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Researchers' Report 2013

Country Profile: Ireland

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1. Key data

National R&D intensity target

"Ireland has a national R&D intensity target of 2.0% of GDP or 2.5 % of GNP, by 2020. In 2011, Irish R&D intensity was 1.72% of GDP, with a public sector R&D intensity of 0.56% and business R&D intensity 1.17%. Over the decade 2000-2010, R&D intensity in Ireland grew at an average annual growth rate of 4.9%, one of the highest growth rates in the EU. One of the main challenges for Ireland would be to return to a trend of increasing public investment in R&D which, if more related to business needs, would raise the R&D intensity of Irish firms. If this line were followed, the shift of the Irish economy towards a knowledge-based economy, already very visible, could be pursued over the years and a more ambitious target could be envisaged at the occasion of the mid-term review of the Europe 2020 targets (2014/2015). This would be more in line with the country's clear potential, illustrated by the trend in the growth above.

In absolute terms, public R&D funding reached a peak in 2008. R&D investment by firms appears not to have been seriously affected by the economic crisis. Where BERD is supported by government, Ireland has a relatively low level of direct support, according to the OECD. Indirect support was almost 3 times higher than direct support. Business R&D investment in real terms has continued to rise and reached a peak in 2010. Overall, firms have almost doubled their R&D investment in real terms over the period 2000-2010. The amount of GERD financed from abroad at 15.6% is almost twice the EU average and reflects the policy of attracting FDI with a large R&D component. In order to reach its national target by 2020, R&D intensity in Ireland would have to grow at an average annual rate of 1.1% over the decade 2010-2020. This growth would depend on sustained incentives to attract and boost business R&D investment.

Under the ERDF Programme, Ireland has been allocated EUR 163.5 million for research, innovation and entrepreneurship. This represents 21.8% of the total FEDER funds for Ireland. Under FP7, beneficiaries from Ireland have received EUR 412 million[1] of which EUR 85 million went to SMEs. Overall, Irish applicants had a close to average success rate"[2].

Key indicators measuring the country's research performance

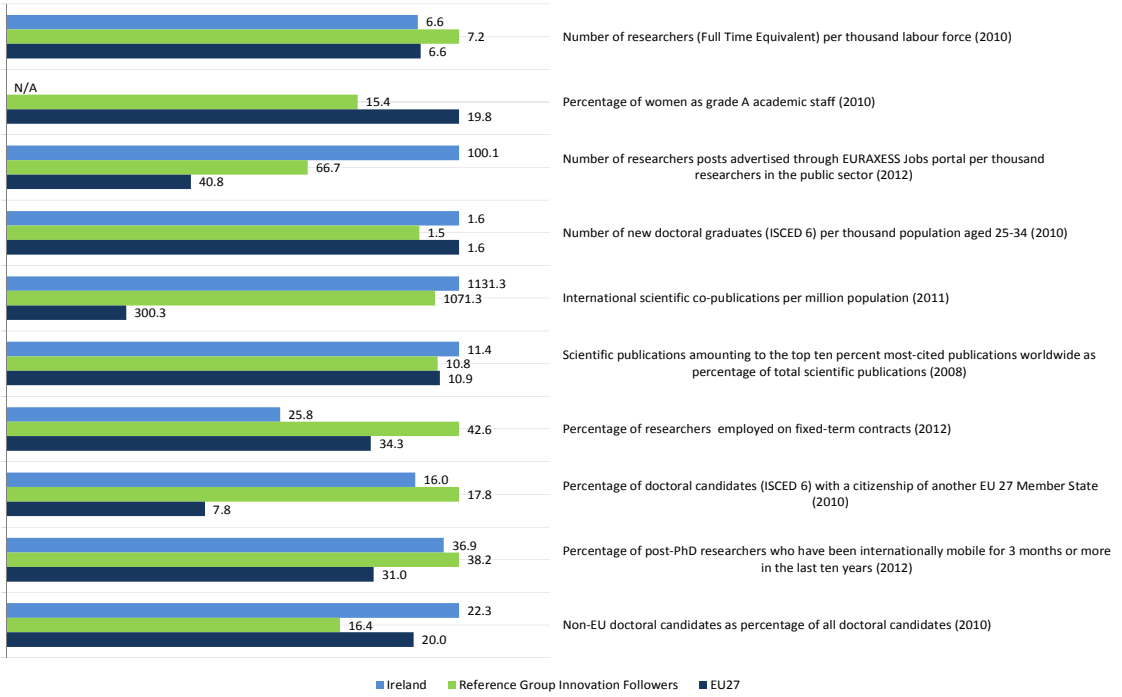
The figure below presents key indicators measuring Ireland's performance on aspects of an open labour market for researchers against a reference group and the EU-27 average[3].

[1] According to CORDA 6 Nov 2012 I-cf. national estimate of EUR 438 million in June 2012

[2] European Commission (2013), "Research and Innovation performance in EU Member States and Associated countries. Innovation Union progress at country level 2013"

[3] The values refer to 2012 or the latest year available

Figure 1: Key indicators – Ireland



Source: Deloitte

Data: Eurostat, SHE Figures, EURAXESS Jobs Portal, UNESCO OECD Eurostat education survey, Innovation Union Scoreboard 2013, MORE2

Notes: Based on their average innovation performance across 25 indicators, Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK show a performance close to that of the EU27. These countries are the Innovation followers[4].

Stock of researchers

The table below presents the stock of researchers by Head Count (HC) and Full Time Equivalent (FTE) and in relation to the active labour force.

