) Research Careers and Diversity Unit by Dr Arwen Raddon and Dr Johnny Sung, Centre for Labour Market Studies (CLMS), University of Leicester, January 2009 - www.esrc.ac.uk/files/public-engagement/public-dialogues/full-report-phd-graduates-career-choices/

[44] http://www.economist.com/node/17723223

"An HE/private sector pay differential was equally was highlighted in the 15-year longitudinal study on PPARC PhD graduates who earned their doctorates in the late 1980s (DTZ Pieda Consulting, 2003)". In terms of career destinations, the study synthesised earlier studies, such as a survey-based piece of research by the Institute of Physics which found that between 9-11 years after completing their PhD about half of post-doctoral researchers (PDRs) were still in academia, and 35% had moved on to positions in the private sector whilst 17% had moved to the public sector, primarily to research bodies. Whilst this may point to the strong value added to PDRs of undertaking a PhD beyond Higher Education (HE), it might equally be due to a lack of longer-term posts within HE. The study however focused on the impact of undertaking a PhD on researchers' careers generally, rather than specifically on the career development trajectory of intersectorally-mobile doctoral graduates.

In terms of the career paths of researchers from specific subject backgrounds, it was found that PhD graduates in the discipline of social sciences "were largely employed in positions which matched their qualifications level, with low levels of unemployment. However, some 60-65% were still in academia, compared with the study focusing on the physics discipline mentioned earlier where the corresponding figure was about 45%.

3. Demand for PhDs

In the UK, a variety of job roles and career routes are available for doctoral researchers. In this section, the extent of demand for doctoral students and graduates for industrial research positions is examined.

According to some literature[45], industrial research and development is one of the most attractive career paths for academic researchers in the UK, since it utilises the researchers' core skills but transfers these to R&D in an industry environment.

The interview feedback found that demand appears to be strongest among academic disciplines in life and physical sciences, including engineering. There is a willingness among many firms in the private sector across a broad range of sectors to recruit at PhD or post-doctoral level to strengthen their research capacity. Large firms appear to be on the lookout for such recruits, since they have the capacity to deliver appropriate training.

4. Drivers of participation in ISM

Among the main drivers of taking part in ISM in the UK are:

- Longstanding experience in the design and operation of ISM schemes – several schemes were identified that have been operating for 15-20 years, with well-developed cooperation structures for bringing industry and academia together.
- There is quite a high level of collaborative research income in the UK, which serves as an incentive to collaborative research, and supports appropriate framework conditions for ISME.

  For instance, according to a study for the HEFCE-universities knowledge exchange (KE) framework[46], which aims to support a culture of continuous improvement in universities, it was noted that the public and third sectors are the largest investors in contract research,

[45] http://www.jobs.ac.uk/media/pdf/careers/resources/10-career-paths-for-phds.pdf

[46] "Request for evidence on good practice in university research commercialisation"HEFCE-universities knowledge exchange (KE) framework: Association for University Research and Industry Links (AURIL), PraxisUnico and Association for Research Managers and Administrators (ARMA) https://newintranetsp.bournemouth.ac.uk/documentsrep/2017.09.04%20HEFCE%20research%20commercialisation%20supporting%20documentation.pdf

with £727 million in income into universities in 2014-15. In that same year, large business commissioned £435 million, and small and medium-sized enterprises (SMEs) £48 million, of contract research (SMEs are larger investors in consultancy). Technology transfer activity is concentrated in a few universities, whereas joint R&D is widespread.

However, the McMillan review of Technology Transfer focused on the exploitation of intellectual property arising from completed research through licensing processes and particularly the formation of spin-out companies. Among the findings were that research commercialisation, in the form of the co-creation of R&D between universities and businesses and other users, is far larger in scale than spin-outs and licensing.

- The presence of private research foundations that are active in providing funding for ISM, such as the Wellcome Trust (three schemes identified in the database, but several more exist that provide mobility opportunities for researchers to work outside of an academic environment).
    - From a researcher perspective, 1) the opportunity to strengthen researchers' employability by conducting industrial research and 2) potential future benefits in terms of increased wage-earning potential and salary differential with doctoral graduates that have not undertaken industrial training.
    - From a HEI perspective, the benefit of bringing in scientists and researchers able to carry out cutting-edge research in industry and academia.
    - From a large firm perspective, participating in an ISM scheme provides them with access to the most talented PhDs and post-doctoral researchers and scientists.

5. Challenges and barriers to participation in ISM

A number of challenges and barriers to participation in ISM were identified in the UK. These include: the relatively high cost of funding such schemes from a HEI / research institute perspective per researcher. This means, for instance, that the number of excellence fellowships that can be funded is relatively limited. Consequently, many ISM schemes have relatively low visibility due to the small number of participants, making it more difficult to attract applicants. That being said, over time, long-established ISM schemes, such as the Royal Society's IF scheme and the Industrial Fellowships scheme at the Royal Academy of Engineering mentioned earlier have managed to attract significantly more applicants than there are places available, which is a proxy for the high quality of such schemes.

6. Framework conditions and R&I system

There are a number of positive framework conditions in the UK which are conducive to promoting intersectoral mobility. These include:

- Specialist organisations such as Vitae work to enhance researchers' careers and to strengthen their professional development, for instance through the provision of training to researchers to develop key transferable skills and competences that can be applied in both academia and industry.
- Vitae's Researcher Development Framework[47] (RDF) is designed for those doing a doctorate, members of research staff, those pursuing an academic career or thinking about applying the skills developed during their PhD in another career. It is worth noting this as a step

[47] https://www.vitae.ac.uk/researchers-professional-development/about-the-vitae-researcher-development-framework

forward in the identification and mapping of the characteristics of excellent researchers. The RDF contains "descriptors" which are structured in four domains and twelve sub-domains, encompassing the knowledge, intellectual abilities, techniques and professional standards to perform research, as well as the personal qualities, knowledge and skills to work with others and ensure the wider impact of research.

- With regard to funding arrangements for universities and researchers in the UK, the general direction of travel is positive for intersectoral mobility, since increased research funding is being made available for collaborative working between industry and academia. For example, the Industrial Strategy Challenge Fund (ISCF) has been allocated more than £3 billion. It links to the strategy being embedded in the impact section of the 2021 Research Excellence Framework. There is also increased collaborative industry funding through Innovate UK, and an increase in research council's budgets, targeted at areas relevant to industry and business, and to quality-related core funding. Overall, funding levels to promote industry-HEI collaborative research is quite significant in scale.
- Taken together, Government has committed to increasing investment in research and development by £4.7 billion over the next 4 years. However, the initial list of six ISCF themes is closely linked to technological priorities associated with strong future industrial demand in new and emerging areas of research and advanced manufacturing technologies, such as batteries for clean and flexible energy storage, self-driving vehicles, healthcare and medicine, robotics and artificial intelligence, manufacturing and materials of the future and satellites and space technology.
- The close relationship between academia and industry, and trends such as the new UK government requirement for higher education institutions to undertake joint collaborative research projects with industry for a minimum of 25% of research grant funding.
- The comparatively strong interest of large corporates in providing financial support (e.g. directly funding schemes, sponsorship) for ISM in the UK compared with many other EU countries.
- Cultural openness to ISM - previous studies and research articles have shown that PhD graduates in the UK are culturally open to exploring other career options outside academia.
- However, seen from another perspective, one of the main reasons why a large proportion of PhD students do not pursue academic careers is the difficulty in securing a permanent university position in the UK, with evidence of precarious employment. Since approximately 43,000 people registered for doctorates in the fields of science, maths, computing and engineering subjects, the academic job market is highly competitive.

Countries associated to Horizon 2020

Country summary - Albania

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

According to Geron Kamberi, Director General of the Albanian Agency for Research, Technology and Innovation "there are no ISM schemes in Albania".

There is a lot of interest in promoting the employability of researchers in Albania, and Mr. Kamberi was very knowledgeable on the subject-matter of industrial PhDs, but that does not seem to be a current priority of the Government – which nonetheless participates in the Marie Curie Actions, and has – according to this Director General of the Albanian Agency for Research, Technology and Innovation – an interest in learning more (and eventually implementing) about these schemes, best practices and the financial costs of implementing them.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

No ISM schemes found.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

Yes, Albania participates in the Marie Curie Actions and in H2020.

Number of Albanian researchers funded in Marie Curie Actions (2007-2014)1: **25**
Share of participations in signed grant agreements in H2020 and FP7 = **below 0.1%**

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

No, the only national fund in place to support the development of PhDs is the "Excellence Fund" which supports researchers that have been admitted to study at the top universities in the world (i.e. Ivy League and others).

Country summary - Bosnia and Herzegovina

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

In Bosnia and Herzegovina existing grant schemes for R&D and innovation do not actively promote policies/measures supporting researchers' dual-careers or inter-sectoral mobility. The concrete measures encouraging researchers to move from the academic to the industry sector and vice-versa are mentioned in relevant Strategies but without any direct financial support. Available public grants for R&D and innovation are more general and do not exclude inter-sectoral mobility. It is up to academic or industry community to write such project proposals for these funds, where inter-sectoral mobility will be a part of such project.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

No. However, existing grant schemes in the country are not limiting or preventing inter-sectoral mobility. The fact is that existing grant schemes look at inter-sectoral mobility as positive element that can be of importance in case of two proposals with same number of points. National funding mechanisms (grants from ministries) as well as access to the Framework programme, resulted with increased inter-sectoral cooperation in the number of joint projects and partnerships, and are involving industrial capacities in research projects and activities. This way is enabled direct transfer of knowledge related to participation in projects, but also in some respect transfer of scientific knowledge from academia to industry. One of examples is establishment of first research driven cluster in Bosnia and Herzegovina in the field of medicine. The Cluster was established as part of the project financed from the funds of the Framework Program 7 and its specific subprogram Regions of Knowledge titled Advanced and Integrated Medical Imaging for Europe (AMI-4EUROPE).

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

In 2009, BiH became associated to FP7 and from January 22014 BiH is also associated to the HORIZON 2020 programme. However, none researcher from BiH took part in projects under Marie Skłodowska-Curie action - Industry-Academia Partnerships and Pathways in the period 20017-2014. However, BiH marks single participation of SME in "Innovation in SME", and we can assume that this project will include some form of inter-sectoral mobility. Also, Bosnia and Herzegovina participated in period 2012-2016 in EUREKA programme. The projects were submitted by 3 SME, 2 large companies and 2 universities. It is possible to conclude that these projects imply that have activities of inter-sectoral co-operation or mobility.

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

In April 2009 the Parliamentary Assembly of Bosnia and Herzegovina adopted the *Framework Law on basics of science-research activities and coordination of internal and international science-research*

cooperation in Bosnia and Herzegovina. This law set special interest in area of science and technology in Bosnia and Herzegovina, basic principles of science-research activities, accomplishment of international science-research cooperation and science-research cooperation within Bosnia and Herzegovina, it's financing, ways of coordination achievement among institutions responsible for area of science and technology, establishment of Council for science Bosnia and Herzegovina, as well as coordination of informational system for area of science-research activities in Bosnia and Herzegovina.

In the same year the *Strategy for the Development of Science 2010 –2015 with the action plan* was adopted. The document prepared by the Ministry of Civil Affairs has specified the role of the public authorities covering all aspects of the country's science and research.

In 2012 the Government of the Federation of Bosnia and Herzegovina adopted a proposal for the "*Strategy of Development of Scientific-Research and Research-Development Work in the Federation of BiH for the period 2012-2022*"which was submitted to the Parliament of the Federation of BiH for adoption. The strategy aims to improve the promotion of scientific work in universities, with a particular focus on education and the promotion of young researchers.

In 2017, Ministry of Science and Technology of Republic of Srpska published its "Strategy for Scientific and Technological Development of Republic of Srpska in period 2017-2021". This Strategy points on importance of strengthening of relations between industry and academia for improvement of the research results and level of innovativeness. Aim 1.3 in the Strategy calls for establishment of specialized Foundation for science and innovativeness of Republic of Srpska (FNIRS). The idea is to gather in one place funds from different budgetary units in Government of Republic of Srpska, including donations and other sources of funding for science and innovation. The Strategy foresees that this Foundation shall be operative by the end of 2018 and that the first calls for grants should be published by June 2019. The modus operandi of the Foundation is not yet known, but it is expected that the industry-academia mobility and cooperation will be one of preconditions or favoured in selection procedure for grants. Aim 3 from the Strategy is completely devoted to the support of co-operation between academia and industry sectors. One of specific goals is to increase the number of co-operative projects for at least 50% compare to the number from 2016. The measure 3.1.1 states that it is necessary to revise existing programmes of support to the innovative organisations and academic institutions co-operating with industry. The measure 3.2.1 states that the research open for innovation in line with industrial needs will be supported with aim to increase transfer of knowledge and technologies. The measure 3.2.3 states that until end of 2018 the book-of-rules on this support incentive should be completed. On the other side, the same Strategy foresees in aim 3.5 to stimulate companies to increase demand for innovative solutions from the academic community through different financial and non-financial tools (including measures to decrease VAT and other taxation benefits). Going even deeper in inter-sector co-operation this Strategy also calls for cross-border mobility and accessibility of research grants and innovative PhD. The intention is to introduce incentives for "industrial doctorates" within measure 3.5.6.

Country summary – Faroe Islands

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

   There are no ISM schemes in Faroe Islands. The FO University is very small and has limited capacity. It sends a number of students abroad as it cannot meet demand for programmes within the institution itself. Around 40% of FO students study in FO, while 50% study in Denmark and 10% 'elsewhere' most of them in the UK.

   - The international office in the university manages a Nordplus programme which is a Nordic Erasmus type programme offering 50% or 100% support depending on the area of study.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

   n/a

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

   FO has access to H2020 and thus also to MSCA (although no MSCA awards noted on Cordis as of January 2018).

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

   Although there is no government ISM policy, there is a EURAXESS mobility network in the Faroe Islands. In 2013, with support from FP7, ESNFO ('EURAXESS service network Faroe Islands) established a network of mobility centres, plus LCPs at research institutions and public authorities. The Faroese Bridgehead Organisation was established at the Faroese Research Council in January 2013. The organisation is responsible for coordinating the mobility network with other EURAXESS members.[48]

[48] http://cordis.europa.eu/result/rcn/155319_en.html

Country summary – FYROM

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

   There are no formal ISM schemes in FYR Macedonia.

   There are also very few informal means of undertaking intersectoral mobility in FYROM. In FYROM the main challenge is that there are no (maybe 10 across the country) enterprises that have any R&I facilities.

   Mobility also requires co-funding which is another challenge in FYROM; there is little money for R&I generally. Not only agencies, but also universities have tight budgets and shy away from activities that require co-funding.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

   n/a

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

   MSCA is the main instrument for mobility (there are no dedicated mobility or ISM instruments in FYROM, although mobility can be funded through project grants). MSCA is highly regarded but FYROM researchers struggle to collaborate with quality institutions (they are instead encouraged to collaborate with other Baltic countries). However, for FYROM researchers to learn they want to work with the best institutions. When it comes to international mobility, FYROM struggle to build real collaborations with high-quality R&I countries.

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

   The Agency for Promotion of Entrepreneurship of FYR Macedonia has had plans on establishing S&T parks; they noticed a few years ago that other Balkan countries where starting them but FYROM has not been able to catch on. The agency tried to get enterprises/academia involved and organised some workshops but found that there was a lack of understanding of the potential role a S&T park could play. More generally, there is a lack of understanding among R&I public and private stakeholder of what collaborations can provide.

   FYROM has also considered the use of innovation vouchers but would need additional funding to facilitate this. The agency is now targeting SMEs to train and help them network. The feedback is that they need more support at the prototype stage.

Country summary - Georgia

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

Only one scheme has been found in Georgia, i.e. Applied Science Grant. It is a direct grant for PhD students. It is managed by the SHOTA RUSTAVELI NATIONAL SCIENCE FOUNDATION.

In this scheme the project proposal has to be developed by a consortium, with at least one member from the industry. The project has to involve a young scientist (the Beneficiary), guided by a senior researcher.

Other entities related to science and R&D promote the match between some of the industry sectors and Universities and organize Fabrication Labs, workshops and hackathons. Some initiatives such as boot camps for start-ups, aimed at promoting technical and scientific knowledge, are expected to address the problems with innovative solutions. They do not have proper ISM scheme and are not organized with that specific sense, neither have established something like that.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

The amount earmarked for the aforementioned scheme is 150k. The country law does not allow to transfer funds to the Universities or to the companies - it has to be directed to natural persons, i.e researchers.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

N/A

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

The State budget for this kind of actions is limited. Therefore, the funds are mainly directed to HEIs in Tbilisi.

A National technology Office (MIT experts were invited to make the assessment) for researchers to commercialize technology is planned to be developed/established.

It is hard for business stakeholders and Scientists to exchange information and communicate effectively.

Bank of Georgia has an MBA program to support scientists in business planning and other related issues.

Country summary – Iceland

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

There are three formal ISM schemes in Iceland operated by Rannis, although some funding has been discontinued.

The three schemes are:

- *START Postdoctoral Fellowship Programme* which targets the career development of early post-doctoral researchers and promotes the international mobility for researchers. The programme is open to researchers from all research fields who have completed their PhD within the last five years.
- *Icelandic Research Fund for Graduate Students.* The objective is to allocate grants to research-related graduate studies undertaken at a university, or in collaboration with research institutions or companies, under the responsibility of the university. This applies both to studies in Iceland and abroad.
- *Icelandic Student Innovation Fund* - the Fund aims to provide opportunities for universities, research institutions and companies to recruit students (in graduate and postgraduate studies) to undertake research projects during the summer.

The Icelandic Institute for Intelligent Machines (IIIM) operates a scheme which was funded by a grant from national government during the first 7 years. The scheme has been continued but more informally and the cost is approximately €500,000 p/a.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

There is evidence that informal schemes have greater prominence than formal schemes in bringing together industry and academia. This is thought to be largely due to the small population, which lends itself to more informal arrangements. Iceland also struggles from a phenomenon of brain-drain from academia to industry, particularly in technologically advanced sectors such as computer science. Schemes such as the IIIM, mentioned above, have been designed to counter this phenomenon whilst also ensuring the exchange of ideas and information between industry and academia.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

n/a

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

While there is no formal policy framework at country level in Iceland, ISM schemes are motivated by a recognised need to grow the academic community in the country by attracting students and researchers from abroad.

Country summary – Israel

1. How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?

Industrial Research has been supported since the late 1970s and early 1980s (mainly in the electronics and communications sectors initially). In 1985, a Law to Encourage Industrial R&D was approved and a fund was established, with hundreds of millions of $ in funding annually.

There are only a few formal ISM schemes in Israel, but in Israeli business and research culture there are well-developed relationships between industry and academia, further supported by defence/ research/ industry linkages. Over the past three decades, some 264 foreign R&D centres have established in Israel49 to take advantage of the strong linkages between R&D, business, and venture capital present in Israel. Israel has 8 Universities (7 with large Research Programs) & 60 Academies/Colleges.

There is a long tradition of Technology Transfer between Israeli academia and industry, although there are only a few formal intersectoral mobility schemes as a mechanism for promoting the transfer of knowledge and research results.

The ISM programmes identified sometimes have an element of drawing Israeli researchers working abroad back to Israel.

The Israeli Tech Challenge (ITC) Fellows Programme is an accelerated professional development programme in the high-demand fields of data science, deep learning & computer vision, cyber security, and full stack web development. Exceptional engineering graduates with at least two years' experience in industry acquire advanced tech skills in Israel. The 10-month programme involves 5 months' training in Data Science and Cyber Security, followed by a 5-month internship at innovative tech companies. Teaching staff are recruited directly from industry and the objectives are to accelerate the career development of researchers and to provide them with a conduit into high-tech industry. The program provides a combination of classroom learning & industry experience. ITC is the only campus in Israel that offers both training and job placement assistance in the Israeli industry.

The Magnet university-business cooperation programmes50 include three sub-programmes, the Magnet, Magneton and NOFFAR incentive programmes respectively). These fall under the responsibility of the Israeli Innovation Authority (IIA), which has a budget of NIS 200 million across all its sub-programmes, with the majority of expenditure going on the Magnet consortia sub-programme.

Israel MAGNET Consortia (through the Israel Innovation Authority). The MAGNET incentive program (Generic Pre-Competitive Technological R&D) focuses on consortiums of industrial companies and research institutions that collaborate to develop innovative technologies. The consortiums enable long-term R&D and create a supportive work environment. Collaboration with industry also

[49] UNESCO, (2019); Mapping Research and Innovation in the State of Israel (GO-SPIN Rep[ort), p.38
[50] http://www.matimop.org.il/MAGNET_Consortiums.html

strengthens the commercialization capabilities of research institutions and assists them in understanding market needs.

The goal of MAGNET is to assist in the development of generic technologies in important fields in the global market, in which Israeli industry has a competitive advantage. Te incentive program specializes in the development of infrastructural technology, thus allows distribution of knowledge and cooperation between companies operating in the same field, which may be difficult to achieve otherwise. The program is targeted at: Israeli manufacturing companies developing competitive products seeking to develop innovative technologies which can be used as a basis to develop a new and advanced generation of product; and, Israeli academic research groups engaged in scientific or technological research, seeking to promote applied research as part of a consortium, as well as to collaborate with the industry and study the market needs.

The grant provided is up to 66% of the approved budget for an industrial company and 100% of the approved budget for a research institution (80% as a grant and 20% from the industrial companies in the consortium). The period of the grant is for three to five years.

NOFFAR Incentive Program (through the Israel Innovation Authority)

The NOFFAR program provides support for applied research in academia. It focuses on technologically feasible ideas which are not sufficiently mature for support through the MAGNETON program but require financing in the initial applied research stage at universities to match them with the appropriate industrial sector. The program is limited to the fields of biotechnology and nanotechnology. The research is carried out in academic institutions, supported by an industrial company. The research institution is entitled to a grant of up to 90% of the approved budget to a maximum of NIS 550,000 over 12 months, with an option to extend up to 15 months. The supporting company serves as partner in professional guidance and in setting of research goals and participates in the funding of 10% of the project cost. At the end of the research, the company receives the first right to negotiate a commercialisation agreement with the research institution. NOFFAR research conducted in collaboration with two different institutions is eligible for funding of up to NIS 660,000. The grant recipients are exempt from repayment of royalties.

Program for Encouraging Research and Development Personnel to Return to Israel

The Ministry of Aliyah and Immigrant Absorption actively supports the return and absorption of Israelis residing overseas. Through the auspices of the Center for Absorption in Science, the Ministry assists returning residents scientists and R&D engineers in finding employment in the R&D sector. The unique assistance programs for R& D personnel have recently been updated, and a new scholarship program has been instituted for PhD research students in order encourage their return.

2. Are there any particular features of ISM schemes that are country-specific in approach?

The strong focus on reversing brain drain in some schemes is specific to Israel. For example, the National Programme supporting the Return of Israeli Academics also assists the Israeli industry to absorb qualified personnel. The Young Entrepreneurs scheme supports the creation of spin-offs. There are also schemes to reverse brain drain and to attract researchers back to Israel both to industry and to academia. These are not formal ISM schemes but focused on addressing gaps in the supply of available researchers.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

n/a

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

There does not appear to be a formal national policy framework specifically focused on the intersectoral mobility of researchers. However, there are a number of specific initiatives such as those funded by the Israeli Innovation Authority (IIA), which support ISM through university-business cooperation programmes. Regarding institutional responsibilities, the Israel Innovation Authority advises the government and Parliament ("Knesset") committees regarding innovation policy in Israel.

Israel does have resources available for programmes to strengthen business-university cooperation. It has one of the highest R&D spending ratios globally and spent 4.2% of its gross domestic product (GDP) on civil research and development in 2013.

Country summary – Moldova

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

   Moldova has established three technology parks as well as seven innovation incubators, which may be potential platforms for intersectoral mobility, however there is no data available if ISM activities are being undertaken in the parks/incubators.

   In Moldova, inter-sectoral business mobility is usually observed from the public research sector to the private sector, motivated by higher salaries and resulting in an interruption of research careers.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

   n/a

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

   Moldova is eligible to participate in MSCA but, according to Cordis data (February 2017) has not yet secured any MSCA funding under H2020. Moldovan researchers were involved in 10 People projects under FP7, of which one project aimed to support the establishment of the EURAXESS network in Moldova.

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

   The main support for public-private R&I activities is provided by the Agency for Innovation and Technology Transfer (AITT) through an annual call for Innovation and Technology Transfer Projects, which link-up research organisations with companies. The approach is bottom-up, covering a very broad spectrum of thematic fields. The projects are supported for a two-year period and require a co-funding from non-public sources of at least 50% of the total budget. However the overall budget for such projects amounts approximately 2% of the state budget for R&I, with a total of approximately EUR 5.4 million for the period 2007-2014.

   The majority of support measures taken so far to improve Moldova's R&I capabilities are targeting PROs (supply-side of innovation) and only few stimulate business R&D and innovation activities (direct funding for business R&D and demand-side measures). A big challenge is that private firms are excluded from governmental funding for R&I, since only entities accredited by the state can receive public funding for R&D and the accreditation criteria are strictly oriented to academia.

   Moldova's internationalisation and mobility policy in R&I is focused on Europe. A priority for Moldova's international scientific cooperation is the integration of the country in the European Research Area. A major challenge in Moldova is that R&D personnel has decreased drastically from 25,200 in 1990 to 5,038 (Head Count) in 2014. This strong decline is largely

due to the low funding of the R&I system over the past 25 years, and to the poor conditions in terms of careers and salaries of national researchers.

Since 2004, the Moldovan Academy of Sciences has set itself the goal to promote and enact policies to reduce brain drain and to consolidate the infrastructure of research organisations and major universities.[51]

[51] Räim and Weiss (2016) Peer Review of the Moldovan Research and Innovation system: Horizon 2020 Policy Support Facility. Written by the independent panel of experts and peers: National Peers

Country summary - Montenegro

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

In the period prior to 90s when there were strong industries, the typical from of intersectoral mobility in Montenegro has been in joint applied research projects between University staff and enterprises. During the 90s, apart from the brain- drain, a partial outflow of young researchers from science to enterprises, in search of better paid jobs and working conditions took place. In the past several years, smaller, recently established enterprises have started to engage academic researchers as short-term consultants. Joint projects have continued only in ICT sector. Nonetheless, more structural forms of inter-sectoral mobility, such as training of young researchers in industry, mutual secondments etc. have never existed, or only sporadically[52].

Communication between companies and research institutions (primarily universities) is still very modest. Certain improvements in this communication may be noticed with the establishment of private universities (which are more proactive in approaching business) but, apart from that, applications of the results of the scientific work in the practice are very rare[53].

Programmes that support research mobility are mainly implemented through national annual Calls to support: participation in multilateral programmes (FP7, COST and EUREKA programme,) cooperation with scientific Diaspora, PhD and master studies, study visits based on the scientific training abroad, participation in scientific congresses in the country and abroad, organization of scientific congresses in Montenegro[54].

During the recent period, the Government has tackled the issue of partnership between education, research and business as well as promotion of business investment in R&D. Also, some new instruments were recently introduced (Science and Technology Park, voucher schemes, etc). However, the set of those measures is in its initial development phase (the number of measures is small, they are not simplified, well-promoted, well-targeted and focused) and would need significantly higher financial support in order to give some positive results. The overall funding support should be better tailed by the needs of companies, particularly SMEs as those are creating more than 90% of the business sector in Montenegro. This is probably one of the areas that would be most requiring and challenging for the government and stakeholders[55].

The identified schemes include Call for proposals for establishing the first Centre of Excellence (CoE) which was announced on May 30th 2013. It was implemented under the Component 3 (Establishing a Competitive Research Environment) of the Higher Education and Research for Innovation and Competitiveness Project (HERIC) funded from the WB loan. The Call was opened to all licenced scientific research institutions applying in partnership with at least an additional licenced scientific

[52] Final report on the project EURAXESS Montenegro. Montenegrin Researchers' Mobility Network, Grant Agreement Number 249708, 2013.
[53] ERAWATCH Country Report 2013: Montenegro
[54] Ibidem
[55] Ibidem

research institution partner, from Montenegro, one international partner and one partner from industry.

The Ministry of Science also announced Call for collaborative research grants on October 18th 2013. A total of 29 research institutions applied. The total amount of funds for the implementation of research grants, for the three year's period, amounted up to 2.1 M €, while financing of the individual projects was from €150,000 up to €400,000. This call was opened for all national licenced scientific research institutions that needed to apply with one partner institution from abroad as well as partner from the industry.

Good example of business-academia cooperation is implemented through the IPA grant scheme "Transfer of knowledge between the sectors of higher education, research and economy", financed from IPA IV funds under the Operational Programme for Human Resources Development (2012-2013). The basic criterion for grant financing was the existence of cooperation between the academic and economic sectors. Funds are allocated i.a. for the following activities:

- Market-oriented research and innovation;
- Transfer of knowledge and innovative skills between the academic sector and companies[56].

2. Are there any particular features of ISM schemes that are country-specific in approach?

The Government of Montenegro has implemented a number of measures aimed at fostering cooperation between the research and business communities, but intersectoral mobility is not the purpose of these actions itself, hence, it is difficult to identify any particular feature of Montenegrin approach in this regard.

3. If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).

Montenegro had a much higher applicant and funding success rate under FP7 compared to other Balkan states.

During the period 2007-2014, 6 researchers participated in in Marie Curie Actions (2 in Initial Training Networks, 2 in Industry-Academia Partnerships and Pathways, 1 in Co-funding of regional, national and international programmes and 1 in Intra-European Fellowships)[57].

Montenegro's Cabinet approved the international agreement on Montenegro's participation in the EU programme "Horizon 2020 - The Framework Programme for Research and Innovation" on 29 May 2014. However, based on the H2020 Statistics of 2015, successful participation is very low.

[56] PROGRESS REPORT on recent developments regarding research and innovation cooperation in/with Western Balkans. Montenegro (period June 2016-June 2017), Steering Platform on Research and Innovation, EC.
[57] Statistics - Marie Skłodowska-Curie actions research fellowships. Country fact sheet: Montenegro. 06 July 2015. http://ec.europa.eu/research/mariecurieactions/statistics_en

Montenegro should assess its current H2020 performance; increase and focus efforts on areas of strategic interest to the country; and stimulate further participation of SMEs in these actions[58].

4. Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?

Since the 1990s, Montenegro has been suffering from a brain drain. The Government has launched some measures to attract young researchers, in particular PhD students, to the University of Montenegro, such as the adoption of the Revision of the Strategy on Scientific and Research Activity (2012-2016)[59] which is the main strategic development R&I document. The SSRA defines three strategic goals: development of scientific research community, development of multilateral, regional and bilateral cooperation and cooperation of the scientific research community with the business sector. According to the recommendations given in this document, special focus should be put i.a. on implementation of measures for connecting the research sector with the economy through the implementation of joint development projects and an increase in investment in research by the economic sector.

The Government of Montenegro adopted the Action Plan for implementation of the Amendments to the Strategy on March 28th, 2013. The Planned activities included cooperation between scientific research community and industry, with operative objectives: establishment of the first Science and Technology Park in Montenegro and stimulating small and medium-size enterprises (SMEs) to become involved in research and innovation[60].

The Strategic Plan for establishing the Science and Technology Park (STP), adopted by the Government on December 27th 2012, envisions the STP in Montenegro to be a networking structure that shall i.a. promote internationalization and commercialization of scientific research. In accordance with the Strategic Plan for establishing the STP, the first impulse center "Tehnopolis", based in Niksic, was created which has also contributed to connecting science and business sectors.[61]

The Government of Montenegro appointed the new Council for Scientific-Research Activities

at its session held on 12 July 2017. The Council has nine members, one member of the Council has been appointed from among the representatives of the Ministry, while eight members have been appointed from among prominent experts who contribute to the development and application of scientific research activity from research institutions, institutions of higher education, the academies of sciences and arts and the economy, with respect for the principle of equal representation of the fields of science[62].

The “Industrial Policy of Montenegro until 2020” identifies insufficient links between industrial sectors and science and research institutions as one of weaknesses and increased linkages between

[58] COMMISSION STAFF WORKING DOCUMENT. MONTENEGRO 2015 REPORT, https://wbc-rti.info/object/document/14559/attach/20151110_report_montenegro.pdf
[59] Researchers’ Report 2014. Country Profile: Montenegro. Deloitte
[60] ERAWATCH Country Report 2013: Montenegro
[61] Ibidem
[62] PROGRESS REPORT on recent developments regarding research and innovation cooperation in/with Western Balkans. Montenegro (period June 2016-June 2017), Steering Platform on Research and Innovation, EC.

businesses and the research sector for development, exchange and introduction of innovations among opportunities of the Montenegrin economy.

The new Strategy for Scientific-Research Activities (2018-2021) is going to be adopted by end of October 2017. Public discussion about the draft strategy is currently open. http://www.mna.gov.me/vijesti/177487/Javni-poziv-za-ucesce-u-raspravi-o-inoviranom-Nacrtu-Strategije-naucnoistrazivacke-djelatnosti-2017-2021-s-Akcionim-planom.html

According to the Action Plan, Program for employment of young researchers PhD students in different areas) is planned. It will be financed by the next operational program for HRD.

Country summary - Norway

1. How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?

Overall, Norway has a large number of ISM schemes. 11 schemes have been identified as part of this study. Among these, 6 schemes aim to promote Norwegian ISM in 'prioritised countries', including Germany, France, US and Japan.

There are different types of ISM schemes in Norway funded jointly by the Government and private sector, as well as funded solely by the companies. Some are implemented in cooperation with other countries and target higher post-doctoral degrees or lower degrees, like PhD. Some are aimed at open innovation and applied science, others for executive training of students. The schemes identified in Norway also target strategic regional collaboration reinforcing the ties between companies and Centers of Expertise. It is common to find international mobility schemes.

Out of the schemes currently operating in Norway, New Scheme PhD appears to particularly stand out. It is an industrial PhD scheme which allows the participating representatives of the industry to select their research partners. There is also a Tax refund program for innovation and research and the Ministry of Finance defines the criteria.

The Research Council of Norway has also established an ISM scheme, the Public sector Ph.D. scheme (OFFPHD) to promote public sector innovation in different types of public administration. The scheme is described in detail in case study 3 on mobility between academia and the public sector (also see description in Section 2 below).

There is the need to adjust the existing legislation to achieve a proper level of academia-industry cooperation – still, the authorities clearly state that there is a long way to go to achieve it. The system must be well-adapted for the innovation activities and for introducing specific indicators of evaluation.

2. Are there any particular features of ISM schemes that are country-specific in approach?

Selected examples of interesting schemes are provided. The **Public Sector PhD Scheme** is an initiative where the Applicant is the Institution and 50% of the funding comes from a public institution and the other 50% comes from the participant university. The candidate has to be a public employee. The proposal is made by the employee and supported by the Organisation. Subsequently, they approach the UNI and make an agreement with the university to support the research. The aim is to improve the functioning of public sector Institutions. Public sector innovation has become an increasing priority for the Research Council in order to strengthen innovation capacity and to develop an improved knowledge base as to how to solve strategic challenges and problems faced by different types of public sector institutions across different sectors. But the quality of the research being undertaken has yet to be proven, since the scheme is still at the piloting stage.

The **Scheme established by ELKEM** is fully financed by the company and managed by its HR department. It focuses on Physical Mobility, lasts for 2 years and has three periods of 8, 8 and 6 months respectively.

The **Japan-Norway Researcher mobility programme** allows the Japanese senior and postdoctoral researchers to participate in Japan-Norway international R&D collaboration. The Research Country of Norway in cooperation with the Japan Society for the Promotion of Science offers two kinds of individual fellowships for Japanese researchers: (I) stays of 1 to 6 months for senior researchers and

(II) stays of 6 to 12 months for postdoctoral researchers. The number of fellowships awarded within each category (I and II) is decided annually depending on available funding.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

N/A

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

With regard to knowledge transfer, Norway has been following the recommendations made by the EU. Following a change of legislation in 2003, universities received broader responsibility for commercialization of research and property rights, which in turn resulted in adoption of new measures and strategies by the universities. As a result, academia-industry cooperation in the area of R&D commercialisation was strengthened, strategies to further reinforce the intersectoral cooperation were developed and implemented, and overall, the mobility of researchers was highly promoted.

Country summary - Serbia

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

The need od intersectoral mobility has been noticed in Republic of Serbia. As an effect of that Republic of Serbia participated in the international project I-SEEMOB (Intersectoral mobility of researchers in south-eastern Europe) implemented in the period 2007-2012. The main goal of the I-SEEMOB project was to contribute to the enhancement of the career development of R&D personnel in ERA by examining the existing legal and research policy gaps hampering the intersectoral mobility of R&D personnel in the South-Eastern European countries participating in the project and, accordingly, provide recommendations and guidelines to the respective governments so as to raise the remaining obstacles and promote intersectoral mobility and the career development of researchers. Serbian participant in the project Was Machine Faculty - University in Nis.

In the assessment included in RESEARCH FOR INNOVATION. Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016 – 2020 it is indicated that mobility is a very important segment in the process of development of each researcher. Consequently, the mobility of researchers is an important step in improving human capacity in Serbian research area, and it plays an important role in the desired rapid development of science in country. However, current diagnosis shows that the intersectoral mobility of researchers in country practically doesn't exist. Mimo tej diagnozy, w Republice Serbii zidentyfikowane zostały działania mające na celu rozwój współpracy pomiędzy nauką i sektorem prywatnym, których efektem był proces mobilności międzysektorowej. Despite this diagnosis, there have been activities in the Republic of Serbia identified which aim at developing cooperation between academia and the private sector, resulting in intersectoral mobility. Nevertheless, the analysis of the current situation provides specific requests to increase the number of researchers in the nonacademic sector

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

No projects directly aimed at supporting ISM in the Republic of Serbia have been identified. The ISM is supported under broader activities aimed at the development of innovativions in companies (Mini and Matching Grants Programmes) or to stimulate cooperation between the HEI / RTO sector and SMEs (The Collaborative Grant Scheme). Such initiatives include grants for the R&D measures with significant market potential.

The companies have engaged a number of PhDs under implementation of the projects within these Programmes. The initiatives has also supported creation and development of the university spin-offs.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

In June 2007, Republic of Serbia signed the Memorandum of Understanding and therefore became asscіated to FP7. Serbia is also associated to HORIZON 2020. There have been 4 projects

implemented in Republic of Serbia in the period 20017-2014 under Marie Skłodowska-Curie action - Industry-Academia Partnerships and Pathways. 19 Serbian researchers took part in those projects.

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

The policy framework for ISM is the Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016 – 2020 – Research for Innovation. This document sets out measures and programmes for the promotion of excellence in science and targeted research for the development of economy and society as a whole.

Measures which include ISM are envisaged under several objectives of the Strategy:

Objective 1: Ensuring excellence and availability of human resources for science and economy and social activities

Measures:

(1.) Improving the programme of doctoral studies - The support will include elements related to educational and research activities, mobility, but also the acquisition of transferable and other skills that are of interest for further career development in research and innovation and in other sectors.

(5.) Improving the mobility of researchers

Improving mobility between science and economy 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 creating new products and services.

Objective 5: Enhancing international cooperation in the field of science and innovation

Measures:

(2.) Strengthening participation in the European Framework - The mobility programmes will be supported through incentives, especially the mobility of young people, as well as the support for more intensive participation in the most prestigious part of the programme related to the exceptional science, and implemented by the European Research Council;

(3.) Strengthening regional cooperation in the Western Balkans and the Danube region - the active role within the Danube strategy/region will continue, especially in terms of coordination in the Priority Area 7 “Knowledge Society”, and in this regard steps will be made towards better use of existing funds for research, opening new research, joint programming, stepping up international cooperation with the Joint Research Centre, the Danube Rectors’ Conference, better use of existing research infrastructure in the region, increased mobility of researchers, etc.;

Country summary – Switzerland

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

A relatively large number of research mobility schemes (12) were identified overall in Switzerland in the database developed for this study. Among these, some dedicated ISM schemes were identified, but more commonly academia-to-academia schemes are in the process of being opened up so that academia to non-academia is possible within the scope of existing schemes. **Examples of researcher mobility schemes identified**

The **ETH Zurich Pioneer Fellowships scheme** is perhaps the best-known scheme in Switzerland. It provides an opportunity for researchers to develop their own research ideas within a different setting, through funding for research projects to commercialise new innovations. The scheme awards research grants to an individual or groups of individuals to independently develop a highly innovative product or service to be exploited commercially and/or for the benefit of society. They are awarded to candidates who want to become entrepreneurs based on their own research carried out during their Master or Doctoral Thesis at ETH Zurich (i.e. during the Master or the PhD). Successful candidates receive money for the 1.5 year test phase of their idea, before bringing it to the market.

Provision is made for the exploitation of IPR relating to new innovations and technologies through licensing and spin-off creation. In the case of several other schemes, patents were filed and innovative products were licensed. Indeed, the initial review of indicators commonly used in ISM schemes found that patents are among the most commonly used indicators in monitoring scheme implementation.

Examples of researcher mobility schemes that have evolved over successive generations include the Advanced Post.Doc Mobility Scheme operated by the Swiss National Science Foundation (SNSF), which is being replaced from 2018 by the Postdoc.Mobility fellowships scheme launched in November 2017.

Postdoc.Mobility fellowships are aimed at researchers who have done a doctorate and who wish to pursue an academic career in Switzerland. A research stay abroad enables such researchers to acquire more in-depth knowledge, increases their scientific independence and enhances their research profile. The fellowships include a grant for subsistence costs, a flat-rate for travel expenses and a possible contribution to research, conference costs and matriculation fees. In addition, fellowship holders can apply for a return grant to finance their initial period of research after returning to Switzerland. The return grant includes a salary and social security contributions. The funding period is in principle 24 months (fellowship) and 3 to 12 months (return phase). Although the main focus is not on ISM, and many researchers carry out research within an academic environment, there is scope to take part in ISM. Postdoc.Mobility will replace the existing **Advanced Postdoc.Mobility fellowships** in 2018. The first call for Postdoc.Mobility fellowships was launched on 1 November 2017, with a submission deadline of 1 February 2018 (two calls per year). Researchers will be eligible to apply if they have a PhD, or if they have completed their studies in human, dental, veterinary, social or preventive medicine. Applications may be submitted up to three years after obtaining the PhD, or up to eight years after receiving a medical licence (state examination). The

Regulations on the awarding of mobility fellowships to postdocs; "Postdoc.Mobility" fellowships, in particular Articles 3 and 5 make clear that ISM is permitted. The follow-up scheme, Postdoc.Mobility involves a reduced eligibility period from five years to three years after the PhD, and for the medical disciplines from nine years to eight years after the state examination.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

No particular features of ISM schemes unique to them being implemented in a Swiss context were identified.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

N/A

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

The national policy framework in Switzerland prioritises researcher mobility in general, but these is no explicit focus on ISM.

The Swiss Confederation has mandated the SNSF to fund basic research and promote young scientists in Switzerland. The national strategy stresses supporting *"high-quality research and researchers in their quest for excellence"* and *"bringing research funding closer into line with researchers' needs".* It does not however explicitly promote researcher mobility to other sectors. The SNF's national action plan 2013–2016[63] states that *"mobility is an important criterion in awarding academic positions and funding, also in highly competitive SNSF programmes to promote young researchers, such as the Ambizione and SNSF professorships".* There is no explicit focus on ISM but the Swiss Science Foundation recently undertook an internal review of its various researcher mobility programmes, which did not previously allow scope for ISM. Following the review, it was decided to amend the regulations of the various researcher mobility schemes being operated to allow scope for ISM. However, to date, there has been limited if any take-up of this possibility, although it is too early to evaluate[64]. Existing SNSF mobility fellowships – including not only Ambizione, Postdoc.Mobility, PRIMA, Eccellenza but also some of their wider Fellowship schemes - have been redesigned and opened up to allow scope for ISM.

[63] http://www.snf.ch/SiteCollectionDocuments/snf_aktionsplan_2013_2016_e.pdf

[64] Examples of ISM schemes include the SNSF mobility fellowships scheme, the Postdoc.Mobility scheme, which is gradually replacing the early Postdoc.Mobility fellowships and the Advanced Postdoc.Mobility fellowships scheme.

Country summary - Turkey

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

Some ISM schemes were identified in Turkey through desk research. Although, a small minority of Universities and research departments' managers was successfully reached and different efforts to do so were unsuccessful. The desk research identified PhD programs in many areas, but the information is not clear enough to be sure if we can classify them as ISM.

The Advanced Biomedical Technologies Doctorate Programme was an exception, however. It is designed to support PhD students addressing Industry problems. It is a program very focused on developing the Industry with the support from the knowledge generated by and the resources coming from the Universities.

It was created by the Ege Üniversity and 9 September University, and is a joint program of both Universities, dedicated for Turkish entreprises.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

In the aforementioned scheme, the Physical Mobility is mandatory. Apart from that, no particular features were identified.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

N/A

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

The ISM schemes are funded by TUBITAK. No specific information was found on this issue.

Country summary – Tunisia

1. How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?

There are no available data on the inter-sectorial mobility of researchers but the overall impression is that it is very limited. University professors have the right, within some limits, (i.e. get in advance a special authorisation from the Prime Minister, not exceed the fifth of the normal working time, cover an area of competence where the country is under-endowed) to work in parallel in the private sector and non-profit organisations (although the implementation is hardly monitored). This actually could offer opportunities to identify needs of the industry and better link the research and educational activity of the university to the specific needs of the business sector and the economy in general.

A programme named “mobility of researchers" was introduced in 2002. It allows researchers to benefit from one or more years of leave to lead or to contribute to an innovative project undertaken by a private or public enterprise. The programme did not have the expected success, as only six researchers have benefited from this action since it was launched. There is no assessment explaining the reasons of this failure65.

There are four main instruments used to support business research activities, which were developed at the end of the 20th century and continue. There are no recent initiatives:

- The Premium for Investment in R&D (PIRD) is a competitive grant instrument, addressing firms, aiming to co finance R&D projects. Half a million euros are allocated each year to this instrument by the Ministry of Industry and Technology. Four to five firms benefit from these grants annually;

- The National Programme for Research and Innovation (NPRI) is a competitive grant scheme addressing firms, aiming at identifying technological needs or support innovation development with the help of the corresponding sectorial technical centres. Research organisations are supported for finding specific solutions to company problems. Half a million euro are allocated each year to this instrument by the Ministry of Industry and Technology;

- The Valorisation of Research Results (VRR) is a competitive grant instrument used by researchers to exploit commercially their research results. For this purpose, they need to involve an industrial partner interested in the project and able to implement the idea. So far, there has been no industry prioritisation. Half a million euros are allocated each year to this instrument by the MHESR. Four to five projects benefit from this grant annually;

- The Federative Research Programme (FRP), is the most important competitive grant scheme for research priority themes which are generally implemented by multidisciplinary teams involving all types of actors (researchers, public or private firms, NGOs etc.). FRP projects are covered by public funds at 100% of the cost. The MHESR allocates more than one million euro to this programme annually. More than 100 research teams and more than 50 economic or social entities participated in the programme since its launch in 2003.

[65] ERAWATCH Country Report on Tunisia (2012)

Inter-sectorial mobility is encouraged by fixed-term placements of academic researchers in industry, as well as by the mobility programme of researchers allowing researchers from the public sector to create their own business firm.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

Mobility of national researchers is not clearly addressed by specific national actions or by initiatives of the universities and other research organisations. The Tunisian researchers benefit however from the mobility schemes of the FP7.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

Tunisia is one of the best performing countries in the South-Mediterranean region for its participation in the successive FPs. No EUREKA participations have been identified.

4. **Is there a formal policy framework and/or have specific initiatives been launched at country level to promote ISM?**

The need for establishing effective linkages between universities and industry is recognised in all policy documents and laws on higher education adopted since 1988. This includes the National Development Plan 2007-2016, the Law on the Higher Education of 2008 and its amendment of 2010. Furthermore, the establishment of the university-industry linkages is also part of all universities' strategies, which led to signing several memoranda of understanding and cooperation agreements between universities and chambers of commerce.

Re-enforcing collaboration between universities, public research organisations and industry is one of the priorities of increasing importance identified in the National Development Plan. This is shown by the rise of relevant measures and the higher level of funds allocated to support collaborative research.

The National Development Plan 2007-2016, supports public-private R&D partnerships in the form of collaboration between public academic institutes and private companies of all sizes, funded through competitive calls for applications. These partnerships are directly supported by the PNRI with the help of the "Technical Centres" and by the VRR measures. However, the last calls show that the uptake is limited to a few proposals per year. With no evaluation studies of these instruments one can speculate that researchers and firms are not aware of these instruments, while the Tunisian firms are predominantly very small, family owned and working in low added value sectors to be sufficiently interested.

The five-year National Development Plan contains a chapter dedicated to Scientific Research.

Additionally, the policy aims to increase and improve investments in knowledge and excellence, with the following means: Reinforce relationships with the business environment, by establishing research and innovation units in enterprises, up-grading the role of technical centres as sectorial innovation partners, running the National Agency for the Promotion of Research and Innovation created in 2008, establishing sector-based networks, as well as pursuing the creation of techno parks and business incubators.

Business incubators have been created since 2001, in industrial zones or within research centres and universities. They provided a locus for young entrepreneurs and researchers. The incubators provide advice and auxiliary services to the project carrier from preparing a business plan to legal, fiscal and marketing assistance. HEI and PRI incubators where implemented to create an appropriate framework to encourage the creation of spinoffs. In reality all the firms in these particular incubators are spinoffs.

Country summary - Ukraine

1. How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?

Ukraine has very few instruments to support innovation. Currently a large gap exists between applied research activities in the public research sector and companies in Ukraine. A few companies know where and how to access relevant competences and sources in the public research sector but most do not. Especially those companies which lack internal resources to conduct applied research or innovation activities face difficulties and/or are reluctant to contact possible partners in the public research sphere. There are no financial incentives in Ukraine to support collaborative research between public research institutions and companies either66.

Systematic business R&D beyond the operations of the industrial research institutes, engineering departments and special engineering bureaus, is either hardly present in Ukraine or statistically insufficiently recorded. The demand for R&D results and innovation from the side of domestic companies dropped substantially since the independence of the country. In 2013, 511 researchers per one million inhabitants were employed by the business enterprise sector in Ukraine. This is a relatively low ration, slightly below that of Turkey (609) and considerably below that of Belarus (1,183). The development of this ratio is negative since 2004 in Ukraine, which indicates a severe demand-sided absorption problem of the business enterprise sector67.

To overcome these problems, "Peer Review of the Ukrainian Research and Innovation System" includes 'Recommendation 29: Science-industry mobility schemes should be established' in view of promoting cooperation between public research organisations and innovative businesses. The scheme would take the form of a State subsidy for 1 to 2 years to public researchers (generally recently graduated people) wishing to develop a research project in partnership with a company, which is also contributing with private funds. The researcher would be based simultaneously in the two environments (company and research organisation) and share his/her time between the two places. It has been indicated that this type of scheme can rather easily be implemented in Ukraine in a pilot phase by providing a limited number of grants to well-targeted individuals presenting a credible proposal of cooperation with private and public partners demonstrating strong commitment to the project. Budgetary implications for the State are limited and additional money is to be provided by the company benefitting from the work of the researcher. Another Recommendation included in the document is 'Recommendation 30: Cooperative projects between the public research sector and industry should be supported'. This would involve grants to consortia formed between actors from the two sides, with the objective to jointly develop innovations based on the exploitation of research results by the company.

International mobility of researchers is mainly stimulated through international projects, schemes and exchange programmes. Since 2011, MESU runs a state mobility programme promoting the

[66] Peer Review of the Ukrainian Research and Innovation System. Horizon 2020 Policy Support Facility. European Commission, Directorate-General for Research and Innovation, 2016.
[67] Background Report - Peer Review of The Ukrainian Research and Innovation System under the Horizon 2020 Policy Support Facility. European Commission, Directorate-General for Research and Innovation, 2016.

education and training of students and post-graduate students as well as internships for scientific and pedagogical staff[68]. There are no special programmes on support of co-operation between research institutions and SMEs in Ukraine[69].

The Science and Technology Center in Ukraine (STCU) through its Commercialisation prgramme supports research projects, focusing on those with practical applications. STCU finances patenting efforts of scientists both in R&D regular and partner projects through the interaction with the recipient's organization. To be eligible for a patent application grant, the project participants must provide i.a. information about governmental or commercial organizations which use or will use probably this invention and supporting letter from company interested to use intellectual property for foreign patenting.

Mobility schemes dedicated specifically to physical mobility between academia and industry do not exist. A number of projects aiming at enhancing intersectoral cooperation has been implemented under Tempus (like e.g. “Higher engineering training for environmentally sustainable industrial development”) and Erasmus+ (the examples could be “Gamehub: University-Enterprises Cooperation in Game Industry in Ukraine” aiming at improvement of the current engineering education or “Development of a Network Infrastructure for Youth Innovation Entrepreneurship Support on Fablab Platforms” with the objective of developing environment that stimulates engineering creativity, entrepreneurial activities and fosters youth employability via university-business-industry networking), but they focus on students and university graduates, not on researchers and if PhD candidates are covered, no mobility to industry has been envisaged.

Since 2006 Ukraine has participated in the EUREKA network which develops cooperation between SMEs, research centres and universities for industrial innovation, but this participation is very low and requires enhancement.

The most relevant scheme that offers a possibility of intersectoral mobility of researchers is the Innovation Voucher Program that aims to develop Ukrainian companies operating in the market of environmental technologies to promote greenhouse gas reduction and improve energy-efficient technologies in Ukraine which welcomes involvement of academic and academic R&D institutions as service providers for beneficiaries (companies).

2. Are there any particular features of ISM schemes that are country-specific in approach?

Since no specific ISM schemes have been identified in Ukraine, no particular features could be discussed.

[68] Ibidem
[69] ERAWATCH report on Ukraine (2012)

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

The Marie Skłodowska-Curie Actions (MSCA) was a very popular and successful scheme regarding the Ukrainian involvement in the 7th Framework Programme. The scheme provided specific short-term stays and exchanges (International Research Staff Exchange Staff Scheme - IRSESS), mostly elaborated for countries which concluded S&T cooperation agreements with the EU including Ukraine. Ukraine was one of the leading countries in terms of participation in the MSCA. Without statistical data on the return phase of the IRSES, the number of Ukrainian researchers funded within the MSCA for 2007-2012 was 107 with an EU budget allocated for the Ukrainian institutions of about EUR 4m within the same period of time.

The number of Ukrainian institutions (universities, research organisations and businesses, including SMEs) participating in the Marie Skłodowska-Curie Actions was 63. This number was distributed as follows:

- Initial Training Networks (ITN): 1 institution (0.215 million Euros allocated to the Ukrainian institutions),
- Industry-Academia Partnerships and Pathways: 3 institutions (0.415 million Euro allocated to the Ukrainian institutions),
- International Research Staff Exchange Staff Scheme: 50 institutions (3.3 million Euro allocated to the Ukrainian institutions),
- International Incoming Fellowships: 8 institutions, 0.12 million Euro allocated to the Ukrainian institutions,
- International Outgoing Fellowships: 1 (budget allocated to the receiving EU institution)[70].

Ukrainian participation in the MSCA Horizon 2020 is presented in the table below[71]:

	Number of participations in the submitted proposals	Number 0f projects Main list	Number of participations in the projects Main list	Planned EC contributions (Ukrainian institutions) main list	Projects total cost
MSCA Individual Fellowships (IF) European Fellowships (EF)	3				
MSCA IF Global Fellowships (GF)	1	1	1	152 207 E	243 934 E
MSCA ITN European Joint Doctorates (EJD)	6				
MSCA ITN European Training Networks (ETN)	16				
MSCA (Research and Innovation Staff Exchange) RISE	165	18	27	4 158 000 E	15 970 500 E

[70] Olena Koval, Vadym Yashenkov et al.: Overview of the internationalisation of Ukraine in RTDI including recent trends and developments, Policy Brief in BILAT-UKR*AINA project, 2012.
[71] Source of information: CORDA, June 2017

Ukraine is an active member in the Erasmus Mundus and Tempus programmes and eligible to apply for funding. The Tempus programme helped facilitate the internationalisation of Ukrainian higher education institutions and contributed to the initiation of several new research projects and exchange programmes.

4. Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?

Ukraine has no special policy for enhancing mobility of researchers. In recent years, the state is trying to keep young researchers by establishing different stipends and awards but these measures are not very effective[72].

There is a number of policy documents in Ukraine, including Conception of Development of National Innovation System, approved by the government in 2009, Law on Priorities in S&T Development (2010), different programmes, which contain numerous references to the role of science and innovation in their realisation (see, for instance, State Programme on Forecasting of S&T Development in Ukraine for 2008-2012). However, none of these programmes and other documents was implemented fully, according to initial plans[73].

"Action Plan of Ukraine on participation in Horizon 2020" envisages adjustments of the national legal framework to European standards, improvement of R&D legislation (taxes, obligatory currency exchange, etc.) and development of Science & Business partnerships.

On 12 August 2015, the Cabinet of Ministers of Ukraine approved the Resolution No. 579 "On Approval of the Regulation on the Procedure for the Implementation of the Right of the Academic Mobility". The key aspects of this provision are the right to participate in academic mobility programs for all participants of the educational process; a clear definition of the types and forms of academic mobility; to consolidate the mechanism for the recalculation of loans obtained on the basis of the European Credit Transfer System (ECTS), in particular by comparing the contents of curricula, and not the names of the courses; reservation of the places of study and scholarships for students and places of work for university staff involved in academic mobility programs. The new procedure for the implementation of academic mobility by all participants in the educational process is an important step in the implementation of the Law of Ukraine "On Higher Education" and the creation of effective tools for the internationalization of Ukrainian higher education institutions.

On 26 November 2016 the Law of Ukraine "On scientific and scientific-technical activity" has been adopted (http://www.wipo.int/wipolex/en/text.jsp?file_id=187983#LinkTarget_431) which triggered reforms in the Ukrainian science and innovation system. The Law is considered a critically important initial step towards a breakthrough in improving the STI. The Ministry of Education & Science (MESU) was advised to publish an action plan, with a roadmap for implementation of the Law in the first quarter of 2017. The Article 6. Research Worker states: "Research scientist can carry out science/research, science/pedagogical, research/engineering, research/technological,

[72] ERAWATCH report on Ukraine (2012)
[73] Ibidem

project/designing, project/technological, investigation and project/investigation work and/or organize carrying out of the above mentioned works at scientific institutions, higher educational institutions of 3rd - 4th accreditation levels and/or laboratories of the enterprises.” In addition “Research scientist shall have right to: (…) carry out business activity according to the current legislation of Ukraine.”

The National Science and Technology Development Council of Ukraine proposed by the Law has been established by the decision of the Cabinet of Ministers on April 5, 2017.

The new Law of Ukraine "On innovation activity“ is to be adopted.

Europe's main competitors

Country Summary - Australia

1. How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?

This study identified four formal ISM schemes in Australia. Two of the schemes appear to be rather bottom-up and flexible in design, prioritising fast-tracked applications from researchers and businesses that wish to collaborate.

The Future Fellowships scheme being implemented by the Australian Research Council (ARC) supports research in areas of critical national importance by giving outstanding researchers incentives to conduct their research in Australia. The aim of the Future Fellowships scheme is to attract and retain the best and brightest mid-career researchers. At present, many highly qualified mid-career researchers choose to work overseas to further their careers due to lack of opportunities in Australia. The Future Fellowships scheme addresses this problem and will significantly boost Australia's research and innovation capacity in areas of national importance. Future Fellowships provide four-year fellowships to outstanding Australian mid-career researchers. **Mobility is partly from academia to academia, but also from industry to academia.**

In addition, the ARC may award the Administering Organisation up to $50 000 of non-salary funding per annum which may be used for personnel, equipment, travel and field research costs directly related to the Future Fellow's research.

The objectives of the Future Fellowships scheme are to:

- ensure that outstanding mid-career researchers are recruited and retained by Administering Organisations in continuing academic positions
- build collaboration across industry and/or research organisations and/or disciplines
- support research in national priorities that will result in economic, environmental, social and/or cultural benefits for Australia
- strengthen Australia's research capacity by supporting innovative, internationally competitive research.

The Future Fellowships scheme encourages proposals from researchers working in areas of national priority. Preference will be given to those researchers who can demonstrate a capacity to build collaboration across industry and/or research institutions and/or with other disciplines. Although international experience is important for Australian researchers, it is also important they have the opportunity to return home to continue their work.

Up to 100 four-year Future Fellowships may be awarded each year, providing a salary awarded at one of three salary levels and up to $50,000 per annum project funding. Project funding may be used for: personnel, postdoctoral research associates and research assistants, up to one higher degree by research stipend, technicians and laboratory attendants; access to research and infrastructure facilities and technical workshop services; essential field research; expert third party services; equipment and consumables; publication and dissemination of outputs and outreach; specialised computer equipment and software; travel costs essential to the project for up to $100,000 over the life of the project; web hosting and development; workshops, focus groups and conferences; and reasonable essential extraordinary costs for researchers who are carers or who themselves require care.

In terms of the level of participation, 1204 researchers were awarded an ARC Future Fellowship, including 74 returning Australians and 146 foreign nationals. In 2014, the Government secured the ongoing future of the ARC Future Fellowships scheme, committing to funding 100 four-year fellowships each year.

Bilateral Secondments scheme. Innovation Connections assists SMEs to access knowledge, engage with researchers and innovate. This initiative is integrated in the Entrepreneurs' Programme established by the Australian Government and provides two types of support (identification of needs/challenges and provision of solutions) at three levels: 1. information technology, 2. new technology, knowledge and expertise and 3. critical and strategic research needs and pathways to engage and collaborate with the research sector. In the case the SME needs support in this 3rd area, the programme previous financial support to companies to have research facilitation, allowing them to undertake a research project that addresses the recommendations made in the Facilitation Report.

Australian Research Council (ARC) Linkage Projects scheme. The Linkage Projects scheme promotes national, and international, collaboration and research partnerships between key stakeholders in research and innovation including higher education institutions, government, business, industry and end-users. To facilitate successful collaboration between higher education institutions and other parts of the innovation system, Linkage Projects proposals can be submitted at any time and funding outcomes are announced within six months of proposal submission.

The **Australian Technology Network also offers IDTC**, an Australia-wide industry research training programme focused on providing solutions to real industry challenges. This programme combines cutting-edge theory and traditional Masters and PhD research training with professional and broad technical skills required by industry from diverse sectors including commercial organisations, Government, research organisations, and not-for-profit sectors.

2. Are there any particular features of ISM schemes that are country-specific in approach?

Some of the programmes and initiatives identified have some relevant features that are interesting to analyse when structuring and implementing ISM:

- the possibility of providing a joint government–private sector fund (e.g. Commonwealth Scientific and Industrial Research Organisation (CSIRO));
- add a commercial perspective (market valorisation) in the results and achievement of the research projects financed (which is the example of the new research funding arrangements for universities);
- promotion of the flexibility of the submission and assessment of proposals, allowing high education institutions, researchers and/or non-academic organisations to prepare, submit and have access to financing any time of the year (continuous open calls and access to financing, like in the example of Linkage Projects scheme); and
- the promotion of schemes addressed to non-academic organizations, allowing them to benefit from financial support to promote research according to their needs and problems (for example, Innovation Connections).

3. If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).

Australia can take part in EU-funded schemes as a participant in two types of the Individual Fellowships of the Marie Skłodowska-Curie Action (MSCA):

- European Fellowships for which Australians can apply by finding a host organisation in an EU Member State or Associated Country.
- Global Fellowships where long-term residents in Europe visit an Australian institution.

4. Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?

The investment of Australian Government in supporting the cooperation between high education institutions and non-academic organisations is being largely reinforced since 2015, with the launch of the National Innovation and Science Agenda, a national strategy to support the exploration of new sources of growth, fostering the maintenance and reinforcement of the Australian business ecosystem at economic and social levels (e.g. maintenance of high standard of living, high wages and generous social welfare safety net; promotion of the conditions for foreign business investment, namely from Asian countries). The Australian innovation policy framework boosts the innovation and science in four key areas: 1) culture & capital, 2) collaboration, 3) talent & skills and 4) Government as an example.. The Government structured and launched a set of initiatives under the National Agenda, aiming to support start-ups & entrepreneurs, business, young Australians, researchers & universities and investors in the development of projects to enhance and reinforce the innovation and science of the country. Overall, the agenda comprises 17 initiatives addressed to researchers and universities, some related to the promotion of the cooperation and symbiosis between academia and non-academic organisations, with a focus in the cooperation between universities and industry. Despite being initiatives focused in the establishment and strengthen of the cooperation between academic and non-academic organisations, most part of them aren't Intersectoral Mobility Schemes, but schemes primarily to promote industry-academic cooperation.

For each one of these pillars, the Government defined a set of incentives/initiatives boosting the innovation for jobs and growth, to be implemented between 2015-2019. These incentives/initiatives are addressed to different target groups, including to researchers and universities, fostering the industry-research collaboration by mobilizing researchers to work together with companies and other organisations in finding solutions to real world problems and needs. The agenda comprises different opportunities, being the most relevant for our study the following ones:

- CSIRO Innovation Fund to commercialise early stage innovations - a joint government–private sector fund that will help Australia's home-grown innovations become successful businesses.
- New research funding arrangements for universities - ensure the increase of the rate of collaboration between universities and industry by encouraging joint endeavours that produce outcomes with commercial and community benefit.
- Linkage Projects scheme: faster industry-research collaboration grants – guaranteeing the continuous submission and assessment of proposals, allowing both researchers and industry partners to take greater advantage of opportunities for collaboration faster and will encourage more partnerships between universities and business.
- Assessing the engagement and impact of university research – focused in assessing and reporting on how our investments in university research translate to tangible benefits for Australia will help show where collaboration with industry and other partners could bolster and more quickly deliver these benefits.
- Innovation Connections: connecting industry to innovation infrastructure - promoting innovation and collaboration between Australian businesses and the research sector.

Along with the efforts and investment made by Australian Government there is also some "movement" from educational, research and/or industrial organisations and networks, aiming at reinforcing and making the programmes and cooperation initiatives between the two sectors more flexible, which are broader schemes with scope for ISM (e.g. Industry Doctoral Training Centre of the Australian Technology Network of Universities).

The Australian Research Council Act 2001 requires the ARC to prepare funding rules for each funding scheme it administers for each calendar year. Funding rules provide applicants with information about a scheme, eligibility requirements, the application, selection and approval processes, and requirements for the administration of funding.

Australia has historically been international in its R&I policy. Australia was the first country with which the EU signed a Science and Technology Agreement (1994). Today there is a formal EU-Australia Framework Agreement in place too. Australia was also one of the first countries to put a researcher mobility portal online, linked to the European Commission's EURAXESS site. The Australian portal, is funded by the Australian Government.

Country summary - Brazil

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

Most part of the intersectoral mobility schemes available in Brazil arises from cooperation protocols with European countries (for example: France, Belgium, United Kingdom, Portugal, among others).

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

The focus of the Brazilian policies and ISM lies in international mobility of researchers to and from Brazil, in particularly in the sector of Technologic Research.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

Brazilian researchers can benefit from the following Marie Skłodowska-Curie actions:

- **Innovative Training Networks (ITN):** for both Brazilian research institutions and researchers;
- **Individual Fellowships (IF)**: experienced researchers based in Brazil can apply for a European fellowship, and their counterparts based in Europe can apply for a global fellowship to carry out research in a third country such as Brazil and return to Europe;
- **Research and Innovation Staff Exchange (RISE)**: Brazilian research institutions can join a consortium as partner but can't receive direct funding from the European Commission for the secondment of their researchers.
- **Co-Funding of regional, national and international programmes (COFUND)**: Brazilian organisations can be partner organisations in a proposal and Brazilian researchers can apply directly to COFUND positions advertised on the EURAXESS job portal.

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

In the beginning of 21st century, Brazil, recognising the relevance and the opportunities to promote and establish fruitful synergies between technologic research institutions and industrial companies, started investing in policies fostering the Brazilian innovation ability. Several initiatives and measures have been and launched by the Brazilian Government since then, most notably:

- the designation of the EMBRAPII - Brazilian Enterprise for Industrial Research and Innovation (*EMBRAPII* - Associação Brasileira de Pesquisa e Inovação Industrial), in 2013, as the state organisation to support institutions dealing with technologic research in the design and implementation of projects for innovation and development, in cooperation with companies from industrial sector. The designation

was made by the Brazilian Ministry of Science, Technology, Innovation and Communication (Ministério da Ciência, Tecnologia, Inovações e Comunicações – MCTIC) and Ministry of Education (Ministério da Educação – MEC), both responsible for financing EMBRAPII.

- the structure and launch of the first Law of Technologic Innovation in 2004 (Law n. 10.973/2004, de 2 de dezembro), fully reviewed in 2016 (Law n. 13.243/2016, de 11 de janeiro), aiming at simplifying the cooperation and relations between enterprises and research institutions.
- the cooperation between the European Union and Brazil on research and innovation, signed in 2004 (entered into force in 2007 and renewed in 2012 for 5 more years; it is currently under renewal procedure).
- the launch of the *Programme Science without Borders* (Programa Ciência sem Fronteiras, Decree-Law n. 7.642/2011, de 13 de dezembro) in 2011, fostering the consolidation, expansion and internationalization of science & technology and of innovation & competitiveness of Brazil by promoting the international mobility of experts.
- The commitment of the Government with the SFIC - Strategic Forum for International Science & Technology Cooperation - Brazil initiative focused in the identification of measures and initiatives to promote the international mobility of researchers to and from Brazil.

Country summary – Canada

1. How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry and to other sectors, and vice versa?

The study research identified six ISM schemes in Canada, of which only a couple are still operating since the approach to supporting intersectoral mobility in Canada has been rationalised. These schemes are now summarised in brief.

ISM schemes operating up until 2016

Several of the following schemes have now been discontinued. A recent development in Canada is that whereas previously there were a number of national, government funded schemes operating, a decision was taken in 2014 to rationalise the schemes and to centralise funding under a single scheme operated by Mitacs from 2016. In the Economic Action Plan 2014, the Government of Canada indicated that Mitacs would become the single delivery agent of federal support for postdoctoral industrial R&D fellowships. As a result, the programmes described below have been discontinued and wound down. The resources were instead redeployed to other priorities within the *Natural Sciences and Engineering Research Council of Canada (NSERC)*.

Industrial R&D Fellowships (IRDF) Programme. The programme provided financial support to highly qualified science and engineering graduates to gain research experience in industry while undertaking advanced studies in Canada. These scholarships aim to encourage scholars to consider research careers in industry, where they will be able to contribute to strengthening Canadian innovation. The administrator was the Canadian Natural Sciences and Engineering Research Council. The research fields were: science and engineering. In terms of eligibility requirements, the scheme was open to Canadian and international graduate students. Those receiving a scholarship receive $30,000 per year for two years plus a minimum contribution of $15,000 per year from the host company. The Industrial R&D Fellowships (IRDF) Program provided financial contributions that support the most promising recent doctoral graduates to engage in R&D in the private sector and with not-for-profit and non-governmental organizations. This is also the only Canadian scheme to have been subject to a formal evaluation was the *Evaluation of the NSERC's Industrial R&D Fellowships (IRDF)*[74].

Industrial Innovation Scholarships (IIS) Programme – The two former lead organisations are the *Fonds de recherche du Québec – Nature et technologies (FRQNT)* and the NSERC. The programme offered scholarships to students enrolled in a Master's or doctoral programme and interested in undertaking research in natural sciences and engineering, through a university-business partnership. The objective was to foster the development of companies' innovation capacity and to improve employment prospects for recent graduates of master's and doctoral programs through university-industry partnerships: by enabling students to acquire experience, as well as personal and professional skills, developing innovative training initiatives; building networks of collaboration and knowledge-transfer; encouraging companies to invest in training and R&D; and by contributing to increased innovation in key sectors of the various regions in Quebec. The duration of support was 12-24 months/Master's and 24-36 months/doctorates. At the Master's level, $7,000 per year were awarded through the scholarships from the NSERC, $7,000 per year from the FRQNT, for a maximum of two years, plus a company contribution of at least $7,000 per year. At doctoral level, the funding available was $9,000 per year from NSERC, $9,000 per year from the FRQNT, for a maximum of three years, plus a minimum company contribution of $9,000 per year. The programme has been discontinued since 2015.

[74] http://www.nserc-crsng.gc.ca/_doc/Reports-Rapports/Evaluations/IRDFReport2013_e.pdf

BMP Innovation Programme (Programme de bourses de recherche en milieu de pratique). The lead organisation is the Fonds de recherche du Québec – Nature et technologies (FRQNT) and formerly also the Natural Sciences and Engineering Research Council of Canada (NSERC), which is no longer involved.

The Visiting Fellowships in Canadian Government Laboratories Program (VF program). Lead organisation - Natural Sciences and Engineering Research Council of Canada. The VF program sought to attract emerging scientists and engineers with the opportunity to work with research groups or leaders in Canadian government laboratories and research institutions. The eligible disciplines are engineering, life sciences and physical sciences. Fellowships are awarded for one year with the possibility of renewal for a second and third year, at the discretion of the government department concerned. Eligible participants must have received a doctoral degree in the natural sciences or engineering from a recognized university within the past five years. Fellowships are awarded for 1-3 years to postdoc scholars who will research in Canadian labs. The stipend is $43,724 per year plus travel expenses. The selection committee rates the applications according to a number of criteria, which include among others the following: academic excellence; scholarships and awards held; duration of previous studies; research ability or potential, judgment, originality, and curiosity; initiative and autonomy; communication skills, interpersonal and leadership abilities and the potential benefits to the government department concerned.

ISM schemes operating post-2016

Mitacs' Accelerate Programme (http://www.mitacs.ca/en/programs/accelerate) . The Accelerate research internship program was launched in 2003 by Mitacs and was designed to increase deployment of highly educated graduates into the private sector. However, the scale of its activities has been scaled up. In the Economic Action Plan 2015, the Government of Canada stated that going forward, Mitacs' Accelerate programme will become the primary delivery agent for federally supported graduate-level industrial research and development internships. The Accelerate programme has therefore replaced earlier schemes listed in the database (see the Industrial Innovation Scholarships Program). The Accelerate program is targeted at both graduate students and postdocs. In terms of how the scheme operates, a graduate student, a supervising professor, and a partner organization develop a research project. The scheme operates very similarly for postdoc students and research projects also receive $15,000 in funding for each four-month internship.

Applicants submit a proposal via Mitacs and if successful, projects receive $15,000 in funding for each four-month internship. All academic disciplines are eligible. Businesses and not-for-profit organizations can participate. Those benefiting from internships spend 50% of the internship with the university and 50% with the partner organization. They are required to submit a final report and exit survey summarizing project results and experiences. In terms of the expected benefits for individual researchers, these are identified on the website as being to 1) apply skills in a non-academic environment 2) Gain non-academic research experience 3) Broaden professional networks 4) get a stipend/salary starting at $10,000 per four-month period and 5) build out the researcher's CV with peer-reviewed research. Professors can also apply, together with either a graduate student or postdoc. An emphasis is put on attracting professors and businesses to apply to take part in the Accelerate programme with a focus on scaling up. The benefits from a company perspective are cited as being to solve research challenges with university expertise, leverage funding (since partner funds are combined with government funding to support research projects). Businesses also receive one-to-one support from the Mitacs support agency. The scheme only commenced relatively recently and has therefore not yet been evaluated. An Accelerate Code of Conduct has been developed. To date there have been 6216 Projects supported. In terms of the thematic split of research projects supported, engineering (36%), Life Sciences (16%) Mathematical Sciences (16%), Natural Sciences (16%) and Social Sciences & Humanities (15%).

Programme de stages Accélération (http://www.frqsc.gouv.qc.ca/bourses-et-subventions/concours-anterieurs/bourse/programme-de-stages-acceleration-quebec-frq-mitacs-rqu2wqrv1416913607691). The lead organisation is Québec-FRQ-Mitacs and this programme is the Quebec branch of the above-described Mitacs Accelerate programme.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

The schemes appear to largely be geared towards supporting ISM periods for R1 and R2 researchers and young emerging' scientists rather than at established professors or promoting flexible innovation-led ISM.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

   n/a

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

   As noted earlier, the Economic Action Plan 2014 by the Government of Canada indicated that Mitacs would become the single delivery agent of federal support for postdoctoral industrial R&D fellowships. ISM has therefore been mainstreamed within the national economic development strategy, illustrating its importance as a driver of innovation.

Country summary – China

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

According to Rio Country Report for China, published by JRC, the country currently possesses two main national schemes (111 Plan and Thousand Talents Programme). The goals of these programmes are attracting researchers from abroad and encouraging the return of nationals. The Higher Education Institution Innovation and Talent Plan (111 Plan, initiated in 2006), seeks to attract 1,000 leading scholars from abroad to work in China's top universities listed in the 985 Programme and 211 Programme. The ultimate goal of the plan is to build world-class universities in China. The Thousand Talents Programme is the largest existing national scheme of attracting nationals to return, which aspires to recruit 2,000 Chinese national specialists to return and work on state-targeted areas. The programme has two categories for recruitment: an Innovation category, which recruits leading scientists and engineers to work in national key projects, key academic disciplines and key labs; and an Entrepreneur category, which targets business elites to start technologically sophisticated enterprises in key industries. In addition, the China Scholarship Council (CSC) is the main government agency for sponsoring Chinese nationals to study abroad, with a mandatory return phase. CSC funds some 185 projects in five categories for overseas training. Those programmes have not only attracted researchers from abroad, but also helped to train domestically talents.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

In the identified schemes and background documents particular attention appears to be put on the following research areas:

- Clean energy,
- Mathematics,
- Agricultural science,
- Biotechnology and nanotechnology,
- Environmental science,
- Medical research,
- Space technology,
- Business parks and incubators,
- Robotics,
- Earthquake science.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

Chinese researchers can and continue to benefit from opportunities presented by various MSCA actions:

ITN: Training networks for PhD students of all nationalities

IF: Individual Fellowships - for researchers of all nationalities

COFUND: additional funding to regional, national and international programmes for research training and career development, for doctoral and fellowship programmes

RISE: support to short-term mobility of research and innovation staff at all career levels

More than 300 researchers and over 312 institutions from China have so far been involved in MSCA doctoral programs.

There is no existing data concerning the Chinese participation in Horizon 2020 SME Associate pilot, however.

4. **Is there a formal policy framework and/or have specific initiatives been launched at country level to promote ISM?**

Two main documents about policies promoting joint labs are Administrative Measures on International Cooperation in S&T centres published by MOST, and International Cooperation Joint Labs Program published by the Ministry of Education. There are lists of International Joint Research Centres published by MOST and International Joint Labs published by the Ministry of Education among years. In the lists, all joint research centres and labs are located in universities and colleges, or based on several higher education institutions. Apart from that, there are other joint programmes, joint research centres and calls for projects organized by MOST.

Country summary - India

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

The Marie Skłodowska-Curie Actions were the only form of ISM schemes found in India, with a large number of researchers awarded with these grants.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

No ISM schemes found through interviews.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

India has a big participation in the Marie Curie Actions.

Number of Indian researchers funded in Marie Curie Actions (2007-2014): 1680

As for H2020, „participants from India, just like the other emerging economies (BRIC) are no longer automatically eligible for funding. Indian participants have therefore to find the financial resources for their participation in Horizon 2020 collaborative projects"[75].

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

No information found[76].

[75] http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020_localsupp_india_en.pdf

[76] Note: this does not mean that there are no ISM schemes in India, only that none was found from direct research

Country summary - Japan

1. **General information on ISM in country. How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

According the 5th **Science and Technology Basic Plan** industry–academia collaboration has yet to reach full maturity. Much of the current industry–academia collaboration is on a small scale, and there is still **little mobility for researchers across organizations and sectors**. Startup companies and the like have yet to reach the point of structurally transforming Japanese industry. It is stated the gap between company needs and the knowledge and technology generated by universities has not fully performed its function. This is leading to deficiencies in Japan's ability to innovate through science and technology.

No measures specifically aimed at ISM promotion have been identified. However, there is a number of initiatives implemented under **Regional Innovation Strategy Support Program** initiated in 2011, which foreseen close cooperation between academia and industry sectors regarding commercialization and technology transfer. The afford has been made to identify the key researchers in the regions in particular specific subjects and foster them in academia and industrial sectors.

The initiatives implemented in the regions under the Support Program are mainly focused on creation of technology hubs (composed with entities from academia and non-academia sector) in particular parts of Japan. Those initiatives offers not only equipment sharing possibilities but also creation of human resources development plans which includes invitations of researchers and fostering specialists in the pertinent fields.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

The sharing of many excellent technology "seeds" possessed by universities and other research organizations, identification of technology needs of local companies, and commercialization of results derived from such technology "seeds." could be regarded as a country-specific approach. The concept of collaborative systems between universities, companies and government is based on the idea of research-seeds-oriented industry-academia-government collaboration support systems, which combines seeds of knowledge-rich institutions such as universities with non-academic organisations (e.g. companies).

Intersectoral mobility of researchers, however, is not the main goal of this type of programmes. They are based primarily on sharing of machines and instruments but also personnel costs of researchers.

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

6 Japanese researchers took part in those projects Marie Skłodowska-Curie action - Industry-Academia Partnerships and Pathways.

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

Since Fiscal 2011, Ministry of Education, Culture, Sport, Science and Technology (MEXT) has been promoting the "Regional Innovation Strategy Support Program" as part of the project for developing innovation systems aimed at establishing and improving the systems that enable individual regions to proactively create innovations through the industry-academia-government collaboration policy. Regional Innovation Strategy Support Program provides support to the “Regional Innovation Strategy Promoting Regions” selected jointly by the relevant ministries, with special focus on the formation of intellectual property and the development of human resources.

Regional Innovation Strategy Support Program is based on four pillars:

- Concentration of researchers who play core roles in regional innovation strategies

This measure foreseen e.g. financing personnel costs of researchers (including the initial costs of facilities and equipment, the costs of project implementation, etc.)

- Development and implementation of human resource development programs for realizing regional innovation strategies

Support is provided for the development and implementation of programs for fostering human resources capable of playing an important role in the development of new local industries and the revitalization of local communities.

- Establishment of knowledge networks of universities and other research institutions

Support is provided for the activities of local collaboration coordinators who render necessary support aiming at establishing knowledge networks of local universities through activities to collect and organize the information on technology "seeds" possessed by universities and company needs.

- Support for sharing of research facilities and equipment among local universities and other research institutions

Support for allocating staff members to show how to use equipment and to give technical advice is provided to organizations that make their facilities and equipment available to companies in local areas, in order to promote sharing of research facilities and equipment.