Table 1: Human resources – Stock of researchers

Indicator	Ireland	EU Average/Total
Head Count per 1 000 active labour force (2010)	9.83	10.17
Head Count (2010)	21 137	2 435 487
FTE per 1 000 active labour force (2010)	6.59	6.64
Full time equivalent (FTE) (2010)	14 175	1 589 140

Source: Deloitte

Data: Eurostat

2. National strategies

The government of Ireland has adopted a package of measures aimed at training enough researchers to meet its R&D targets and at promoting attractive employment conditions in public research institutions[5]. The table below presents key programmes and initiatives intended to implement the strategic objectives to train enough researchers to reach Ireland's R&D targets, to promote attractive working conditions, and to address gender and dual career issues.

[4] European Commission (2013), "Innovation Union Scoreboard 2013"

[5] Note: the majority of publicly funded research in Ireland is carried out in Higher Education Institutions (Universities and Institutes of Technology), predominantly in the universities. A small number of publicly-funded research organisations are also in existence, for example, Teagasc, which carries out research in the area of agriculture and agrifood

Table 2: National strategies

Measure	Description
National Development Plan 2007-2013 Transforming Ireland — A Better Quality of Life for All	Under this Plan, researchers are encouraged to develop collaborative cross-border relationships, to have up-to-date training as well as to go and work abroad. The Plan intends to grow the stock of researchers quantitatively and qualitatively by increasing the funding, recruiting top-level researchers from home and overseas, developing career paths and promoting mobility mechanisms. All government departments and public sector organisations are responsible for its implementation.
National Strategy for Higher Education to 2030 (2011)	The National Strategy for Higher Education, implemented by the Department of Education and Skills, and the Higher Education Authority, provides for better researcher mobility, increased career opportunities and strong collaboration between higher education researchers and the business sector. The Strategy also encourages researchers in Ireland to be connected with leading researchers internationally and become involved in projects which are demonstrably world class.
Programme for Government - Government for National Recovery 2011-2016	The Programme for Government states that the Government will promote Ireland's full engagement in the 'Innovation Union'. It focuses on supporting investments in technology research, development and commercialisation beyond basic research supported by Science Foundation Ireland (SFI), as well as removing barriers to innovation. The Programme also aims to establish a network of Technology Research Centres focused on applied technological research in specific areas, to be linked to appropriate higher education institutions. Finally, the Programme points out the necessity to overhaul the student visa system and encourage high-value research students (together with their families) to come to Ireland to work. All government departments and public sector organisations are responsible for its implementation.
Report of the Research Prioritisation Steering Group 2012	This report sets out the recommendations of the Research Prioritisation Steering Group which met between October 2010 and September 2011. The Group were asked by the Irish Government to identify a number of priority areas for future publicly-performed research to contribute to enterprise development, employment growth, job retention and tangible improvements in the quality of life. The report makes recommendations on 14 priority areas of focus and on wider science, technology and innovation investment. The majority of public research funding will be aligned with the 14 priority areas, particularly in the form of jobs, and monitoring systems are being developed to measure the outputs and impact of funding provided. Six areas of underpinning Platform Science and Technology, as well as key integrating infrastructure, are also included in the scope of the report. Research for policy (e.g. environmental and health research for which there is a public policy need or indeed an international obligation) and research for knowledge (covering an array of underpinning skills and areas of expertise necessary to produce excellent outputs from research) have been also identified as two overarching goals of public investment. A key economic goal in the implementation of the Research Prioritisation process is a significantly enhanced focus on collaborative research with enterprise and on commercialisation by growing the number of researchers in enterprise and enhancing the flow of researchers between academia and enterprise. An Intellectual Property Protocol has recently been published, outlining a clear, robust and industry-friendly policy for the commercialisation of intellectual property arising from state funded research. Implementation of Research Prioritisation is a responsibility of the Prioritisation Action Group (PAG) which includes representatives of all key Government Departments and all research funders. Moreover, the Group will engage in discourse with other informed stakeholders, including universities, Institutes of Technology and industry representative bodies, as well as national/ international experts.
Report: Towards a Framework for Research Careers 2008	This report, by the Advisory Council for Science, Technology and Innovation, recommended a major restructuring of science careers in Ireland in order to encourage people to take up a career in science. The report recommended the adoption of a structured researcher career path across industry, academia and the public sector.
Report: The role of PhDs in the Smart Economy 2009	This report, by the Advisory Council for Science, Technology and Innovation, highlighted Ireland's need to maintain a competitive output of PhDs in relevant disciplines in line with other developed countries, and set out a list of recommendations to maximise the development of structured PhD education in

Measure	Description
	Ireland and its critical relevance to enterprise and society.
Strategy for Science, Technology & Innovation (SSTI) 2006-2013	Since 2006, the Irish authorities (the Higher Education Research Group and the Technology Ireland Group) have been implementing the Irish Government's Strategy for Science, Technology & Innovation (SSTI). The objective of the Strategy is to make Ireland internationally renowned for the excellence of its research and to develop a knowledge economy to contribute to national economic and social progress. The SSTI also takes account of developments at EU level, in particular the ERA targets, the European Partnership for Researchers, the Europe 2020 Strategy, as well as the Innovation Union. According to a recent progress report on implementation of the SSTI, good progress has been made in achieving the key targets and objectives in the SSTI. The Strategy aims to double the number of postgraduate researchers by 2013, with significant numbers of these going on to take up employment in the enterprise sector. It has also facilitated flows of researchers into and out of the country and from academia to enterprise. Evaluation Reports: Reviews of the SSTI were performed in 2008,[6] 2009,[7] and 2011.[8]
The National Recovery Plan 2011-2014	Ireland's National Recovery Plan, implemented by all government departments and public sector organisations, takes account of the need for focus on collaboration between industry and research providers, and the need to bring the outputs of research and innovation activity to the marketplace. The Plan requires research investments to be concentrated in areas where Ireland secures the greatest economic and social returns and it provides for the number of industry-led research competence centres to be doubled to ensure that industry drives research agendas. There are currently nine industry-led researcher competence centres and this number will increase to 16 by the end of 2013.