Another policy paper which is a framework for promotion of ISM in Japan is The 5th Science and Technology Basic Plan. There is four pillars of the Basic Plan. One o them (fourth) is: Reinforcing the “Fundamentals” for STI which foreseen building an innovation system to ensure the mobility of human resources, knowledge, and capital beyond all kinds of barriers, and keep Japan at the leading edge of worldwide innovation. This will be achieved through building effective collaboration between companies , universities, and public research institutions, and by both creating and strengthening venture businesses. The measures under the Plan are foreseen too strive to increase the flexibility of the human resources, knowledge, and capital that are now unevenly distributed between large corporations, SMEs and startup companies, universities, and public research institutes, and to set up environments conducive to the flourishing of innovation. In addition, “space for co-creation ” is about to be established for urging the human resources, knowledge, and capital available to industry, academia, and government to come together and nurturing collaborative

innovation between these sectors. Through these initiatives, the goal is to increase the mobility of researchers between Japan's companies, universities, and public research institutes by 20% over the term of the Fifth Basic Plan. Since the mobility of researchers from universities to companies and public research institutes has been particularly low, it is aimed to double its level by the end of the term.

Country summary – South Korea

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

Several initiatives to intensify and strengthen the regional Science and Technology cooperation between Korea and the European Research Area (ERA) were launched during FP7. KORANET (Korean Scientific Cooperation Network with the European Research Area) led to successful joint pilot programs and key projects:

An Initiative to Intensify and Strengthen the Regional S&T-Cooperation between Korea and the ERA (KorA-Net) aims at strengthening the ERA by integrating national and European S&T schemes through International Cooperation in S&T with Korea, with a specific focus on existing "Competency Networks". This project has produced interesting joint studies, i.e. an inventory of S&T cooperation programmes EU-Korea analysing the degree and the pattern of internationalisation in S&T of various KORANET member countries and providing information on Korea's participation in multilateral EU and international collaboration programmes.

Stimulating and facilitating the participation of European researchers in Korean R&D programmes (KORRIDOR) aims to widen and strengthen the RTD cooperation between Korea and the EU in the area of common research interests by opening up access opportunities for European research groups in Korean national research and/or innovation programmes, providing information on existing access opportunities and analysing, quantitatively and qualitatively, the participation of European researchers in the Korean RTD programmes.

Korea-EU Science and Technology Cooperation Advancement Programme (KESTCAP) provides a platform to strengthen the S&T agreement between Korea and the EU and improve this cooperation by identifying S&T fields of common interests of Korea and the EU, set up a website and information help desks to respond to specific inquiries on existing opportunities and available funding instruments; contribute to the Korea-EU policy dialogue on science, technology, and innovation.

2. **Are there any particular features of ISM schemes that are country-specific in approach?**

In the identified schemes and background documents particular attention appears to be put on the following research areas:

- chemical engineering (catalysis, bioengineering),
- materials science (biomaterials, metals and alloys),
- engineering (building and construction, mechanics of materials), renewable energy,
- surfaces/interfaces,
- physical and theoretical chemistry

Special focus is also given to clustering initiatives that foster overall academia-industry cooperation within the country, e.g., The Industrial Complex Cluster Program of Korea (ICCP).

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

In FP7 collaborative projects, there were 67 participations of entities from South Korea. They took part in 54 projects that had a total budget of €284 million. Most of the projects were in the areas of ICT, Health, Nanotechnologies, Materials and Production technologies, Environment, and Euratom.

Up to October 2017, under Horizon 2020, there are 29 South Korean participations in collaborative actions, 13 participations in Marie Sklodowska-Curie Actions (MSCA) and 1 participation in a European Research Council (ERC) grant, with ICT and energy as the most active areas of cooperation. The success rate of South Korean applicants is 25.7% (as compared to 14.7% overall).

Horizon 2020 participation so far is mainly in the areas of ICT, health, energy, climate action, and satellite navigation. For example, there are two South Korean participants in the €25 million TBVAC2020 project.

The EC's Joint Research Centre cooperates with South Korean institutions mainly in the fields of health, measurement science, energy and transport, construction standards, nuclear safety and security.

4. **Is there a formal policy framework and/or have specific initiatives been launched at country level to promote ISM?**

The Science and Technology Framework Law (Law No. 6353, 2001) is the main law covering systematic promotion of S&T at the national level. Important provisions of this law include the establishment of policies and plans for S&T and the overall support mechanism for related projects and agencies. It also aims to provide the legal mechanism for inter-ministerial coordination of R&D activities and to establish an institutional system to foster an innovation-prone culture in South Korean society.

The Science and Technology Promotion Law (Law No. 1864, 1967) and the Special law for Scientific and Technological Innovation (Law No. 5340, 1997). The Technology Development Promotion Law (Law No. 2399, 1972) provides financial and tax incentives to encourage and facilitate the technological development activities of private enterprises.

The Promotion of Engineering Services Law (Law No. 2474, 1973) deals with the improvement of the engineering industry, which contributes to manufacturing enterprises and expedites the commercialization of R&D results.

The Promotion of Basic Science Research Law (Law No. 4196, 1989) provides financial support promoting innovative research in basic science at R&D institutes and universities to encourage innovation.

The Dual-use Technology Programme Facilitation Law (Law No. 5535, 1998) was enacted upon the recommendation by four ministries, namely: MOST, the Ministry of Information and Communications, the Ministry of Commerce, Industry and Energy, and the Ministry of National Defense. It aims to strengthen the nation’s industrial competitiveness and military readiness by facilitating dual-use research and development and promoting technology exchange between the private sector and the military

Country summary – USA

1. **How common are intersectoral mobility schemes (ISM) for mobile researchers from academia to industry, and vice versa?**

Informal intersectoral mobility (ISM) for researchers appears to be quite common in the US, with state level polytechnics being particularly active in lining up industry placements and internships. Leading US Business Schools are also very active in organising mobility programmes for their students that involve placements and internships but these tend to be for Masters students rather than doctoral and post-doctoral researchers.

Business-academia cooperation in the US is generally quite strong. Despite this, there seems however to be only a relatively small number of formal ISM schemes in the US. Examples include:

- **The USC Pharmaceutical Industry Fellowship programs** (http://pharmacyschool.usc.edu/programs/fellowship/) are designed to prepare postdoctoral scholars for rewarding careers in the pharmaceutical industry. The programme provides exceptional preparation and education for postdoctoral graduates entering the pharmaceutical industry. Entry into the program is competitive. Fellows work with mentors to participate in activities that enhance the skills required to excel in their field. Graduate-level coursework and seminars at the University of Southern California School of Pharmacy are part of the fellowship along with industry partners (e.g. Allergan PLC and Gilead Sciences, Inc.). The USC School of Pharmacy is the only private pharmacy school on a major health sciences campus, which includes the Keck School of Medicine, Keck Hospital of USC and the USC Norris Comprehensive Cancer Center and is immediately adjacent to the LAC+USC Medical Center, one of the largest public hospitals in the country. There are two types of fellowships, the USC-Allergan Fellowships and the USC-Gilead Fellowships. USC Pharmacy's fellowship programs adhere to the guidelines of the American Association of Colleges of Pharmacy and the American College of Clinical Pharmacy. Graduate-level coursework and seminars may be included in the program, in addition to hands-on project activities in Allergan teams. Upon program completion, fellows will be prepared for the challenges of a career in the pharmaceutical industry. Past fellows have been placed into rewarding positions in industry, pharmacy practice and research.
- **Clinical Development Fellowships, USC School of Pharmacy –** one-year Clinical Development fellowship provides an immersive introduction to clinical research in global drug development. As an active member of multiple clinical teams, the fellow will develop an understanding of the principles and challenges in developing novel therapeutics, while operating within GCP, ICH, and other agency guidelines. Under mentored guidance, the fellow will gain broad exposure to many interdisciplinary functional areas, while individualized objectives will tailor their involvement to projects of particular interest. The objectives are to:
    - Explore the pharmacology of therapeutics and their clinical use

- Develop and optimize study documents (e.g. protocols, investigator brochures, procedure manuals, clinical development plans, informed consent forms, clinical study reports)
- Learn operational aspects of clinical trial design from startup, through execution, and closeout
- Participate in processes of ongoing data review, analysis, and reporting
- Understand the roles and responsibilities of clinical team members

- **Clinical Research Fellowships, Genentech (private company)** - https://www.gene.com/careers/university-and-early-career/clinical-fellows Conducting clinical research requires close collaboration between academic and industry professionals. The year-long Clinical Research Fellowships in Oncology, Neurology, Immunology, Ophthalmology, Pulmonary Medicine and other specialty areas give fellows the crucial experience they need to transform knowledge into practice, working directly with top institutions and physicians to strengthen commitment to developing innovative new medicines.
- **Genentech's Postdoctoral Program (private company)** - https://www.gene.com/careers/university-and-early-career/postdocs . The four-year scheme pairs PhD graduates with world-class scientists to conduct research of the highest caliber. Postdocs at Genentech are encouraged to study meaningful scientific questions and to develop their abilities as independent scientific investigators. Postdocs come to Genentech after completing their doctorate or with some years of postdoctoral experience. Postdoctoral tenure at Genentech is for up to four years. Annual salary starts at $70,000 for your first year in the program, $72,000 for the second year, $74,000 for the third year, and $76,000 for the fourth year. Those successfully applying to the scheme benefit from a nurturing environment with mentors who help them to become independent scientific investigators. Further postdoctoral program activities include:
  - Annual Offsite Meeting - A keynote speaker from outside of Genentech postdocs presents their work
  - Onsite Postdoctoral Meetings - Held twice monthly to give postdocs the opportunity to present their latest research
  - Postdoc Seminar Series - Part of an annual seminar series, postdocs invite and host 10-12 speakers of their choosing
- **Individual Research Fellowships (NIH)** supports training of graduate students and postdoctoral fellows through the Ruth L. Kirschstein National Research Service Award (NRSA) program. These fellowships provide a stipend for salary support and a small institutional allowance to partially offset the costs of research, tuition, and health insurance. The goal of these programs is to support promising applicants with the potential to become productive, independent investigators in scientific, health-related research fields relevant to the NICHD mission. NRSA fellowships are limited to U.S. citizens or permanent residents.
- **Postdoctoral Individual National Research Service Award (NIH).** The aim is to provide postdoctoral research training to individuals to broaden their scientific background and extend their potential for research in specified health-related areas.

- **NRSA Individual Postdoctoral Fellowships (F32) Program available through the National Institute of General Medical Science - https://www.nigms.nih.gov/training/indivpostdoc/Pages/PostdocFellowshipDescription.aspx** The program offers Fellowships for postdoctoral research training in areas related to the scientific programs of the Institute. Applicants must have received the doctoral degree (Ph.D., M.D., D.O., D.C., D.D.S., D.V.M., O.D., D.P.M., Sc.D., Eng.D., Dr.P.H., D.N.S., N.D., Pharm.D., D.S.W., Psy.D. or equivalent doctoral degree from an accredited domestic or foreign institution) by the beginning date of the proposed award. For applicants holding the Ph.D. degree, this award is designed to provide support for advanced and specialized training in basic research, in basic research associated with clinical problems or in clinical research. For applicants holding the M.D. or other clinical-professional degree, this program is intended to provide at least 2 years of rigorous basic or clinical research training. An applicant's proposed study must include the conduct of research with supervision or other opportunity for guidance appropriate to his or her background and objectives. Prior to submitting an application, an applicant must arrange for acceptance at an appropriate training institution by a responsible sponsor. The institutional setting may be domestic or foreign, private or public.
- **The NIH's International Research Fellowships (https://researchtraining.nih.gov/programs/fellowships/F05).** The goal of this program is to support qualified foreign scientists and clinicians with a research or clinical doctoral degree, by enhancing their basic, translational or clinical research skills in a research setting in the United States. Throughout the Fellowship, Fellows are exposed to an array of policy, technology, and communication issues and programs that may be disease specific or span multiple areas of research. Past areas of involvement have included cancer genomics, domestic and global HIV/AIDS, nanotechnology, health disparities, technology transfer, legislative affairs, health literacy, scientific peer reviews, advisory boards, and strategic planning. The Office of Science Policy (OSP) manages the placement opportunities of applicants to the Health, Education, & Human Services (HEHS)/NIH component of the AAAS Science and Technology Policy Fellowship Program. Fellows in the AAAS program at the NIH are classified as temporary federal employees for the duration of their fellowship (24 months maximum) and are eligible for most federal benefits at the start of their fellowship. While AAAS Fellows at the NIH are not automatically converted to permanent employment at the end of their fellowship, they are encouraged to apply for qualifying federal positions. Detailed information is available about the AAAS Science & Technology Fellowship Program - http://www.aaas.org/page/fellowships
- **The Science and Technology Policy Fellowship Program -** The NIH also operates a scheme to place scientists into policy organisations/government[77]. NIH partners with the American Association for the Advancement of Science (AAAS) to provide one- to two-year Science and Technology Policy Fellowships throughout the NIH's 27 Institutes, Centers, and the Office of the Director. The program is designed to foster relationships between federal decision-makers and scientific and engineering professionals in the public policy arena, and to

[77] https://osp.od.nih.gov/policy-reporting/aaas-science-technology-policy-fellowship-program/

communicate policy and biomedical and behavioral research issues to a wide audience. Each year the NIH sponsors 20-30 fellows whose placement is contingent on the emerging needs, compatibility, goals, and available resources of the sponsoring offices.

- **Ruth L. Kirschstein NRSA for Individual Predoctoral Fellowships to Promote Diversity in Health-Related Research (https://grants.nih.gov/grants/guide/pa-files/pa-16-308.html).** The p**urpose is to p**romote greater diversity of the health-related research workforce by providing up to 5 years of support for doctoral candidates (Ph.D. or equivalent research degree) or up to 6 years support for combined M.D. /Ph.D. degree. Regarding eligibility, predoctoral students from underrepresented racial and ethnic groups, individuals with disabilities, and individuals from disadvantaged backgrounds. Detailed eligibility criteria are described in the full announcement.
- **Ruth L. Kirschstein NRSA for Individual Postdoctoral Fellows (https://www.nichd.nih.gov/grants-contracts/training-careers/extramural/individual).** The purpose is to provide up to 3 years of support for postdoctoral research training in the laboratory of an established investigator (mentor). Research training must be in fields relevant to the NICHD mission.
- **IBM PhD Fellowships (IBM Research).** The 2018 two-year IBM PhD Fellowships are awarded in both the US and worldwide. The PhD Fellowship Program advances this collaboration by recognizing and supporting exceptional PhD students who want to make their mark in promising and disruptive technologies. In 2018, the Fellowship Program is focusing on: AI, security, blockchain and quantum computing. IBM is well positioned to advance these technologies and exploit their ability to transform industries and societies. A fellowship includes a stipend for two academic years (2018-2019 and 2019-2020) and, in the US, an education allowance for year one (2018-2019). In the US, fellowship recipients while in school will receive a stipend for living expenses, travel, and to attend conferences (US$35,000 for 2018-2019 and US$35,000 for 2019-2020). US fellowship recipients will also receive $25,000 toward their education in 2018-2019. Outside the US, fellowship recipients while in school will receive a competitive stipend for living expenses, travel, and to attend conferences for the two academic years 2018-2019 and 2019-2020. Fellowship stipends vary by country. All IBM PhD Fellows are matched with an IBM Mentor according to their technical interests, and they are strongly encouraged to participate in at least one internship at IBM while completing their studies.
- Since the creation of the IBM PhD Fellowship Program in 1951, IBM have supported thousands of PhD Fellowship students -- with more than 700 students supported over the past 10 years alone. In terms of eligibility requirements, students must be nominated by a doctoral faculty member and must be a full-time student in a PhD program over the two consecutive academic years of the award or forfeit their fellowship. Students must be approximately two years from receiving their degree. phdfellow@us.ibm.com
- **The Jay Jordan IFLA/OCLC Early Career Development Fellowship Program.** The International Federation of Library Associations and Institutions (IFLA) and OCLC jointly sponsor up to five individuals annually to participate in a four-week intensive Early Career Development Fellowship program based at OCLC's headquarters in Ohio, USA. The Fellows visit many libraries, cultural heritage institutions and library organizations. Promising library and

information science professionals from Developing Countries who are in early stages of career development and who meet all of the qualifications are encouraged to apply. The Fellows also observe OCLC's governance structure in action, gaining insight into issues affecting the global library cooperative. Fellows give presentations about their home countries and libraries and discuss real-world solutions to the challenges facing libraries today. The Fellows translate their learning and experiences into specific professional development plans that guide their continued growth as well as their personal contributions to their home institutions and country of origin. The Fellowship Program is for library and information science professionals who are in early stages of career development and from countries with developing economies.

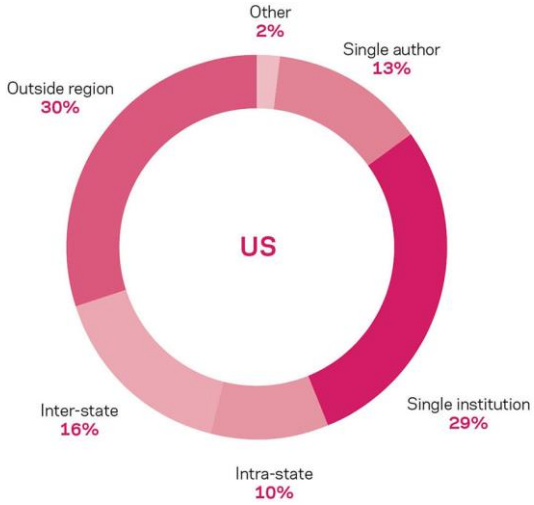
- **The Hubert H. Humphrey Fellowship Program**[78] provides 10 months of professional enrichment. It is a non-degree graduate-level study programme in the United States for **accomplished early-stage and mid-level professionals from designated countries**. Fellows are nominated by US Embassies or Fulbright Commissions based on their potential for leadership and a demonstrated commitment to public service. The fellows are placed in groups by professional field at selected U.S. universities offering specially designed programs of study and training. The focus is on leadership development and on professional collaboration with U.S. counterparts. The programme duration is 10 months.
- **The Professional Fellows Program (PFP)**[79] **is a two-way, global exchange program designed to promote mutual understanding, enhance leadership and professional skills**, as well as build lasting, sustainable partnerships between mid-level emerging leaders from foreign countries and the United States.
- The two schemes presented above are **interesting examples of short public sector to academia mobility scheme.**

It is also important to point out that there are a number of organisations that work on academia to industry cooperation more broadly, such as the role of the UIDP, which seeks to promote innovative approaches to University-Industry collaboration (see https://www.uidp.org/).

Although the following data relates to international collaborations in research articles rather than to intersectoral mobility, it can be seen as something of a proxy since it shows that 30% of research collaborations take place outside the region, whilst 16% are inter-state. In other words, cooperating with researchers in other institutions outside a specific US state is common.

[78] https://exchanges.state.gov/non-us/program/hubert-h-humphrey-fellowship-program
[79] https://exchanges.state.gov/non-us/program/professional-fellows-program

Assessment of international collaborations in research articles.



Source: Comparative benchmarking of European and US research collaboration and researcher mobility: a collaboration between Science Europe and Elsevier's SciVal Analytics, September 2013

The same benchmarking report found that regardless of duration, the US was one of the three most common destinations for researchers from the UK, which suggests that the US welcomes in-bound mobility. However, most of these researcher mobility experiences involved international academia-to-academia mobility.

There seems to be a much greater focus on international research mobility than intersectoral, including in programmes that promote mobility between the US and individual EU countries. For instance, the **Chateaubriand Fellowship in Science, Technology, Engineering, Mathematics and Health** for doctoral students aims to initiate or reinforce collaborations, partnerships or joint projects between French and American research teams. The Chateaubriand Fellowship supports PhD students registered in an American university who wish to conduct part of their doctoral research in a French laboratory. However, no ISM is involved.

2. Are there any particular features of ISM schemes that are country-specific in approach?

There are no particular features of ISM schemes in the US that are country-specific. However, the organisation of ISM in the US does reflect the prevailing institutional system and the role of different actors in the higher education and research system. The US has a strong culture of industry placements. Lots of (underfunded) PhD researchers spend the summer in high-tech companies as an "intern". They gain valuable work experience and if they manage to get a place in a company that is related to their research expertise, it can also be a valuable learning experience and a significant career boost. This is the kind of culture that would also benefit Europe, but also has some risks: it's not a formal scheme, not funded by the government and in many cases could be seen as a cheap way for companies to hire high-achievers.

The J1-visa for international graduates is a well-known and much sought-after government strategy, which as such combines international and intersectoral mobility (although not specifically targeting

researchers: https://j1visa.state.gov/programs/intern There are a number of websites that illustrate this:

- https://www.amazon.jobs/en/teams/phd-internship
- https://www.imf.org/external/np/adm/rec/job/summint.htm
- https://www.microsoft.com/en-us/research/careers/
- https://careers.google.com/jobs#!t=jo&jid=/google/software-engineering-intern-phd-summer-1600-amphitheatre-pkwy-mountain-view-ca-2824680006&
- https://www.tesla.com/careers/search#/?keyword=intern
- https://www.shell.us/careers/students-and-graduates.html

3. **If there are no ISM schemes, do universities and research institutes take part in EU-funded schemes instead (e.g. Marie Skłodowska-Curie actions, Horizon 2020 SME Associate pilot).**

Non-European organisations can participate as additional partners in ITNs, enabling doctoral-level candidates to gain experience outside Europe during their training. Statistics on the Marie-Curie Actions relating to US applications[80] show that 3,826 applications were received of which 944 were successful. There were 716 applications; 98.36 million Euros of requested EU contribution.

4. **Is there a formal policy framework and/ or have specific initiatives been launched at country level to promote ISM?**

At federal level, these does not appear to be a formal policy framework specifically relating to intersectoral mobility. However, there are policies in place to strengthen business-university cooperation. The conditions are generally propitious to investing in ISM since there is strong spending on R&D. The USA devoted 2.81% of GDP to research and development (R&D) in 2012. The private sector contributed two-thirds of this total.

[80] http://ec.europa.eu/research/iscp/index.cfm?amp;pg=usa

D. BASIC SCHEME MAPPING

- Excel file

E. EXTENDED MAPPING OF INTERSECTORAL MOBILITY SCHEMES IN EU-28 MEMBER STATES

Austria	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Industrial PhD Programme (Industrienahe Dissertationen)
1.2 Country or countries/region	This scheme is partly domestic, partly international. Firms need to be based in Austria in order to participate. Universities/Phd students from elsewhere can participate.
1.3 Reason for selection	Excellent example of an ISM scheme focusing on industrial PhDs.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	Name: Adelheid Merkl Organisation: Austrian Research Community (FFG) Email: adelheid.merkl@ffg.at Phone: +43 5 7755 2714
2.2 Promoter / lead organisation (type of organisation)	Other: public research association
2.3 Budget (€)	• Total budget: unknown o Public sector share: 50% o Private sector share: 50% The maximum amount of funding per project is € 100,000 (or 50% of total cost). Typical cost per researcher undertaking intersectoral mobility (total during mobility period): unknown.
2.4 Funding type and organisation(s)	• National public The programme is sponsored by the National Foundation for Research, Technology and Development (Nationalstiftung für Forschung, Technologie und Entwicklung)
2.5 Funding mechanism and incentives	The funding consists of reimbursement of 50% of cost (mostly human resources-related, travel expenses) for placing PhD candidates in firms/non-university research institutions. Individual researchers cannot apply directly for participation in the scheme. Rather, firms need to apply to take in a PhD candidate they have already identified. While no incentives have been put in place for firms to participate in the scheme, there generally is high interest in the scheme since it allows them to implement projects going beyond their usual internal R&D initiatives.
3 Description of scheme	
3.1 Scheme objectives	The programme aims at the systematic build-up and further qualification of research and innovation staff in companies and non-university research institutions. This way, the availability of excellent research personnel should be supported, the entry into research careers outside the science community facilitated, and existing cooperation relationships between science and industry deepened. Ultimately, the scheme shall contribute to strengthening the innovation capacity of the Austrian economy.
3.2 Description of intersectoral mobility scheme	An Industrial PhD project is a three-year industrially focused PhD project where the student is working in a company and enrolled at a university at the same time. The company applies for a project funding from the FFG, and the student is employed by the company. Thus, the PhD students will not only get access to industry but work as fully integrated professionals for the duration of the project guaranteeing the swift transfer of scientific results to industry while at the same time laying the foundation for a research career that

	might lead to being hired as regular staff after the funding period.
3.3 Scheme launch date	Current programming period started in 2015 and runs until 2020.
3.4 Number of participants and other factual information about scheme	Funds are awarded on a first come first serve basis until the total budget is used up. Number of researchers per year participating in scheme: unknown Main institutions: Some industry leaders (e.g. Bosch) have participated in the scheme. PhD candidates spend 50% of their time in the non-academic institution (typically an enterprise). They spend the other 50% of the time working on their dissertation. The project of the dissertation will typically be of interest to the non-academic partner. The duration of the ISM period is between 24 and 36 months.
3.5 Area(s) of industrial research	In terms of disciplines, the focus lies on Natural Science and Technology - especially information technology, mobility, materials and production, environment and energy, life sciences, mobility, space. But the programme promoters are also interested in intradisciplinary methods.
3.6 Eligibility requirements to participate	Applications are permitted by firms and non-university research institutes with R&D activities in natural science and technology located in Austria. The PhD candidates must be employed by an Austrian non-academic institution for the duration of the PhD project. The funding project must not be started before the funding application is received by the FFG. 50% of funding must be dedicated to female students.
3.7 Application and selection process	Applications can be made online in response to a call for proposals. As soon as the funding is exhausted the call will be closed. The latest one was open from 2 November 2016 until 3 October 2017. Proposals can be submitted continuously and are continuously evaluated by at least two independent experts. Funding decisions are made following the meetings of the advisory board of the FFG General Programmes (advisory board of the FFG Basisprogramme). • How long does the application process take? unkown Applications with a research question that is not considered innovative enough may be rejected.
3.8 Partnership finding	To promote the scheme, the FFG organises roadshows where they present the programme across Austria. Events and career conventions are used to get in touch with firms but also with possible PhD students who can then contact firms themselves. Universities are also involved in these events. There are no difficulties in reaching industry. Many firms applying for participation in the programme are spin-offs from universities. The FFG also receives applications from non-academic research institutes. Then, there is very close proximity to universities which should facilitate cooperation. However, it is not permitted to have the same supervisor in the university and in the non-university partner. The FFG regularly informs universities and alumni networks of calls for proposals and its then up to them to spread the information. Large firms (e.g. Bosch) also advertise the programme on their website. Interested researchers could visit these websites or go to the FFG site to find out more about the programme.
3.9 Links with other mobility schemes	The programme is linked to other FFG programmes with a Human Resources focus, namely: COMET; Research Cooperation: Young Scientists; BRIDGE; Talents; Laura Bassi Centres of Excellence. However, these other programmes focus on supporting individuals while the scheme described here supports firms and research institutions taking in PhD candidates.
3.10 Governance,	It is essential for applicants to have a crisis management plan in place. The external

support structures and coordination measures during mobility period	evaluators appraising applications also consider this. An interviewee confirmed one instance where a firm filed for bankruptcy which resulted in premature termination of the project. The FFG checks the coordination between the academic and non-academic supervisors in a formal assessment. They also carry out site visits during project implementation to monitor progress. No regular meetings take place between academic and non-academic supervisors. In their final project report the participating non-academic partners need to explain how they organised the information exchange with universities who sent the PhD students. This does not require face-to-face meetings but could done via phone. Where all partners are closely located to each other physical meetings may take place.
3.11 Obstacles in scheme implementation	One potential obstacle may be the limited sector scope. Another obstacle concerns the fact that some firms may not be able or willing to pay for the other 50% of the project cost. SMEs generally do not submit many applications even though they are eligible. Many SMEs state that it would be too costly for them to take on a PhD candidate even on a half-time position due to the taxes they would then need to pay. There may be issues when firms want to take on PhD students from non-EU countries (e.g. India) since it is difficult to obtain a work permit in these cases. Firms need to mention the name of PhD student they want to support in their application. Sometimes, it happens that the individual decides not to join the project after an application has already been submitted. It can then be difficult for the applying firm to find an alternative for the research project. Changing the topic of the research would mean that firms had to reapply. By this time, however, funding may have already run out, meaning the firm in question cannot participate in the Call. There are no issues related to IPR. PhD students know that they can safeguard dissertation results. The FFG advises PhD students to sign a contract with the practice partner before launch of the funding period. But the FFG does not monitor if this actually happens or not. Generally, the calls receive many applications and the FFG ends up having to close it prematurely because they run out of funds.
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	<u>Results</u> The FFG does not survey participants in the scheme but does have reports of what kind of training PhD candidates receive in firms. These reports suggest that quite a lot of useful training takes place. Anecdotal evidence suggests that many times PhD students end up staying in the firm with a permanent contract after the project has come to an end. The main indicators the FFG monitors right now include the number of publications resulting from a project, and the number of conferences attended by participants.
4.2 Monitoring and evaluation	An evaluation of the scheme has not yet been carried out but is due to take place in 2020. Relevant data and indicators have been defined and are being collected.
4.3 Lessons learned	The scheme is very successful and in demand. A lesson learned is that it may be advisable to increase funding for the scheme in future Calls to satisfy the demand. Fairly few implementation challenges were faced so far, suggesting that the scheme runs smoothly. The evaluation in 2020 should reveal more lessons learned and identify room for improvement.
4.4 Good practices	Supporting female researchers in the sciences and technology degrees; close cooperation between universities and non-academic partners
4.5 Replicability	The scheme should be of medium replicability. What it requires is a concentration of R&I-

potential	intensive industries and businesses in a certain region that are experienced in cooperating with universities.
5 Additional information sources and keywords	
Other information	https://www.ffg.at/en/research-partnerships https://www.ffg.at/sites/default/files/downloads/call/pd_forschungspartnerschaften_bis2020.pdf
Keywords	Industrial PhD programme, equal opportunities

Belgium	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Doctiris
1.2 Country or countries/region	The scheme only applies to the Brussels city/region, in Belgium.
1.3 Reason for selection	Scheme is simple and well regarded, has good funding support, its implementation is straight to the point, and it counts many positive reviews from all stakeholders
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	**Name**: Julie Verstraeten + Aline Grosfils **Organisation**: Innoviris **Email**: jverstraeten@innoviris.brussels ; agrosfils@innoviris.brussels **Phone**:
2.2 Promoter / lead organisation (type of organisation)	Innoviris is the Brussels Institute for Research and Innovation, a business support organisation focusing on helping Brussels-based companies thrive and make full usage of existing support and funding mechanisms

2.3 Budget (€)	• Total budget has no cap, depends on proposals;
	  ○ Public sector share = 100% = €1.4M/year
	  ○ Private sector share = only need to pay for working costs + HR time to train the new researcher
	• Typical cost per researcher undertaking intersectoral mobility (total during mobility period) = €150.000 to €170.000 x2years = around €300.000 to €350.000

2.4 Funding type and organisation(s)	Select one or more funding streams. • National and regional – funded by Innoviris - Brussels Institute for Research and Innovation
2.5 Funding mechanism and incentives	• *What is the funding mechanism?* grants • *Have any incentives for individual researchers been put in place for the intersectoral mobility scheme?* Yes – Innoviris pays a full grant for researchers that can engage a Univ+industry to develop a common project based on his/her efforts. • *Have any incentives for specific institutions been put in place for the intersectoral mobility scheme?* Yes, as there are no costs for the host organisation (other than working costs and HR time to train the researcher).
3 Description of scheme	
3.1 Scheme objectives	The objective is to promote links between academia and industry, and support PhD students into getting first-hand industry experience to increase and diversify their skills and make them more employable and connected to the industrial network of opportunities for R&D.
3.2 Description of intersectoral mobility scheme	In this scheme anyone (Belgian or not) interested in running research in a Belgian university can apply for a grant by linking their research to a specific company – and an intended industrial output (goods/services); PhD candidates are then accepted / hired by a HEI which receives the funding from Innoviris. PhD needs to spend at least 50% of her/his time in the company. Projects can be submitted by all researchers, companies and HEIs; A jury then evaluates projects and decides on funding/no funding, according to previously-set thresholds (including promotion of knowledge exchange, valorisation of the project and demonstration that researcher can obtain, during the project, the necessary skills to be hired by the company);
3.3 Scheme launch date	2011
3.4 Number of participants and	• 4 new projects awarded per year (15 on-going presently) • Researchers spend 50% of their time in the organisation

other factual information about scheme	• Grants last 2 years and can be renewed once.
3.5 Area(s) of industrial research	• Scheme is open across all scientific and research disciplines
3.6 Eligibility requirements to participate	• No requirements in terms of experience, or nationality, from researchers. Between 30-50% of grantees are not Belgian but are enrolled in a Brussels' university • Both HEIs and companies need to either be based in Brussels or have an operating base in the capital.
3.7 Application and selection process	• All researchers, HEIs and/or industry can start the process. Whomever initiates the process needs to get the other two stakeholders on board and (collectively or individually) draw a proposal for funding from Innoviris A jury then evaluates projects and decides on funding/no funding, according to previously-set thresholds (including promotion of knowledge exchange, valorisation of the project and demonstration that researcher can obtain, during the project, the necessary skills to be hired by the company); • The application process can take up to 6 months until funding approval.
3.8 Partnership finding	• Partnership finding and arrangements are left to the participants in the funding opportunity. Meaning that the funding organisation does not engage or invest efforts in "team-building" for these schemes.
3.9 Links with other mobility schemes	• There are no identified links between the intersectoral mobility scheme identified and other schemes regionally, nationally and internationally.
3.10 Governance, support structures and coordination measures during mobility period	• Participants can contact Innoviris at any time for questions or support. • There is a follow-up Committee for each grantee, with experts in the field of research, to help the researcher with feedback and evaluate progress. • 6 months into the project, researchers need to submit an activity report and workplan – if approved, the next one is due in 3 years' time. In the meanwhile the Committee will follow progress, and in the end of those 3 years, evaluate the outcomes. • In terms of conflict management, there is an ad-hoc conflict mediation by Innoviris, but this is mostly made by HEIs' Technology Transfer Officers (TTOs)
3.11 Obstacles in scheme implementation	• IPR negotiations are always a problem – it has prevented projects from happening in the past due to lack of agreement between grant participants; • Focus on Brussels-only also constrains expansion of funding, and thus growth of the scheme;
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	• From the 5 projects that have been completed since the launch of the program in 2011, there has been a 100% hiring rate for researchers – meaning they all ended up being engaged with the companies (or sector) in which they conducted research. o 1 was already working in the company that participated in the scheme, when he decided to do the PhD. He was hired back upon the conclusion of research. o 1 was hired by the company he produced research on o 2 were hired by Walloon companies o 1 went working abroad in a related sector • Note: there is a 30% drop-out rate for this scheme
4.2 Monitoring and evaluation	• No M&E reports yet, the scheme is too recent
4.3 Lessons learned	
4.4 Good	• Simplicity of setting up and presenting funding proposal

practices	• Good funding with hands-off management by the funding org
4.5 Replicability potential	• high replicability potential; easily transferable to other regions, depending of political interest (and available budget) to implement.
5 Additional information sources and keywords	
Other information	http://www.innoviris.be/en/homepage_content/call-for-projects/doctiris
Keywords	

Bulgaria	
1 Example of inter-sectoral mobility scheme – key data	
1.1 Scheme title	Science and Business Project (under OP HRD, Project РД 09-1033/27.07.2011)
1.2 Country or countries/region	An international type of ISM scheme.
1.3 Reason for selection	The scheme could be considered as a good practice example. This scheme was initiated and coordinated by a team from the Ministry of Education and Science. A National web-portal "Science to Business" (http://s2b.mon.bg/en/home/) was developed and the aim was to continue to serve the ISM activities after the expiration of the project. Although there is still no continuation of this project, its idea was to lay the foundations for long-term partnerships and the convergence of science and business interests through ISM. This scheme did not have a large budget but nevertheless has funded the largest number of mobilities of scientists to the industrial sector. Total of 1371 participants were involved as end beneficiaries. Total of 693 representatives of the target groups - 632 researchers and 61 students participated in 7 scientific schools and 7 "research ideas" exchanges.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing inter-sectoral mobility scheme Contact details	**Name**: Ministry of Education and Science, "Science" Directorate (Mrs. Albena VUTSOVA) **Address**: 2 Dondukov Str.; 1000 Sofia Bulgaria **Phone**: **Email**: avutsova@yahoo.com
2.2 Promoter / lead organisation (type of organisation)	Ministry of Education and Science
2.3 Budget (€)	• **Total budget**: o 2,600,000 EUR o Entirely funded by EU funds • **Typical cost per researcher undertaking inter-sectoral mobility (total during mobility period)**. Travel and daily subsistence; Conference taxes; Taxes for publication; Consumables.
2.4 Funding type	*Select one or more funding streams:* • EU-funded
2.5 Funding organisation(s)	The scheme is funded by the Ministry of Education and Science as a delegated authority for implementation of the Operational Programme Human Resources Development (OP HRD). The OP HRD itself is managed by the Ministry of Labour and Social Policy (Directorate "European Funds, International Programs and Projects").
2.6 Funding mechanism and incentives	• *What is the funding mechanism? (e.g. grant, bursary, pay from the company, repayable loan)* Grant • *Have any incentives for individual researchers been put in place for the inter-sectoral mobility scheme?* No • *Have any incentives for specific institutions been put in place for the inter-sectoral mobility scheme?* No • *What support structures have been put in place to help researchers whilst they are undertaking a mobility period?* No such support structures involved.
3 Description of scheme	
3.1 Stated	The Science and Business project was launched in 2011 under a grant scheme for direct

objectives of scheme	grant BG051PO001 / 3.3-05-001 under the Operational Programme "Human Resources Development" 2007-2013, co-financed by the European Social Fund. The main objective of the project is to create a favourable environment for active interaction between science and business and stable and sustainable partnerships between the main components of the knowledge triangle - scientists, research and the realisation of scientific results. The specific activities include: • Improving "science-business" communication through the establishment of contacts between sectors and the realisation of "exchanges" for scientific ideas; • Promotion of scientific results, dissemination of information on conducted research and new scientific developments, presentation of successful scientific products for society and for business; • Increasing the qualification of scientists, including young scientists, to meet the needs of the labour market and the business sector's demand for professionals.
3.2 Description of inter-sectoral mobility scheme	The key project activities include: • Supporting young scientists for one-month placements abroad to work with high-tech complexes and products as an important step towards building a new generation of scientists responding to the needs of business; • Dissemination of information on ongoing research and new scientific developments, promotion of scientific results, presentation of successfully implemented scientific products with benefits to society and business; • Thematic events and science schools in seven priority areas such as energy; green chemistry; biotechnology and new materials and others; Development of a national interactive platform, which will be a unique entrance and will integrate three existing systems - The Register of Scientific Activity; information from the Bulgarian Patent Office and information on the dissertation papers preserved in the National Centre for Information and Documentation (NACID) database. In total, the incoming beneficiaries were 1371 and the outgoing beneficiaries were 1289. There were 240 young scientists involved in the project approved for high-tech placement abroad, of which 149 were women. 63 of the approved young scientists were under the age of 29. 97 of the candidates work in universities and 143 in scientific institutes at the Bulgarian Academy of Sciences. 204 young scientists have completed the placement period and submitted their reports. A total of 693 representatives of the target groups - 632 researchers and 61 students participated in 7 scientific schools and 7 scientific exchanges. In the first two scientific schools, 302 representatives of the scientific community (282 researchers and 20 students) participated, and 32 scientific representatives (26 scientists and 6 students) took part in the third scientific school. A total of 83 representatives of the scientific community took part in the fourth scientific school and the exchange, of which - 72 researchers and 11 students. A total of 114 representatives of the scientific community, including 97 researchers and 17 students, took part in the fifth scientific school and trade fair. In the sixth scientific school and exchange a total of 70 representatives of the scientific community took part - 67 researchers and 3 students. A total of 92 representatives of the scientific community took part in the seventh scientific school, of whom 88 were scientists and 4 students. A total of 377 business representatives participated in the seven scientific schools and exchanges, as well as 35 representatives of NGOs and 26 representatives of state and local authorities and institutions. (In the first two scientific exchanges there was a total of 67 participants from the business, in the third scientific school 137 business representatives, 66 representatives of the business and the exchange were attended by 66 representatives of the business, and in the fifth scientific school and exchange 27 representatives of the business took part, 42 business representatives participated in the sixth scientific school and the exchange, and in the seventh 38).

3.3 Scheme launch date	14.06.2011
3.4 Number of participants and other factual information about scheme	• **Number of researchers per year participating in scheme**: 240 researchers from which 149 women. 63 from the approved young scientists are below 29 years of age. • **Main institutions**: Ministry of Education and Science 97 of candidates are working for universities and 143 are from the institutes of the Bulgarian Academy of Sciences • **What % of time is being spent by researchers in the non-academic host institution during the mobility period?** 1 month • **Duration of inter-sectoral mobility period**: 1 month
3.5 Area(s) of industrial research	The scheme is open to all research fields of the natural and technical sciences and fields from other sciences are also allowable. The main requirement of the competition for selection is the research activities of the candidates to be in a field or to contribute to the development of areas of high technological potential. However, advantage is given to candidates conducting research and development in the following areas: Information Technology; Eco and energy saving technologies; Health related technologies.
3.6 Eligibility requirements to participate	Eligible applicants for one-month placements for working with high-tech complexes abroad are persons with PhD scientific degree who fall within the specific target group of young scientists and post-doctoral students. Candidates may be Bulgarian nationals who carry out scientific work in a public or private organisation in the field of science and innovation. Candidates should: a) have scientific publications on the topic in Bulgarian and / or foreign scientific journals; b) have a good command of English and / or the language of the host country; c) have an employment contract in a scientific organisation or a higher education institution in Bulgaria.
3.7 Application process	Competition Procedures 1. Within the framework of the Science and Business project, 5 competitive procedures were organised for the selection of 200 young scientists and post doctoral students for one-month training for work with high-tech complexes. 2. Each contest procedure was published on the Ministry's website and on other specialised websites. Requests for Application 1. Filing-in an application in a form containing: a) Annotation of future research work; b) A description of the applicant's current scientific work and a brief scientific plan; c) Description of the host institution - a high-tech complex; d) Financial plan; 2. Cover letter of the applicant - 1 page in Bulgarian and English or in the language of the country for which the applicant applies; 3. Curriculum vitae of the candidate according to a template; 4. Letter of Host State consent; 5. The applicants shall prove the data declared in item 1 "b" with the submission of the relevant documents (contracts or other type of verification). • How long does the application process take? Procedure/Call 1 Call open date 15-30/09/2011

	Deadline for submitting the applications by the candidates 30/10/2011 Publishing the names of the approved candidates 30/11/2011 Deadline for submitting final reports by the candidates who have passed the period abroad 30/03/2012 All the other four procedures follow the same time schedule.
3.8 Partnership finding	One of the positive aspects of this project is that, alongside ISM, 7 thematic schools and 7 exchanges for offering innovative research products and results were conducted. In pursuance of the activities envisaged in the project, the Project Working Group has selected seven priority areas in which there is scientific capacity and economic potential for the country for high-tech and innovative development. The Task Force endorsed 7 "themes" at its second meeting, held on September 12, 2011. Each of the scientific schools has a duration of 2 days and the scientific exchange is scheduled for 1 day in the following thematic directions: "Traditional foods and the health of Bulgarians"; Scientific Ideas in the field of Information and Communication Technologies "Energy Efficiency"; "Scientific instruments"; "Green Chemistry"; "Engineering sciences - optics and electronics"; "New Materials and Technologies". Within the framework of all the scientific exchanges, talks and discussions were held between the business representatives, the researchers and the students.
3.9 Links with other mobility schemes	No
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	• *To what extent does joint supervision by academia and industry take place during a mobility placement of a researcher?* No information available • *What measures are in place to ensure smooth coordination between academic and non-academic PhD supervisors?* No information available • *Governance aspects - what is the allocation of roles and resources between different partners in designing the research agenda?* All activities are coordinated by the Ministry. The organisation of the scientific forums, scientific schools and research exchanges was subcontracted based on a tender procedure for selecting the most appropriate contractor.
3.11 Obstacles in scheme implementation	• *What are / have been the main obstacles in implementing inter-sectoral mobility schemes?* No special obstacles to be reported • *To what extent have IPR issues deterred participation in schemes?* No information available

Croatia	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	PoC Public (Proof of Concept Programme for Scientist and Researchers)
1.2 Country or countries/region	Croatia (national scheme)
1.3 Potential good practice?	Although the PoC Public scheme is not a true intersectoral mobility scheme, as it does not involve mobility or cooperation between research institutions and companies, it does play an important part in mobility (involvement) of researchers from the academic sector into business sector, as it enables researchers to perform the first step (the proof of concept) in the process from an idea to a product/service that is offered on the market, and possibly also establishment of and cooperation or employment in a spin-off company. Financing offered by PoC Public is an important source of financing for proof-of-concept activities, as proof-of-concept activities are not typically covered by public research institutions / universities as a part of regular activities of researchers (even if proof-of-concept activities of researchers are supported by such institutions, they would not, for example, finance employment of new researchers solely for the purpose of working in a proof-of-concept project). The effectiveness of the scheme is evident from the number of patents subsequently obtained by researchers and the number of products/services that were eventually placed on the market.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: Croatian Agency for SMEs, Innovations and Investments (HAMAG-BICRO) Address: Ksaver 208, Zagreb Phone: +385 1 488 10 15 Email: inovacije@hamagbicro.hr * from 2017 on the PoC Public scheme came under auspices of the Ministry of Science and Education. PoC Private remains under auspices of HAMAG-BICRO
2.2 Promoter / lead organisation (type of organisation)	agency for SMEs, innovations and investments
2.3 Budget (€)	• Total budget ○ Public sector share: co-funding provided by HAMAG-BICRO: 2,100,000 Eur (co-financing for the 6th round (2016); includes both PoC Private and PoC Public). The scheme (6th round) was financed through the Second Science and Technology Project (STP II, 2013 - 2019). ○ Private sector share: the participating organisation (public research institute / university) has to provide at least 10% of co-financing • Typical cost per researcher undertaking intersectoral mobility (total during mobility period) Staff costs depend on the number of researchers in a project and their salaries. However, staff costs are only a part of costs in a project, as co-financing also covers other activities (material costs, patent filing costs, ...). Minimum amount of co-financing provided by the scheme is 4,600 Euro (35,000 kuna) and maximum co-funding is 46,000 Euro (350,000 kuna). Many projects have a budget of more than 350,000 kuna and are co-funded by the maximum co-funding amount. In the 6th round of PoC Public the highest budget of a project was around 800,000 kuna (106,000 Euro).
2.4 Funding type	• National public X (the funds for PoC were provided from the budget for the STP II programme - total budget for STP II is 24 million Euro) • Private – other X (self-contribution of the applicant)

	• Internationally funded X (a loan of 20 million Euro has been provided for the STP II programme to the Croatian government by the International Bank for Reconstruction and Development (IBRD))
2.5 Funding organisation(s)	Until 2016 the scheme was funded by HAMAG-BICRO. Successive rounds will be funded by the Ministry of Science and Education
2.6 Funding mechanism and incentives	The funding mechanism is co-funding of projects. The incentive for participation in the scheme is co-funding. No additional incentives for individual researchers have been put in place. No incentives for specific institutions have been put in place. The Recognised Centres provide researchers with support throughout the application process and implementation (e.g. help in preparation of the project application, help in protection of intellectual property, ...).
3 Description of scheme	
3.1 Stated objectives of scheme	The stated objectives of the scheme are: Applicable to PoC Public: - to set foundations for establishing spin-offs from public universities / research institutions, to help scientists and researchers to launch their ideas and inventions from the laboratory to the market Applicable to PoC Public as well as PoC Private: - to increase the number of innovative products, services and technological processes - to enable creation of new knowledge based companies with a potential and capability for growth and development - to decrease the time needed and risks from the phase of preliminary research of an innovation to development and commercialisation Applicable to PoC Private: - to enable entrepreneurs to finance pre-commercial activities in the beginning phase of development of products, services and technological processes, with the aim to aid further development and direct it, and to decrease the risk of investment in the later phase of development and commercialisation
3.2 Description of intersectoral mobility scheme	The PoC Public scheme offers researchers from public research institutions / universities, who, based on their work at the institution, get an idea for a product/procedure, which they think could be commercialised, but are not sure about its feasibility (no prototype has yet been developed, procedure has not yet been tested), co-funding for proof-of-concept research. PoC Public is complimentary to PoC Private, which is essentially the same scheme but provides co-funding to private institutions (companies and private institutes) and individuals. Together they constitute the Proof of Concept (PoC) scheme, managed by HAMAG-BICRO, but each of them has a separate legislative basis, separate budget (the two budgets were approximately the same), different conditions for participation, separate evaluation and selection process and, to some extent, different aims. The PoC Public scheme provided co-financing for 3 main activities: - making of a prototype - demonstration of technical feasibility - checking and protection of intellectual property (this could only be done in combination with at least one of the other two activities) Co-funding could also be used for additional project activities, such as:

	- market analysis and feasibility study - preparing a concept and strategy for development or commercialisation of a product / service No more than 10% of the total project budget could be used for these additional activities. Eligible costs, covered by co-financing: - salaries of researchers, employed at the applicant institution (an amount of up to 50% of the salary forms eligible costs) - salaries of newly employed researchers, that were employed explicitly for the purpose of working on the project - material costs - costs of external services and consultants (e.g. study of commercial potential, checking and protection of intellectual property, study or plan for commercialisation) - equipment that is necessary for execution of the project In the scheme implementation, HAMAG-BICRO cooperated with selected "Recognisable Centres". Institutions of different types, that have experience in proof-of-concept research, product development, intellectual property protection and other necessary competences, could act as Recognisable Centres - universities, research institutions, technological parks, innovation centres, incubators. Recognisable Centres offered researchers support throughout the application process and implementation of the project. They were also responsible for preliminary evaluation and for monitoring of project implementation and reporting about it to HAMAG-BICRO. The Recognisable Centres were chosen on the basis of a call for proposals. Altogether there were 12 Recognisable Centres.
3.3 Scheme launch date	The scheme was established in 2010. 6 Calls for Proposals have been published since then.
3.4 Number of participants and other factual information about scheme	41 projects were co-financed in the 6th round. Projects typically include a small number of researchers (3 to 5). Institutions applicable for applying for co-financing by PoC Public are public research institutes and public higher education institutions. In general, there is no mobility to a non-academic host institution. PoC Public projects are implemented by a public research institution / university alone. Projects can last up to 12 months. Most projects last from 10 to 12 months.
3.5 Area(s) of industrial research	The scheme is open across all scientific and research disciplines and is not focused on any particular area of industrial research. However, each call for proposals may define priority fields. Priority fields in the 6th round were: • electronics and electrotechnics • energy, environment, materials • ICT • medicine, biomedicine, pharmaceutics • food technology • engineering and shipbuilding • technology of traffic
3.6 Eligibility requirements to participate	The only requirement for a participating organisation is, that it is a public research institution or a public university. Regarding participating researchers, the only official requirement is, that the participating institution, during the application process, is able to demonstrate, that it has a team of researchers that will be able to carry out the project. There are no requirements regarding

	the level of education, experience or other characteristics of the participating researchers. Usually the leader of the team was a researcher with a PhD.
3.7 Application process	Officially the applicant in the PoC Public scheme is the public research institution / university in which the researcher / team which will carry out the project, works. Decision for application is taken by a researcher(s) who will carry out the project, with approval of the institution in which he/she (they) is (are) employed and through which he/she (they) will apply. Application can be submitted after a Call for Proposals has been published and must be submitted on-line. At the time of application the applicant has to choose a Recognised Centre to which the application will be submitted and with which the applicant will cooperate in the application and implementation process. The application undergoes a two-step evaluation process. First, basic information on the project proposal is prepared and preliminary evaluation is carried out by the chosen Recognised Centre, which involves evaluation of administrative criteria (whether the applicant organisation and the application form satisfy requirements) and programme criteria (innovativeness, market potential, technological risk). For projectsthat pass the preliminary evaluation, a complete application is submitted and full evaluation is carried out by HAMAG-BICRO. It involves evaluation of programme criteria (innovativeness, market potential, project quality) and business and financial criteria (alignment of proposed budget with the scheme requirements, applicability and analysis of costs). All projects are graded and ranked according to the number of points reached. Best graded projects are then chosen for co-financing.
3.8 Partnership finding	As the projects financed through the PoC Public scheme are carried out by researchers from a participating institution alone, there is no need for search of partners. Researchers who will be newly employed by the institution for the needs of the project are searched for through different channels (e.g. among PhD students, through job advertisements, through previous contacts).
3.9 Links with other mobility schemes	Proof of concept is only the first step in the process leading from an idea for a new product / procedure to putting the product / procedure on the market, possibly through establishment of a spin-off company. HAMAG-BICRO runs other schemes that offer support (directly or indirectly, through funding support institutions) to researchers from public institutions for further development of a product / procedure and its commercialisation. These include the Programme III: Collaborative Research and Development (IRCRO Programme) and the Programme for Support of Technology Transfer Offices (UTT Programme). An important synergy has established between the PoC Public and PoC Private programmes. Although the programmes were run separately, researchers from the two programmes interacted (communicated) with each other and established cooperation.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	Joint supervision does not apply, as the projects are carried out by a public research institution / university alone. PhD students, participating in PoC Public projects were supervised only by their academic supervisor.
3.11 Obstacles in scheme implementation	There were no significant obstacles in implementation of PoC Public identified by HAMAG-BICRO. IPR issues have not deterred participation in the scheme as one of the aims of the scheme is

	to enable and support the participating researchers to obtain a patent on the product / procedure they are developing.

Cyprus	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	**ΔΙΔΑΚΤΩΡ (DIDACTOR) RESTART 2016-2020 – Programme**
1.2 Country or countries/region	National programme of national scope. Individual projects may preview involvement of partners from other countries, nevertheless the project implementation should be in Cyprus.
1.3 Potential good practice?	This is not an ISM scheme, it is a research programme that encourages ISM
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: RPF Research Promotion Foundation Address: Strovolou Ave, Nicosia, Cyprus Phone: +357 22 205036 Email: kkarakasidou@research.org.cy
2.2 Promoter / lead organisation (type of organisation)	National Organisation for the Promotion of Research, Technology and Innovation.
2.3 Budget (€)	The funding of the previous programme was 5.6 million euro for three call for proposals (2008, 2009 and 2011). The new programme has available funding 9.4 million euro. As this is a research programme and not an ISM scheme, we cannot estimate typical cost per researcher.
2.4 Funding type	National public
2.5 Funding organisation(s)	RPF Research Promotion Foundation in Cyprus with funds from the RESTART 2016-2020 Programme
2.6 Funding mechanism and incentives	The programme provides grants to research projects. The involved researchers receive their remuneration from the involved institutions (partners) as salary. There are not any specific incentives apart the funding. Support is provided by universities and research institutes, by informal channels.
3 Description of scheme	
3.1 Stated objectives of scheme	The objectives of the programme are to develop the research capacity of Cypriot R&D system, to integrate new scientists and create a critical mass of researchers and the creation of sustainable jobs for the young scientists.
3.2 Description of intersectoral mobility scheme	The DIDACTOR Programme aims at integrating new postdoctoral scientists into the Cyprus RTD system to develop high-level research projects, aiming at their involvement in the development of new research activities, the creation of a critical mass of researchers in cutting-edge sciences and the creation of sustainable jobs highly skilled for the employment of young scientists. The programme concerns the realisation of a research project by a New Researcher (NE), a doctorate holder, in the framework of his / her employment by a Cypriot research organisation, enterprise or other body. The New Researcher, who may have under his / her responsibility and the coordination of the proposed project, will work in the Contractor with the main object of the project implementation, while being able to participate in other research and / or educational activities. Other researchers may contribute to the projects. Grant / Co-financing rate: 85%

	Maximum funding per Project € 160,000 for Projects falling under the Science Areas "Life Sciences" and "Natural Sciences and Engineering" € 120,000 for Projects within the Scientific Area "Social and Human Sciences" Thematic Categories: Research, Technological Development and Innovation Beneficiaries: • Private Entities • Non-Profit Organisations • Small and medium-sized enterprises (SMEs) • Researchers / Research Centres / Organizations • Local Authorities • Educational Institutions • Non-Governmental Organisations • Links / Associations • Chambers • Trade unions • Training Centres • Central Government • State Organisations and State Enterprises • Young people • Large Businesses Promoter Organisation may be a Research Organisation, Enterprise or Other Entity. Participants as Co-Operative Entities are Research Organisations, Businesses and Other Entities. Foreign Research Institutions are allowed to participate. The New Researcher must hold a Doctoral Degree with a maximum of seven (7) years from the acquisition of his / her PhD by the date of the Announcement of the Invitation, with the possibility of extending the time limit in special cases.
3.3 Scheme launch date	2008
3.4 Number of participants and other factual information about scheme	In the period 2008-2015, two projects with a company as an applicant were approved, that involved industrial research and intersectoral mobility. In these two programmes, the researchers spent most of their time in the companies, while they had some meetings with the other involved partners. The RPF manages the programme.
3.5 Area(s) of industrial research	The programme is open to different scientific disciplines in the broad areas of Life sciences, Natural sciences and engineering and Social and human sciences. It funds basic and industrial research.
3.6 Eligibility requirements to participate	Eligibility requirements for young researchers are: Holders of PhD, less than eight years from the acquisition of PhD and up to 40 years old.
3.7 Application process	The application is submitted by an applicant organisation on behalf of a consortium. The individual researcher is employed in the applicant organisation.
3.8 Partnership finding	Partner finding works mainly through organisations' own networks and informal channels.
3.9 Links with other mobility schemes	n/a
3.10	There are regular meetings between the partners involved in the project. The cooperation

Governance and measures to ensure coordination during mobility period between academia and industry	measures are described in the proposal and are part of the research project design.
3.11 Obstacles in scheme implementation	The main obstacle for ISM is that there are not companies interested in research, apart from very few large companies in energy, telecommunications and pharmaceutical sector. The Cypriot economy is based on small companies and the research sector itself is still young and trying to establish itself. Therefore, the priority is to attract a critical mass of researchers into the Cypriot RND system, rather than to establish intersectoral cooperation.

Czech Republic	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Knowledge Transfer Partnership
1.2 Country or countries/region	Czech Republic
1.3 Potential good practice?	The scheme is in its beginnings with only a pilot programme completed and assessed, while the extended programme funded from the ESIF 2014-20 has only projects which started this year and no evidence is available.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: Ministry of Industry and Trade with the administrative support from the Agency for Enterprise and Innovation. Person responsible for the scheme: Robert Wenzel Address: Na Františku 32, 110 15, Prague 1, Czech Republic Phone: +420 224 85 2644 Email: wenzel@mpo.cz
2.2 Promoter / lead organisation (type of organisation)	Other: Ministry with the administrative support from the central agency administering all the OP EfI grants.

2.3 Budget (€)	• Total budget EUR 41 961 720 allocation in 2 Calls for Proposals
	  ○ Public sector share 70%
	  ○ Private sector share 30%
	• Typical cost per researcher undertaking intersectoral mobility (total during mobility period) - not available as the projects vary considerably in size for the grant funds not only the researcher's personal costs but also equipment necessary for the research.

2.4 Funding type	• EU-funded
2.5 Funding organisation(s)	• Ministry of Industry and Trade as the Managing Authority of the Operational Programme Enterprise for Innovation (OP EfI)
2.6 Funding mechanism and incentives	• GRANT (70%), provided through the scheme which is part of the Operational Programme and 30% funding from the host industrial company. • *Have any incentives for individual researchers been put in place for the intersectoral mobility scheme?* NO, apart from the usual wage paid to the researcher while in the host industrial company. • *Have any incentives for specific institutions been put in place for the intersectoral mobility scheme?* NO • *What support structures have been put in place to help researchers whilst they are undertaking a mobility period?* No official support structures in place. But the HEI usually provides support to the researcher through informal cooperation by the research team by which the mobile researcher is sent to the industrial company.
3 Description of scheme	
3.1 Stated objectives of scheme	The objective of the KTP is to strengthen cooperation between academia and industry, to improve/increase number of linkages between academia and industry and to motivate universities to become more open to the needs of industry.
3.2 Description of intersectoral mobility scheme	It is a Czech adaptation of the UK scheme Knowledge Transfer Partnership. The scheme was piloted in the Czech Republic as part of the Operational Programme Enterprise and Innovation 2007-2013. The programme stimulates transfer of knowledge by supporting post-graduates and post-doc researchers to work in companies while being employed by the university and supervised by university experts. The pilot scheme has been developed into a full national programme funded by ERDF

	programme OP Enterprise and Innovation for Competitiveness 2014-2020. It is now linked to the National RIS3 specialisation domains (though they are rather broad anyhow). The KTP has been developed by the Ministry of Industry and Trade, its part dealing with the operational programme strategy, while it is implemented by the implementation department and administered by the Agency for Enterprise and Innovation which is subordinated to (and established by) the Ministry in order to implement Operational programme Enterprise and Innovation for Competitiveness (OP EIC).
3.3 Scheme launch date	The scheme was established in 2010 as a pilot programme and then adapted to a full national scheme within the new OP EIC 2014-20. 2 Calls for proposals have been launched so far in the new programme, one in 2015 and the second in 2016.
3.4 Number of participants and other factual information about scheme	• Number of researchers per year participating in scheme - 45 from both CfPs. Number of applications approved was about 2 times higher but many beneficiaries withdrew prior to the grant being awarded. • Main institutions: Ministry of Industry and Trade as MA of OP Enterprise and Innovation for Competitiveness. Agency for Enterprise and Innovation – Intermediary body for the OP, responsible for administration of the CfPs and projects. However implementation is also made by the MA department for implementation (such as approval of Applications for Payment, etc..) Universities and research organisations as partners in the project Industrial companies as direct beneficiaries. • What % of time is being spent by researchers in the non-academic host institution during the mobility period? Formally the "knowledge transfer assistant" is to be fully working for the company and most of the time shall spend there. They may do some work at the university facilities but it should be linked to the work in the company. • Duration of intersectoral mobility period. Majority of researchers - 36 months.
3.5 Area(s) of industrial research	The scheme aims at specialisation domains as described in the National RIS 3 strategy. However these domains are rather broad and the focus is not very limited by them. The research topics covered depend on the agreement between the HEI and the company.
3.6 Eligibility requirements to participate	• Mobile researchers (Knowledge Transfer Assistants) should apply within 4 years of completion of Master's degree. No other requirements.
3.7 Application process	• Both parties, i.e. HEI or industry can initiate the collaboration. They need to contact each other and achieve general agreement about the topic, contents, and specific objectives of the project/knowledge transfer before applying for the grant. In case their project is selected in the competitive application process the model agreement between HEI and the company is provided but it can be amended and specified provided it fulfils basic requirements as stipulated by the scheme/conditions of the grant. • Length of application time varies. - CfP no. I was launched on 29.5. 2015 and applications could be submitted till 7.3. 2016. Selection of projects was finished in December 2016 and first grants awarded, projects really started in 2017. - CfP no. II. was launched on 24.10.2016, applications could be submitted till 7.2. 2017, selection of projects was finished in July 2017 and grants awarded afterwards. - CfP no. III. was launched on 30.6. 2017 and applications could be submitted till 13.10 2017.
3.8 Partnership finding	There is no common or standard process of establishing the partnership. Both parties have to find themselves/each other by their own effort, usually based on the previous contacts and collaboration (but not in all cases). Programme CLUSTER COOPERATION which was implemented in 2005-2009 by the OP Industry and Enterprise 2004-2006 was one of the sources for academia-industry contacts. Both parties make preliminary agreement and the industry applies for the grant with the HEI being bound to provide the Knowledge Transfer

	Assistant.
3.9 Links with other mobility schemes	There is no other national ISM scheme operational in the Czech Republic. There is no formal link between the H2020 schemes and this national one. There may be, case by case, previous experience of collaboration among the parties involved, but it is not necessary and it is not monitored and information about the previous contacts or participation of one of both parties in other schemes are not collected, reported of known.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	HEIs shall provide supervision and knowledge support to the Knowledge Transfer Assistant which works for/within the company and shall support the Assistant in transferring the knowledge required/anticipated by the industrial company. Coordination is an informal one depending on the agreement between the HEI and the company. Research agenda is negotiated and designed in advance, usually based on previous contacts and mutual experience of both partners. There is no specific allocation of roles of both partners and they may vary considerably, based on the institutional conditions of partners as well as on their previous practices and forms of collaboration. The research agenda is solely designed by both partners, no external agent is influencing it.
3.11 Obstacles in scheme implementation	There are numerous obstacles or difficulties: - HEIs are afraid of losing good PhD students to industry (which is often the implicit objective of the company) - Even if both partners know each other and have cooperated previously it is not easy for the usually young researcher to adapt to the industrial environment and to become part of the company team. It is estimated that it takes about 6-12 months before the issue is settled. - Unlike other projects (e.g. the projects within the OP Research, Development and Education) the HEI must provide finance for the project in advance and is remunerated ex-post for really incurred funds. - The selection process in the first CfP was extremely long even given the Czech environment. It is difficult for the company and HEI to wait such a long time, and for the researcher as well. - Eligibility of expenditures is an issue for both parties – in case of ineligible expenditures which then has to be returned to funding body the HEI and company may have difficulties to cover them from their own resources. - Companies are afraid of very slow administration at the side of HEIs, particularly universities, which may delay already long and complicated administrative process. E.g. whatever is the research team partnering with the company, all legal documents, e.g. agreements, etc. can be signed only by the chancellor. Similarly university lawyers repeatedly change the agreements between the university and the company before it is signed by both parties which makes it difficult for the companies both because of the delays as well as because of the doubts about reliability of the HEI partner. Although the IPR has been mentioned as possible difficulty in cooperation between the company and the university, it is not generally considered as a major issue.
Denmark	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Industrial PhD
1.1 Country /region	Denmark. A national scheme that allows transnational participation from PhD candidates, research organisations and universities, but participating enterprises have to be based in Denmark (can be foreign subsidiaries based in Denmark).
1.3 Reason for selection	The scheme has been successfully operating since 1971 and it has already been the subject of interest from the EU. The Commission took inspiration from the Danish Industrial PhD programme to create and launch the European Industrial Doctorate (EID) under Marie Curie in 2011 with assistance from the Danish Liberal MEP, Morten Løkkegaard. At the time, Denmark contributed DKK 150 mio. (€20m) to the project. Generally, this scheme is thought to work well, but in contrast to the Danish scheme it does not require the company to

	employ the researcher at the end of the programme, nor to contribute to the financing, which is considers to be a deficiency by the Danes.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	Name: Klaus Ammitzbøll, Programme advisor / Hanne Harmsen, Vice Director Organisation: Innovation Fund Denmark Email: klaus.ammitzboll@innofond.dk / Hanne.Harmsen@innofond.dk Phone: +45-6190 5022 / +45-6190 5009
2.2 Promoter / lead organisation (type of organisation)	Innovation Fund Denmark is a public-sector organisation set up in 2014 to provide investment in innovative knowledge and technology for the benefit of Danish society by creating growth and employment. The scheme was previously run by various other organisations, most recently by the Danish Agency for Science, Technology and Innovation (Rådet for Teknologisk Innovation).

2.3 Budget (€)	• The annual budget for Industrial PhD (and Industrial PostDoc, since they are run jointly) is DKK 160mio (+/-€20m) divided between two calls for applications for each programme each year.
	  ○ Public sector share – 50-75% depending on the individual exchange
	  ○ Private sector share – 25-50%
	• Public sector contribution per researcher taking part in the programme varies depending on the project, but there is a max. ceiling of €27,000 per year.

2.4 Funding type and organisation(s)	• National public and private • The funds invested by Innovation Fund Denmark in the ISM scheme emanate from the Danish State, but participating enterprises also contribute, usually with between 25-45% of total expenditure related to the placement/exchange they are involved in.
2.5 Funding mechanism and incentives	• A grant or subsidy is paid by Innovation Fund Denmark to the host company who in turn employs the PhD student for the full three years of their PhD research study (partially funded by the scheme, partially by the firm itself). Employment conditions of the PhD student should be the same as for any full-time employee and the salary in accordance with the collective agreement for PhD fellows employed by the public sector. • The participating university/ research organisation gets a grant to cover their overheads in relation to mentoring, use of research facilities (lab use etc.), course participation and evaluation/printing of the PhD thesis (max €16,000 per year). • An incentive for individual researchers is that they get an industry-oriented education that will give them a much better career basis, a clear advantage given the limited number of PhD posts available at universities. The fact that their research will be used in practice is another highly motivating factor. • Incentives for participating research institutions is that they get funding and an insight into how industry uses research. Additionally, it creates scope for developing new research. • Incentives for participating hosts include getting a highly qualified collaborator to carry out a research project of very high quality at a very reasonable price as well as getting closer relations and cooperation partners within academia.
3 Description of scheme	
3.1 Scheme objectives	The Industrial PhD Programme specifically aims to: • Educate and develop research talent to become industrial researchers • Contribute to business oriented innovation and research in Denmark, • Strengthen the collaboration between Danish enterprises and universities in Denmark and abroad. In more general terms, the programme seeks to increase knowledge sharing between universities and private sector companies, promote research with commercial perspectives, and take advantage of competences and research facilities in private business to increase the number of PhDs.
3.2 Description of inter-sectoral mobility scheme	• The Industrial PhD programme aims to offer doctoral education in cooperation with industry. It consists of a three-year industry-focussed research project and research training programme conducted jointly by a private enterprise, an industrial PhD student and a public research organisation, typically a university. The business model of the participating firm would usually be research-based. The PhD student would be enrolled

	at the university but employed by the firm and would share their time between the two places working on the same project for the benefit of both. Projects can relate to all fields of research as long as they are of high quality and commercially relevant to the enterprise with the potential of creating growth and employment. • Since 2010, it has also been possible for public-sector organisations, institutions and enterprises to get involved in an Industrial PhD project in cooperation with a university/research organisation, as long as the project lives up to the general requirements of the programme. Since this was introduced, there has been considerable interest from public institutions and their participation rate corresponds to around 20% of all hosts. Students and universities of all nationalities may take part.
3.3 Scheme launch date	• The Industrial PhD scheme, originally called the 'Industrial Researcher Programme' was created in 1971 by the Polytechnic University (*Polyteknisk Læreanstalt*). The responsibility for the scheme has subsequently moved around different organisational structures as these were reorganised, until finally it went to Innovation Fund Denmark in 2014, when this organisation was set up.
3.4 Number of participants and other factual information about scheme	• Around 110 researchers take part each year (2015:111, '14:130, '13:110, '12:112). Since the start in 1971 some 2,000 PhDs have been through the programme. Approximately 20-25% of these have been from abroad (compared with around 30-35% of foreigners among 'normal' PhD students in Denmark). • They main institutions involved vary from one project to the next: research institutions/universities from outside Denmark have access to the scheme. Danish public sector institutions can get involved as hosts on the same conditions as private sector enterprises. • Usually researchers divide their time more or less equally between the academic institution and the host company. • The mobility scheme involves a three year period, i.e. covers the full period of the researcher finishing his/her PhD degree.
3.5 Area(s) of industrial research	• Research projects can relate to all scientific fields and research disciplines as long as they are of high scientific quality and is commercially relevant to the enterprise/public sector institution with the potential of creating growth and employment.
3.6 Eligibility requirements to participate	• The candidate should have finished a two-year Master's degree with a minimum result in their dissertation and overall course (10 according to DK grade system). Foreign candidates do not have the same grade requirement but have to be among the best 30% of their year in their field of study. A 1-year Master's degree might be accepted if the candidate has previous research experience. However, the candidates that are typically selected for the Industrial PhD programme tend to have considerable professional experience (on average 4 years) and most come from the Danish Technical University (DTU). There are no requirements relating to age or gender, but the proposed projects should be of high scientific quality and commercially relevant. • The researcher and the research project must offer the host company the possibility of solving specific R&D tasks that create growth and employment and must strengthen the relationship between the business sector and the university and create potential for new research.
3.7 Application and selection process	• Innovation Fund Denmark organises calls for proposals twice a year and they tend to concentrate on a specific sector or specialisation. The initiative can come either from the PhD student, the potential host company or from the university. A survey in 2013 showed that it is mostly the enterprise that takes the initiative (41%, followed by the student (35%) and the university (18%). • The length of the application process is considered to take considerable time and effort, but the above survey shows time varies among applicants – 32% of respondents spent 1-3 months, 29%: 3-6 months and 19%: 6-12 months.
3.8 Partnership finding	• Innovation Fund Denmark organises many information meetings at different universities to promote the programme among students and the university management, but the initiative also frequently comes from enterprises which are keen to get a qualified researcher to join their firm to work on a specific project.
3.9 Links with other mobility schemes	• Innovation Fund Denmark organises a similar scheme for Postdocs (Industrial Postdoc Programme), as well as a number of other programmes that encourage cooperation between academia and industry. Grand Solutions is Innovation Fund Denmark's largest scheme. As the name suggests, the programme focuses on creating innovative solutions and results of value to society that respond to concrete challenges and innovation needs that have been identified, both in the private and public spheres. In order to ensure that

	project goals are achieved, the scheme has a very high ambition level that requires excellent research and very strong teams with the necessary competences to make a difference. There is no shortage of PhD candidates for this programme – it is seen as an advantage to get involved with an attractive company and researchers are able tie themselves for a shorter period than for the Industrial PhD programme (1-3 years). However, there is no demand from Postdocs for this scheme – possibly it is not sufficiently well known by young researchers. • Otherwise, the InnoBooster Programme invests in new ideas that have the potential to create business, i.e. knowledge-based innovative projects developed by SMEs, start-ups or scientists. The investment does not require reimbursement or a share in the business, but the idea should have concrete innovative business potential.
3.10 Governance, support structures and coordination measures during mobility period	• A kick-off meeting is organised with all the new researchers that have been selected. • Innovation Fund Denmark has just launched a new preparatory training component which takes place at Copenhagen Business School. They see the preparation of candidates as an important element in making a success of their individual projects and find it essential that participating researchers get a chance to meet each other and create networks. The new course includes elements like commercialisation, project management, self-management, etc. It lasts a month and will correspond to 5 ECTs. The scheme previously included a preliminary training course which had been inactive for the past few years, before the current training component was launched. • Mentors are appointed both by the university and by the host company to supervise the placement and regular project meetings are organised between the participating partners. Halfway through the placement the PhD has to provide Innovation Fund Denmark with a mid-term evaluation of project progress. • There is a Help Desk number specifically intended for Industrial researchers. An association of Industrial PhD & Postdocs has also been set up to provide professional inspiration by encouraging exchange of experience and network building with regular meetings and talks http://www.erhvervsphdforeningen.dk/
3.11 Obstacles in scheme implementation	• There have not been any specific implementation obstacles or challenges, however some obstacles to participation have been identified both among students and host companies. • Compared to total number of PhD students in Denmark the proportion who take part in the scheme is low (some 4% of all), to some extent caused by a reluctance among candidates to sign themselves up for three years, preferring to do a traditional PhD where they are more free to arrange their commitments as they want. Another hindrance is a lack of any significant prior links with industry leading many candidates to have reservations about choosing that direction. • On the industry side obstacles also relate to the length of time that they have to commit for and the consistency that is required with regard to the funded project; many businesses change strategy quite regularly and it is difficult to find projects that will remain unchanged for a period of 3 years, if the firm's overall strategies shift. Projects tend to spring out of existing relations which then in turn lead to additional new projects. • There is potential for conflicts of interest between the wish of PhD students to publish their work as widely as possible and the host company's potential wish to keep quiet about new developments for commercial and competitive reasons. It is an area that needs genuine consideration and discussion in advance of a project going ahead and all applications have to include a publication plan and the issue is specifically dealt with at the project meetings with all new researchers.
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	Results • Participation in the Industrial PhD scheme is perceived to be very useful for participating students and has a considerable impact on their future career prospects. Getting an industry-oriented education and already having 3 years' practical industry experience will give them a much better career basis than traditional PhDs have, especially as mentioned above in a climate where there the posts available at Danish universities are rather limited. • The programme ensures that more academic researchers end up in industry than has typically been the case. • The scheme has shown very positive outcomes for participants in terms of high employment rates (95-99%) and higher incomes: in 2010 the average annual income

	was DKK 636,000 (€86,000), compared with conventional PhDs whose average annual income was DKK 38,800 lower (€5,250 or 6%)[81]. Industrial PhDs with a degree in social sciences/law earned up to €106,000 on average. Some 80% of Industrial PhDs are employed in the private sector, but if they are employed in the public sector, incomes are the same! • In spite of the advantages only some 4% of all PhD students in Denmark are taking part in the scheme given some of the factors mentioned above (see point 3.11). Impacts • The scheme has created closer links between academia and industry over the years. • According to an 2011 evaluation of the scheme (see link below), the main impacts were summarised as follows: Industrial PhDs earn approx. 7-10% more than regular PhDs and university graduates. They are more likely to be found at the top level of their company's hierarchy 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. The comparison with a control group of highly similar control companies suggests that companies hosting Industrial PhDs would have considerably less positive gross profit and employment developments if they did not participate in the scheme. The study did not find robust differences in productivity between companies having hosted Industrial PhDs and those that had not. However, the relatively high wages of Industrial PhD graduates, on the other hand, indicate that they have high individual productivity. Findings indicate that the programme also has positive effects for participating companies in terms of firm growth and patenting activity. • It is interesting that the rate of mobility and brain drain out of Denmark is limited with few Industrial PhDs choosing to leave for work abroad (only about 7%).
4.2 Monitoring and evaluation	• There have been several evaluations of this programme over the years and some statistics. • 2012 evaluation (EN): https://innovationsfonden.dk/sites/default/files/the_effect_of_the_industrial_phd_programme_on_employment_and_income_v4_1.pdf • 2015 evaluation of public sector Industrial PhD (DK): https://innovationsfonden.dk/sites/default/files/analyse_offentlige-erhversphd-projekter_if-uddrag_april2016.pdf • 2013 Survey among former participants (all 3 groups) (DK): https://innovationsfonden.dk/sites/default/files/erhvervsphd-ordningen-en-videnindsamling.pdf • 2011 evaluation (EN): https://innovationsfonden.dk/sites/default/files/analysis_of_the_industrial_phd_programme.pdf • Programme Statistics: https://innovationsfonden.dk/sites/default/files/erhvervsphd-statistik_28.06.2016.pdf
4.3 Lessons learned	• A number of positive evaluations have shown that the goals initially formulated for the scheme have been met of educating research talent to form a bridge between academia and industry.
4.4 Good practices	• The initial training course (see point 3.10).
4.5 Replicability potential	• The scheme has a high degree of replicability potential, although it will require the availability of a fairly large public sector budget. As mentioned above under 1.3, the scheme has already been the inspiration for creating and launching the European Industrial Doctorate (EID) under Marie Curie in 2011.
5 Additional information sources and keywords	
Other information	https://innovationsfonden.dk/en/application/erhvervsphd
Keywords	Intersectoral mobility, PhD programme, exchange between academia and industry, industrial research

[81] See 2012 evaluations below: Danish Agency for Science, Technology and Innovation: The Effect of the Industrial PhD Programme on Employment and Income, December 2012. Oxford Research A/S

France	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	CIFRE
1.2 Country or countries/region	France. National Scheme.
1.3 Reason for selection	Scheme allows PhD to prepare their thesis in a public lab (university or research institute) or within industry and can be combined with research credits (tax credits for companies conducting R&D); there is also no mobility obligation
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	**Name**: Clarisse Angelier + Valérie Zwilling **Organisation**: ANRT **Email**: angelier@anrt.asso.fr; Zwilling@anrt.asso.fr; **Phone**:
2.2 Promoter / lead organisation (type of organisation)	CIFRE is the Convention industrielle de formation par la recherche: a scheme funded by the Ministère de la Recherche in France, that allows PhD to prepare their thesis in a public lab (university or research institute) or within industry. The CIFRE ISM typically lasts 3 years, and is financed by the State – funds are allocated directly to the industry/company that hires the researcher to work on a research line that is similar to another one in a research centre (university or other) that can support the researcher – and give them a PhD diploma at the end

2.3 Budget (€)	• Total budget has no cap, depends on proposals;
	  ○ Public sector share = €14,000/year, for 3 years;
	  ○ Private sector share = industry must pay the researcher a MINIMUM salary of €23,484/year (including the grant) –meaning that the industry invests at €10,000 / year in the research(er);
	• Typical cost per researcher undertaking intersectoral mobility = at least €23,484/year, sometimes up to €45,000

2.4 Funding type and organisation(s)	• National and regional – France's Ministry of Research
2.5 Funding mechanism and incentives	• *What is the funding mechanism?* grants • *Have any incentives for individual researchers been put in place for the intersectoral mobility scheme?* Yes – CIFRE allows researchers to undergo a subsidized industrial PhD, with a salary of at least €23.000/year. • *Have any incentives for specific institutions been put in place for the intersectoral mobility scheme?* Yes, companies can combine the grant to employ the researcher, with tax credits that the French state offers to companies that undergo R&D in France.
3 Description of scheme	
3.1 Scheme objectives	The objective is to promote R&D investment and efforts in French companies, while strengthening links between academia and industry.
3.2 Description of intersectoral mobility scheme	This scheme allows PhDs or Post-docs to get their first job in industry, by financing 2/3 of her/his salary n a company conducting R&D in a related field of research. Projects can be submitted by all researchers, companies and HEIs.
3.3 Scheme launch date	1981
3.4 Number of participants and other factual information about scheme	• Researchers are expected to spend 20% of their time in the universities of choice, but this is not mandatory/enforced • Grants last 3 years and cannot be renewed.