Source: Deloitte

3. Women in the research profession

Measures supporting women researchers in top-level positions

National legislation[9] prohibits any discrimination based on gender. However, each Higher Education Institution (HEI)[10] applies its own procedures for promoting gender equality, including the 'European Charter for Researchers' & the 'Code of Conduct for the Recruitment of Researchers' principles.

As part of gaining the 'HR Excellence in Research' label, all institutions will have to plan progress towards gender equality in all aspects of research life, and consider how dual career couples can be accommodated to build a research career in Ireland.

The Irish Equality Authority has the overarching role in promoting equality in the workplace, including the promotion of gender equality for researchers.

Women have since 2006 been encouraged to take science to an advanced (doctoral) level by the initiatives of the Centre for Women in Science & Engineering Research (WiSER)[11]. WiSER aims to recruit, retain, return and advance women in academic science, engineering and technology by developing sustainable practices to ensure that women's scientific expertise, knowledge and potential are nationally recognised. In addition, the Women in Technology and Science Programme (WITS) has since 2008 aimed to facilitate and support women in returning to a career in science and technology.

[6] First Report on the Strategy for Science, Technology and Innovation: http://www.djei.ie/publications/science/2008/firstreportonSSTI.pdf
[7] Science, Technology and Innovation Report 'Delivering the Smart Economy: http://www.djei.ie/publications/science/2009/Delivering_the_Smart_Economy.pdf
[8] Strategy for Science, Technology and Innovation Indicators: http://www.djei.ie/publications/science/2011/SSTI_Indicators_December2011.pdf
[9] Employment Equality Act of 1998, Equal Status Act of 2000, Equality Act of 2004
[10] The term Higher Education Institution describes any provider of tertiary education in Ireland, and includes the seven Irish Universities (www.iua.ie), the Institutes of Technology (www.ioti.ie) and the Royal College of Surgeons in Ireland
[11] Available at: http://www.tcd.ie/wiser/

Measures to ensure a representative gender balance

Institutions have full autonomy in setting quotas to ensure a representative gender balance for researchers. However, a general government commitment requires the institutions to increase female participation on State Boards up to 40%.

Maternity leave

For researchers who are employees of a Higher Education Institution (normally Research Profiles R2 – R4)[12], maternity leave is automatically provided for. Usually the person may return from maternity leave to complete the project, but it is up the research funder to decide on any replacement or not.

For doctoral candidates (Research Profile R1), who are not normally employees of the University/Institute of Technology, there is no automatic entitlement to maternity leave, which is at the discretion of the research funder and/or Higher Education Institution.

Science Foundation Ireland (SFI) has adopted the Principal Investigator Career Advancement (PICA) scheme (catering for researchers returning from maternity leave) which is now incorporated into all its grant schemes. The PICA scheme supports outstanding researchers returning to active research after a prolonged absence including maternity, paternity, parental, and adoptive leave.

Female researchers funded by the Programme for Research in Third-Level Institutions (PRTLI) as well as by the Irish Research Council are allowed to interrupt and extend their contract to go on maternity leave. Payment in addition to welfare payments during maternity leave is at the discretion of the host institution or the research funder.

4. Open, transparent and merit-based recruitment

Recruitment system

The Employment Equality Acts (1998 to 2011) and the Equal Status Acts (2000-2011) cover a broad spectrum of activities including recruitment and selection, determination of pay and the composition of terms and conditions of employment.

The Universities Act (1997) provides that Universities are allowed to appoint staff "having regard to available resources and accountability for use of public funds". The Fixed Term Workers Act (2003) ensures that researchers employed on fixed term contracts are eligible for the same entitlements as comparable permanent employees.

For example, across the seven universities, positions for Research Profiles R2 – R4, and many at R1, are advertised internationally and recruitment is based on the quality of the candidates. Nearly 40% of PhD students are foreigners (with about 15% of non EU-nationals in the total) and 35% of post-doc researchers are foreigners (half coming from another EU country and the other half from third countries). In 2011, the ratio of international academic staff ranged from 26% to 42% across the universities.

Open recruitment in institutions

The table below presents information on open recruitment in higher education and public research institutions.

Table 3: Open recruitment in higher education and public research institutions (Researcher Profile R2 – R4 only)[13]

Do institutions in the country currently have policies to …?	Yes/No	Description
– **publish job vacancies on relevant national online platforms**	Yes	Institutions as well as some funding schemes have policies to publish job vacancies on relevant national online platforms.
– **publish job vacancies on relevant Europe-wide online platforms (e.g.**	Yes	Institutions have policies to publish job vacancies on relevant Europe-wide online platforms.