3.5 Area(s) of industrial research	• Scheme is open across all scientific and research disciplines
3.6 Eligibility requirements to participate	• There is no condition of nationality for the researcher; • Industry and Research Lab need to be French • There can be a third-party industry, with HQ out of France but with a national representation. They can participate if in collaboration with French industry.
3.7 Application and selection process	• All researcher, HEIs and/or industry can start the process. Whichever party initiates the process needs to get the other two stakeholders on board and (collectively or individually) draw a proposal for funding under CIFRE. • Fund allocation process can take up to 6 months.
3.9 Links with other mobility schemes	• This scheme can be combined with existing tax incentives which the French government grants to companies that conduct R&D actions in the country.
3.10 Governance, support structures and coordination measures during mobility period	• The ARNT demands an annual report of developments, to verify that all is going smoothly and according to plan between industry, research centre / univ, and the PhDs. • Regarding trainings and formations, HEIs do that themselves during the PhD program, so the ANRT does not. • ANRT does offer some training ("but by pleasure, not by obligation"). • There is a collaboration contract between the Industry and the HEI that needs to be submitted within the first 6 months. The IPR agreement is done between all parties and should be complete (include provisions of time, sharing, specifications of product/service, etc.) • The ARNT stays out of these discussions (only needs to receive something complete and finalised, independent of the content).
3.11 Obstacles in scheme implementation	• "Not many obstacles" – only that the company needs to have a clear R&D objective to participate (selective applications).
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	• According to ANRT survey, after 5 years most PhDs continue doing research in industry, which is very encouraging and reveals a hands-on skills acquisition that is valued by companies. • Thesis completion rates for CIFRE doctoral students have remained particularly high over the years, at 98%. Company-laboratory-ANRT triple supervision is clearly crucial to its success. • Two-thirds of "former CIFREs" make their career in a company, compared to barely a third of doctorate holders in France in general. • In companies, 64% of those who terminated CIFRE in 2010 were still working on R&D in a company in 2016; this is triple the figure of PhDs as a whole three years after defending their thesis. • The median salary of "former CIFREs" is 23% higher than the average for PhDs recruited by companies. • The vast majority of "former CIFREs" say they are satisfied with their job.
4.2 Monitoring and evaluation	• The ARNT demands an annual report of developments, to verify that all is going smoothly and according to plan between industry, research centre / HEI, and the PhDs.
4.3 Lessons learned	
4.4 Good practices	• Simplicity of setting up and presenting funding proposal • Good funding with hands-off management by the funding org
4.5 Replicability potential	• high replicability potential; easily transferable to other regions, depending of political interest (and available budget) to implement.
5 Additional information sources and keywords	

Other information	Reports: http://www.anrt.asso.fr/sites/default/files/devenir-docteurs-cifre-23112016-en.pdf Q&As: http://www.anrt.asso.fr/fr/faq-7782

Estonia	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Doctoral Studies and Internationalisation Programme "DoRa" (note – only Activity 3 - Training doctoral students in cooperation with businesses involves ISM)
1.2 Country or countries/region	Estonia. National ISM scheme.
1.3 Reason for selection	This industrial PhD scheme operated for 7 years (2008-2015) within the DoRa programme. It involves a period of mobility for 5 months in a foreign country which is an interesting dimension to a mainly national scheme. An evaluation has been carried out of the scheme to assess its effectiveness.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	Name: Anne-Ly Võlli Organisation: Archimedes Foundation Education Agency Email: anne-ly.volli@archimedes.ee Phone: +372 730 0809
2.2 Promoter / lead organisation (type of organisation)	The Archimedes Foundation, an education agency, is the lead organisation. Archimedes is an independent body established by the Estonian government with the objective to coordinate and implement different international and national programmes and projects in the field of training, education and research.
2.3 Budget (€)	• The DoRa programme (2008-2015) was supported through the European Social fund (ESF), which funded the Operational Programme for Human Resource Development 2007-2013, supported by national co-funding. • Total budget for the priority within the HRD Operational Programme funded through the ESF was €32 million. However this covered seven different activities within the DoRa programme and only one activity line related to ISM (a mobility programme within the context of an industrial PhD).
2.4 Funding type and organisation(s) involved in funding	• The scheme was EU financed through the ESF. The Archimedes Foundation Education Agency administered the scheme, using funding from the Estonian Ministry of Education and Research, which administers ESF. • The DoRa scheme involved the award of a double scholarship in which the ESF-financed scholarship provided funding to complement the modest funding available under Estonia's national PhD scholarship scheme.
2.5 Funding mechanism and incentives	• Eligible expenditure under Activity 3 include the student's tuition fees, a monthly stipend and the remuneration of the student's co-supervisor at the company. Supported doctoral student places were be funded on the same terms that apply in relation to doctoral studies under the funding scheme established in Estonia in relation to government-funded provision of higher education. • An incentive was that successful applicants receive a double scholarship i.e. double what they would otherwise receive if they were applying under the national PhD scholarship programme. This made the scheme to apply for an industrial PhD more attractive and encouraged greater competition for places.
3 Description of scheme	
3.1 Scheme objectives	The specific objectives of the ISM component within DoRa (Activity 3 - Training doctoral students in cooperation with businesses) were to: • Assist innovative companies who successfully apply research results, technology and professional design in their services and products by funding the creation of doctoral student places. • Make it possible for universities to train doctoral students in cooperation with businesses. Such partnerships will help to link research with practical problem-solving and to ensure that research results will find practical applications.

3.2 Description of intersectoral mobility scheme	DoRa was initially implemented as a pilot scheme, but subsequently became a full programme to promote intersectoral mobility at domestic level, as well as the internationalisation of researchers at a doctoral level. However, the ISM component within Activity 3 also has an international dimension since all participants were able to participate in a mobility period of up to 5 months. Support was provided for seven different types of activities, including national and international researcher mobility. As noted above, only Activity 3 featured a specific ISM component to foster R&D cooperation between universities and businesses, and to increase the R&D&I intensity of businesses.
3.3 Scheme launch date	2008 (operated until 2015 when it closed due to the end of the 2007-2013 ESF programming period).
3.4 Number of participants and other factual information about scheme	• 52 new PhD places were funded through the programme in total. • Researchers spent the majority of their time (>95%) working in industry where they were employed as industrial researchers. They only spent a limited amount of time in their non-academic host institution. • In addition, participants were able to spend up to 5 months on an international mobility experience as part their PhD, although this could be either intersectoral or not involve such mobility.
3.5 Area(s) of industrial research	• There was a strong sectoral focus to the DoRa scheme (which has been replicated in the follow-up ERDF-funded successor programme in 2014-2020 to promote Smart Specialisation). The six priority areas targeted were: ICT and health, biotech, energy, materials technology and environmental technology.
3.6 Eligibility requirements to participate	• To be eligible to take part in Activity 3, applicants must be employed in an Estonian enterprise for the 4-year duration of their PhD and must be in the process of applying to become a doctoral student. • Successful applicants typically spent the majority of their time working at their employer, with only limited time spent at an Estonian university. • Partner universities must find a suitable partner in industry and assume responsibility for the quality and progress of their studies. • The business where the researcher carries out their industrial PhD must have a reasonable prospect of still being operational in 4 years. It must therefore already have been established for >3 years, and employ >11 people. • PhD students were required to work in one of the six priority sectors identified and researchers must have an employment contract from a company throughout the 4 year duration of their PhD studies.
3.7 Application and selection process	• The majority of the activities allowed final beneficiaries to be selected by the partner institution. In the case of some activities, however, the final beneficiaries had to submit the application directly to the Centre for Higher Education Development (CHED), a unit of the Archimedes Foundation • The application and selection process took up to 6 months.
3.8 Partnership finding	Arkimedes, the education agency, actively engaged in promoting participation in Activity 3 of the DoRa programme and established relationships with academic institutions and with industry.
3.9 Links with other mobility schemes	There were no links between the intersectoral mobility scheme identified and other schemes regionally, nationally and internationally.

3.10 Governance, support structures and coordination measures during mobility period	Regarding support structures, there was no scheme-level support. Rather the main support available for PhD participants was that they had access to both an industry supervisor of their research project and an academic supervisor. Some instances were identified where academic and industry supervisors never met, and others where they met and coordinated on a very regular basis. There may be a link between effectiveness and the extent of cooperation between supervisors. Sometimes there was less interest from supervisors from universities than from industry.
3.11 Obstacles in scheme implementation	Since researchers were required to be employed by a company in an eligible sector throughout their studies, this has posed problems in terms of the participation of start-ups and relatively newly established SMEs due to concerns about risk management relating to the use of ESF funds. The concern among scheme managers was that there is a high failure rate among start-ups and it is also difficult for smaller firms (e.g. micro and small) to commit to maintaining funding for researchers throughout a 4 year PhD.
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	Results 52 new PhD places were created. In order to graduate from the PhD scheme, participants had to meet the formal requirement of having had three published articles, but this related to the mandatory requirement in the Estonian law on PhDs rather than to the scheme itself. Regarding employment outcomes, there is a lack of data available on the employment destinations of participant PhD students, but programme managers interviewed believe that most students upon becoming post-doctoral researchers remained at their employer, with the exception of some of the women that dropped out of the PhD course for reasons relating to challenges in women returning to the PhD post-maternity leave. With regard to the sustainability of impacts, a follow-up programme has been funded focusing on Smart Specialisation. The programme will help to ensure follow-up to DoRa I which will be funded using the European Regional Development Fund (ERDF). In addition, the DoRa plus programme will also be supported using ERDF (http://haridus.archimedes.ee/en/dora-plus-programme). However, the actions supported for the latter do not involve ISM. Rather they relate to other kinds of research-related outgoing and incoming mobility.
4.2 Monitoring and evaluation	An independent evaluation of the programme took place in 2016. Among the weaknesses are that 50% of respondents would have taken up a nationally-funded PhD anyway. The main reasons they took it up was that researchers applied for the scheme was they were already working in an enterprise but wanted to combine work and study in parallel. Participants perceived that in addition to the benefits of received additional funding through a double scholarship, more opportunities would open up from their PhD as a result of taking part in DoRa due to the 5 month international mobility component. Further evaluation findings were that the scheme has been very successful overall, but there are ways in which it could have been improved, such as: involving more companies that have not previously participated in EU funding schemes or cooperated closely with universities before. Universities and industry were found to differ in terms of their expectations from taking part in the scheme. Universities were mainly interested in what new funding the scheme could bring which would enable them to deliver taught short courses to industrial PhDs. Industry was more interested in the potentially useful research outcomes from their employees undertaking PhD level researcher whilst remaining at the enterprise.
4.3 Lessons learned	• Keep the scheme as flexible as possible and at the design stage, avoid having overly prescriptive rules. • Accordingly, the eligibility rules have been kept as basic as possible (see description under section on eligibility)

4.4 Good practices	Among the good practices identified were: • The scheme combines elements of international and intersectoral mobility, since all PhD students are guaranteed the opportunity to study abroad for a period of a minimum 5 months. • The importance of incorporating flexibility into scheme design. • The advantages of aligning sectoral eligibility criteria to meet the national economy's needs in small countries (e.g. tying in eligible research topics to national priority sectors).
4.5 Replicability potential	• Strong scope for replicability i.e. for other countries to use either ESF or ERDF funding in order to support ISM. However, the specific sectors that Estonia has focused on would need to be adapted to the country in question, depending on their sectoral strengths and on the priorities identified in their Smart Specialisation strategies.
5 Additional information sources and keywords	
Other information	The DoRa programme https://www.ttu.ee/studying/tut_admission/scholarships/scholarships-for-phd-students-5/dora-programme-5/ Brochure regarding the doctoral studies and internationalisation programme DoRa - www.ut.ee/sites/default/files/www_ut/oppimine/dora_eng_2010.pdf Study on Researcher Mobility in Estonia and Factors that Influence Mobility - http://www.cs.ioc.ee/excs/policy/teadlasmobiilsus-en.pdf Evaluation of the DoRa programme –only available in Estonian from Archimedes upon request.
Keywords	Intersectoral mobility, international mobility, ESF, ERDF.

Greece	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Industrial Research Fellowship Programme at NCSR Demokritos
1.2 Country or countries/region	Programme with national scope, nevertheless it may include transnational intersectoral mobility.
1.3 Potential good practice?	The programme is new and has not been evaluated yet. It is a good practice for the Greek situation.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: **NCSR Demokritos** Address: **Patr. Gregoriou E & 27 Neapoleos Str, Agia Paraskevi, Greece** Phone: **0030 210 650 3022,** Email: **smagki@central.demokritos.gr**
2.2 Promoter / lead organisation (type of organisation)	Research institute
2.3 Budget (€)	• Total budget 5.5 million euro o Public sector share 4 million o Private sector share 1.5 million funded from the participating industries • Typical cost per researcher undertaking intersectoral mobility (total during mobility period) 48,000 for Phd researchers (4 years) 85,550 for postdoc researchers (3 years) 147,200 for adjunct researchers (4 years)
2.4 Funding type	• National private
2.5 Funding organisation(s)	• Public share 4 million funded from Stavros Niarhos Foundation (private foundation). • Private share 1.5 million funded by the participating companies.
2.6 Funding mechanism and incentives	• Scholarship that funds the researcher's salary for 4 years, plus some travel expenses for presentations and publications, consumables and other expenses. • The incentive for the researchers is the scholarship. • The incentive for the participating companies is the possibility to have a highly qualified researcher undertaking a research project. The company can benefit from the expertise and knowhow of the researcher and from developed patents. • There is frequent communication and cooperation, between the researchers, the companies and the NCSR Demokritos.
3 Description of scheme	
3.1 Stated objectives of scheme	From the side of the managing authority the objective is to fight unemployment of researchers and minimise the brain drain. From the side of companies, the objective is to acquire expertise and know-how in their area of business and have access to high qualified staff. Companies with their own research capacity have also the objective to create exploitable products and services and new patents.
3.2 Description of intersectoral mobility scheme	The ISM scheme is a scholarship for industrial research. The grant supports the provision of scholarships for industrial doctorate degrees and fellowships for industrial post-doc positions or Industrial Adjunct Researchers over a 3-4 year period. The grant provides remuneration for the participants for 3 years, plus expenses for travelling and attending European conferences. The company funds one year of the researcher salary. The industrial research is carried out by the cooperation between the National Centre for Scientific Research "Demokritos", one HEI in Greece or another country and an industrial enterprise. During the four years period, researchers spend 1 year at the cooperating industry. The grant scheme is funded by the Stavros Niarchos Foundation. The research should be in one

	of the fields of Demokritos. The National Centre for Scientific Research "Demokritos" was established in 1960 in Athens and is the largest multidisciplinary research centre in Greece and is supervised by the General Secretariat of Research & Technology. Its expertise lies in the fields of Nanotechnology, Energy & Environment, Biosciences, Particle and Nuclear Science, Informatics and Telecommunications. Its research activities are currently coordinated by five Research Institutes: a) Informatics & Telecommunications, b) Biosciences & Applications, c) Nuclear & Radiological Sciences & Technology, Energy & Safety, d) Nanoscience & Nanotechnology, and e) Nuclear & Particle Physics
3.3 Scheme launch date	2016
3.4 Number of participants and other factual information about scheme	• *Number of researchers per year participating in scheme*. 59 researchers **were selected in 2017. There are remaining funds for 10 researchers.** • *Main institutions*. NCSR Democritos is managing the scheme. Stavros Niarchos Foundation funded the scheme. • *What % of time is being spent by researchers in the non-academic host institution during the mobility period?* One third of the four years, on average. • *Duration of intersectoral mobility period*. The researchers spend one third of the time in the company on average. This period can be arranged for shorter periods, throughout the duration of the project. The arrangement of the time spend in the industry depends on the project, on the research capacity of the industry and it may vary a lot.
3.5 Area(s) of industrial research	• The scheme is open to the scientific disciplines of NCSR Democritos : a) Informatics & Telecommunications, b) Biosciences & Applications, c) Nuclear & Radiological Sciences & Technology, Energy & Safety, d) Nanoscience & Nanotechnology, and e) Nuclear & Particle Physics
3.6 Eligibility requirements to participate	• The scheme funds three different levels of researchers: PhD, postdoc and adjunct researchers. • There are no other requirements regarding eligibility.
3.7 Application process	• The researcher has to present a research proposal in collaboration with a company, the NCSR Democritos and a HEI. The contacts are usually initiated by the researcher who contacts either the company or the research institute first. • The application process takes five months. The call for proposals was published on 30th of December 2016, the deadline for the applications was on 21st of March 2017 and the selection results were announced on May 2017.
3.8 Partnership finding	• Partnerships are built mainly through informal networks and contacts of the researchers themselves.
3.9 Links with other mobility schemes	• This is an independent scheme.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	• Supervision and monitoring is described in the research proposal and is part of each research project design. • There is frequent communication and meetings between academic and non-academic PhD supervisors. The research agenda is developed in collaboration between the researcher, the academic supervisor from Democritos and the mentor from the company.
3.11 Obstacles in scheme implementation	The main obstacle is to persuade companies to join the scheme and to invest in money, as they need to co-fund the salary of the researcher for one year. Another obstacle is the Greek institutional framework, which is not friendly for this type of programme. The IPR was an issue for the large companies. Although there is legislation in Greece for IPR management, the large companies want to retain IPR and exploitation rights of the research outputs. In most projects, there is a prior agreement for IPR.

Hungary	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Involving PhD students into industry initiated software-engineering projects (Ericsson, NOKIA Siemens, ELTE, BUTE)
1.2 Country or countries/region	The scheme is a transnational intra-EU intersectoral mobility scheme.
1.3 Reason for selection	The goal of the EIT Digital Doctoral School (DSL) is to develop the ICT Innovation concept, where doctoral candidates are offered the opportunity to acquire a mindset for Innovation and Entrepreneurship (I&E). After graduation, these PhDs will be commercially aware ICT leaders who understand current and future challenges, as well as the opportunities that these present to industry. To achieve this goal, the EIT Digital Doctoral School organises Innovation and Entrepreneurship (I&E) education that complements the ordinary doctoral studies of the candidates. Main added value of the EIT Digital Doctoral programme is creating awareness of the role of business in technology realization; offering students practical training and experience in a business context and providing students with the experience of starting up new ventures or new business activities.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: EIT Digital Budapest Associate Partner Group (Dr. Zoltán ISTENES director) Address: 10/A Bogdanfy utca, HU - 1111 Budapest Phone: +36.1.381.2299 Email: zoltan.istenes@ictlabs.elte.hu https://hu.wikipedia.org/wiki/EIT_ICT_Labs_Budapest_Associate_Partner_Group http://budapestictnetwork.elte.hu/language/en/
2.2 Promoter / lead organisation (type of organisation)	EIT's Knowledge and Innovation Centres and Co-Location Centres The European Institute of Innovation and Technology (EIT) created in 2008, is a leading European Innovation Organisation, a unique EU initiative that spurs innovation and entrepreneurship across Europe through doctoral programmes. EIT is a part of H2020 programme The main headquarter of EIT is in Budapest, Hungary. The Budapest Associate Partner Group is leading one of the EIT Knowledge and Innovation Community (KIC) and Co-location Centres in Budapest and actively integrates R&D, higher education, and industry into a network. ELTE and BUTE, as the two strongest Hungarian universities in ICT higher education, give a significant cohort of students to the EIT Digital Doctoral School programme.
2.3 Budget (€)	Total budget: Public sector share -3.2 million EURO funding from the National Development Agency and Research and Technology Innovation Fund of Hungary since 2012 82 -4.6 million EUR from EIT Digital since 2012 In 2012, the Hungarian State, more particularly, the National Development agency and the Research and Technology Innovation Fund, issued a call for promoting Hungary's participation in the EIT KICs. In this call for proposals, the EIT ICT Labs Budapest Associate Partner Group received HUF 1 billion funding from the State. The funding has been used to set up the local co-location centre and served as a carrier for the research projects complementing the EIT funded catalyst projects.
2.4 Funding type	• National public • EU-funded • Other

2.5 Funding organisation(s)	EIT has an investment model in its structure of financing. EIT funding (the so-called catalyst 25%) is allocated to the value-adding actions leading to a particular innovation, whereas the non-EIT funding (the so-called carrier 75%) may be of different types, coming from national governments, industry or other EU sources. The financial support of the Research and Technological Innovation Fund helped to kick-off other, particularly EU-funded projects in Hungary. EIT funding: The European Commission through H2020 program. Non-EIT funding: Hungarian Government to the EIT Digital Budapest Associate Partner Group. The EIT Digital Budapest Associate Partner Group is a consortium of two local universities – namely, Eötvös Loránd University (ELTE) and Budapest University of Technology and Economics (BUTE, former name BME) – and their leading industrial partners (consortium partners: Ericsson Hungary, Magyar Telekom; cooperating partners: Cisco Systems Hungary, Nokia Solutions and Networks, and General Electric Healthcare). The group is supported by the cooperation of MTA-SZTAKI (Institute for Computer Science and Control of the Hungarian Academy of Sciences) and ELTE-Soft Nonprofit Ltd.
2.6 Funding mechanism and incentives	The EIT ICT Labs Budapest Associate Partner Group follows the EIT's investment model in its structure of financing. EIT funding (the so-called catalyst) is allocated to the value-adding actions leading to a particular innovation, whereas the non-EIT funding (the so-called carrier) covers complementary activities, including research, education, and business. The ratio of EIT-funding to the non-EIT funding is 1:4. The non-EIT funding must come from different sources, e.g. the partners' own resources, other EU funding, national/regional funding, and private funding (e.g. donations). Funding for mobility and I&E provided by EIT ICTLabs is 50k euro per student.
3 Description of scheme	
3.1 Stated objectives of scheme	The mission is to foster economic growth and enhance quality of life for European citizens. EIT Digital Doctoral Schools mobilise a pan-European ecosystem of 18 leading European Technical Universities, 130 top European corporations (large companies, SMEs, scaleups and research institutes) in 7 Doctoral Training Centres in Europe (Trento, Paris, Madrid, Budapest, Helsinki, Rennes, Sophia Antipolis). Budapest universities were among the first with a significant number of PhD students joining this education. The EIT Digital Doctoral School offers a new kind of doctoral programme based on the deep expertise in key digital areas together with a strong background in Innovation and Entrepreneurship. It creates a unique experience combining research, innovation, entrepreneurship, industry involvement and pan-European mobility. EIT Digital Doctoral School invests in strategic areas to accelerate the market uptake of research-based digital technologies focusing on societal challenges strategic for Europe. EIT Digital also breed T-shaped entrepreneurial digital talent focused on innovation through a blended education strategy. The Doctoral School on ICT Innovation features three specific elements: – Hands-on Innovation and Entrepreneurship Education consisting of two phases; Business Competence phase followed by a Business Development Experience – Mobility; six months of geographical mobility and six months of organisational mobility – Thematic alignment of the I&E thesis to the Innovation Areas of EIT Digital. Budapest DTC provides in cooperation between Eötvös Loránd University (ELTE) and Budapest University of Technology and Economics (BME) a unique opportunity for young researchers who wish to pursue PhD studies, especially in communication software and system performance in an innovative environment in close cooperation with industries.

	Budapest DTC offers a doctoral education which provides full integration of both technical and business aspects of ICT.
3.2 Description of intersectoral mobility scheme	The ISM programme is running in the EIT Digital Doctoral Training Centres (DTC) in Budapest, Helsinki, Madrid, Paris, Rennes, Sophia Antipolis, Trento. The Budapest Doctoral Training Centre (BDTC) has been active since 2012, providing a unique opportunity for excellent PhD students in communication software and system performance. A doctoral education provides full integration of both technical and business aspects of ICT. Its purpose is to activate startups, to provide opportunities for students, and to empower the academic and research sector in 8 focus countries. Within the scouting and mobility activity, the programme aims at establishing connections with universities, research institutions, and companies and helps local researchers, professors and students to become partners of international EIT Digital projects. The EIT Digital Industrial Doctorate is a new PhD programme that integrates scientific and technical research work with 'hands on' innovation and entrepreneurship training. Geographical mobility (6 months) as well as an internship-based business development venture (6 months) are fully embedded within the doctoral work. The DTC ensures that a business partner participates in the mentoring of each doctoral student. Furthermore, the DTC contributes to and facilitates the implementation of the Innovation and Entrepreneurship (I&E) education required by the EIT Digital Doctoral School and works proactively to promote cross-node mobility. The role of the DTC is also to actively support doctoral students' driven entrepreneurial efforts.
3.3 Scheme launch date	The Scheme was established in 2009 under EIT ICT Labs, and it was rebranded as "EIT Digital", as a leading European player in innovation and entrepreneurial education. EIT Digital Budapest has created his own Budapest Doctoral Training Centre (DTC) and Intersectoral Mobility programme in 2012.
3.4 Number of participants and other factual information about scheme	Since the Budapest Doctoral Training Centre (DTC) started, 31 doctoral students have been enrolled in the programme in Budapest, which is the highest number of PhD students among the EIT Digital DTCs (25% of total). (2017 January data). The Business Competence courses are followed during the doctoral studies and amount to a study load of 30 ECTS. The Business Competence phase consists of three components: Opportunity Recognition (one week); Business Modelling and Development (15 weeks); Growth and Harvest (one to two weeks). The Business Development Experience provides six months of organisational mobility to work in a business-driven environment. It can be either an internship period at a large company or SME, or with a startup in an innovation-friendly place, such as an incubator. The Business Development Experience is assessed with an I&E thesis, written in English. EIT Digital grants and adds the EIT Label to the PhD degree. Joint proposals from several industrial partner companies are welcome. Co-financing from sources outside EIT Digital should in all cases amount to at least 50%. Proposed thesis topics should come from a Partner Company (or Partner Companies) and address its future plans to ensure market and industrial relevance. Thesis topics must substantially align with EIT Digital Innovation Action Line activities. Thesis topics and work should be discussed at an early stage with a Partner University Academic Supervisor to allow for a PhD degree of the highest scientific and technical quality. Industrial Doctorate Students are employed either by a Partner University or a Partner Company. In both cases, the Industrial Doctorate Student must be enrolled as a PhD Candidate at the Partner University.
3.5 Area(s) of industrial research	The theme of the Budapest Doctoral Training Centre is tightly linked to the action lines Networking Solutions for Future Media and Internet Technologies and Architectures. Aim of the DTC is to develop powerful and open new ICT infrastructure, capable of delivering

	rich data-intensive storage services, at competitive costs, across administrative domains, ensuring quality of service, to end users in various contexts of use. The Budapest DTC's theme focuses on the development of new communication and networking architectures. The companies and the universities involved in the co-located academy-industry cooperation are situated in Infopark, which is the first innovation and technology park of Central and Eastern Europe. It is an innovation centre primarily for IT, telecommunication and software development companies.
3.6 Eligibility requirements to participate	The call for recruitment is open to all the students who are in the first year of their Ph.D. at one of the Universities which signed the declaration access, who are interested in the EIT Digital Innovation and Entrepreneurship (I&E) programme and who will work on a topic aligned with those of the local DTCs and Innovation Areas.
3.7 Application process	Each position has a specific application process and deadlines. The applications must be submitted to the relevant partner university and DTC indicated in the description of the position. The application will then be evaluated by the university admission committee, according to local rules, and by the EIT Digital selection committee. The procedure for application and selection is published with the PhD positions announcements on the DTC websites as Call for students and Call for Partners regularly.
3.8 Partnership finding	EIT Digital organise their innovation and education activities in and around their co-location centres, where students, researchers, engineers, business developers and entrepreneurs come together to drive the digitalisation of society. EIT Digital organise internal and external events and competitions, like IDEA Challenge or EIT Digital Awards regularly and they also join to international networking events, like Startup Europe to enlarge the EIT Digital network among the various types of stakeholders.
3.9 Links with other mobility schemes	Within EIT, EIT Digital KICs is touched with all other KICs (Climate, Energy, Health, Raw Materials). On a European level, EIT Digital engages with a number EU ISM related programmes, like ERC or support networks, like EURAXESS, that leverage its pan-European scope.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	The EIT Digital Doctoral School Budapest is organised/managed by the EIT Digital Budapest Associate Partner Group. The DTC is headed by a DTC Lead. The DTC Lead is supported by an Advisory Committee which gives advice on the technical profile of the DTC, the business partnership, specific DTC activities, doctoral candidates admission and examination. The DTC is located in the EIT Digital Co-Location Centre (CLC) and work in close cooperation with another CLCs to exploit the local innovation network. The DSL educate the doctoral students with a direct involvement of companies through direct participation of companies in the selection process and presence of an industrial mentor who collaborate with the academic advisor, work on projects of interest for the companies and a period of 6 months in a company.
3.11 Obstacles in scheme implementation	No real obstacles are encountered in the implementation of the ISM.

Ireland	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	SFI Research Centres
1.2 Country or countries/region	The 16 SFI Research Centres each have a physical location in Ireland. They aim to attract scientists and engineers from across academia and industry. As part of the collaboration between academics (at post-doctoral level) and industry there is some intersectoral mobility, depending on the circumstances of particular research projects. The aim is also to use the research centres as a vehicle for getting more researchers to gain employment in industry. Those working in and with the centres are predominantly from Ireland, but may be from anywhere.
1.3 Reason for selection	The research centres, established in 2012, are similar to centres established in other Member States as a focus for research and innovation, especially in areas of advanced technology. They represent a different model for the interaction of academia and industry from conventional mobility schemes.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	Organisation: Science Foundation Ireland Wilton Park House, Wilton Place, D02 NT99, Ireland Email: info@sfi.ie Phone: + 353 (0)1 607 3200
2.2 Promoter / lead organisation (type of organisation)	Science Foundation Ireland is a Foundation, established in 2000, by the Irish Government to administer Ireland's Technology Foresight Fund. The SFI Research Centres Programme was launched in 2012

2.3 Budget (€)	For each centre, funding can be at a level of between €1-5 million per year in direct costs for a total of 6 years.
	• Total budget: € 1 – 5 million p.a.
	  ○ Public sector share : up to 70%
	  ○ Private sector share: at least 30%

2.4 Funding type and organisation(s)	Funding streams: • National public – the Irish government through SFI • National private – industry funding • Private – international companies • EU-funded research projects – mainly Horizon 2020
2.5 Funding mechanism and incentives	The funding is provided to SFI by the Irish government. Centres are established after periodic calls for proposals on the basis of a grant from SFI, but research centres are expected to raise at least 30% of their finding from industry sources. Additional funding is brought in, especially from Horizon 2020, as funding for individual projects. Individual researchers are attracted to the research projects undertaken. Initially they are employed on contracts with the sponsoring Higher Education Institutions, but SFI has an aim of having 50% of post-graduate students associated with research centres (and other SFI schemes) being employed in industry at the end of their course.
3 Description of scheme	
3.1 Scheme objectives	A key objective of the scheme is to create research centres that will consolidate research activities across Irish Higher Education Institutes in order to create a critical mass of internationally leading researchers in strategic areas who in turn become a magnet for industry and lay the foundation for effective and productive academic and industrial partnerships. In terms of the mobility between academia and industry, the centres aim both to attract researchers from industry, but also to move research to higher TRLs, create spin-offs and

	train research staff that can move into industry.
3.2 Description of intersectoral mobility scheme	The research centres have had some success in training and educating a cohort of engineers and scientists at MSc/MEng, PhD and post-doctoral level that are able to take up high-value employment in MNCs and SMEs. Around one third of students working with the research centres currently move on to employment in industry and SFI aims to raise this to at least 50%. Rather than encouraging movement of individuals between academia and industry (although this does happen as a result of the research centres), the main aim is to develop structures where general mobility between the sectors becomes more usual.
3.3 Scheme launch date	Research centres (now 16 in total) have been set up in response to a series of calls for proposals, since the scheme was launched in 2012.
3.4 Number of participants and other factual information about scheme	The scheme is contributing to Ireland's Innovation 2020 strategy, which aims to increase the enrolment of postgraduate researchers from 1,750 to 2,250, and deliver a 30% increase in the number of funded post-doctoral researchers. All research centres are currently hosted by Irish Higher Education Institutions (universities and Institutes of Technology).
3.5 Area(s) of industrial research	Research centres each focus on a specific industrial area or technology, including: Advanced Materials and Bio-engineering, Applied Geosciences, Medical Devices, Data Analytics and Future Networks and Communications The scheme tends to promote product and process innovation.
3.6 Eligibility requirements to participate	Recruitment of researchers to work in or with the centres is by the participating HEIs or firms. The posts are at different levels (MSc/MEng, PhD and post-doctoral), but there is keen competition for the research places.
3.7 Application and selection process	Application to establish research takes some time, involving an initial submission of an abstract, submission of pre-proposals: and finally a submission of a full proposal. For the last call this process lasted from March to November 2016. Applications by individuals to work in a research centre follow the usual application procedures of the HEIs and commercial organisations that participate.
3.8 Partnership finding	Research centres have been successful in attracting industry involvement and in creating their own spin-offs. The industrial partners therefore come to the centres and may employ research staff as part of their arrangements with the centres.
3.9 Links with other mobility schemes	One of the aims of the research centres is to bring together research initiatives in a single point of focus. This includes making use of other funding opportunities, including EU and national mobility schemes, while also making these other schemes more fruitful. Consequently, they are very complementary.
3.10 Governance, support structures and coordination measures during mobility period	Researchers who work in research centres are usually employees, either of the host HEI or of another co-operating in the joint research projects. Or they may remain employees of industrial partners. Whichever is the case, they enjoy the support of their employing organisations. Co-ordination between the academic and industry sides of the research is achieved within focused projects.
3.11 Obstacles in scheme implementation	Research centres have gradually been moving to higher TRLs and consequently greater engagement with industry. However, this process is taking time and the full benefits have yet to be realised. IPR is generally owned by the HEI, but arrangements have been made with industry on a case-by-case basis. There have been some problems, however, especially with SME participants.
4 Impacts and replicability potential	
4.1 Outcomes	Results

(results and impacts)	The following results have been achieved by the research centres: • Over 500 collaborative research agreements have been signed with 300 companies. • The centres have secured €50 million in co-funding from industry for collaborative research. • Currently around 32% of those trained in the research centres are employed immediately by industry. • 14 spin-out enterprises have been created to date. • SFI Research Centres account for 33% of Ireland's total H2020 funding: up to June 2016 over €100 million EU funding was secured. • 18 of the 40 Irish-based European Research Council awardees are researchers in SFI Research Centres (29 Awards). • Centres are a focus for attracting talented international researchers – 7 of the recently recruited SFI Research Professors are associated with SFI Research Centres. <u>Impacts</u> The research centres build long-term relationships with industry, of which recruitment by industry and mobility in the other direction are only a part. The longer terms outcomes are therefore a more stable engagement of HEIs with industry providing a more substantial basis for mobility. The creation of spin-offs is one of the ways that research centres encourage the exploitation of the research they undertake. More spin-offs can be expected in the future.
4.2 Monitoring and evaluation	SFI conducts periodic reviews of all its operations and publishes a report. The 2015 report credited the research centres with achieving a marked increase in the co-operation between HEIs and industry. The review builds on systematic monitoring processes, such as the annual Research Outputs exercise, which among other things monitors the destinations of researchers funded by SFI. This is the basis of the figures for industry take-up of researchers.
4.3 Lessons learned	The research centres approach can be a highly effective way of increasing academic engagement with industry, including mobility from HEIs into industry. It therefore represents a much more systematic approach to improving mobility
4.4 Good practices	Good practice features include the coherence and consistency in the systematic approach to building relationships between academia and industry and the specific aim (and monitoring) of increasing the take-up of researchers by industry.
4.5 Replicability potential	A number of EU Member States have research centres that are similar to those that operate in Ireland. The theme of the transfer of researchers to the industrial sector is less immediately apparent in other countries, but could easily be given a higher profile elsewhere.
5 Additional information sources and keywords	
Other information	http://www.sfi.ie/sfi-research-centres/
Keywords	SFI research centres

Italy	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	CORIMAV scheme in Milan
1.2 Country or countries/region	Italy. Scheme implemented locally in Milan.
1.3 Reason for selection	The scheme is entirely privately funded, but with in-kind support from the Milano Bicocca University[83], it has been operating for an extensive period since 2001, and has been adapted to meet the changing needs of the participants. It involves close academic-industry cooperation using ISM as a mechanism to promote broader forms of research collaboration.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	Name: Gianfranco Pacchioni Organisation: The University of Milano-Bicocca Email: gianfranco.pacchioni@unimib.it
2.2 Promoter / lead organisation (type of organisation)	The scheme involves cooperation between Pirelli and Bicocca University. The industry-academic consortium agreement between Pirelli and Bicocca University is renewed once every 5-6 years and was most recently renewed in 2017. A board has been established which is responsible for taking key strategic decisions regarding the scheme including overseeing spending of its annual budget.
2.3 Budget (€)	Whilst the total scheme costs are confidential, the approximate costs can be estimated. In any one year 9 PhDs are funded (3 new PhDs and 6 ongoing PhDs in their second and third year). The salary of a PhD in Italy is €18,000/ year or circa €50,000 for a full PhD. This implies annual funding of €162,000 plus any administrative costs. It should however be noted that the costs of PhDs are relatively low compared to other countries. CORIMAV also supports the salary costs of a full-time researcher position, with a cost of 50,000 Euro/year. The researcher position is higher than a post-doc and assumes a key role in supervising the activities and ensuring regular scientific research related contacts between Pirelli and the university. In addition, there are also running costs for laboratories and for research experiments.
2.4 Funding type and organisation(s)	• Private funding but with university in–kind support In terms of cash funding, the scheme is entirely privately funded by Pirelli. However, in-kind financing contribution has been provided by the university by making research, infrastructure personnel and administrative support available to help support the scheme's implementation.
2.5 Funding mechanism and incentives	PhD students obtain a grant covering their salary for the full duration of a three year PhD.
3 Description of scheme	
3.1 Scheme objectives	The evolution in scheme objectives over time is interesting. The initial objective was to "develop cutting-edge technologies in the field of new materials, to support research and experimentation with the aim of producing patents, and to promote initiatives for training and professional updates for new researchers". The first phase of the CORIMAV programme provided scholarships aimed at three principal areas: nano-composite materials, energy transfer (superconductivity and distributed generation) and molecular modelling. The consortium has evolved over the years, as have the research aims and needs of Pirelli as the company itself evolved and split into two separate companies. Since

[83] The ***University*** of ***Milano***-***Bicocca*** is a public ***university*** located in ***Milan***, Italy, providing undergraduate, graduate and post-graduate education. Established in 1998, it was ranked by the Times Higher Education 2014 ranking of the best 100 ***Universities*** under 50 years old as number 21 worldwide and first in Italy

	2010, research is therefore increasingly focused on tyre production. The rationale for this is that when the scheme was set up, Pirelli had two divisions, tyres and cables with research labs but the firm now has an exclusive focus on tyres. In the last six years, CORIMAV has transformed itself into the preferred mechanism to channel knowledge and resources between the university and the company.
3.2 Description of intersectoral mobility scheme	The CORIMAV scheme in Milan, Italy, was established in 2001. The scheme is targeted at PhD students seeking to develop a career in industry. Pirelli, the tyre company, finances PhD fellowships for Materials Science students at the Bicocca University (a relatively new university, which is only 20 years old). The scheme has now been operating for 17 years. When the scheme began, CORIMAV was a one year post-doctoral fellowships programme, with 5-6 fellowships awarded per year. This approach worked for the first 5 years, but a transition was subsequently made towards funding full 3 year industrial PhDs. The rationale was that this allows Pirelli to stipulate industry-relevant research topics relating to tyres and to fully exploit the research outcomes. Since 2010, the focus has shifted to working only on technologically–relevant research.
3.3 Scheme launch date	2001
3.4 Number of participants and other factual information about scheme	• Between 2001 and 2016, 44 student scholarships and 36 doctoral scholarships were supported. • When the scheme started, the focus was mainly on attracting applicants from materials sciences, but today the target group is broader and open to PhDs in other disciplines including biotechnology, environmental and computer sciences. • Whereas 5-6 fellowships were awarded per year for the one-year fellowships, following the transition to a 3 year PhD, 3 new PhD Fellowships schemes are supported each year (meaning 9 ongoing PhDs) • During their mobility period, PhD students spend 50% of their time in industry and 50% at the university working to undertake research part-time at both. • Duration of intersectoral mobility period – formerly one year under the previous arrangements to fund post-doctoral research fellowships but now supporting full 3 year PhDs.
3.5 Area(s) of industrial research	• The scheme is focused on materials science and research and innovation into advanced materials historically. However, the research and technological development needs of Pirelli have evolved over time. • In the past 6 or 7 years a broader range of scientific and research disciplines are relevant to the company's research activities, including materials science, but also computer sciences, environmental sciences etc.
3.6 Eligibility requirements to participate	• Applicants must wish to study for an industrial PhD scheme. • There are no other specific requirements.
3.7 Application and selection process	• Applications are made annually and three PhD Fellowship awards are made. • The application and selection process takes a couple of months.
3.8 Partnership finding	• PhD candidates become aware about the scheme run by Pirelli easily since Pirelli and the Materials Science Department are co-located at the same site.
3.9 Links with other mobility schemes	• None
3.10 Governance, support structures and coordination measures during mobility period	Scheme management and governance: The industry-academic consortium agreement between Pirelli and Bicocca University is renewed once every 5-6 years and was most recently renewed in 2017. A board has been established which is responsible for taking key strategic decisions regarding the scheme including overseeing spending of its annual budget. Supervision of PhD students: Measures are in place to ensure that all PhD students benefit from having both an academic and an industrial supervisor. There is some degree of

	coordination between the academic and non-academic PhD supervisors. Skills development and training: The university's doctoral school provides taught courses to PhD students on management, IP and bringing products, innovations and ideas to the market.
3.11 Obstacles in scheme implementation	No major obstacles to implementation were identified, other than the need to gradually overcome the cultural challenges between a university and a company setting which requires time.
4 Impacts and replicability potential	

4.1 Outcomes (results and impacts)	• **Scheme participation:**
	  ○ Between 2001-2016, 44 student scholarships and 36 doctoral scholarships were supported.
	  ○ Whereas 5-6 fellowships were awarded per year for the one-year fellowships, following the transition to a 3 year PhD, 3 new PhD Fellowships schemes are supported each year (meaning 9 ongoing PhDs)
	  ○ Around 20% of fellowships historically were hired but since 2010 and the recovery from the crisis 40-50% of scholars have later been hired by Pirelli. The most recent two PhD scholars were both hired and their research contributed to two patent applications on new materials for tyres to reduce energy consumption;
	• **Impact on employability:** Although there are no statistics available on the employability of PhD graduates completing PhDs, industrial PhDs are attractive to industry and Pirelli has recruited many of those completing the scheme.
	• **IPR:** Since the scheme was set up, approximately one patent has been filed per year. Patents are registered as co-patents with the University as a co-inventor but Pirelli has the right to buy out the industrial rights and to compensate the inventors.
	
	In terms of the longer-term scheme outcomes, both the academic and industry side are highly satisfied with their participation in the scheme. Since the restructuring of the scheme in 2010, CORIMAV has transformed itself into the preferred mechanism to channel knowledge and resources from the university to the company and vice versa. The CORIMAV scheme is viewed as being an integral part of a wider strategy of the appreciation and promotion of knowledge and innovation that the University of Milano-Bicocca and Pirelli, together with other partners, are producing through the Bicocca District project, which consists of a new network of institutions and companies committed to developing the exchange of skills and opportunities and the development of services and the growth of human capital.

4.2 Monitoring and evaluation	No external evaluations have been undertaken but the Board established regularly reviews the outcomes achieved through the research fellowships schemes.
4.3 Lessons learned	• It takes considerable time through the framework of an industry-academic consortium to build up reciprocal trust and to develop a common cultural understanding as to what can be achieved through joint cooperation if you want to be effective in undertaking collaborative research together. • Time was also needed to allow IPR-related rules to be homogenised. The company funding the scheme has strict rules on IPR and it has taken some time for the legal offices of the two respective parties It is important to strike the right balance in terms of IPR sharing arrangements (see obstacles).
4.4 Good practices	• Physical co-location at the same site has facilitated the scheme since Pirelli and the university along with other private sector players are located in close proximity which has meant that it was more easily feasible for researchers to work part-time carrying out research at the university site and part-time at the enterprise.
4.5 Replicability potential	• High replicability potential at the level of individual HEIs which have large companies based in reasonable proximity.

5 Additional information sources and keywords	
Other information	http://www.mater.unimib.it/en/sections/research/institutes-centers/corimav https://www.pirelli.com/global/en-ww/life/the-growth-of-talent-at-bicocca-corimav-consortium-agreement-renewed
Keywords	Privately funded ISM, industry-academic cooperation mechanisms

Latvia	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Strengthen the academic personnel of higher education institutions in the areas of strategic specialisation
1.2 Country or countries/region	National
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Ministry of Education and Science Name: Agrita Kiopa, Head of Higher Education, Innovation and Science department Address: Vaļņu Str. 2, Riga, LV-1050, Latvia Phone: 00371 67047983 Email: Agrita.Kiopa@izm.gov.lv Name: Dace Jansone, Senior Expert in Higher Education, Innovation and Science department Address: Vaļņu Str. 2, Riga, LV-1050, Latvia Phone: 00371 67047785 Email: Dace.Jansone@izm.gov.lv
2.2 Promoter / lead organisation (type of organisation)	Ministry of Education and Science Each of the projects within the programme will be led by university or college.

2.3 Budget (€)	• Total budget - *34 340 690 EUR*
	  ○ Public sector share – *ERDF 29 189 585 EUR*
	  ○ Private sector share – *no funding will be required from the industry partners*
	• Typical cost per researcher undertaking intersectoral mobility (total during mobility period).
	It is planned that support for supervisor of the researcher – intern will be 400 EUR a month and 100 EUR will be given to lecturer for the travel costs and civil insurance. Internship will be 6 months long. For all the internships the aggregated funding within the program 5.4 million EUR is planned (each of the 900 lecturers will have an internship twice).

2.4 Funding type	• EU-funded
2.5 Funding organisation(s)	European Regional Development Fund
2.6 Funding mechanism and incentives	Grant/Bursary. Only universities and colleges will be able to apply.
3 Description of scheme	
3.1 Stated objectives of scheme	Objective is to involve 900 lecturers in the internships. Each lecturer will be involved twice within a 6-year period.
3.2 Description of intersectoral mobility scheme	Support for: • attracting foreign lecturers to work in a higher education institution in Latvia, incl. for Latvian language studies; • the improvement of academic personnel competences and skills, incl. studies of EU languages and internships in enterprises; • attracting young teachers, supporting doctoral students' academic work at a higher education institution.
3.3 Scheme launch date	It is in the process of development, Regulation by Cabinet of Ministers is planned to be approved at the end of 2017.
3.4 Number of participants and other factual	

information about scheme	
3.5 Area(s) of industrial research	Priority is given for projects that are focused on Smart-Specialisation Areas, however, other sectors are not excluded.
3.6 Eligibility requirements to participate	
3.7 Application process	
3.8 Partnership finding	
3.9 Links with other mobility schemes	Programme complements Erasmus + mobility projects for academic personnel to have internships in foreign companies. This programme will in exceptional cases support internships in foreign companies (e.g. when there is no appropriate company in Latvia, and use of Erasmus + mobility is not possible).
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	Conditions for project governance and management will be incorporated in the project evaluation criteria. In the project applications HEIs and colleges will have to explain the selected management model, division of roles with industry partners and planned communication.
3.11 Obstacles in scheme implementation	

Lithuania	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Commercialisation of R&D results
1.2 Country or countries/region	It is a national level ISM scheme, operating in Lithuania.
1.3 Potential good practice?	The scheme can be considered as a good practice example, however some precautions must be taken into account (see lessons learned section).
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: Agency for Science, Innovation and Technology (MITA) Address: A. Gostauto str. 12-219, LT-01108 Vilnius Phone: +370 (5) 2644708 Email: info@mita.lt
2.2 Promoter / lead organisation (type of organisation)	Innovation agency
2.3 Budget (€)	• Total budget for the phase 2016-2020: 10 136 700 EUR. • During its first phase (2012-2016) the scheme was funded from national funds which could cover up to 80% of the project costs (the rest had to be covered by beneficiaries). Currently, the scheme covers up to 100% of project costs • Maximum project size: 23579 EUR - in case the VAT is suitable for funding; 21404 EUR - in case the VAT is not suitable for funding.
2.4 Funding type	EU-funded
2.5 Funding organisation(s)	EU structural funds (EU Regional Development Fund)
2.6 Funding mechanism and incentives	• The funding mechanism is a universal grant provided to the project team, consisting of academic researchers and the support staff, aiming to establish a start-up company by commercialising their research results. • The scheme does not involve direct intersectoral mobility of researchers, but since it supports the commercialisation of research results and establishment of business organisations by, it can be considered as ISM
3 Description of scheme	
3.1 Stated objectives of scheme	From the perspective of policy makers and funders, the overall aim of this measure is commercialisation of R&D results, by creating research intense enterprises. The measure aims at promoting innovative product, technologies or services commercialisation process and its transfer to the market. From the perspective of beneficiary researchers, the scheme provides opportunities to have the commercial profit from their work. For some researchers it gives an opportunity to switch the direction of their career from academic to business sector. In addition, the scheme another key motive to participate is overcoming the bureaucratic and legal issues, which would be encountered in university environment. The researchers could commercialise their research results in university environment, however, there they would have to deal with complex administrative and legal barriers and rulings (such as related to public procurements, for instance). With much simpler structure and procedures, this measure helps them to overcome these administrative and legal issues. Universities, in their turn, are interested in sharing and allowing the knowledge transfer to business sector. If the university name stands behind a very successful research-intensive company, this is considered as the promotion of the university brand. In addition, the universities expect to get their share of commercial success through IPRs, which are applied in each project.

3.2 Description of intersectoral mobility scheme	The activities supported under this measure include R&D activities corresponding to the TRL levels 7-9, as well as activities related to commercialisation/market application of the prototypes and technologies developed. The scheme is designed in a way that each project should necessarily include representatives of the research/academic sectors (researcher and/or students), but in addition the average project also often include other type of specialists (business consultants etc.). The project selection committee even gives credits to those projects that include a wider variety of specialists in the project team. The possible project costs include the salaries of the team members, costs related to buying commodities and services relevant to project activities, as well as administrative/technical project costs.
3.3 Scheme launch date	Scheme was first launched in 2012
3.4 Number of participants and other factual information about scheme	• During the period 2012-2016 35 start-ups were established, making it around 9 companies/teams of researchers per year. • The maximum project duration is 12 months; • The main institutions involved are the start-up companies established by the beneficiary researchers. In addition, in some cases the universities were also involved and provided additional support (such as the tools, laboratories, human resources etc.).
3.5 Area(s) of industrial research	The project must necessarily contribute towards at least one of the Broad R&D and innovation priority areas approved in the Programme on the Implementation of the Priority Areas of Research and (Socio-Cultural) Development And Innovation (Smart Specialisation) and Their Priorities[84]: - Energy and sustainable environment; - Health technologies and biotechnologies; - Agricultural innovation and food technologies; - New production processes, materials and technologies; - Transport, logistics and information and communication technologies; - Inclusive and creative society. In addition, the project must contribute towards at least one priority goal envisaged in the Working document accompanying the Communication concerning the European Union Strategy for the Baltic Sea Region.[85]
3.6 Eligibility requirements to participate	There are no requirements related to the experience, scientific excellence etc. of the beneficiary researchers. The beneficiaries are any researchers or even students working/studying in a university or research institute and aiming to commercialise their ideas. The excellence and feasibility of the project are the main criteria of project selection.
3.7 Application process	The project proposals are submitted in the name of universities or research institutions (not by individual researchers). In addition to the project applicant, the project proposal can include other project partners, including partner universities, research institutions, or private companies. The project team (consisting of researchers aiming to commercialise their research results) is usually already built before the project application. The application process (from proposal submission to signature of the grant) usually takes several months.

84 http://ukmin.lrv.lt/uploads/ukmin/documents/files/imported/lt/inovacijos/Smart%20specialization/Priority%20areas%20Nr951.doc

85 http://ec.europa.eu/regional_policy/sources/docoffic/official/communic/baltic/action_20032017_en.pdf

3.8 Partnership finding	Usually the team of researchers is built through informal contacts and networking: researchers who knew each other and work together in a university environment/research institute decide to establish together a company.
3.9 Links with other mobility schemes	There are links with "Technology development projects funding measure", which aims at creating favourable conditions for the country's technological development and promoting scientific research targeted at productive innovations in public and private sectors. Under this measure, each project has to have a project coordinator - a research and education institution and a partner - a business organisation (an SME). The expected result of the project must be a technology/prototype corresponding to the TRL level 5 or upper. The possible project costs covered by the measure include salary costs for staff (other possible costs being the project costs related to infrastructure, tools, materials, services etc.), including (although not exclusively focusing on) those of research staff employed in the company to cope with the project activities. It is expected that the companies created under the scheme "Commercialisation of R&D results" will apply and participate in with the "Technology development projects funding measure", therefore there are links between them.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	As the scheme does not focus on direct mobility of researchers, there are no formal mechanisms for join-supervision and coordination of activities between business and academia. However, usually universities willingly cooperate with the new companies, for instance, by allowing them to use their laboratories and other infrastructure for free.
3.11 Obstacles in scheme implementation	The main challenge related to the implementation of the scheme was incomplete and weak composition of the project teams. The researchers usually lack managerial and entrepreneurship skills. Similarly, sometimes the researchers lack the responsibility related to project administration (the reports are often provided late, with significant mistakes etc.). In terms of the IPRs, no serious issues in this area were encountered: university and researchers usually agree on IPRs in their contract, which is followed during and after the project implementation. Also there were some regulation/legal difficulties related to the requirements posed by National Food and Veterinary Agency. Also for some companies, the funding received was too small to expand its activities.

Luxembourg	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Programme for Research-intensive Doctoral Education
1.2 Country or countries/region	Luxembourg. Transnational Scheme.
1.3 Reason for selection	This Scheme provides professional stability to the researchers allowing them to have a position of several years doing research in a solid and organised team. The research approaches key issues for the strategic and economic development of the country. It intends to attract talent and high-level researchers from all over the world.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	**Name**: Tom Jakobs **Organisation**: FNR – National Research Fund **Email**: Tom.JAKOBS@fnr.lu **Phone**: +352 26 19 25-45
2.2 Promoter / lead organisation (type of organisation)	The Luxembourg National Research Fund (FNR) is the main funder of research activities in Luxembourg. It invests public funds and private donations into research projects in various branches of science and the humanities, with an emphasis on selected core strategic areas. Furthermore, it supports and coordinates activities to strengthen the link between science and society and to raise awareness for research. The aim is to establish Luxembourg as a leading knowledge-based society through science, research, and innovation, thereby contributing to the country's economic diversification and future prosperity. A lump sum of 10.000 € will be paid per DTU PhD and Postdoc position to cover organisational expenses of the DTU.
2.3 Budget (€)	• Total budget (for all types of Schemes) o Public sector share = 15% (University and Government) = €6.5M/year for PhD and Post-doctorates o Private sector share = 85% (Companies) All schemes from FNR have a 15% contribution. More would have a negative impact. With higher rates of funding, companies would apply with "fake" applications to get funding for hiring purposes. With 15% they keep themselves committed with the programmes. • Typical cost (PRIDE Scheme) per researcher undertaking intersectoral mobility (total during mobility period) The FNR contributes an amount of 41.158 € / year (salary index as of 1st January 2017) to the annual salary costs of a PRIDE-funded PhD candidate.
2.4 Funding type and organisation(s)	National and Private (could be from Companies abroad, but they must have a representation office in Luxembourg). The FNR requires co-funding for each DTU funded under PRIDE. Funds provided by the FNR in the framework of PRIDE are aimed at Doctoral Training Units (DTU). The DTU hosts at least 7 PhD candidates, supervised by one or more members of the DTU consortium. The financial contribution is defined in lump sums per DTU position as stated above. Expenditures should be for the benefit of the whole DTU (as opposed to be used as selective support of individual candidates).
2.5 Funding mechanism and incentives	Candidates are employed by the host institutions (leaders of the DTU) A topping-up by the employer is possible. The salary contribution will be awarded for a duration of max. 48 months. For PhD positions fulfilling the requirements for a public-private partnership (PPP), a

	supplementary contribution to the candidate's salary of 3,972 €/year is covered by FNR. A fixed training & mobility allowance of 6,500 € and 4,500 € will be paid per DTU PhD and Postdoc position, respectively. These allowances include a one-off travel lump sum of 500 €, to be paid to the candidates at the start of their employment contract.
3 Description of scheme	
3.1 Scheme objectives	The PRIDE programme will be one of the central instruments to implement FNR's strategy which has as strategic priorities: • Attaining scientific leadership in key areas • Turning public research into a competitive advantage for Luxembourg. • Anchoring Science and Research in Society To this end, the key objectives of the programme are stated as follows: • to provide more specific support for research teams that demonstrate good quality work over time, in order to achieve critical mass in a limited number of fields of excellence, • to support Luxembourg-based research institutions in their efforts to attract and recruit outstanding PhD candidates that pursue internationally competitive research, • to support institutions to offering attractive working conditions to PhD candidates and to training them to become highly skilled professionals, able to respond to the needs of research, society, and economy. The programme intends for an attraction of high potential PhD candidates to Luxembourg is one of the key aspirations of the PRIDE programme
3.2 Description of intersectoral mobility scheme	The PRIDE programme has a bottom-up approach, i.e. proposals in all domains of research and technological development are eligible for funding. However, the programme targets research teams that have already a certain record of accomplishment in doctoral training and wish to consolidate and develop long-term doctoral training programmes around strong research priorities. Through the PRIDE programme, the FNR supports Luxembourg research institutions by awarding a block of PhD grants to a consortium of supervisors united around a coherent and competitive research programme and offering excellent structures for PhD training. PRIDE confers flexibility to research institutions to carefully select and recruit the most promising PhD candidates. Candidates recruited under PRIDE are offered a full 4-year PhD grant (based on employment contract), which constitutes a major asset in the competition for the best candidates Europe- and worldwide. Candidates will develop their activity in the Doctoral Training Unit (DTU)
3.3 Scheme launch date	The first PRIDE call was in 2015 and the second in 2017.
3.4 Number of participants and other factual information about scheme	1st PRIDE call • 135 PhD positions were awarded in blocks to 11 successful Doctoral Training Units (DTUs) 2nd PRIDE call • 130 PhD positions were awarded.
3.5 Area(s) of industrial research	• All domains of research and technological development are eligible for funding • The first call covered six of the country's research domains
3.6 Eligibility requirements to participate	• Eligible for funding under the PRIDE programme are public institutions and non-profit associations and foundations performing research activities based in Luxembourg. Eligible institutions are termed "host institutions". The DTU:

	• has to be a research team constituted by a consortium of at least 7 supervisors from one or several host institutions, • to be coordinated by an internationally recognized scientist (i.e. DTU coordinator), • to be founded on a coherent and competitive research programme, which is in line with the respective institutional research strategy(ies) • to host at least 7 PhD candidates, supervised by one or more members of the DTU consortium • to provide an innovative high-quality training environment, • and potentially to collaborate with other partners, such as national institutions, foreign universities/research institutions or companies.
3.7 Application and selection process	Proposals are submitted through a Commitment of Participation followed by a Full Proposal. The Commitment of participation must contain: • Online application form • PRIDE Summary description • Bibliography The Full Proposal must contain: • Online application form • PRIDE proposal description • Bibliography + CVs of supervisors + commitment letters The Submission should be made electronically by the coordinating institution via FNR Grant Management System. Proposals are ranked and selected based on the following selection criteria: • Scientific/technological quality of the multiannual research programme • Contribution of the multiannual programme to training and career development of doctoral candidates • Scientific competence of the host institution and quality of supervision • Potential contribution by the multiannual programme to the strategic goals of the host institution • Outcomes and possible applications of the multiannual programme The Doctoral Training Unit (DTU), under the lead of the DTU coordinator, is the applying entity Prospective PhD candidates apply directly to the successful DTUs for a PhD position.
3.8 Partnership finding	• Partnership finding can be made by the researchers, the coordinator or assisted by the University. • In Luxembourg the after co-funding being obtained to get partnerships is relatively easy. There is a promotional agency in Luxembourg working on that. They do the communication and they do it well, they bring the companies and FNR just needs to do the matchmaking. Besides the fact of being a small country makes it easy.
3.9 Links with other mobility schemes	• All mobility schemes in the country are promoted, established, or designed by the FNR, so there are some institutional links with the other schemes, but not functional.
3.10 Governance, support structures and coordination measures during mobility period	• PhDs and post docs have monthly meetings, Other participants/stakeholders hold at least monthly meetings, but is something that FNR don't manage directly, (it is done between the institutions and the DTU).
3.11 Obstacles in scheme implementation	• Consortium agreements • IP Rights (setting up contracts and get to an agreement is time consuming and quite complex)
4 Impacts and replicability potential	
4.1 Outcomes (results and	• All PhDs funded through PRIDE will receive employment contracts with their host institutions

impacts)	• PRIDE provides greater advantage to institutions and PhD candidates, as institutions are able to immediately offer a full PhD grant to promising candidates, without having to undergo a separate application and selection procedure at the FNR. • In addition to the 135 FNR-funded doctoral candidate positions, around 20 further PhD positions are to be funded by the Luxembourg host institutions. • It targeted the following domains: Biomedical Sciences, Education & Humanities; Sustainable Resource Management; ICT and Mathematics, Economics. Law and Social Science
4.2 Monitoring and evaluation	All PRIDE proposals which receive funding from the FNR are subject to reporting requirements as specified in the PRIDE convention. To this end, DTU coordinators are required to submit. • periodic activity reports after year 1, 2 and 4 of the PRIDE convention, providing updates on the progress of implementation of the PRIDE research and training programme and including an update on the financial expenses • a final activity report at the end of the PRIDE convention, providing information on the overall achievements of the PRIDE project and including an account of the total project expenditures In addition, DTU coordinators are required to create a registry of all PhD candidates recruited in the frame of the PRIDE programme in the FNR online submission system (https://grants.fnr.lu). This registry serves as record of PhDs recruited within the PRIDE project and allows the individual monitoring of the progress of each PhD. Moreover, six years after the end of the PRIDE convention, host institutions are expected to provide an account on the careers of the trained candidates
4.3 Lessons learned	Too soon to analyse at present
4.4 Good practices	• It ensures a permanent position for researchers • It supports the development of critical mass in key research areas • It attracts excellent PhD candidates • promotes the active involvement of researchers and scientists in addressing current and future societal challenges
4.5 Replicability potential	• High replicability potential; • Requires some organisation involving several institutions what can cause some bureaucracy and administrative burdens • DTU is something that can be made in other countries
5 Additional information sources and keywords	
Other information	https://www.fnr.lu/funding-instruments/pride/ file:///C:/Users/Hugo%20Gr%C3%A1cio/Downloads/PRIDE%20Call%202017%20Info%20Session_120717.pdf
Keywords	

Netherlands	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Professional Doctorate in Engineering degree (PDEng)
1.1 Country or countries/region	Netherlands
1.2 Geographical scope	National Scheme
1.3 Reason for selection	The Scheme is very well adapted to the companies' and regions' needs. The PDEng study subject is something specific to address a critical situation in the companies, and a pressing issue in the region and society. It is conducted together by several research universities in the country, and with research institutes.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	**Name**: Harold Weffers **Organisation**: TUE- Technische Universiteit Eindhoven **Email**: h.t.g.weffers@tue.nl **Phone**: +31 40-247 4610
2.2 Promoter / lead organisation (type of organisation)	Eindhoven University of Technology (TU/e) is a research university specializing in engineering science & technology. Research universities are mainly responsible for offering research-oriented programmes in an academic setting. The promoter is the Department of Mathematics and Computer Science of Eindhoven University of Technology. It trains high-calibre students to conduct pioneering scientific research, they also enter into special collaborative partnerships with companies and government authorities.

2.3 Budget (€)	• Total budget
	  ○ Public sector share = 75% (University 25% and Government 50%)= €1.4M/year
	  ○ Private sector share = 25% (Company) = only need to pay for working costs + HR time to train the new researcher
	• Typical cost per researcher undertaking intersectoral mobility (total during mobility period)
	Highly dependable from the type of field, company, and research University. At TuE PDEngs receive €2,222 per month every year, increasing for €2,840 per month in the last year.

2.4 Funding type and organisation(s)	National and Private. It depends from which kind of programme, although, normally public-private is sought from different sources. Normally some funding comes from the university and most part from the company.
2.5 Funding mechanism and incentives	• Researchers are in the payroll of the company or in the payroll of the university.
3 Description of scheme	
3.1 Scheme objectives	The objective is to promote links between academia and industry, and support PhD students into getting first-hand industry experience to increase and diversify their skills while making them more employable and connected to the industrial network of opportunities for R&D. The Professional Doctorate in Engineering (PDEng) is a practical oriented professional doctorate in engineering which is better suited to the direct needs of industry research. It has the duration of 2 years and the researcher engaged with the professional field has a contract with the company/industry or with the university. The aim is develop students' capabilities to work within a professional context. These programmes focus on applied techniques and design, in their respective engineering fields. The technological PDEng

	programmes were initiated at the request of the Dutch high-tech industry. The Professional Doctorate in Engineering programme from the TuE is a two-year post-Master's programme. It qualifies students with an MSc degree in mathematics, statistics and computer science to become top-level professionals. The PDEng are joint initiatives of Eindhoven University of Technology with other universities, research centres and companies. It is a thriving science community, in which postgraduate education, innovation, entrepreneurial activities, lifelong learning, and scientific research are integrated.
3.2 Description of intersectoral mobility scheme	It is a programme of advanced training which, whilst adhering to the university criteria for the award of a doctorate, is designed to meet specific needs of a professional group external to the university. The common programme is established together by the university and the company; they jointly set the agenda, share the ambition, try to achieve things together, merge points of view. They comment, monitor, and evaluate independently. The practical part of the programme allows students to spend time working in industry on a challenging and innovative technological design project – a real problem that needs to be solved. In this design project they will transfer knowledge and research results into technological innovation in industry and society. Throughout the project supervision will be made by engineers from industry as well as by the university staff. They are able to gain scientific knowledge, practical design experience and project management expertise at the same time. After successful completion of a PDEng programme researchers are entitled to use the academic degree of Professional Doctorate in Engineering (PDEng).
3.3 Scheme launch date	Various
3.4 Number of participants and other factual information about scheme	• 54 Professional doctorates in Engineering (PDEng) students • 11 two-year designer programmes (PDEng) • Grants last 2 years and can be renewed once.
3.5 Area(s) of industrial research	• Smart buildings and cities • Automotive systems design • Mechatronic systems design • Process and product design • Design and Technology of Instrumentation • User System Interaction • Data Science • Qualified Medical Engineer • Information and Communication Technology • Healthcare Systems Design • Software Technology • Industrial Engineering • Clinical Informatics
3.6 Eligibility requirements to participate	• It is essential that you speak, read, and write English well. You must have passed an English language test. IELTS and TOEFL are commonly accepted, but institutions may accept other tests as well, like Cambridge English. • The required scores are at least 550 (paper based) or 213 (internet based) for TOEFL. For IELTS a score of at least 6 is required. • The programmes fall within the 3rd cycle of higher education, as do the doctorate PhD programmes. • Applicants for the PDEng programme should have a MSc degree or an equivalent qualification from an officially recognised university or accredited academic institution

	in a discipline related to that of the Master's programme (foreigners are included).
3.7 Application and selection process	• A research proposal must be written and submitted to the university. This proposal must be designed together with the Industry, Company, department, etc • The PDEng programmes use strict selection criteria to ensure the required high quality. Excellent marks, motivation and a design-oriented attitude are vitally important. • It can be applied by sending a letter of application with a complete curriculum vitae and at least two letters of recommendation (in English). Suitable candidates will be invited for an interview with the selection committee of the relevant PDEng programme.
3.8 Partnership finding	• Partnership finding can be made by the researchers or assisted by the University. • After collaboration is settled, UNI starts to look for funding from all kinds of sources; normally some funding comes from the university and most part from the company.
3.9 Links with other mobility schemes	• There were no links identified with other mobility schemes
3.10 Governance, support structures and coordination measures during mobility period	
3.11 Obstacles in scheme implementation	• People not used to strategic partnerships such as the ones between enterprises and Universities • People spend too much time writing proposals • Finding funding to start with the research – to prove that the specific subject/theme worth to study/research • Many times, expertise is needed by some companies, but after a short period is not needed anymore, Companies are a bit unstable.
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	• Majority believes is beneficial having a wide range of benefits. • It is a recognized way for researchers to assure a stable professional situation. Some of them will work in the future in the area where they are doing the programme/scheme. • The programme stimulates researchers towards activities related with the issues approached in the programme/scheme. • People started to work collectively; to look strategically to certain issues; they start to look for companies as strategic partners; it had a multiplier effect in PhD programmes attraction. • The quality of young researchers' work improved
4.2 Monitoring and evaluation	
4.3 Lessons learned	
4.4 Good practices	• Very focused in solving real problems of the market • Brings scientifically knowledge from the universities to the companies. • Allows to show clearly how it is working in an Institution outside from the university
4.5 Replicability potential	• Considerable replicability potential; • Good for policy makers - the Dutch model was conceived and developed having in mind the specialization of the companies from the different regions (clusters) and the knowledge from the universities which led to regional development
5 Additional information sources and keywords	
Other information	https://www.tue.nl/en/education/tue-graduate-school/pdeng-programs/
Keywords	

Poland	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Bridge – scheme implemented in the period of 2010-2015 comprised of 5 projects: • Knowledge and practice - the key to business success (2010-2011) • Knowledge, practice, staff - the key to business success (2011-2013) • Knowledge, practice, cooperation - the key to business success (2013-2014) • Green light to innovation (2013-2015) • Knowledge, practice, experience - the key to business success (2014-2015)
1.2 Country or countries/region	Regional
1.3 Potential good practice?	The scheme is an example of very simple regional initiative which could be a good practice for the countries with small experience in ISM or even academia-industry cooperation in general.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: Malopolska Regional Development Agency Address: Kordylewskiego Str. 11, 31-542 Cracow, Poland Phone: (+48) 12 617 66 01 Email: marr@marr.pl http://www.en.marr.pl/
2.2 Promoter / lead organisation (type of organisation)	Malopolska Regional Development Agency Joint-stock company with the self-government of the Lesser Poland Voivodship as majority stakeholder.
2.3 Budget (€)	• Total budget – *15 000 000 PLN (3.570.000 EUR) (85% ESF)* ○ Knowledge and practice - the key to business success (2010-2011): 3 500 000 PLN (850.000 EUR) ○ Knowledge, practice, staff - the key to business success (2011-2014): 3 000 000 PLN (700.000 EUR) ○ Knowledge, practice, cooperation - the key to business success (2013-2014) 3 500 000 PLN (850.000 EUR) ○ Green light to innovation (2013-2015): 3 000 000 PLN (700.000 EUR) ○ Knowledge, practice, experience - the key to business success (2014-2015) 2 000 000 PLN (470.000 EUR) • Public sector share –100% - ESF 85% • Private sector share – no funding required from the industry partners • Typical cost per researcher undertaking intersectoral mobility (total during mobility period). Bursary level 700 EUR per month
2.4 Funding type	• EU-funded •
2.5 Funding organisation(s)	European Social Fund managed by self-government of the Lesser Poland Voivodship
2.6 Funding mechanism and incentives	Grant/Bursary • *Have any incentives for individual researchers been put in place for the intersectoral mobility scheme?* No. It was own initiative of individual researchers to participate in the scheme. • *Have any incentives for specific institutions been put in place for the intersectoral mobility scheme?* No. • *What support structures have been put in place to help researchers whilst they are undertaking a mobility period?* No such support structures involved.
3 Description of scheme	
3.1 Stated	The projects were implemented under one of the Measures of Human Capital Operational

objectives of scheme	Programme 2007-2013. The main objective of the Measure was "Increasing transfer of knowledge and strengthening connection of R&D sphere with enterprises, serving economic development of the regions". The possible types of projects included temporary employment of highly qualified personnel in small and medium enterprises as well as internships and practical trainings for: • employees of enterprises in scientific institutions, • scientific employees of scientific institutions and scientific and didactic/scientific employees of higher schools - in enterprises. Objectives of the projects feed into the main objectives of the Measure. All of them aim to increase knowledge transfer and strengthen the cooperation between academia and industry sectors.
3.2 Description of intersectoral mobility scheme	Bridge initiative was implemented by Malopolska Regional Development Agency and comprised of five projects implemented under EU funded Human Capital Operational Programme 2007-2013. The above mentioned projects: • Knowledge and practice - the key to business success (2010-2011) • Knowledge, practice, staff - the key to business success (2011-2014) • Knowledge, practice, cooperation - the key to business success (2013-2014) • Green light to innovation (2013-2015) • Knowledge, practice, experience - the key to business success (2014-2015) It included temporary employment of highly qualified personnel in small and medium enterprises as well as internships and practical trainings for: • employees of enterprises in scientific institutions, • scientific employees of scientific institutions and scientific and didactic/scientific employees of higher schools - in enterprises. It was a regional initiative, and therefore, researchers during mobility period did not change their place of residence. It was possible to combine the internship with regular work at university which was an additional incentive to take part in the ISM under the project.
3.3 Scheme launch date	The whole scheme was implemented under financial period 2007-2013. First project under Bridge initiative was launched in 2010.
3.4 Number of participants and other factual information about scheme	○ Knowledge and practice - the key to business success (2010-2011): internships of 109 researchers in 84 SME companies ○ Knowledge, practice, staff - the key to business success (2011-2013): internships of 70 researchers in the companies and of 20 representatives of industry sector in academia; temporary employment for 10 (highly qualified) people ○ Knowledge, practice, cooperation - the key to business success (2013-2014): internships of 139 researchers in companies, internships of 15 industry workers in academia sector ○ Green light to innovation (2013-2015): temporary employment for 18 (highly qualified) people ○ Knowledge, practice, experience - the key to business success (2014-2015): internships of 75 researchers in companies, internships of 11 industry workers in academia sector • Main institutions: Human Capital Operational Programme managed by Ministry for Regional Development. At regional level, the measures which include knowledge transfer under HCOP were implemented by Voivodship Labour Office. Projects under Bridge initiative implemented by Malopolska Regional Development Agency. • *What % of time is being spent by researchers in the non-academic host institution during the mobility period?* The projects foresawfull time internships and temporary employment, of 6 months duration.
3.5 Area(s) of industrial research	Projects under Bridge initiative were open across all scientific and research disciplines. Among all the projects under Bridge initiative, only "Green light to innovation" was focused on life science, ICT, chemistry, sustainable energy, cultural (creative)industries and tourism. Other projects were open for all industrial areas.

3.6 Eligibility requirements to participate	Employment in a Higher Education Institution was the only requirement for researchers to participate in the projects.
3.7 Application process	To participate in the project it was required to fill in the form and register in the database (as a scientist, researcher, company or university). The participant's application was placed in the database. It was possible for researcher to indicate the name of the particular company or sector chosen to conduct an internship there. Another option was to choose the company already registered in the database (it was possible to select up to 5 companies). If the researcher did not indicate a particular company, s/he waited for the internship offer to be chosen by the registered company or the system would automatically assign the researcher to the company. Researcher could also have been matched with the company by the recruitment committee. At the end of this process the researcher received information about the initial selection and was arranged with the company to determine the details of the internship. Recruitments took two months and were organised during the period of the project, until funds in the projects exhausted.
3.8 Partnership finding	The search for a partner to participate in the project took place via the created database of potential participants. On the basis of the entered data, the system connected profiles of both sides (academia-industry - e.g. researcher and company). Partners were also matched by a specially appointed recruitment committee. It was also possible to find a partner before the project and to indicate a specific partner at the recruitment stage.
3.9 Links with other mobility schemes	There was no direct connection to other ISM schemes. However, the projects under the Bridge initiative were interconnected, among others through a common database of potential project participants. The participant (e.g. company) entered into the database could be included in the next edition of the Bridge project.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	The scheme did not take into account the direct cooperation of entities from the academy and industry. The participants of the projects under Bridge initiative were individual researchers and companies or universities and companies representatives. Therefore, there was no joint supervision by the academy and industry. The general management of the scheme was the responsibility of the implementing institution - MARR. The research agenda was developed at the application stage by the researcher together with the host organistion.
3.11 Obstacles in scheme implementation	Bureaucracy is noted as an obstacle. With regard to IPR issues, the contract on cooperation between the researcher and the company provided that the intellectual property rights are transferred entirely to the host organisation.

<table>
<tr><th colspan="2">Portugal</th></tr>
<tr><td colspan="2">1 Example of intersectoral mobility scheme – key data</td></tr>
<tr><td>1.1 Scheme title</td><td>PhD Studentships in Industry</td></tr>
<tr><td>1.2 Country or countries/region</td><td>Portugal</td></tr>
<tr><td>1.3 Potential good practice?</td><td>Financial programme to support graduates who wish to carry out research projects in an industry setting, leading to a PhD. The programme has two main interesting aspects:
the fact of the project starts from a real need or challenge identified by the company (the starting point of the PhD project and the focus of the research
the possibility of optimising the resources, knowledge and know-how of the university/researcher to provide a solution/answer to the company, promoting the match between the needs/challenges of the industries and the activity and resources of academia.</td></tr>
<tr><td colspan="2">2 Organisations involved in implementing scheme and funding arrangements</td></tr>
<tr><td>2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details</td><td>Name: FCT – Fundação para a Tecnologia e Ciência
Address: Av. D. Carlos I, 126 | 1249-074 Lisboa
Phone: +351 213 924 300
Email: bolsas@fct.pt</td></tr>
<tr><td>2.2 Promoter / lead organisation (type of organisation)</td><td>FCT – Fundação para a Tecnologia e Ciência - Portuguese funding agency for science, technology and research (Public body)</td></tr>
<tr><td>2.3 Budget (€)</td><td>Maximum amount for 2015 per a project of 4 years between € 46,080 and € 46,630, split as follows:
monthly allowance to PhD student - € 980
support to training activities - € 500-€ 750
scientific meetings - € 2,050-€ 2,350
enrolment and fee in PhD training at University per year - € 2,750</td></tr>
<tr><td>2.4 Funding type</td><td>National funding</td></tr>
<tr><td>2.5 Funding organisation(s)</td><td>Portuguese State Budget</td></tr>
<tr><td>2.6 Funding mechanism and incentives</td><td>• The funding provided by FCT is as follows:
<table><tr><th>Item</th><th>Conditions</th><th>Amount</th><th>Beneficiary</th></tr><tr><td>Allowance</td><td>Monthly base</td><td>€ 980</td><td rowspan="6">PhD student</td></tr><tr><td rowspan="2">Training activities</td><td>Single amount - National</td><td>€ 500</td></tr><tr><td>Single amount - International</td><td>€ 750</td></tr><tr><td rowspan="3">Scientific meetings</td><td>Single amount - fee</td><td>€ 750</td></tr><tr><td>Single amount – Travelling (EU)</td><td>€ 300</td></tr><tr><td>Single amount – Travelling (outside EU)</td><td>€ 600</td></tr><tr><td>Enrolment and fee</td><td>Single amount per year</td><td>€ 2750</td><td>University</td></tr></table>• Additionally, the company in which PhD student will run his/her project will pay him/her, at least, the same amount provided by FCT (minimum of € 980/month).</td></tr>
<tr><td colspan="2">3 Description of scheme</td></tr>
<tr><td>3.1 Stated objectives of scheme</td><td>With Studentships and Fellowships call, FCT aims to support the best graduates who wish to pursue research leading to a PhD degree, and the most creative post-doctoral researchers in pursuing cutting-edge projects, in Portuguese or foreign research centres, in</td></tr>
</table>

<table>
<tr><td></td><td>all fields of research.

In the case of PhD Studentships in industry the main aim is to support graduates who wish to carry out research projects in an industry setting, leading to a PhD. Studentships have a maximum duration of four years, and must run for a minimum of three consecutive months.</td></tr>
<tr><td>3.2 Description of intersectoral mobility scheme</td><td>In this programme any worker with graduation or master can request financial support to FCT to perform a research project in a specific industry, attending and achieving, at the same time, a PhD degree, recognised by a Higher Education Institution.

FCT provides funding mostly to the PhD student (monthly allowance, training support, support to scientific meetings) and to university (to pay the enrolment and fee of the candidate in PhD training at the university).

The focus of the research project of PhD student is selected by the candidate in the planning phase and Is usually in line with a specific need/challenge identified by the company. The parties (PhD student, university and company) need to agree on the focus of the research project in the planning phase and establish a cooperation agreement to perform it.

Once the project is approved, the PhD student will start the research to be performed in the company and, at the same, time, attending training sessions/classes at the university as a complement. By this way the PhD student will have the opportunity of:

• Develop a research for the development of a solution/product to the company;
• Achieve a PhD, essential for his/her career development.

The context in which the PhD student will need to do the research depends on the resources available in the company and university, but he/she needs, at least, to attend the classes at the university.

Besides receiving the monthly allowance from FCT, the PhD student will also be paid by the company (this is mandatory), receiving, at least, € 980/month. In some, cases, the companies pays more than this amount.</td></tr>
<tr><td>3.3 Scheme launch date</td><td>Scheme was first launched in 2012</td></tr>
<tr><td>3.4 Number of participants and other factual information about scheme</td><td>In the website of FCT is possible to see that in 2015 there were 16 PhD and in 2014 there were 14 Studentships in Industry funded. Is also possible to mention the number of PhD Studentships approved in the previous calls, that includes also the PhD Studentships in Industry, however, there are no numbers available for the calls of 2012 and 2013 for the PhD Studentships approved:

<table>
<tr><th>Item</th><th>Call 2012</th><th>Call 2013</th><th>Call 2014</th><th>Call 2015</th></tr>
<tr><td>PhD Studentships</td><td>1220</td><td>461</td><td>452</td><td>463</td></tr>
<tr><td>PhD Studentships in Industry</td><td>NA</td><td>NA</td><td>14</td><td>16</td></tr>
</table>
</td></tr>
<tr><td>3.5 Area(s) of industrial research</td><td>The studentships in industry projects are open to researchers from all fields and to companies of all sizes. Portuguese citizens, and citizens of EU member states may apply, as well as citizens of other countries, as long as they are resident in Portugal or are citizens of countries with which Portugal has exchange agreements.</td></tr>
<tr><td>3.6 Eligibility requirements to participate</td><td>The PhD Studentships in industry is an individual funding addressed to candidates that meet the following requirements:

• National citizens and citizens from other EU Member-States;
• Citizens from third countries with valid resident card or benefiting from a long-term residence status;
• Have Higher Education degree completed in the date of submission of the proposal for funding;
• The candidate must have an average mark of 14 or higher on his or her academic</td></tr>
</table>

	transcript; • The applicant may not have benefited from previous FCT funding in the same call; • The applicant may not have benefited from previous FCT funding; • The applicant cannot benefit from another FCT doctoral fellowship; • The candidate needs to be registered in the System of Information of FCT.
3.7 Application process	The application process to submit a proposal for funding the PhD Studentships in industry is as follows: 1. Definition of the PhD programme between individual candidate, company and HEI, according to the information requested by FCT; 2. Registration of candidates and tutors (both from university and company) in the FCT System of Information; 3. Submission of the PhD programme in the FCT Platform by the individual candidate; 4. Assessment of the applications received by FCT, according to the time period defined in the terms of reference of the call; 5. Once the application has been accepted, the academic and business spheres will need to establish a nominative cooperation agreement.
3.8 Partnership finding	The PhD Studentships in industry is an individual funding addressed to candidates willing to develop a research project in industry and achieve, at the same time, a PhD degree. So, usually a PhD programme can emerge from: • the PhD student candidate, who approaches the company in which he/she wants to develop the research and the university that will allow him/her to achieve the PhD graduation; • the company that can challenge 1 or more workers to apply to this individual funding to perform a specific research to the company and that can also contact the university and work in a PhD research programme. The process is a little bit different from other schemes in which the university or the researcher of the university establish the first contact.
3.9 Links with other mobility schemes	No.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	The PhD programme is defined by the parties (PhD candidate, company and University) in the planning phase before the submission of the proposal for funding. At this stage there is, already, an agreement between parties in terms of: programme, tasks/activities, responsibilities (for which persons are already identified). The formal agreement is established once the funding for the PhD programme is approved, usually it is established between the company and the university and is a nominative cooperation agreement. During the project implementation, the PhD student will be monitored and supported by tutors from the company and university that meet on a regular basis.
3.11 Obstacles in scheme implementation	The biggest challenge is to involve the companies in the PhD Studentships in industry, mostly because: • the companies need to assure part of the payment of the PhD student; • due to the requirements related to the development of the research in the company, is important that the involved companies have a certain structure and be focused on innovation and research.