[12] Research Profiles described in "Towards a Framework for European Research Careers": R1 First Stage Researcher, R2 Recognised Researcher, R3 Established Researcher, R4 Leading Researcher

[13] For positions as Research Profile R1 (doctoral candidates), open and transparent recruitment procedures are the norm, despite that there are no fixed policies in place regarding this across the HEIs, nor obligations in law to do so

Do institutions in the country currently have policies to …?	Yes/No	Description
EURAXESS)		
– **publish job vacancies in English**	Yes	English in the main language for publishing job vacancies.
– **systematically establish selection panels**	Yes	Institutions have policies to systematically establish selection panels.
– **establish clear rules for the composition of selection panels (e.g. number and role of members, inclusion of foreign experts, gender balance, etc.)**	Yes	Institutions are obliged by law to establish clear rules for the composition of selection panels.
– **publish the composition of a selection panel (obliging the recruiting institution)**	Yes	Institutions have policies to publish the composition of a selection panel.
– **publish the selection criteria together with job advert**	Yes	Institutions are obliged by law to publish the selection criteria together with the job advert.
– **regulate a minimum time period between vacancy publication and the deadline for applying**	Yes	Institutions have policies to regulate a minimum time period between vacancy publication and the deadline for applying.
– **place the burden of proof on the employer to prove that the recruitment procedure was open and transparent**	Yes	The burden of proof to prove that the recruitment procedure was open and transparent is by law placed on the institutions.
– **offer applicants the right to receive adequate feedback**	Yes	Institutions are obliged by law to offer applicants the right to receive adequate feedback.
– **offer applicants the right to appeal**	Yes	Institutions are obliged by law to offer applicants the right to appeal.

Source: Deloitte

EURAXESS Services Network

In 2012, the number of researchers posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector was 100.1 in Ireland compared with 66.7 among the Innovation Union reference group and an EU average of 40.8[14].

All publicly funded (and research-active private) organisations are encouraged to advertise research positions on the EURAXESS Ireland portal (www.euraxess.ie) and can request access to the national and EU researcher CV database. Information on entry conditions, transfer of social security and pension contributions, accommodation and administrative assistance is available at EURAXESS Ireland. EURAXESS Ireland provides a range of information services for researchers and their families wishing to enter the country or to go abroad. SFI jobs are published on the SFI website and on the EURAXESS Jobs portal.

Although Ireland is not in the Schengen area, it opted in to the Third Country Directive and has put in place a 'Hosting Agreement' to fast track non-EU researchers and their families wanting to come to Ireland with the support of the EURAXESS Ireland Office. Between the commencement of the scheme in October 2007 and 1 January 2013, the EURAXESS office processed 1 600 Hosting Agreements for researchers and academics involved in research. See also Chapter 8 "Mobility and international attractiveness".

5. Education and training

Measures to attract and train people to become researchers

As part of the implementation of the revised primary school curriculum, science was introduced to all primary schools from September 2003 to help children develop scientific skills.

In the same year, the Irish government introduced Discover Science and Engineering (DSE) as its national science awareness programme at the primary and secondary level, which in the longer term will feed into the third level, (i.e. universities and Institutes of Technology) and also the PhD level. The programme promotes an awareness and understanding of the importance of science and engineering in a modern knowledge-based

[14] See Figure 1 "Key indicators – Ireland"

economy and develops effective ways of engaging students, teachers and the public in science, technology and innovation[15]. DSE has been within Science Foundation Ireland since the spring of 2012.

In addition, the government in 2003 launched a revised syllabus in Junior Certificate science. The revised syllabus was supported by a comprehensive programme of professional development for teachers, and investment of some EUR 16 million in 2004 in resources and laboratory facilities. As a result, in 2011, 89% of students sat 'Science' in the Junior Certificate examination[16].

The STEPS to Engineering' Engineers Ireland Programme, established in 2005, encourages primary and post-primary students to explore the world of science and engineering through various initiatives, including an extensive Champions Programme, Engineers Week, student seminars, scholarships, summer camps, videos and career profiles, mathematics tutorials, and a Maths and Music show.

A further successful initiative to encourage interest in science among young people is the BT Young Scientist and Technologist Exhibition, which takes place in Dublin in January of each year. Now in its 49th year, the exhibition invites Young Scientists from both primary and secondary schools to compete for the right to demonstrate their project at the event and win one of the national awards for excellence in science and technology. The event attracts 45 000 people, many of them schoolchildren, and encourages interest in research and science through the 550 school projects on display and many interactive exhibits. The success of this initiative is evidenced by the fact that it is now being replicated throughout Europe. However, Ireland's track record of producing young scientists of excellent potential is also shown by the fact that 14 Young Scientist winners have received the first prize award in the 22 years of the EU Contest for Young Scientists to date[17]. Many previous winners have also gone on to significant business and academic success[18].

Undergraduate students in higher education generally undertake a research project during the final year of undergraduate study. They work with established research teams at their institutions and in this way they have the possibility of research as a viable career path. As part of structured PhD delivery, students undertake modules, such as advanced research and analytical techniques to assist in carrying out high level research.

In Ireland, higher education is referred to as third level education. To help coordinate the changes in Irish doctoral education, the seven Irish universities[19] together with the Higher Education Authority (HEA) have formed a 'Fourth Level Ireland' Network, to mediate and help direct the changes in doctoral education. Consequently, graduate education is increasingly referred to as the 'Fourth Level Ireland' (University Graduate Education)[20]. Under this framework, the seven universities work together under the banner of the Fourth Level to provide graduate education opportunities in all disciplines, both taught and research degree programmes.

Students have the opportunity to gain experience in relevant employment areas and there are often placements in companies for training or research. Alongside the universities, there is a strong Institutes of Technology sector, which also provides PhD and Masters research opportunities. There are 14 Institutes of Technology located across Ireland, and the postgraduate education on offer builds on their strong links with industry and inter-connection with the regional landscape.