Romania	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	MANUNET II - Romania
1.2 Country or countries/region	24 regional or country agencies involved, from 14 EU Member States (Romania, Spain, Austria, Belgium, Estonia, Finland, France, Germany, Greece, Italy, Luxembourg, Portugal, Slovakia, United Kingdom) and 4 EU associated countries (Iceland, Israel, Turkey and Switzerland)
1.3 Reason for selection	Potential good practice – recognised by documents of European Commission and by continuation of the programme (MANUNET, MANUNET II, MANUNET III)
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Lead organisation: Agencia Vasca of Euskal Agentzia Innovacion-Berrikuntzaren (INNOBASQUE / Spain) Implemented and monitored in Romania by UEFISCDI (Executive Unit for Financing Higher Education, Research, Development and Innovation). Name: Nicoleta Dumitrache (responsible person for Romania) Address: Str. Mendeleev nr. 21-25, Sector 1, RO- 010362, Bucharest, Romania. Phone: +40/21.302.38.86, +40/21.302.3850 Email: nicoleta.dumitrache@uefiscdi.ro
2.2 Promoter / lead organisation (type of organisation)	Lead organisation Innobasque: regional public-private alliance focused on innovation Implementation agency in Romania: UEFISCDI - public organisation in charge with monitoring high education institution and implementation of national research plan
2.3 Budget (€)	• Total budget: figures for the whole programme, together with MANUNET: in 10 years: mobilised over 211 M€, out of which 121 M€ regional or national founding, with a 4.2€ support from EC (technical assistance). In Romania: 2.5 M€ in public expenditure (only MANUNETII) ○ Public sector share – over 60% in Romania ○ Private sector share – between 20 to 40%, depending on the size of the company involved and the share of the project budget • Typical cost per researcher undertaking intersectoral mobility (total during mobility period) – Not available, as the programme is not dedicated to the IMS; travel budget being covered from private co-financing for companies, national agency did not monitor them directly
2.4 Funding type	• National public – main source • Private – other – cofinancing, according to state aid regulation • EU-funded – only technical assistance
2.5 Funding organisation(s)	In Romania: UEFISCDI is the main funding organisation, funds being made available from the National Budget by the Ministry of Research and Innovation, according to the National Plan for Scientific Research. Companies are funded according to state aid scheme, having to cover co-financing 20-40% of their expenditures, depending on their size.
2.6 Funding mechanism and incentives	• *What is the funding mechanism?* Grants, awarded on the previously described system • *Have any incentives for individual researchers been put in place for the intersectoral mobility scheme?* NO • *Have any incentives for specific institutions been put in place for the intersectoral mobility scheme?* NO • *What support structures have been put in place to help researchers whilst they are undertaking a mobility period?* No special support structures for researchers, only a general help desk available during the development of the project and the implementation.

3 Description of scheme	
3.1 Stated objectives of scheme	Strategic objectives: to increase cooperation between different regional or national agencies in proposing effective solutions for European research programme, to foster cooperation among manufacturing partners, to support R&D active SMEs and their strategic partners and to improve and accelerate knowledge and technology transfer.
3.2 Description of intersectoral mobility scheme	The scheme is not dedicated to ISM, ISM being just an implicit component of the direct cooperation between research and industry. Under MANUNET 6 calls were launched for transnational collaborative projects between research organisations and companies, aimed at developing new products, methods or technologies to the advanced manufacturing industries. The calls have very large objectives, requirements including usually territorial coverage (participation in the call being voluntary), connection to manufacturing domain, minimal size of the partnerships (usually, minimum one research organisation and two SMEs from two countries/regions involved; one of the calls, considered very successful by Romanian agency, supposed cross cooperation between one research organisation from one country/region and a company from another country/region in parallel with a similar mirror pairing: one company from the first country/region with one research organisation from the second). Two major features underlined in the evaluation report: focus on regional research policies and special support to SMEs – about 80% of the beneficiaries being SMEs. Romania was represented in numerous projects, being on the 3rd place in the network, with 39 projects funded; usually companies being small and microenterprises, most of them specialised in research and development, but also a few medium companies focused on production.
3.3 Scheme launch date	1.04.2011
3.4 Number of participants and other factual information about scheme	• *Number of researchers per year participating in scheme – from Romania:* Minimum 50 researchers per year involved, not all participating to ISM activities. • *Main institutions* Research organisations and companies – usually small and microenterprises. • *What % of time is being spent by researchers in the non-academic host institution during the mobility period?* Not clearly identified in the projects implementation and monitoring – most of them being short term periods. • *Duration of intersectoral mobility period*. Same as above - not clearly identified in the projects implementation and monitoring.
3.5 Area(s) of industrial research	• Open across all scientific and research disciplines connected to the manufacturing domain. The scheme covers areas related to advanced manufacturing technologies: Knowledge based engineering, ICT for manufacturing; Manufacturing technologies for environmental and energy applications include resource efficiency and recycling; New materials for manufacturing; New manufacturing methods, components and systems; Adaptive manufacturing technologies including processes for removing, joining, adding, forming, consolidating, assembling; Other technologies, products and services related to the manufacturing field.
3.6 Eligibility requirements to participate	There are no specific eligibility requirements for participants in the network rules; in Romania, if the coordination organisation is a research institution, the project leader needs to have a PhD, according to Romanian regulation for public financing of research projects; for companies there are no specific rules, but they are rarely in charge with the coordination of the project, since their research skills are limited for the advanced level of activity supposed.
3.7 Application process	There are no rules established, but usually the scientific organisation initiates the collaboration, based on its own prospective of the market needs and its experience in collaboration with industry. Application and evaluation process takes 9-10 months: calls are launched in January, with

	deadline for pre-proposals in March, deadline for full proposals in July (after pre-acceptance in May/June), the evaluation of the full proposals being finalised in October (projects up to 3 years long).
3.8 Partnership finding	Partnerships are often established based on to former collaboration; support is offered by the national agency, that cooperates with other national or regional agencies in the programme; an electronic platform is offered to support partnerships finding but its efficiency is limited.
3.9 Links with other mobility schemes	MANUNET was established as an ERA-NET network, as a complementary tool for implementing science and innovation policies, and it is perceived by beneficiaries as complementary to other national and transnational funding instruments. At national level, it is perceived as an integral part in application of the national strategy for scientific research. Yet, there is no direct link to other national or international scheme. Partnerships in MANUNET II originate, most of the times, in previous partnerships in other schemes and base, at the same time, future collaborations – 87% of the respondents in impact valuation declared to continue collaboration in a certain way.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	The mobility being a implicit part of the projects, there is no special supervision apart from the one related to the tasks to be performed, according to the activity plan. Coordination of supervisors is established at the general level of the project, depending on the expertise of the persons involved and the share of the responsibilities within the consortium. The roles and resources are established through the activity plan in the development of the project.
3.11 Obstacles in scheme implementation	For the national agency in Romania, the main obstacle perceived was the difficulty to identify partnerships, especially when the call imposed more than two partners in the project. Even if support was offered to that respect, identifying a partner remained a challenge. There were no special problems related to IPR – usually negotiated within the participating consortium from the beginning of the project.
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	Results identified by participants in the programme (an important part of the respondents being from Romania): • development of new products, process and methods: (75% of applicants had innovative results , 61% confirmed that the results had been commercialised, most of them having reached the market in a period of 2 years • increase of R&I activities: (65% of beneficiaries increased their R&I expenses, 66% increased their R&I personnel, 46% offered a permanent position to non-permanent personnel recruited during the project • economic benefits: (41% of the respondents experimented an increase in turnover, 73% of the cases resulted in business opportunities) There are no references to quantify results, the impact evaluation did not offer any data to that respect (a part from responses in the evaluation survey) What % of researchers that have participated in intersectoral mobility schemes: No special records on this aspect, but the perception of the coordinating agency in Romania was that there were no researchers leaving the academic/research institutions Received transferable skills training during their mobility experience? This was also not followed within the implementation and monitoring procedures, but most of the researchers could benefit from the different approach promoted by the

	companies, they became much more proficient in drafting project proposals and ideas in English, they became much more careful with administrative aspects, especially with respects to financial rules. Impacts: Outcomes perceived by the national agency: closer relationships between academia and companies, increasing interest to new calls and challenges, better definition to thematic areas according to thematic profiles of Ro actors, attracting more companies focused on production; at the level of the programme, benefits perceived by the agencies were: exchange of knowledge and good practices, possibility of being aware of advanced developments and identifying challenges and new trends in the manufacturing field.
4.2 Monitoring and evaluation	• *Has there been any monitoring and evaluation of scheme implementation*? Yes – the monitoring team was separated from the contracting and implementation team; An impact evaluation was realised for the whole programme (available at http://www.manunet.net/help/MANUNET-II-impact-assessment.pdf • *Does this shed light on the effectiveness and impact of schemes?* Yes, but it is not seen from the perspective of ISM activities, as not explicit an objective within the programme. • *What are the main lessons learned from scheme implementation?* Calls need to be discussed early, in order to adapt them to the national requirements in terms of timing, thematics, procedures; other needs for improvement: simplification of the application and implementation processes; improvements on the monitoring tool should be developed in order to allow a better follow-up of on-going projects and to share that information among agencies; attract more countries to participate, especially large countries and relevant countries outside EU memebers and associates (USA, Australia).
4.3 Replicability potential	• The scheme is highly transferable, with a specific focus on ISM added • High replicability potential, as it was continued under the new financial programme within MANUNET III, new country and agencies having joined the network.
5 Additional information sources and keywords	
Other information	Signpost to any websites providing sources of further information. https://www.era-learn.eu/network-information/networks/manunet-ii http://www.manunet.net/help/MANUNET-II-impact-assessment.pdf http://old.uefiscdi.ro/articole/2318/MANUNET-II.html http://www.manunet.net http://cordis.europa.eu/result/rcn/197843_en.html
Keywords	Manufacturing advanced technologies, SMEs, increased R&I, economic benefits, regional policies, voluntary participation, simplified procedures
Slovakia	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Support to Research Cooperation Bilateral Projects Between Slovakia and Other Countries
1.2 Country or countries/region	Apart from the H2020 schemes, such as MSCA-ITN and others there are no international or national intersectoral mobility schemes in Slovakia. On the other hand existing international mobility schemes, though focused mostly on academia-academia mobility, do not exclude intersectoral mobility per se.
1.3 Reason for selection	There is a long-term experience with these schemes in Slovakia. The potential best practice is in the simplicity of the scheme and its objectives.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	Name: Slovak Research and Development Agency Address: Mýtna 23, P.O.BOX 839 04, 839 04 Bratislava 32, Slovakia Phone: +421 2 5720 4561 E-mail: jergus.benkovic@apvv.sk www.apvv.sk

2.2 Promoter / lead organisation (type of organisation)	Research and development support agency (public body)
2.3 Budget (€)	• Varies annually; for each call for proposals between EUR 66,000 – 106,000. • Varies according to the country with which the bilateral programme is implemented; between EUR 2000 (e.g. Austria) and EUR 8000 (e.g. China)
2.4 Funding type	• Internationally funded There is a combination of funding from both countries that participate in the scheme.
2.5 Funding organisation(s)	• Slovak Research and Development Agency (on behalf of the Slovak Government) from the state budget.
2.6 Funding mechanism and incentives	• *What is the funding mechanism? (e.g. grant, bursary, pay from the company, repayable loan)* GRANT to the Slovak research organisation. • *Have any incentives for individual researchers been put in place for the intersectoral mobility scheme?* NO. • *Have any incentives for specific institutions been put in place for the intersectoral mobility scheme?* NO • *What support structures have been put in place to help researchers whilst they are undertaking a mobility period?* NO official support structures in place.
3 Description of scheme	
3.1 Stated objectives of scheme	The objective of the bilateral cooperation schemes is as follows: "… to establish or to strengthen research and development cooperation with organisations from other countries by supporting following activities: (i) development of common international projects, (ii) preparation of common publications or other outputs of international cooperation, (iii) active participation in conferences and organisation of common scientific events, (iv) reciprocal or joint use of utilities and equipment of both parties, (v) collection of research materials, samples, etc…, (vi) involvement of PhD students or junior researchers (up to 35 years) into common research."
3.2 Description of intersectoral mobility scheme	"Support to Research Cooperation Bilateral Projects Between Slovakia and Other Countries" is not one scheme, this is a set of Calls for Proposals launched each year (up to 5). Each CfP is aimed at cooperation with one country only. The scheme is based on competitive application process in which only registered research organisations (incl. universities) may participate in. The scheme, in the form of a grant, simply covers direct costs of researchers associated with the international mobility and cooperation. The grants are usually provided for maximum 2 years. The grants were limited in the beginning by the number of days that the participants were allowed to stay in other/host countries, later the limits have been introduced by setting up maximum size of the grant per project which varies between EUR 2000 (e.g. Austria) and EUR 8000 (e.g. China). 17 countries have been participating in various schemes since 2007, some of them repeatedly. There have been 51 calls for proposals implemented between 2007 and 2017.
3.3 Scheme launch date	The scheme in its current form (or very similar) has been operational since 2007.
3.4 Number of participants and other factual information about scheme	• Number of researchers per year participating in scheme Number of researchers varies each year according to the CfP and number of CfPs. 17 countries have been participating in various schemes since 2007, some of them repeatedly. There have been 51 calls for proposals implemented between 2007 and 2017. • Main institutions: Slovak Research and Development Agency, on behalf of the Slovak Government. Universities and Research organisations as partners in the project Foreign partners, which may also be companies. • What % of time is being spent by researchers in the non-academic host institution

	during the mobility period? There is very limited participation of researchers in industry/company within these schemes though there were some examples of this kind. It is therefore rather difficult even to estimate the % of time spent in the non-academic host, apart from being very limited. • Duration of intersectoral mobility period. Majority of researchers up to 2 years.
3.5 Area(s) of industrial research	• There is no specific sectoral or research focus of the scheme. The research topics covered depend on the agreement between the HEI and the partner organisations.
3.6 Eligibility requirements to participate	• An applicant may be research and development organisation registered by the Slovak lawThere are no other requirements.
3.7 Application process	• The partnership is initiated by the HEI/RTO which contacts the foreign partner. Usually the contacts have been established previously and the cooperation project is built on the previous cooperation experience. The partners need to achieve general agreement about the topic, contents, and specific objectives of the project/knowledge transfer before applying for the grant. The application process varies according to the call for proposals but usually up to 6 months.
3.8 Partnership finding	• There is no common or standard process of establishing the partnership. All parties have to find themselves/each other by their own effort, usually based on the previous contacts and collaboration (but not in all cases).
3.9 Links with other mobility schemes	• There are no links with other schemes. (
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	As this is often senior research mobility, particular measures of the research supervision are not envisaged. The scheme does not suppose specific PhD supervision hence in case it is necessary it is undertaken in an informal way. The research agenda is negotiated and designed in advance, usually based on previous contacts and mutual experience of both partners. There is no specific allocation of roles of both partners and they may vary considerably, based on the institutional conditions of partners as well as on their previous practices and forms of collaboration. The research agenda is solely designed by both partners, no external agent is influencing it.
3.11 Obstacles in scheme implementation	The obstacles are not major ones. The scheme is simple enough and RTOs are used to its administration and processes. However, it is mostly international mobility and international cooperation scheme. Its intersectoral element is very weak and depends on the participating organisation. Slovak RTOs have in general limited interest in cooperation with industries and with private companies. Therefore the obstacle for intersectoral mobility is in the expectation and interests of the participants, and, more general, the purpose of the scheme which has intersectoral mobility only implicitly and its stipulated objectives are international cooperation. • IPR questions are not an issue due to nature and focus of the projects.

Slovenia	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Strengthening of Research Departments in Companies (Krepitev razvojnih oddelkov v podjetjih - KROP)
1.2 Country or countries/region	Slovenia (national scheme)
1.3 Reason for selection	According to the Ministry of Economic Development and Technology, the KROP scheme could be considered a potential good practice, as it has successfully achieved its goal of helping companies significantly expand their research and development activities. Although many companies have expressed satisfaction with the results of the KROP scheme, the KROP 2012 scheme did prove problematic for a lot of companies, as out of 87 participating companies only 62 have succeeded in completing all operations, which can be mostly attributed to conditions set by the scheme. However, the KROP 2013 scheme proved much less problematic in this respect (51 of 55 companies successfully completed all operations) and could be as such taken as the basis for examination.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details	The KROP 2011 scheme was managed by the Ministry of Higher Education, Science and Technology (defunct - abolished at the beginning of 2012). The KROP 2012 and KROP 2013 schemes were managed by the Ministry of Economic Development and Technology. Contact Data: Name: Ministry of Economic Development and Technology Address: Kotnikova 5, 1000 Ljubljana Phone: +386 1 400 33 11 Email: gp.mgrt@gov.si Contact persons: Marta Slokar, marta.slokar@gov.si Maša Ravnik, masa.ravnik@gov.si
2.2 Promoter / lead organisation (type of organisation)	Ministry
2.3 Budget (€)	• Total budget: o Public sector share: ▪ KROP 2012: 11,000,000.00 EUR (EU contribution (European Social Fund) 9,350,00.00 EUR; Slovenian contribution 1,650,000.00 EUR) ▪ KROP 2013: 9,700,000.00 EUR (EU contribution (European Social Fund) 8,245,00.00 EUR; Slovenian contribution 1,455,000.00 EUR) o Private sector share: The employer (applicant institution) has to cover the difference between the cost of the researcher and co-financing provided by the scheme. Rate of co-financing by the scheme depends on the type of activity (employment of young researchers undertaking PhD studies - 100%, employment of new researchers - 50%, inclusion of researchers, already employed at the applicant institution, in the new research group - 25%). • Co-financing per company: in KROP 2013 the amount of co-financing per company was limited to 400,000.00 EUR. In KROP 2012 no limit on the amount of co-financing was set (instead, the number of researchers that could be newly employed through co-financing by the scheme was limited - companies without a research department could employ up to 2 researchers through co-financing by the scheme, while companies with a research department could increase the number of researchers by at most 100% through co-financing by the scheme). • Standard cost (full cost - includes contribution by the scheme and contribution by the employer) per researcher in full-time employment, undertaking intersectoral mobility, per year (in most cases duration of mobility within the scheme is 1 year): o young researchers undertaking PhD studies: 33,655.00 Euro in KROP 2013

	(32,102.64 Eur in KROP 2012) ○ other cases: 61,234.00 Eur in KROP 2013 (60,775.00 Euroin KROP 2012)
2.4 Funding type	• National public • Private – other (self-contribution of the applicant) • EU-funded
2.5 Funding organisation(s)	• Ministry of Economic Development and Technology
2.6 Funding mechanism and incentives	The funding mechanism is co-financing (in the range of 25% to 100%, depending on case) provided by the scheme to participating companies (organisations) for work costs of researchers working in the research group to be established in the project financed by the scheme. Other than co-financing provided by the scheme, no additional incentives for researchers or institutions have been put in place. No support structures for researchers during the mobility period have been put in place.
3 Description of scheme	
3.1 Stated objectives of scheme	The aim of the scheme is to strengthen research and development in companies through employment and training of researchers and developers in interdisciplinary R&D groups and, through this, to support companies in strengthening their development and innovation capacities. The specific objective of the scheme is the establishment of R&D groups in companies which do not yet have an R&D department or which plan to expand their R&D department with a new R&D group in new R&D fields. The result of project, financed by the scheme, is a new research group, which is entered in the Database of Research and Development Actors at the Slovenian Research Agency (ARRS). KROP 2012 stated, in respect to the funder (the Ministry of Economic Development and Technology), additional objectives: - increasing the number and share of researchers in the business sector - increasing the number and share of PhD holders among researchers in the business sector - stimulating employment and training of young researchers (researchers at most 35 years old, enrolled in a 3rd level Bologna studies) - stimulating employment of experts in companies
3.2 Description of intersectoral mobility scheme	The KROP scheme financially supported participating organisations in establishing of new R&D groups in new R&D fields, thus enabling them to strengthen their R&D capacities and extend their R&D into new fields. For this purpose the scheme provided co-financing for work related costs (salaries with mandatory contributions, training, products, services, amortisation) for researchers working in the R&D group to be established in the project. The programme and activities of the new R&D group, its role in the strategy for development of the company, employment plan and expected results of the work of the R&D group had to be clearly presented in the application. The duration of the co-financing period was approximately 1 year (the exact duration depended on the date of signing of the co-financing contract). By design, the scheme was employer-centred, stressing improvement of R&D capacities of companies, not improvement of skills of researchers. This is also evident from the application process, in which the organisation was the sole applicant and was given a possibility to also select researchers after it had been selected for co-funding (although in

	many cases companies had chosen the researchers prior to submitting the application). However, through criteria employed in the selection process (new R&D groups should be interdisciplinary, they should include researchers already employed at the company as well as new researchers (in KROP 2013)), the scheme also laid a basis for acquisition and transfer of knowledge and skills. Through providing a possibility for co-financing of "young researchers" (PhD students at most 35 years old when entering PhD studies), the scheme offered (indirectly, as they were not the applicants) young people a possibility to advance their career by obtaining a PhD. A participating company must be incorporated either as a company as defined by the Companies Act, or as an institute, as defined by the Institutes Act, which is not a public service provider (this includes, e.g., private schools and universities, private hospitals and clinics, private research institutes; public institutes are in most cases public service providers). The scheme supported five different types of activities, which differed in the category of participating researchers and whether participating researchers would be newly employed by the company with support of the scheme or have already been employed at the company at the time of the issue of the Call for Proposals: A1: new employment or training (if already employed at the company) of a "young researcher" enrolled in a PhD (3rd level Bologna) study programme (industrial PhD) - a young researcher is a researcher, who is at most 35 years old if enrolling in the 1st year of a PhD programme (and correspondingly older, if enrolling in a higher year of a PhD programme); co-financing covers 100% of costs A2: new employment of a researcher from a research institution (higher education institution or research institute; either public or private, either Slovenian or foreign); co-financing covers 50% of costs A3: new employment of a researcher or an expert from Slovenia or a foreign country; co-financing covers 50% of costs A4: new employment of a recent graduate of a 2nd or 3rd level Bologna programme, who has graduated less than one year before the issuing of the call of proposals, or who will be graduating before the start of the scheme; or new employment of an unemployed person with at least a 2nd level Bologna degree (or equivalent), officially registered as unemployed at the Employment Service of Slovenia; co-financing in both cases covers 50% of costs A5 (applies only to KROP 2013, this option was not available in KROP 2012): involving a researcher, already employed at the company, into the new research group; the researcher has to have at least a 2nd level Bologna degree (or equivalent); co-financing covers 25% of costs The key feature of the 2013 scheme, which is reflected in the criteria for evaluation of applications, is the emphasis that the R&D group to be established should include researchers already employed at the company (25% to 50%) as well as newly employed researchers (50% to 75%) (up to 4 points) and that it should be interdisciplinary (more than 66% of researchers should come from different research fields) (up to 2 points). Other selection criteria included alignment with the national development strategy (1 point), reality of achieving the stated objectives (previous cooperation with R&D organisations (1 point), financial self-contribution in relation to the income of the organisation (1 point)) and contribution to the objectives of sustainable development and equal opportunities (1 point). More than a half of the applicants had achieved the full score (10 points) in evaluation and the projects to be co-financed were selected on a basis of an additional criterion, as specified in the Call for Proposals - the added value per an employee of the company (companies with a higher added value were selected for co-financing).
3.3 Scheme launch date	The scheme was established in 2011. Altogether, three calls for proposals were published

	for the scheme (in years 2011, 2012 and 2013).
3.4 Number of participants and other factual information about scheme	In KROP 2012, 87 companies were co-financed through the scheme, with co-financing provided for 285 researchers (87 in category A1, 35 in category A2, 62 in category A3 and 101 in category A4). 62 companies successfully completed all operations. Among the companies that were co-financed in KROP 2012, the number of researchers co-financed by the scheme ranged from 1 to 15. In KROP 2013, 55 companies were co-financed through the scheme. 51 companies successfully completed all operations. Companies and institutes co-financed through the scheme came from different fields of research and development, and were of diverse sizes (from companies with only a few employees, to companies with several thousand employees). In general, researchers spent the entire time for which they were employed by the company (non-academic host institution) in the company. In KROP 2012 all researchers, co-financed by the scheme, had to be employed by the company full-time, while in KROP 2013 in activities A2 and A3 part-time employment by the company (at least for 30% of total work time) was also possible. The time available to companies to complete operations under the scheme (this is also the time during which researchers could be co-financed by the scheme) was limited by the date when co-financing contract was signed, and the deadline for operations as set in the scheme. The time available could be up to 18 months in KROP 2012 and up to 14 months in KROP 2013. Duration of most mobilities in KROP 2013 was around one year.
3.5 Area(s) of industrial research	The scheme is open across all scientific and research disciplines and is not focused on any particular area of industrial research. No priorities regarding specific scientific or research disciplines or areas of industrial research were explicitly stated as such in the Call for Proposals, although, according to the criteria for selection of projects for co-financing, greater weight was given to projects in which the field of work of the R&D to be established included elements of sustainable development or equal opportunities.
3.6 Eligibility requirements to participate	Requirements for participating researchers Educational requirements: In all activities participating researchers must hold (by the time of employment) at least a 2nd level Bologna degree or equivalent. In activity A1 the researcher must be enrolled in a 3rd level Bologna study programme. Requirements regarding research title according to the classification of the Slovenian Research Agency (ARRS): The researcher, depending on the activity, has to be registered or meet requirements for registration as a developer in the Register of Research Organisations at the ARRS (the title of Developer (1st level development title) in case of activities A2, A4 and A5, and the title of Independent Developer (3rd level development title) in case of activity A3). Requirements regarding age: In the activity A1 (young researcher enrolled in a 3rd level Bologna programme) the participating researcher must be at most 35 years old if enrolling in the 1st year of the programme (and can be correspondingly older, if enrolling in a higher year of the programme).
3.7 Application process	Application is filed by the company (eligible organisation), which will employ the researcher(s). In the application the applicant company has to present the programme and activities of the new R&D group that will be established with the support of the scheme, as well as the number of researchers that will be employed with the support of the scheme under each of the activities (A1 - A5) and their field of work and role in the new R&D group. The names of the researchers do not have to be specified in the application (at the time of application, the company does not need to have candidates to fill the research positions

	that will be co-financed by the scheme). From the date of publication of the Call for Proposals, companies have 1 month to submit their application. Results of the selection process are published by the Ministry of Economic Development and Technology in 60 days after the deadline for submission of applications.
3.8 Partnership finding	There are no specific partnership-finding arrangements commonly used. In some cases cooperation in the scheme is established through previously established cooperation between the researcher/research institution and the company (e.g. a researcher, employed at a research institution/university, has worked on a joint project(s) with the company); a student worked for the company during his/her bachelor's studies; a student has prepared his/her diploma in cooperation with the company; a university professor (who would serve as a mentor for an industrial PhD) has collaborated with the company; a researcher, employed at the company, wants to prepare a PhD thesis in cooperation with the company). In other cases companies would search for researchers through advertisements at the Employment Service of Slovenia and in other places.
3.9 Links with other mobility schemes	There are no links between the KROP scheme and other schemes.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	In most cases (activities A2 to A5) supervision by academia does not apply, as the researcher works as an employee of the participating company and is only directly responsible to the company and is thus only supervised by the staff of the company. Joint supervision by academia and industry only takes place in the case of PhD students (industrial PhDs). The scheme does not prescribe any measures or offer support for joint supervision and coordination between academic institutions and companies and measures regarding joint supervision and coordination depend only on mutual agreements and practices of the academic institution and the company. In most cases the applicant company was the only participant in the project co-financed by the scheme and the research agenda was designed by the company alone.
3.11 Obstacles in scheme implementation	The main obstacles in scheme implementation encountered by the participating companies include: - recruitment of researchers - some companies found the conditions for researchers eligible for co-financing too limiting and the time available to find appropriate candidates too short to be able to find researchers that would really suit their needs - the scheme did not provide clear mechanisms for dealing with cases if a researcher quit employment or if he/she didn't perform work satisfactorily or did not succeed in progressing into the next year of PhD studies; if a researcher quit his/her employment, the whole project would fail; The scheme did not set companies any conditions regarding intellectual property rights and publication of results and allowed companies to fully manage their IPRs.

<table>
<tr><th colspan="2">Spain</th></tr>
<tr><td colspan="2">1 Example of intersectoral mobility scheme – key data</td></tr>
<tr><td>1.1 Scheme title</td><td>Catalan Industrial Doctorates</td></tr>
<tr><td>1.2 Country or countries/region</td><td>Spain/Catalonia</td></tr>
<tr><td>1.3 Reason for selection</td><td>• The Catalan Industrial Doctorate is structured based in two well-known and consolidated experiences in EU: CIFRE - Conventions Industrielles de Formation par la Recherche from France and the Industrial PhD Programme from Denmark.
• The programme has some interesting features that can be useful in the definition and preparation of guidelines and suggestions of improvement for other schemes and is suitable of being transferred, namely: the training provided to researchers; the financial support provided to universities, companies and researchers; the support provided to researchers for international mobility.</td></tr>
<tr><td colspan="2">2 Organisations involved in implementing scheme and funding arrangements</td></tr>
<tr><td>2.1 Promoter / lead organisation responsible for managing intersectoral mobility scheme Contact details</td><td>Name: Secretaria d’Universitats i Recerca | Departament d’Empresa i Coneixement | Generalitat de Catalunya
Address: Via Laietana 2| 08003 Barcelona
Phone: +34 93 5526797
Email: jordi.alba@csuc.cat</td></tr>
<tr><td>2.2 Promoter / lead organisation (type of organisation)</td><td>Regional Government of Catalonia (Public body)</td></tr>
<tr><td>2.3 Budget (€)</td><td>• The Government of Catalonia, via the Agency for Management of University and Research Grants (AGAUR), provides one of two different types of financing, depending on the nature of the project: Co-funding type of financing (DI-COF) and Specific funding type of financing (DI-AJUT ESP), however the most relevant to this study is the DI-COF, once:
o Is related exclusively to the mobility of researchers to industry;
o Provides financial support to universities, companies and researchers/students
o Researchers/students must by full-time in the development of their industrial doctorate project
• Maximum amount for 2017 per a project of 3 years - € 55 560,00, split as follows:
o Business sphere: € 21 600,00
o Academic community: € 25 488,00
o Industrial doctorate student: € 8 472,00
• The programme is fully funded by the Government of Catalonia</td></tr>
<tr><td>2.4 Funding type</td><td>Regional funding</td></tr>
<tr><td>2.5 Funding organisation(s)</td><td>Government of Catalonia</td></tr>
<tr><td>2.6 Funding mechanism and incentives</td><td>• The funding provided by the Government of Catalonia is as follows:
<table>
<tr><th>Item</th><th>Amount Maximum (1 year)</th><th>Amount Maximum/project (3 years)</th><th>Beneficiary</th></tr>
<tr><td>Company supervision costs</td><td>€ 7 200</td><td>€ 21 600</td><td>Business sphere</td></tr>
<tr><td>Research group funding</td><td>€ 7200</td><td>€ 21 600</td><td rowspan="2">Academic community</td></tr>
<tr><td>Research group funding overhead (18%)</td><td>€ 1 296</td><td>€ 3 888</td></tr>
<tr><td>Subsidy for doctoral programme enrolment</td><td>€ 624</td><td>€ 1 872</td><td rowspan="3">Industrial Doctorate student</td></tr>
<tr><td>Mobility fund</td><td>€ 2 200</td><td>€ 6 600</td></tr>
<tr><td>GOVERNMENT OF CATALONIA FUNDING</td><td>€ 18 520</td><td>€ 55 560</td></tr>
</table></td></tr>
</table>

	• The business is required to employ the industrial doctorate student, paying an average minimum annual gross salary of at least €22,000, plus the corresponding social security contributions. The company must guarantee to pay a minimum gross salary of at least €66,000 over the 3 years, not including social security contributions, each year being paid in accordance with the company's remuneration policy. • Industrial doctorate project expenses which are financed by the business sphere (the industrial doctorate student's salary, consumable materials and other project expenses) may be eligible for tax rebates and deductions, in accordance with current legislation and the procedures established for that purpose. • All industrial doctorate students will be given an annual mobility fund funded by the Government of Catalonia and accumulative for a maximum period of 3 years, allowing them to take part on workshops, conferences or exchanges between students/researchers. • The Government launch different calls (per university and companies) at various times each year.
3 Description of scheme	
3.1 Stated objectives of scheme	The Industrial Doctorates Plan is an initiative of the Government of Catalonia in partnership with the Catalan university and research system. Its aims are: 1. To boost the competitiveness and internationalisation of Catalan industry. 2. To retain home-grown talent and attract international talent. 3. To give doctoral students the opportunity to work on R&D&I projects with companies. This initiative is intended to address the challenges involved in transferring to the business world the advanced, world-beating technology developed by our university and research system in the last decade, thereby ensuring this technology and knowledge is used to further Catalonia's own economic and social development. It is based on programmes developed in other countries, such as France's Conventions Industrielles de Formation par la Recherche (CIFRE) and Denmark's Industrial PhD Programme and is in line with other programmes created later on, such as the European Commission's European Industrial Doctorates (EID). The parties involved are companies (the business sphere), universities and research centres (academic sphere), future doctoral students and the Government of Catalonia. (Description from the "Industrial Doctorates Plan", Basic information Catalan Industrial Doctorates DI-2017)
3.2 Description of intersectoral mobility scheme	An industrial doctorate project is a strategic research project carried out by a company in partnership with a university or research centre and which will form the basis for a doctoral thesis, enabling future doctoral students to begin their research training and career in a dual business and academic environment. The representative of the academic sphere can be a public or private university in Catalonia where the future doctoral student is enrolled in an official doctoral programme. Industrial Doctorate students need to divide the working time on the research project between company and university and to take part in training programmes in cross-cutting business skills, with a minimum duration of 60 hours: 30-hour common programme provided by the Government of Catalonia and 30 hours training provided by the university and the company on leadership and the coordination and management of R&D&I projects; valorisation and transfer of research results; the development of new companies and sources of funding; and intellectual and industrial property, among other relevant subjects. All the projects carried out within the framework of the Industrial Doctorates Plan will receive recognition, along with the industrial doctorate students, project managers and

<table>
<tr><td></td><td>thesis directors.

(Description from the “Industrial Doctorates Plan”, Basic information Catalan Industrial Doctorates DI-2017)</td></tr>
<tr><td>3.3 Scheme launch date</td><td>Scheme was first launched in 2013</td></tr>
<tr><td>3.4 Number of participants and other factual information about scheme</td><td>In the website of the Catalan Industrial Doctorates statistics related to the programme are presented:

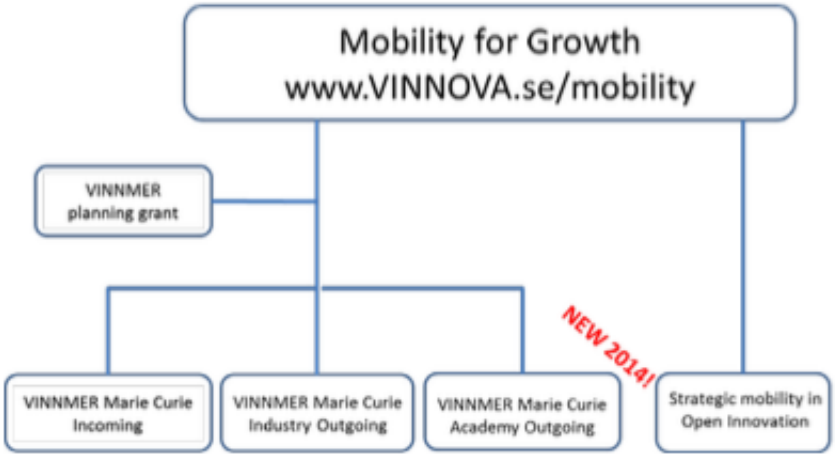
<table>
<tr><th>Number</th><th>Pilot 2012</th><th>Call 2013</th><th>Call 2014</th><th>Call 2015</th><th>Call 2016</th></tr>
<tr><td>Projects approved</td><td>17</td><td>60</td><td>76</td><td>73</td><td>79</td></tr>
<tr><td>Universities involved</td><td>17</td><td>64</td><td>83</td><td>86</td><td>95</td></tr>
<tr><td>Companies involved</td><td>12</td><td>54</td><td>74</td><td>74</td><td>73</td></tr>
<tr><td>Students involved</td><td>17</td><td>64</td><td>83</td><td>86</td><td>95</td></tr>
</table></td></tr>
<tr><td>3.5 Area(s) of industrial research</td><td>Industrial doctorate projects are open to researchers in all fields, to companies of all sizes, from start-ups to major companies, and to future doctoral students of any nationality.</td></tr>
<tr><td>3.6 Eligibility requirements to participate</td><td>• The research project and doctoral thesis are developed under a collaboration agreement between at least one representative of the academic sphere and one of the business sphere.
• The representative of the academic sphere will be a public or private university in Catalonia where the future doctoral student is enrolled in an official doctoral programme.
• The candidate must have an average mark of 6.50 or higher on his or her academic transcript.
• The thesis director must be part of an active recognised research group (SGR) of the Government of Catalonia or a researcher from the ICREA programme or be a recipient of European Research Council (ERC) funding.
• The time the industrial doctorate student spends working on the research project will be divided between the two spheres.
• Industrial Doctorate students will take part in training programmes in cross-cutting business skills, with a minimum duration of 60 hours.
• The length of the collaboration agreement must be for 3 years.
• The business is required to employ the industrial doctorate student, paying an average minimum annual gross salary of at least €22,000, plus the corresponding social security contributions.
• The industrial doctorate student must work exclusively on the research project.
• The same thesis director cannot receive more than 14,400 euros of annual funding within the framework of the Industrial Doctorates Plan.
(Description from the “Industrial Doctorates Plan”, Basic information Catalan Industrial Doctorates DI-2017)</td></tr>
<tr><td>3.7 Application process</td><td>The application process for the Industrial Doctorate Plan is streamlined, simple and with minimal documentation requirements in order to ensure applications are dealt with rapidly:
1. The academic and business spheres will present a proposed industrial doctorate project, providing basic information
2. The proposal is published on the website of the Industrial Doctorates Plan, in the 'Open call' section, so that candidates who are interested and meet the requirements described may submit their applications
3. Selection of the researcher who will carry out the industrial doctorate project
4. Signing of the collaboration agreement between parties
5. Presentation of their application for funding under the current call for industrial doctorates via the Government of Catalonia's Virtual Procedures Office (OVT)
6. Assessment of the applications received by the Government of Catalonia, according to the time period indicated for guidance purposes in the terms of the call for industrial doctorates</td></tr>
</table>

	7. Once the application has been accepted, the academic and business spheres will have 60 calendar days to accept the funding, presenting the documentation stated in the terms
3.8 Partnership finding	Policy level • Government of Catalonia invest in campaigns and in workshops to promote the engagement of companies and show them the added value of the research to applied fields. • The regional Government has a platform to advertise the projects of companies and Universities that allow researchers to be aware of the different opportunities. Implementation level • The project is designed by the company in cooperation with the University. The first contact can be stablished by the University or company (it depends on the project) and its common that the cooperation arises from organisations that are cooperating already. • Once having the project, the regional Government advertise it in the platform, guaranteeing that different students can have access to open calls and apply for it. Is also possible and it happens sometimes, to University and company suggest a certain student to work on industrial doctorate project, that needs to be approved by the Regional Government (according to the criteria defined in the terms of reference of the call). • Is very common the continuous involvement of the same company in the different calls, as a result of the benefits of this cooperation.
3.9 Links with other mobility schemes	The funding provided by the Government of Catalonia may be awarded in conjunction with other R&D&I grants provided by the University Grants Management Agency (AGAUR). In the perspective of Regional Government, It makes sense to complement the regional/national schemes with European ones, at list in terms of cooperation and exchange of experiences. In this moment the Government is in contact with Spanish Ministry to work at national level and also with France CIFRE.
3.10 Governance and measures to ensure coordination during mobility period between academia and industry	The research project and doctoral thesis are developed under a collaboration agreement between at least one representative of the academic sphere and one of the business sphere. The collaboration agreement is a framework document governing the relationship between the academic and business spheres and it establishes the terms and conditions of the call for proposals for funding. This document must include: • The specific conditions of the employment contract • The distribution of working hours • Intellectual and industrial property rights • The persons responsible for supervising the project in the academic and business • The specific funding of the project • The mechanisms for monitoring the progress of the projects and tasks carried out by the researcher in training • Conditions related to the rights of the industrial doctorate student to publish his or her research results during the training period • Terms referring to mobility and attendance in events • The period covered by the agreement This agreement is established in the planning phase of the industrial doctorate project and besides this agreement, the cooperation between parties will also comprises: • The identification of a thesis director appointed from the academic sphere and a project manager from the business sphere, to be named in the collaboration agreement • Organisation of regular meetings - the number of meetings is defined when the two parties celebrate the agreement and it depends on the project and organisations involved

3.11 Obstacles in scheme implementation	Identified by Public Administration • The biggest challenge is to involve non-profit organisations in the projects (namely from social sectors), once they are co-funded and many times these organisations do not have support to guarantee their contribution. • The involvement of new companies in the programme is also a challenge. Identified by Universities • The period of funding of the industrial doctorate project (3 years) sometimes is not compatible with the time needed for research. • The involvement of companies and businesses organisations in the programme, because besides incorporating a PhD student, the companies need to support part of the research.