All universities and Institutes of Technology have school liaison programmes and open days to increase young people's interest in science, technology, engineering and mathematics (STEM) subjects. The Deans of Science have established a network promoting science (www.universityscience.ie), including science demonstrations at the Young Scientist Festival, school debating and other competitions, the Science Raps Challenge and Science Speak competitions. Moreover, a decision was taken by HEIs in 2010 to apply an additional award for

[15] An independent evaluation of DSE in 2009 by an International Panel noted that DSE represents very good value for money and plays an important role in encouraging young people to study science and technology. Following specific recommendations, Maths has been included in the scope of DSE and it has been refocused on second level education, as a support for Project Maths

[16] Available at: http://www.examinations.ie/index.php?l=en&mc=ca&sc=sc

[17] Full list of winners available here http://www.btyoungscientist.com/downloads/2013-BTYSTE-factfile.pdf

[18] Examples of the success of previous winners and wider facts about the effectiveness of the event are provided in: http://www.btyoungscientist.com/downloads/2013-BTYSTE-factfile.pdf

[19] Dublin City University, Trinity College Dublin, University College Dublin, University College Cork, University of Limerick, National University of Ireland Galway, National University of Ireland Maynooth

[20] Fourth Level Ireland - University Graduate Education resource website: http://www.4thlevelireland.ie/.

attainment in mathematics in entrance criteria for higher education to encourage more students to take maths at a higher level in secondary education.

There are currently a number of initiatives in place to target young people studying maths and science within the school system to ensure that they develop a practical skillset relevant to industry. These range from the new Project Maths syllabus, the roll-out of a project-based curriculum at Junior Certificate level and a new science curriculum in primary schools, in place since 2002.

Project Maths involves the introduction of revised syllabuses for both Junior and Leaving Certificate Mathematics. It involves changes to what students learn in mathematics, how they learn it and how they will be assessed. Project Maths aims to provide for an enhanced student learning experience and greater levels of achievement. Greater emphasis is placed on student understanding of mathematical concepts, with increased use of contexts and applications that will enable students to relate mathematics to everyday experience.

The initiative also focuses on developing students' problem-solving skills. Assessment will reflect the different emphasis on understanding and skills in the teaching and learning of mathematics. The initiative is led by the NCCA (National Council for Curriculum and Assessment) and the Department of Education and Skills. Project Maths commenced for incoming first year and fifth year students in September 2010 and involved training of mathematics teachers in the form of Continuous Professional Development (CPD). Funding is made available from the Department of Education and Skills as required.

National annual events, such as the Smart Futures Conference, ICT Champions Programme, Engineering Week, Science Week and Maths Week, also drive awareness among students and provide new opportunities for engagement in science and maths projects. Bonus Points have also applied for the Leaving Certificate results in Honours Maths since 2012.

A Dublin City of Science 2012 initiative was held in tandem with Dublin's hosting of the prestigious Euroscience Open Forum (ESOF) and this saw over 600 000 people take part in a celebration of science with over 160 events and activities held countrywide, crossing the worlds of art and culture to entertain the public and bring science to life.

In Ireland, the major funding agencies focusing on STEM disciplines are Science Foundation Ireland (SFI)[21], Enterprise Ireland (EI), the Health Research Board (HRB), the Irish Research Council (IRC)[22] and the Environmental Protection Agency (EPA).

The number of researchers in the higher education system increased from 10 072 in 2006 to an estimated 11 900 (+18%) in 2009. Of these researchers, the number with PhD's increased from 5 684 in 2006 to 7 906 (+39%) in 2009, reflecting the overall drive to increase excellence in the research system over the period.

Total university Masters graduates in SET (Science, Engineering and Technology) and HSS (Humanities and Social Sciences) increased from 6 193 in 2005 to 8 714 in 2010. There were also an additional 1 705 Master graduates from the Institute of Technology sector in 2010. The number of PhD graduates increased from 774 in 2005 to 1 153 in 2010 from the university sector (+48%). The number of SET PhD graduates increased by 34% over the same period in line with the target in the SSTI from 576 in 2005 to 776 in 2010 (96.8% of SSTI target of 801), with an additional 56 SET PhD graduates from the Institute of Technology sector. It should be noted, however, that the original intention of doubling the number of PhD graduates by 2013 has had to be tempered by the consequences of the economic downturn which has occurred in the interim, and is no longer a realistic target.

Doctoral graduates by gender

The table below shows doctoral graduates in Ireland by gender as a ratio of the total population cohort.

[21] For example, SFI funds in the broad area of STEM with a focus on the 14 priority research areas described in the Report of the Research Prioritisation Steering Group 2012

[22] The Irish Research Council was established in 2011 via a merger of the Irish Research Council for Science, Engineering and Technology and the Irish Research Council for the Humanities and Social Sciences

Table 4: Doctoral graduates by gender

Indicator	Ireland	EU Average
New doctoral graduates (ISCED 6) per 1 000 population aged 25-34 (2010)	1.6	1.5
Graduates (ISCED 6) per 1 000 of the female population aged 25-34 (2010)	1.5	1.4
Graduates (ISCED 6) per 1 000 of the male population aged 25-34 (2010)	1.7	1.6

Source: Deloitte
Data: Eurostat

Funding of doctoral candidates

The table below summarises different funding opportunities for doctoral candidates.

Table 5: Funding schemes available to doctoral candidates

Funding scheme	Description
Fellowships	Over the period 2009-10, approximately 60% of PhD students in Science, Engineering and Technology and 19% of PhD students in the Humanities and Social Sciences were in receipt of fellowships from national funding agencies. Fellowships normally include a stipend and fee. The main funding options for doctoral candidates are: 1) Individual Scholarships/Fellowships - awarded by a number of bodies, including the Irish Research Council (IRC), and the Health Research Board (HRB) (e.g. clinical scholarships to enable medical practitioners to do a PhD); 2) Scholarships/Fellowships through structured PhD programmes - awarded through the HEA programme for Research in Third Level Institutions (PRTLI), Irish Research Council Graduate Education Programmes (GREP's), the Health Research Board PhD Scholarship Programme, Marie Curie Initial Training Networks and ERASMUS MUNDUS; and 3) Participation in funded research projects, e.g. Science Foundation Ireland and general FP7. According to the Irish Universities Study (IUS)[23], over 80% of PhD students receive funding from a sponsor (public or private). Key funders were Irish Research Council (21%), SFI (16%) and Universities (16%).
Stipends/grants	More than 90% of PhD students receive a stipend/grant.
Employment contracts	Fewer than 10% of PhD students sign an employment contract.

Source: Deloitte

Measures to increase the quality of doctoral training

To achieve the objective of developing PhD graduates with the skills necessary to develop and manage their careers across a broad range of employment sectors, including academia, universities are providing more structured support for students, incorporating research and generic skills development opportunities.

Fourth Level Ireland's skills training aims to:

- Communicate to students, supervisors and employers the skills and attributes of a PhD graduate;
- Aid students, graduate schools, graduate programmes and other advisory committees in establishing students' skills development needs; and
- Inform the development of further skills development opportunities for all PhD students.

The skills identified by the Irish Universities Association's Fourth Level Network of Deans of Graduate Studies as relevant to PhD student education are: personal effectiveness/development, team-working and leadership career management, and entrepreneurship and innovation.

The Institutes of Technology have also developed structured support programmes in support of postgraduate students. The Graduate Research Alliance project initiated as a pilot project in 2007 and officially launched in 2009, brought together Institutes to develop graduate skills training modules that together would offer a 60 credit Level 9 Special Purpose Award in Research Practice. This equipped postgraduates with essential wider skills, such as research methods, research management, communication skills, creativity and entrepreneurship, data handling and analysis, communications and personal development. The modules are currently being rolled out across a number of Institutes in support of their postgraduate provision.

[23] Irish Universities Study (2009), Report on Undergraduate and Taught Postgraduate Students in Irish Universities, IUS 1/09

In addition, the national funding agencies for research and innovation also provide support for human capital development. Science Foundation Ireland includes provision for training researchers in line with national targets in its funding programmes. The Irish Research Council identifies and supports excellent early career researchers throughout the research system across all disciplines, with a focus on career development. The National Academy for Integration of Research and Teaching and Learning (NAIRTL) provides training for academics to develop their supervising and mentoring skills.

Finally, the National Strategy for Higher Education to 2030 recommends that a consistent quality framework be developed for Irish PhD education, based on critical mass. The Higher Education Authority (HEA) and Irish Research Council will work with HEIs to ensure greater consolidation and collaboration among HEIs and funders. The HEA has a particular focus on supporting and enhancing human capital development mostly at the graduate level through policy drive and support for a doctoral education system characterised by a structured PhD model.

Skills agenda for researchers

For Doctoral candidates (R1): to help develop and support consistent national skills agendas, the Fourth Level Ireland Network has compiled an 'Irish Universities' PhD Graduates' Skills Statement', which is consistent with national descriptors of PhD graduate attributes. Typical PhD programmes enable the students to identify a tailored set of relevant course modules to develop disciplinary, transferable and generic skills. The seven universities have a collaborative agreement that ensures that courses taken in one university are recognised in all others through the European Credit Transfer System (ECTS).

For Research Profile R2 to R4: a number of HEIs have recently launched programmes to support skills development for post-docs. An example is the Research Careers Framework operated by University College Dublin[24], which establishes a structured and supportive skills and early career development model for non-tenured research staff at the university. These programmes are primarily aimed at researchers at R2 level. Researchers at R3 and R4 level can take advantage of the Continuing Professional Development (CPD) programmes offered to all staff members at HEIs[25]: many of these programmes offer tailored courses for researchers.

6. Working conditions

Measures to improve researchers' funding opportunities

The Irish Research Council offers funding opportunities for early-career researchers across all disciplines. All funding competitions are open to all qualified candidates from anywhere in the world. Competitions are based on the merit of the individual applicants rather than allocating awards to specific research disciplines or areas.

IRC has also funded researchers via participation in transnational funding calls such as the EUROCORES programme administered by the European Science Foundation, and calls run by the members of ERA Networks.

Since 2006, IRC has participated in the Ulysses Programme for research visits between Ireland and France. This has opened up research collaborations between these two countries, and in many cases, has led to the creation of pan-European research networks which have received large-scale support from the Framework Programmes. In addition, IRC has successfully secured three rounds of funding (in 2008, 2009 and 2011) from FP7 Marie Curie Actions to co-fund international mobility fellowship programmes for post-PhD researchers, with a total EU contribution of EUR 13 million (40% of the total programme budget). Three additional Irish funding programmes for post-doc researchers are supported by FP7 co-funding; these are offered by the Royal College of Surgeons in Ireland, HRB and SFI.[26]

SFI also provides grants for researchers from around the world who wish to relocate to Ireland and those already based in Ireland, for outstanding investigators, for conferences and symposia, and for collaboration with industry. The majority of SFI awards are in the fields of science and engineering, with a focus on the research areas identified in the Report of the Research Prioritisation Exercise.

[24] Available at: http://www.ucd.ie/hr/rcf/
[25] For an example, see http://www4.dcu.ie/hr/training/index.shtml
[26] Available at: http://www.iua.ie/irish-marie-curie-office/funding-calls/cofund/

Apart from IRC and SFI funding schemes, the Irish government promotes international and bilateral cooperation programmes, greater EU FP involvement as well as participation in Joint Programming projects.

Remuneration

The majority (>90%) of doctoral candidates (R1) receive a stipend, the value of which depends on the source of the funding, although efforts to standardise the stipend amounts are ongoing[27]. This stipend is non-taxable and in general does not provide the recipient with social security coverage or pension benefits.