Sweden	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	VINNOVA, the Swedish Innovation Agency – Mobility for Growth
1.2 Country or countries/region	Sweden. National scheme.
1.3 Reason for selection	This is a long-running scheme, which has evolved over time to better adapt to ISM conditions (e.g. shorter mobility period, tailored negotiations between the researcher and host institution). The rationale behind the programme is that a long-term goal for VINNOVA is to support the universities to develop their own strategies to better link their activities to the needs of society and industry.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	**Contact details** **Name**: Erik Litborn (National Contact Point (NCP) Marie Skłodowska Curie Actions (MSCA) Programme Director Mobility for Growth and VINNMER **Organisation**: VINNOVA **Email**: erik.litborn@vinnova.se **Phone**: +46 8 473 31 98
2.2 Promoter / lead organisation (type of organisation)	VINNOVA is the Swedish Innovation Agency, a government agency operating under the Ministry of Enterprise and Innovation.
2.3 Budget (€)	2012-2017 - €35 million, of which EUR 10 million is co-funding from MSCA. The repatriation grant may only be applied by university researchers who intend to do an exchange programme in industry for at least 12 consecutive months at least 80 per cent full-time. A repatriation grant may be applied for including overheads, but no more than €52,000.
2.4 Funding type and organisation(s)	National public agency (government agency).
2.5 Funding mechanism and incentives	Successful applicants for the Mobility for Growth scheme receive a grant.
3 Description of scheme	
3.1 Scheme objectives	The overall objectives of the programme relate to: • Intersectoral mobility – Promoting mobility between the private and public sectors. • Transnational mobility – Promoting researcher mobility and developing attractive careers. • Qualified future leaders in R&I – Advancing training and skills demand by enhanced human resource management in highly competitive environments. • Equal opportunities – Advocating and promoting a better work/life and gender balance through flexible working arrangements under full employment contracts. • Supporting mobility as a merit – A mobile career should be a strong future merit in all sectors conducting R&I. The programme Mobility for Growth aims to address the increased demand of highly skilled workforce, but not only the quantity of highly qualified researchers but also the quality of their skills and their relevance to the private sector. The programme is expected to result in the presence of significantly more research-qualified individuals who can become future leaders in public and private R&I organisations.
3.2 Description of intersectoral	VINNOVA's Mobility for Growth programme is implemented by partnerships of universities, research institutions, research infrastructures, businesses, SMEs and other

mobility scheme	socio-economic actors from different countries across Europe and beyond. Individual institutions which can provide the same environment as the afore-mentioned institutions may also apply. The programme targets experienced researchers who have a doctorate or at least four years' full-time equivalent research experience and who are interested in mobility as a career development option. Actions will be open to training and career development activities within all research and innovation domains. The rationale behind the programme is that a long-term goal for VINNOVA is to support the universities to develop their own strategies to better link their activities to the needs of society and industry. Moreover, in the Research Bill 2012 VINNOVA was appointed to develop and validate a model for appropriations based on assessment of collaboration. The programme Mobility for Growth links to this work and the programme support the demand from universities to increase mobility. Further basic information regarding the scheme is provided below: • Length of tenure: Awards are for a minimum period of three months. • Place of tenure: Must involve transfer between Swedish private industry and a Swedish university or a not-for-profit research organisation
3.3 Scheme launch date	2012
3.4 Number of participants and other factual information about scheme	• VINNOVA awards around 100 grants, which is the equivalent of a 30-40% success rate. • Main institutions participating are Swedish universities and larger companies (although other types of applicants do also exist) Through the Incoming scheme, experienced researchers of all nationalities can apply for international mobility to Sweden with project times of up to 3 years and get up to 50% of their salary costs as well as additional relevant costs relating to mobility covered. Through the Outgoing scheme, experienced researchers of all nationalities currently affiliated with industry or research institutes in Sweden with at least four years of research experience can apply for research stays abroad of up to 3 years, where at least 50% of the time is spent outside Sweden, or of 3 months, where all of the time is spent outside Sweden. In both cases up to 50% of their salary costs as well as additional relevant costs relating to mobility covered.
3.5 Area(s) of industrial research	The scheme is open to a broad range of scientific and research disciplines which include the following: • Formal sciences • Humanities • Natural sciences • Professions and applied sciences • Social sciences • Any TRL
3.6 Eligibility requirements to participate (for researchers and organisational/ institutional participants)	Researchers of any nationality, who have a doctorate or at least four years' full-time equivalent research experience, may apply. There are no additional firm rules but the grantee must adhere to the EU's co-fund rules as Mobility for Growth is co-funded by MSCA.
3.7 Application and selection process	The application process is initiated by the researcher wishing to apply for the mobility grant. The researcher can also apply for a planning grant to support the development (and

	negotiations associated with the host institution) of the application. More generally, the programme also promotes gender equality (as part of the selection process). In practice, this means that the programme is open to applications from all researchers, but that the underrepresented gender may be given strategic preference in areas where there is great need to equalise gender imbalances. The same applies in regard to the EU working life rules, which state that it is permissible to use positive action to achieve equality impacts for an underrepresented gender in the case of active recruitment.
3.8 Partnership finding	The partnership search responsibility lies with the applicant researcher. The key rule is that the application should put the individual (mobility grantee) in focus. The grant is for applicants to engage in an international collaborative project and to grow as a professional. It is up to this individual to shape the project and to negotiate the best deal (with the most suitable host) for the mobility period.
3.9 Links with other mobility schemes	VINNOVA views Mobility for Growth as an umbrella for all activities and programmes supporting individual career development. This includes programmes organised in collaboration with other funding institutions (e.g. MSCA).  *Source: Mobility for Growth programme material* For example, another VINNOVA initiative focusing on strategic mobility is the Open Innovation programme, which initiated a call under Mobility to Growth aimed at increasing academic competence in the field of open innovation by financing specific mobility actions. Another linking programme is that of VINNMER, which ran 2007-2014 and was also co-funded by MSCA. This long-term objective of the VINNMER programme was to help to increase the number of postgraduates that could become the leaders of the future at universities/colleges, centres, research institutes and companies. The programme was directed towards the underrepresented gender in the scientific field of the application and towards researchers who have a PhD and who have completed their Postdoc qualification. The programme applied to qualification for people who conduct needs-driven research and in co-operation between a university/college and operations in the private/public sector.
3.10 Governance, support structures and coordination measures during mobility period	VINNOVA governs the overarching programme goals but the specific contracts between the researcher and host institution are tailored during the application (negotiation period) and thus differ for each grant. VINNOVA vets the contracts and ensure that they adhere to some general rules, e.g.: • Abide by EU working life rules

	• Abide by MSCA co-funding rules.
3.11 Obstacles in scheme implementation	According to VINNOVA, a major challenge in engaging businesses is that normally they tend to take a short-term view, focusing on the next business results quarter and therefore lack flexibility. Although the top management of enterprises recognise the advantages of mobility and collaboration with academia more generally, this view is not sufficiently reinforced at an operational management level, which is a key collaborator, insofar as it is the operational management who would oversee any mobility exchange directly. From the individual industry researcher's point of view, participation in a programme comes down to logistics and personal views. A stay abroad is likely to impact on family matters. There may also be a sense that, although in theory a mobility period is a career boost, in practice the 'rewards' and impact of participation is not always clear. VINNOVA has over the years adapted the Mobility for Growth programme to take these issues to account: 1. Shortening the minimum period of mobility to 3 months 2. Minimised rules to encourage the applicant to design their own mobility period, including negotiating prospective deals with (potential) host institutions.
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	Mobility of Growth is yet to be evaluated (although the commissioning of an impact evaluation is imminent). Basic monitoring on the number of applications, grantees etc., is carried out by VINNOVA. However, the VINNMER programme, which was similar in design and objectives to Mobility for Growth was evaluated through an on-going (real-time evaluation). It provided over 100 researchers with opportunities for further research qualifications and career development. Key impacts observed included: <u>Short term (during the programme):</u> • Interview/questionnaire shows the value of the programme to the individual's qualification during the project. • Medium term (five years after the programme's conclusion): • At least 25 projects have resulted in lasting international collaboration involving the private sector after conclusion. • At least 15 projects have resulted in lasting international collaboration between public sectors. • 80% of VINNMER Marie Curie Fellows have boosted their careers. <u>Long term (10 years after the programme's conclusion):</u> • At least 25 VINNMER Marie Curie Fellows are in leading positions in the private or public sectors.
4.2 Monitoring and evaluation	VINNOVA is planning to commission an impact evaluation of Mobility for Growth later this year (2017), which should include looking at long-term impacts of the programme.
4.3 Lessons learned	As mentioned above, VINNOVA has over the years adapted the Mobility for Growth programme to take into account lessons learned since the programme began: 1. Shortening the minimum period of mobility to 3 months to ensure that researchers feel embarking on a mobility exchange to be practically feasible. However, VINNOVA has also found that industrial researchers who take up mobility periods are very productive and organised and can achieve a project in 3 months, but which would take considerably longer if carried out within an academic environment. Industrial researchers tend to hit the ground running, as they are used to working under similar kinds of time pressures.

	2. Minimised rules to encourage the applicant to design their own mobility period, including negotiating prospective deals with (potential) host institutions. Another important lesson learned is that an ISM programme needs to adapt to the target groups. In terms of company participation – it is easier for larger firms to participate – they have better HR capacity. In small firms, the R&D activities is more dependent on the level of commitment from the individual who is looking to apply to a mobility scheme. Especially in these cases – but also generally – it is key to have the buy-in from the operational management, i.e. the line manager must see the opportunity for personal development of the person wishing to participate. Generally, women applicants need more encouragement to apply. VINNOVA has found that female applicants tend to look at the programme criteria and say they only fulfil 7/10 criteria so they hesitate, while the typical male applicant does not react like this.
4.4 Good practices	For VINNOVA, the co-funding aspect with MSCA works very well. Unfortunately, under H2020, the rules for wages have changed (they do no longer take into account wage differences across the EU). Nevertheless, overall co-funding is an effective way of ensuring EU funding contributes towards national objectives. Also, it ensures good evaluation standards (driven by EU). The key to a good programme is to keep it flexible and to allow the applicants to develop shared mobility activities, aims, and schedule. The programme should focus demands on the quality of the proposal and of the proposed project.
4.5 Replicability potential	High replicability potential since the good practices above are transferable to other countries.
5 Additional information sources and keywords	
Other information	Web address about scheme – https://www.vinnova.se/en/m/mobility-for-growth/
Keywords	Intersectoral mobility, Fellowship Scheme

United Kingdom	
1 Example of intersectoral mobility scheme – key data	
1.1 Scheme title	Royal Society's Industrial Fellowship Grants Scheme
1.2 Country or countries/region	UK. National scheme.
1.3 Reason for selection	The scheme could be considered as a good practice since it has been successfully operating for a number of years, is considered to be an excellence scheme, attracts significantly more applicants than there are places available and has succeeded in attracting corporate sponsorship.
2 Organisations involved in implementing scheme and funding arrangements	
2.1 Promoter / lead organisation responsible for intersectoral mobility scheme	**Contact details** Name: Alasdair Taylor/Dorothy Wang Organisation: The Royal Society (RS) Email: industry@royalsociety.org or grants@royalsociety.org Phone: +44 20 7451 2500
2.2 Promoter / lead organisation (type of organisation)	The Royal Society is the independent scientific academy of the UK and the Commonwealth, dedicated to promoting excellence in science.
2.3 Budget (€)	• Typical cost per researcher undertaking intersectoral mobility (total during mobility period) based upon researcher's salary and length of Fellowship, so can vary from ~£50k to £200k+. • The research fellow's basic salary only will be paid during the secondment; the employing institution continues to pay national insurance and pension contributions. Research expenses may be claimed up to the value of £2,000 (€2,200) per year.
2.4 Funding type and organisation(s)	National public and private. The scheme is funded mostly from the UK Department of Business, Energy and Industry Strategy and partly self-funded by The Royal Society. However, it has also attracted corporate sponsorship, including currently from the aerospace industry.
2.5 Funding mechanism and incentives	• Successful applicants for the IF research fellowship receive a grant.
3 Description of scheme	
3.1 Scheme objectives	• The objective of the scheme is to enhance knowledge transfer in science and technology between those in industry and those in academia. It provides opportunities for an academic researcher to work on a collaborative project with industry, or a researcher employed in industry to work on a collaborative project with a university department or not-for-profit research organisation. It is anticipated that fellows will establish personal and corporate links between the two sectors in the UK as a foundation for their long-term future development and collaboration. • From a business perspective, the corporate sponsor aims to support research excellence and to foster industrial talents with a view to gaining access to a talent pool of industry-focused senior researchers and academics engaged in industrial research.
3.2 Description of intersectoral mobility scheme	The Industry Fellowships scheme is for academic scientists who want to work on a collaborative project with industry and for scientists in industry who want to work on a collaborative research project with an academic organisation. The scheme is bi-directional, with currently 70% of participants moving from academia to industry, and 30% from industry to academia (although there are no fixed shares). The scheme provides a basic salary for the researcher and a contribution towards research costs. The scheme is open to all career stages post-PhD, but typical applicants tend to be researchers with a well-established career (particularly for applicants from academia). There are two rounds / year with 5-6 fellows awarded/ round. At any one time, there are approximately 35-40 industry fellows in post. A broad range of sectors are covered, from the energy sector (oil and gas) through topharmaceuticals and communications

	technology. Further basic information regarding the scheme is provided below: Length of tenure: Awards can be for any period up to two years' full-time or pro rata, i.e. could be held at 50% part-time for four years enabling fellows to maintain links with their employing institution more easily. Place of tenure: Must involve transfer between UK private industry and a UK university or a not-for-profit research organisation
3.3 Scheme launch date	The scheme was initially established in 1979 between the Royal Society and the Science Funding Council. It has been running in its current format since 1994 and operated continuously since 2003.
3.4 Number of participants and other factual information about scheme	• *Number of researchers per year participating in scheme*: 10-12 funded per year; 35-40 active at any point • *Main institutions* UK Universities and UK based companies • *Duration of intersectoral mobility period*. Arrangements are flexible a key feature of the scheme. Majority 4 years at 0.5FTE; minority 2 years full-time; other arrangements also funded.
3.5 Area(s) of industrial research	The scheme is open to a broad range of scientific and research disciplines (reflecting the natural sciences remit covered by The Royal Society) which include the following: • The scheme covers academic disciplines across the life and physical sciences, including engineering. • Examples of natural sciences that are supported include: agriculture, mathematics, biotechnology, environmental research, medical and engineering sciences, but excluding clinical medicine. • Projects are supported at any TRL stage from fundamental science to industrial innovation.
3.6 Eligibility requirements to participate (for researchers and organisational/ institutional participants)	Applicants must hold: • a PhD or be of equivalent standing in their profession • a permanent post in either a UK university, a not-for-profit research organisation or in UK industry. Applicants can be of any nationality and should be at a stage in their career when they would particularly benefit from establishing or strengthening personal and corporate links between the two sectors. • In terms of the eligibility requirements for participant institutions and companies, Fellows can be hosted by an academic institution or industry, and should be partnered with an industrial or academic partner accordingly. The application must clearly state the mutual benefit of the fellowship and the collaborative project to both organisations. • In terms of the types of industrial partners able to participate, applications are welcomed from large industrial firms but also from SMEs, and from spin-offs or small companies provided they have a well-established research team and facilities.
3.7 Application and selection process	• The senior researcher typically initiates contact with industry or in the case of an industrial researcher they initiate contact with publicly-funded research when wishing to participate in an ISM period. • Applicants must meet the eligibility criteria, and produce a Data Management and Data Sharing Plan as part of their application. • The application process is electronic only, and paper-based applications are not accepted. • There is typically a time lag of six months between the deadline for the finalisation of the application process and the results of the competition.
3.8 Partnership finding	• The scheme is promoted via the Royal Society's website and promotional routes. • Industrial partners tend to approach academic institutions directly and vice versa wherever senior academic researchers or their counterparts within industry identify potential for a research project involving ISM.
3.9 Links with other mobility	• There any links between the IF scheme, which has served as a testbed for developing good practices in the design, management and operation of intersectoral mobility

schemes	schemes, and new ISM schemes introduced by the Royal Society. These include: • In terms of industry-academia ISM, the Society has launched the **Entrepreneur-in-Residence scheme,** which aims to increase knowledge and awareness in UK Universities about cutting-edge industrial science, research and innovation. The RS is also opening in 2018 a new short-term IF scheme which will also encourage applications with/from SMEs. • The RS is encouraging ISM in the policy sphere, and has piloted a **Policy Secondment Programme**, which commenced in November 2017. The Society also has an established secondment scheme in collaboration with the BBC, encouraging early career researchers to gain experience in how science media works and to develop skills in communicating science.
3.10 Governance, support structures and coordination measures during mobility period	• RS assumes overall responsibility for ensuring effective governance. There are basic requirements for participants in terms of what is required of organisational participants relating to ensuring that they work proactively to strengthen coordination and cooperation between academia and industry both during the mobility period and over a more sustainable period. • An academic contact is available during the placement but supervision has less relevance compared with schemes for early-stage researchers since the researchers eligible to participate will typically be R3 and R4 i.e. experienced researchers and well-established professors. • All fellows are required to provide an annual update on progress as well as a final report (see 4.2).
3.11 Obstacles in scheme implementation	No major obstacles identified but practical difficulties for participants in taking part in the IF scheme relating to the physical mobility aspect (see Section 4.2 – lessons learned under monitoring and evaluation). • To what extent have IPR issues deterred participation in schemes? No info
4 Impacts and replicability potential	
4.1 Outcomes (results and impacts)	Approximately 200 fellows have taken part over 20 years. Industry Fellows either employed by, or hosted, at over 40 universities and about 100 companies since 2003, and the applicants are more distributed across the UK HE sector compared to purely academic funding schemes (in terms of both university mission group and location).
4.2 Monitoring and evaluation	Since the IF fellowship scheme has already been operating for 20 years, some evaluations have been undertaken of the scheme. This includes a recent independent evaluation of the programme, which demonstrated that these Industry Fellowships lead to the growth of long term business-university collaborations, significant commercial and academic outputs, follow-on funding and investment that far exceeds the initial investment and the enhancement of the individuals' career through obtaining new knowledge, skills and a wider network. It also highlighted the value of these schemes offering the types of flexibility that allows companies of different sizes to use them. Two sets of case studies have been produced by the RS focusing on ISM: 1) Changing expectations – project looks at the impact of ISM on research culture through a number of case study based examples of researchers whose careers have spanned research and other sectors and 2) Pushing the revolving door – focusing on ten individuals who have moved between academia and industry. In 2018 a specific set of case studies featuring past holders of an IF will be published.
4.3 Lessons learned	Among the lessons learned from scheme implementation are: • Opening up the ISM scheme to many subject disciplines was perceived as having advantages, rather than being overly prescriptive • Geographic considerations need to be taken into account when designing ISM schemes. Many industry fellows work for host organisations that are not local to their current employer or where they live, which has implications in terms of travel time and costs, time away from home/family etc. • The scheme duration is presently up to 2 years full-time or 50% part-time for 4 years. The scheme therefore tends to attract interest from larger firms since SMEs are not able to manage without key staff for a long period. The Royal Society is therefore in the process of setting up ISM schemes of shorter duration to facilitate SME

	participation.
4.4 Good practices	The scheme has a number of features that represent good practice, such as: • Allowing scope for bidirectional mobility in collaborative research projects, i.e. from academia to industry, but also vice versa; • Targeting experienced researchers to take part in collaborative research projects. R3 and R4 researchers and academics are arguably well placed to ensure the formation of sustainable cooperation arrangements between academia and industry by using ISM as a mechanism to initiate and foster joint collaboration; • The use of innovative approaches to communicating the outcomes of participation in ISM from the perspective of promoting the professionalisation and development of researcher careers such as making case study videos is worth highlighting. • The emphasis on the adaptation of scheme design and/ or implementing arrangements and on flexibility as a means of overcoming any difficulties. For example, since SMEs found it difficult to take part in a 2-4 year scheme, shorter schemes are being designed which will run in parallel with the IF scheme.
4.5 Replicability potential	• High replicability potential since the good practices above are transferable to other countries.
5 Additional information sources and keywords	
Other information	Web address about scheme - https://royalsociety.org/grants-schemes-awards/grants/industry-fellowship/ Case study materials about scheme implementation available here: https://royalsociety.org/topics-policy/industry-innovation/case-studies/pushing-the-revolving-door/ https://royalsociety.org/topics-policy/projects/research-culture/changing-expectations/ Policy secondment scheme - https://royalsociety.org/grants-schemes-awards/policy-secondment-programme/

A. List of ISM schemes that are supported by ESIFs

The attached annex provides supporting information regarding the use of EU Structural Funds (now ESIF) to promote intersectoral mobility.

Use of EU Structural Funds to promote intersectoral mobility in 2007-2013 and 2014-2020

Country	Scheme title and mini description	ESIFs/ SF programming period
Bulgaria	The "Science and Business" (started in 2011) measure was supported under the *HRD* Operational Programme (*OP)* and is managed by the Ministry of Education and Science (MES). The objective was to create a favourable environment for promoting interactions between science and business, through the creation of sustainable partnerships across the 'knowledge triangle' – education, science and industry and to promote the implementation of research results. Activities include: support for young researchers for a one-month study abroad to help to develop new high-tech products, an important step towards the creation of a new generation of scientists better able to meet the needs of businesses. The budget was €2.6m of which only a small % was for ISM.	ESF – 2007-2013
Bulgaria	The Bulgarian SMEs Promotion Agency (BSMEPA) implemented a project through the "Development of the Competitiveness of the Bulgarian Economy" 2007-2013 (OPC) and the Ministry of Economy announced call for proposals under BG161PO003-1.1.06 „ SUPPORT FOR RESEARCH AND DEVELOPMENT ACTIVITIES IN BULGARIAN ENTERPRISES. Component 1 - "Conduct of "industrial research" or "experimental development" foresaw some activities that promoted ISM, in particular performing research, measurement, testing and R&D related to the innovative products, processes or services developed by the project by staff employed, by the applicant/partner or by an external contractor (remuneration, external services). Funding was provided to hire researchers from academic institutions and for the estimated employment costs (including health and social security contributions) for employers.	ERDF – 2007-2013
Cyprus	*RESTART 2016-2020 Programmes for Technological Development and Innovation* The main objectives of the Framework Programme RESTART 2016-2020 are the following: 1. The smart development, with focus on selected priority fields, through strengthening the effectiveness of the RTDI System in Cyprus, its connection with the productive base of the Economy, the support of its extroversion, the fortification of its ties and interactivity between its components. 2. The ensured sustainability and potential of the Research, Technological Development and Innovation (RTDI) system and the reinforcing of its prospects, emphasising on excellence and on the support of its pool of human resources, and especially the new generation human resources. 3. The support of the operational framework of the RTDI system, and the production of added value resulting from research and innovation activities, through the development of support instruments and pilot measures, the encouraging for dissemination and exploitation of research results, and the development and promotion of appropriate culture. The three pillars of the Framework Programme RESTART 2016-2020 are classified in Modules, each comprising of programmes of specified targets. Numerous ISM schemes have been implemented under the Programme	ERDF - 2014-2020
Czech Republic	*Knowledge Transfer Partnership (Partnerství znalostního transferu) - Pilot Programme* https://www.mpo.cz/cz/podnikani/dotace-a-podpora-podnikani/oppi-2007-2013/programy-podpory-z-oppi/pilotni-projekt-inovativni-akce---podpora-transferu-znalosti-v-ramci-oppi--90864/ The scheme was a Czech adaptation of the UK scheme Knowledge Transfer Partnership. The scheme was adapted from the successful UK scheme (originally called Teaching Company Scheme) and financed as a pilot from the Czech OP Enterprise and Innovation 20107-13. Overall objective of the pilot scheme was to strengthen cooperation between companies	ERDF 2007-2013

	and research and higher education organisations aiming at better innovation in companies. The pilot scheme also aimed at testing the new tool supporting cooperation and partnership. The programme stimulates knowledge transfer by supporting post-graduates and post-doc researchers work in companies while being employed by the university and supervised by university experts.	
Estonia	*The Doctoral Studies and Internationalisation Programme "DoRa".* www.ut.ee/sites/default/files/www_ut/oppimine/dora_eng_2010.pdf In **Estonia**, the ESF-funded DoRa programme (2008-2015) had a total budget of €32 million for the measure within the HRD OP which supported a whole series of activities, and only a small part of this total was for the industrial PhD part of the mobility programme. 52 new PhD places were funded through DoRA. The researchers had to be employed by businesses in eligible sectors throughout their studies.	ESF – 2007-2013
Estonia	*Smart Specialisation (growth) scholarships scheme* - http://haridus.archimedes.ee/node/366 The scheme is primarily for PhD students but extends to Masters and Bachelors scholarships. The programme will be implemented in the 2016-2022 period and has a programme budget of €3 million. Under the scheme, €422 per month (equal to the doctoral grant paid by the government) is paid to PhD students of Estonian universities who conduct research related to the smart specialisation growth areas. The objectives are to: support cooperation between R&D institutions and companies, to diversify the career prospects of PhD graduates and to contribute to capacity-building in research-intensive industry sectors. Preference is given to applicants conducting doctoral research responsive to industry needs, addressing the practical problems of a specific sector/company or contributing directly to the implementation of research findings in everyday industry practice (industrial PhD).	ERDF – 2014-2020
Greece	*Innovation, research and development grants in chemical-polymer sector in the framework of Operational Programme „Eastern Macedonia – Thrace 2014-2020"* http://www.gsrt.gr/central.aspx?sId=108I334I1106I646I444510&olID=671&neID=673&neTa=12_10422_1&ncID=0&neHC=0&tbid=0&lrID=2&oldUIID=aI671I0I108I334I1106I0I2&actionID=load&JScript=1 The scheme is implemented within the framework of the Operational Program "Eastern Macedonia and Thrace" of the NSRF 2014-2020, in Priority Axis 1: "Improving the Competitiveness of the Local Economy", namely the Thematic Objective 1: "Strengthening research, technological development and innovation", Investment Priority 1b, and Specific Objective 1: "Increasing business investment in Research and Innovation for the development of new products and services in priority areas of the Regional Smart Specialization Strategy (RIS3) ". Beneficiaries of the scheme are existing enterprises. Investment Projects will be subsidized for: (i) Innovation, (ii) Applied or industrial research, (iii) Experimental development, and which are exclusively associated with the chemical - polymeric industry. Each project can be implemented either by businesses that can carry out such actions, either through a contract with research organisations or their research departments	ERDF 2014-2020
Hungary	*Institutional developments for smart specialization* https://www.palyazat.gov.hu/efop-361-16-intelligens-szakosodst-szolgl-intzmnyi-fejlesztsek The general objective of the program is to expand the research capacities of higher education institutions, to improve their research results, to enhance social innovation, to strengthen the knowledge base of R & D as a whole and to strengthen the third mission of higher education through the quadruple helix model, and thereby to facilitate their effective involvement in the implementation of the National Intelligent Specialization Strategy. To achieve a higher scientific capacity of the higher education institutions it is requested to develop knowledge base and complex research processes that enable institutions to providing intensive Researchers` Support that meet R & D & I needs. The program, co-financed by the ESF, contribute to strengthening research, technological development and innovation in strengthening the R & D & I sector through	ESF – 2014-2020

	✓ postgraduate training and entrepreneurial skills development in research training programs, organized by higher education institutions or research and technology centres or business organisations ✓ researcher`s mobilities, networking activities and partnerships. ✓ Involvement of corporate professionals in doctoral training. Involvement of corporate professionals in research processes or higher education project, related to the strategic research areas of the institutions.	
Latvia	*Grants for postdoctoral research* http://www.cfla.gov.lv/CFLA2/item.php?itemID=3 One of the objectives of the scheme is to develop the skills of young scientists and to increase their scientific capacity by ensuring the career opportunities of young scientists in scientific institutions and companies.	ERDF 2014-2020
Lithuania	*Support programme for scientists and other researchers' capacities development* http://www.esinvesticijos.lt/lt/patvirtintos_priemones/mokslininku-ir-kitu-tyreju-gebejimu-stiprinimas This programme provides support for doctoral studies' development, attracting young researchers from abroad, developing databases and e-infrastructures, increasing the internationalisation of Lithuanian research. Among other activities, the measure supports the capacities of R&D commercialisation among researchers, knowledge and technology transfer skills development, as well as marketing training among researchers. Measure supports the training-related mobility costs for researcher, training services, preparation of training methodologies.	ESF 2014-2020
Poland	*Green light to innovation* Project objective: Improve the skills and adaptability of SMEs' employees regarding innovative projects and new technologies implementation. In the first stage of the project, participants took part in a series of trainings on the implementation of innovations and new technologies. The second element of the project was temporary employment of highly qualified staff in SMEs. This project is an example of many similar initiatives implemented over the period 2007-2013, financed by EU funds (ESF). These projects were based on the scheme of mobility of researchers to business on internship basis, however, particular projects implemented under this scheme differed in details such as: intellectual property rights, the possibility of simultaneous involvement in the company and the university, etc. Project results: development of innovative solutions implemented in companies, business experience gained by the researchers from HEI, development of the professional competence of SMEs employees, improving innovation of the companies.	ESF – 2007-2013
Poland	*TEAM-TECH,* EU funding under the Smart Growth Operational Programme (ERDF). Grants for research teams headed by leading scientists carrying out R&D projects related to a new product or production process (technological or manufacturing) of significant importance for the economy. The programme aim is to improve human potential in the R&D sector in team projects pursued by scientists (regardless of nationality) having outstanding experience in implementing the results of scientific research in economic practice, or in providing research services or operating research equipment for corporate customers.	ERDF – 2014-2020
Romania	*2.1.1 SOP REC - R&D partnerships between universities/research institutes, and enterprises for generating results directly applicable in the economy* http://www.fonduri-structurale.ro/Document_Files//competitivitate/00000028/rxcyc_SOP_IEC_Revised_Official_Proposal_June28.pdf Priority Axis 2 of the Sectoral Operational Programme Raising Economic Competitiveness (2007-2013) was dedicated to raising research and development (RD) capacity and stimulating cooperation between R&D and innovation companies. Operation 2.1.1 was specifically dedicated to joint R&D projects between universities/research institutes and enterprises where different forms of collaboration between enterprises and R&D institutions were encouraged with the aim of enhancing their R&D activities and fostering the technology transfer.	ERDF 2007-2013

Slovenia	*Young Researchers in the Business Sector* http://www.spiritslovenia.si/razpisi/2010-09-24-Javni-razpis-Mladi-raziskovalci-iz-gospodarstva---generacija-2010 The scheme provides participating companies with co-financing for expenses linked to research work of young researchers, employed by the company and enrolled in a PhD study programme (industrial PhD), until their graduation. For each researcher, the scheme covers the salary of the researcher, mentoring supplement for the researcher's in-company mentor and other material and non-material costs. During his/her employment at the company, the researcher will work on basic research for the need of the company, which will eventually lead to a PhD. Development of products and services based on acquired knowledge can only start after the conclusion of the scheme. The scheme concludes successfully, after the researcher has successfully defended his/her PhD thesis.	ESF 2007-2013
UK	Knowledge Economy Skills Scholarships (KESS 1). *Lead organisation - Bangor University).* The scheme is a major, ESF-funded European Convergence programme led by Bangor University on behalf of the Welsh higher education sector involving collaboration between all Welsh Universities. The KESSII Programme is a continuation of the KESS (2009-14). KESS offers collaborative research projects and links researchers undertaking a Masters or a PhD with a local company partner, with the scholarships supported through ESF. KESS achieved 230 PhD and 223 Research Masters projects across Wales (73 PhD and 84 Research Masters at Bangor). KESS closed at the end of September 2015.	ESF – 2007-2013
UK	Knowledge Economy Skills Scholarships (KESS 2). *Lead organisation - Bangor University, but scheme involves all Welsh Universities.* In KESS 2, over 500 businesses are expected to be partnered with academics and postgraduate research students to develop innovative research projects aimed at driving business growth. KES II has a total budget of £36 million of which ESF accounts for £26 million. This will enable 645 Research PhD and Research Masters projects to be supported, each implemented in collaboration with a local business across eight Universities in Wales. External partners must be based in the Convergence area (West Wales and Valleys Convergence region), and all types of organisations are eligible (micro, small, medium, large companies, and third sector). The overall portfolio of projects is weighted towards collaboration with SMEs with activities in the WWV region. Partners are required to make a cash contribution of £3,500-5,000 per year (depending on company size).	ESF – 2014-2020

EIT funding for intersectoral mobility

A further source of EU funding to support ISM is the **European Institute of Innovation & Technology (EIT),** which operates both Masters and PhD programmes across some of the different Knowledge and Innovation Communities (KICs) which are partnerships that bring together businesses, research centres and universities). Examples of such Masters and PhD programmes run by different EIT KICs are now provided:

EIT Masters and PhD Programmes	Description about course	Intersectoral mobility dimension
EIT Climate-KIC Master's Programme https://learning.climate-kic.org/master-label-programme/mlp	EIT Climate-KIC runs a climate innovation programme which adds value to existing Master programmes offered by European Climate-KIC partners institutions in the Netherlands, Germany, France and the UK.	Participants spend 30 ECTS of their master's programme outside of their home university, e.g. by doing an internship or thesis research. Through the course, there is the potential for students to launch their own start-up business venture with support from the KIC-Climate's business coaches and a pre-incubation programme.
EIT Digital Master School https://masterschool.eitdigital.eu/	A two-year Master's programme with eight technical Majors and a Minor in Innovation & Entrepreneurship. Students study at two different European universities and receive a double Master's degree and an EIT-labelled Certificate.	The EIT Digital Master School is designed to meet future industry needs. 20 top European universities, renowned researchers and leading businesses are in partnership with EIT Digital to provide cutting-edge ICT excellence in combination with innovation and entrepreneurship training.

EIT Health CAMPUS https://www.eithealth.eu/campus	The CAMPUS is a virtual marketplace for learning which develops and supports Master and PhD Programmes delivering Innovation and Entrepreneurship in areas relevant to EIT Health. The current EIT Health landscape of degree programmes consists of two EIT labelled Masters: 1) IHC – Innovation in Healthcare 2) IMIM – International Masters of Innovative Medicine MSc Innovation in Health Care (IHC) is a two-year, full time degree of 120 ECTS. IHC builds on the partnership between Copenhagen Business School (CBS) and the universities of Copenhagen, Rotterdam (Erasmus), Lisbon and Coimbra. IHC opened in 2016 and was EIT labelled simultaneously. IHC emphasizes managerial, economic, organizational and business aspects of health care innovation. MSc IHC delivers a new type of graduates with strong skills in the analysis and management of health care innovations. The degree combines organizational, economic, commercial, and IT related skills with an understanding of the operations of the health care system.	MSc Innovation in Health Care – the practical orientation of the program is one of its key features. Class work and projects will bring the students into close contact with potential future employers during their studies. Courses draw on industry experts, high quality academic faculty and real life cases. The programme prepares students for innovation tasks in both national and international settings. EIT mobility grants provide students with a deeper understanding of national differences and their implications for health care innovation and their implementation. The indirect target market of MSc IHC is the broad range of firms, start-ups, healthcare providers, government organisations, etc. that will be involved in the coming transformation of health care.
EIT Raw Materials https://eitrawmaterials.eu/eit-rm-academy/	The RawMaterials Academy is the brand for educational activities of the EIT RawMaterials. These range from innovative education projects launched via calls and run by KIC partners to centrally-operated projects. Activities cover the complete ecosystem of learners – PhD students, Masters' students, industrial partners, professionals within the raw materials sector, and wider society – foster new ways of learning and teaching by linking academia, industry and research organisations. Both and within a programme, students have the opportunity to study at several centres of excellence throughout Europe.	Master's and PhD education at EIT RM promotes interdisciplinary and international collaboration and is provided through industry-focused programmes which foster collaboration between specialists from academia, research and industry. Students strengthen their technical expertise while fostering the entrepreneurial and innovation skills, knowledge and problem-solving mindset to promote sustainable supply in the raw materials sector across the value chain.
EIT InnoEnergy http://www.innoenergy.com/education/phd-school/new-the-innoenergy-innovation-doctorate/	The PhD candidate has the opportunity to take part in the challenge-driven curriculum provided by the InnoEnergy PhD School, including: • Training courses in entrepreneurship, innovation, and business • International placements across Europe • Access to Europe's largest energy-sector network The aim is to ensure that research results can be turned into revenue-generating products or services contributing to a more sustainable energy mix. Proposals for doctoral research are sought from companies of any size that i) wish to employ a PhD candidate to boost their own R&D or product development and ii) are committed to working with an academic partner, such as a university or research centre. Both the company and its academic partner should already be InnoEnergy partners, or wish to become a partner in future. Start-ups taking part in InnoEnergy's Business Creation Services Highway are especially welcome. Regarding the eight thematic research fields within focus, these are: 1) Clean	An InnoEnergy Innovation Doctorate is a joint doctoral training project that involves InnoEnergy, an academic participant and a company (either a major industrial player, a small specialist or an entrepreneurial start-up). It can also involve a local, regional, or national institution that is committed to promoting the Innovation Doctorate. Innovation Doctorates are carried out by a PhD candidate who is employed by the company involved.

	coal and gas technologies 2) Energy from chemical fuels 3) Energy efficiency 4) Energy storage 5) Nuclear instrumentation 6) Renewable energies 7) Smart electric grid and 8) Smart and efficient buildings and cities. InnoEnergy co-funding is €20,000 a year / student over the duration of the project (a maximum of four years). Applicants are encouraged to apply to the local, regional or national institution to cover the remainder of the PhD candidate's salary if necessary. InnoEnergy also funds candidates' participation in all PhD School activities, including training courses, the annual conference, and other agreed activities. They also financially support the development of Europe-wide connections through international placements that all candidates are required to undertake.	

Among the common themes across all the EIT programmes are firstly that of bringing together key actors within the knowledge triangle through ISM and secondly, the importance placed on fostering skills for employability through a close relationship with industry partners and a focus on entrepreneurial and innovation skills, the knowledge, attitudes and aptitudes needed to succeed in an entrepreneurial setting.

According to the Interim Evaluation of the EIT[86], approximately 820 individuals have graduated from EIT-labelled Masters and PhD programmes. Despite the progress made, the evaluation points out that there remains scope for improvement. "*The 2015 business plan assessment of EIT InnoEnergy recommends that the participation of industry in education should be further increased in the KIC's Masters and Executive programs. It also flags timing issues (duration of the innovation projects vs. program duration), as well as content issues (low TRL for PhD, higher TRL for innovation projects and business creation) with the KIC's PhD programmes as barriers to greater industry involvement in the Doctoral programmes" (pg. 41).*

It is also worth noting that the EIT puts a strong emphasis on the value added of the EIT label through a focus on educational excellence. It has developed a handbook on the labelling of educational EIT programmes, which sets out the 'Quality for Learning' EIT Quality Assurance and Learning Enhancement Model. One of the indicators, "Quality Indicator 4 – Stakeholder Experiences" is a relevant metric in assessing the experiences of different stakeholders taking part in a scheme which involves some form of intersectoral mobility. Another interesting aspect of the QA framework is the focus on strengthening skills for employability. This has been incorporated into the EIT's overarching learning outcomes template for assessing EIT Labelling and for follow-up reviewing of Master Programmes. Among the considerations here (see template on page 11) are:

- Are the EIT Overarching Learning Outcomes for Creativity skills and competencies specified sufficiently in the programme?
- Are the EIT Overarching Learning Outcomes for Innovation skills and competencies specified sufficiently in the programme?
- Are the EIT Overarching Learning Outcomes for Entrepreneurship skills and competencies specified sufficiently in the programme?
- Are the EIT Overarching Learning Outcomes for Research skills and competencies specified sufficiently in the programme?
- Are the EIT Overarching Learning Outcomes for Transforming skills and competencies specified sufficiently in the programme?
- Are the EIT Overarching Learning Outcomes for Leadership skills and competencies specified sufficiently in the programme?
- Are the EIT Overarching Learning Outcomes for Making Value Judgements specified sufficiently in the programme?
- Do sufficient amount of modules of this programme deal with relevant content for the thematic field of the KIC?

[86] https://ec.europa.eu/education/sites/education/files/2017-eit-interim-evaluation_en.pdf

This study was carried out for the European Commission's DG Research and Innovation. The purpose was to examine the feasibility of further EU initiatives to increase the participation of researchers in intersectoral mobility ("ISM") in Europe. The study involved the identification of 270+ national ISM schemes in 50 countries to identify scheme characteristics from their design and set-up through to management, implementation, monitoring and evaluation. Case studies were developed by type of mobility (e.g. academia-industry, academia to the public and third sectors) to identify good practices. The outcomes were a strengthened evidence base about existing national ISM schemes, information about the outcomes of participating in schemes for researchers, industry and other research actors and insights into factors determining their sustainability.

Studies and reports