All post-doc researchers (R2 – R4) working at Irish HEIs are employees, and thus are provided with a salary package that includes social security coverage and pension benefits. For non-tenured researchers a process of standardising researcher salary scales is ongoing: Researcher Salary Scales[28] were developed by the Irish Universities Association in 2011 and adopted by many HEIs and the national research funding agencies. However, these scales are guidelines only and are not legally binding. The majority of tenured researchers at universities are appointed as lecturing staff whose responsibilities include teaching in addition to research. The salary of these researchers is determined according to the operating pay scale in the institution. Despite the general reduction recently in salary levels due to the downturn in economy, Irish researcher salaries remain competitive with private sector salaries[29].

For non-EU researchers entering Ireland to be employed as a researcher, there are strict criteria on salary levels set out in the Hosting Agreement scheme (2007)[30] to ensure there is no discrimination.

For further information, see the new country profile on remuneration of researchers from the MORE2 study (forthcoming, on the EURAXESS website).

Researchers' Statute

In Ireland, the majority of doctoral candidates have the same status as all other tertiary education students. They do not have employment contracts and do not have the same employment rights as staff members. A number of doctoral candidates funded by some sources, including FP7 Marie Curie and industry, are on an employment contract (not more than 10% of the total), and hence have full employment rights.

Based on the Fixed Term Workers Act (FTWA) of 2003, all non-tenured researchers who are employees of an HEI have employment contracts and enjoy the same rights (including social security entitlements) as permanent staff, and have full access to all opportunities for continuous professional development.

For those on employment contracts, all national funding agencies provide full funding for research including entitlement to social security and pensions

'European Charter for Researchers' & the 'Code of Conduct for the Recruitment of Researchers'

All seven Irish universities and some Institutes of Technology (IoT's) have voluntarily signed up to the EU 'Charter & Code' and thus operate a policy of open recruitment. Science Foundation Ireland (SFI) also applies criteria for research grant funding based on the 'Charter & Code'.

In addition, IRC and the Irish Universities Association are spearheading an initiative to have all Irish Higher Education Institutions receive the Commission's endorsement of their recruitment policies and working conditions for researchers via permission to use the 'HR Excellence in Research' label. This initiative has so far resulted in the award of the logo to University College Dublin, University of Limerick and University College Cork and put four of the remaining Irish universities[31], six Institutes of Technology,[32] and three other research performers[33] on the path to receiving the label, in addition to IRC, who are also implementing the process.

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[27] In most cases the stipend offered and recommended by the funding agencies is EUR 16 000 (keeping in mind that this is neither subject to tax nor social security deductions)

[28] Available at: http://www.iua.ie/research-innovation/researcher-salary-scales/

[29] According to Irish Universities Association (2010), Guidelines for Contract Researchers Salary Scales and EU funded study in 2008 (CARSA)

[30] The Hosting Agreement Scheme enables approved research active organisations to recruit researchers from outside the European Economic Area to carry out research in Ireland without the need for a Green Card or Work Permit: http://www.iua.ie/iua-activities/HostingAgreementScheme.html

[31] Dublin City University, Trinity College Dublin, National University of Ireland Galway University College Cork

Autonomy of institutions

According to Universities Act (1997), Irish universities have full autonomy to appoint their employees, taking into account the resources available and accountability for use of public funds.

Universities may pay employees such remuneration, fees, allowances and expenses as approved from time to time by the Minister for Education and Skills. However, a university may depart from these levels of remuneration, fees, allowances and expenses in accordance with a framework agreed between the university and the Higher Education Authority in an effort to attract and retain key research staff.

Funding for salary top-ups can come from public or private sources.

Table 6: Types of institutional autonomy[34]

Organisational	Financial	Staffing	Academic
– Selection procedure for the executive head: the process is determined and conducted by the university governing authority in accordance with procedures specified in a university statute – Selection criteria for the executive head are determined by the university governing authority – Dismissal of the executive head: set out in Universities Act (1997)[35] – Term of office of the executive head: 10 years as prescribed in Universities Act (1997) – Inclusion and selection of external members in governing bodies based on the composition of governing authority as set out under Universities Act (1997) – Capacity to decide on academic structures: universities decide their academic structures – Capacity to create legal entities: provided	– Length and type of public funding: annual recurrent block grant (which incorporates a core recurrent grant and a grant in lieu of fees for national/EU undergraduate students) – Ability to keep surplus: no restriction – Ability to borrow money: universities may borrow subject to restrictions agreed under a Framework for Borrowings and Loan Guarantees – Ability to own buildings: no restrictions – Ability to charge tuition fees for national/EU students (BA, MA, PhD): in accordance with the Universities Act (1997), a university may determine and charge fees subject to review by the Higher Education Authority. The HEA, having consulted with the Minister, will then advise the universities on the fees which in its	– Capacity to decide on recruitment procedures (senior academic/senior administrative staff): set out under employment equality legislation and Universities Act (1997)[38] – Capacity to decide on salaries (senior academic/senior administrative staff) with due regard to current government policy and legislation. – Capacity to decide on dismissals (senior academic/senior administrative staff): set out under employment equality legislation and Universities Act (1997)[39] – Capacity to decide on promotions (senior academic/senior administrative staff with due regard to current government policy.	– Capacity to decide on overall student numbers: universities may decide on overall student numbers at an aggregate level, and also at a programme level for most programmes[40] – Capacity to select students (BA, MA): universities have statutory responsibility for selection and admission policies and practices – Capacity to introduce programmes (BA, MA, PhD): universities may decide on the portfolio and timing of programme offerings, assuming that the necessary conditions (proven demand, academic, financial, accreditation, etc.) have been met where required – Capacity to terminate programmes: universities may likewise decide if and when to terminate a programme, following due consultation with relevant stakeholders – Capacity to choose the language of instruction

[32] Athlone Institute of Technology, Cork Institute of Technology, Dundalk Institute of Technology, Limerick Institute of Technology, Institute of Technology Sligo, Waterford Institute of Technology

[33] Royal College of Surgeons in Ireland, Dublin Institute for Advanced Studies, Teagasc

[34] Data in this table relates to the seven universities only: for more information, see 'University Autonomy in Europe II: The Scorecard', European Universities Association 2011: http://www.eua.be/university-autonomy-in-europe

[35] 'Only in accordance with procedures, and subject to any conditions, specified in a statute made following consultation through normal industrial relations structures operating in the university with recognised staff associations or trade union'

Organisational	Financial	Staffing	Academic
for under the Universities Act 1997[36]	opinion should be charged.[37] – Ability to charge tuition fees for non-EU students (BA, MA, PhD) universities may determine and set tuition fees for these categories of students.		(BA, MA): universities are free to choose the language/s of instruction in any programme – Capacity to select quality assurance mechanisms and providers: universities and other HEIs are not free to select their own external quality assurance mechanisms. These are provided, in a variety of forms, for Irish HEIs through the Quality and Qualifications Ireland agency[41] – Capacity to design content of degree programmes: universities may decide on the content of degree programmes at all levels. In a number of professional areas (e.g. engineering, medicine, teacher education, nursing, etc.), this content must be agreed with the relevant professional or regulatory bodies, in order to ensure that graduates have a license to practice in these areas.

Source: the information in this section relates to Irish Universities Association Members only.

Career development

As an example, the majority of universities in Ireland have introduced their own research career structure (e.g. in some cases, post-doc phase is limited to 4-5 years in order to ensure the researcher's progress). Progression

[38] 'A university may, in accordance with procedures specified in a statute or regulation, appoint such and so many persons to be its employees as it thinks appropriate, having regard to (a) the efficient use of its available resources, the requirements of accountability for the use of moneys provided to it by the Oireachtas and the policy relating to pay and conditions in the Public Service as determined from time to time by the Government'

[39] 'A university may suspend or dismiss any employee but only in accordance with procedures, and subject to any conditions, specified in a statute made following consultation through normal industrial relations structures operating in the university with recognised staff associations or trade unions, which procedures or conditions may provide for the delegation of powers relating to suspension or dismissal to the chief officer and shall provide for the tenure of officers'

[40] Exceptions exist in a number of professional areas where employment is predominately in the public sector (e.g. teacher education, medicine, nursing, etc.)

[36] 'A university may establish by incorporation in the State or elsewhere, or participate in the establishment of, such trading, research or other corporations as it thinks fit for the purpose of promoting or assisting, or in connection with the functions of, the university'.

[37] Note: these "fees" have, since 1997, not covered the cost of tuition, which is covered by part of the annual recurrent block grant (see above). The "fees" charged by universities (and all other publicly funded HEIs) under this mechanism have been referred to as a "student charge" or "student contribution". The level of "fees" charged under this mechanism is identical across all publicly-funded Irish HEIs

[41] www.qqi.ie

to a more senior role is dependent on the ability of individuals to compete for work and win research grants. Permanent academic positions are filled through open international recruitment. For more information on professional skills development for researchers, see chapter 5 "Education and Training".

Shift from core to project-based funding

In Ireland, research funding has been always project-based. Core funding exists only for teaching activities and does not directly fund research. However, in the seven universities, the salary of tenured academic staff is provided from core funding: their job description includes teaching and research duties. This is in contrast to the Institutes of Technology, where academic staff are only required to teach.

Social security benefits (sickness, unemployment, and old-age)

Post-doctorates (R2-R4) are treated as employees and therefore covered for social security purposes, whereas the majority of pre-doctorates (doctoral candidates, R1) are treated as students and do not come under the Social (Welfare) Security code. Approximately 90% of PhD candidates in Ireland are full-time registered students and not employees. Therefore, they are not covered by employment-related social security.

Students are not entitled to receive social welfare payments such as unemployment, supplementary welfare or illness payments[42] while attending a full-time course of study. The Fixed Term Workers Act 2003 ensures researchers employed on fixed term contracts (non-tenured) are eligible for the same entitlements as comparable permanent employees, in contrast to doctoral candidates who are regarded as students. Hence, all non-tenured researchers have the same sick leave entitlements as permanent employees.

The Programme for Research in Third-Level Institutions (PRTLI), and IRC grants for post-doctoral researchers include provision for an employer's Pay Related Social Insurance (PRSI) contribution, which can entitle employees to benefits such as maternity and illness benefits, and jobseekers (unemployment) allowance.

All funding awards for non-tenured researchers include an employer and employee pension contribution.

7. Collaboration between academia and industry

The Government places a strong focus on industry-academia collaboration. The national funding agencies for Research & Innovation promote collaboration between academia and industry. The Research Prioritisation Exercise involves a significantly enhanced focus on collaborative research with enterprise and on commercialisation of research.

The universities and Institutes of Technology have dedicated Technology Transfer Offices (TTOs) to forge close links to industry. In addition, Enterprise Ireland, the Irish Government agency tasked with developing indigenous industry, has provided staff for TTOs in ten Higher Education Institutes, including each of the seven universities[43]. The TTOs support and manage the Intellectual Property generated by the universities' researchers, including helping the researchers to forge links with industry. Moreover, the Health Research Board (HRB) has a strong focus on translational medicine and funds a number of programmes designed to enhance collaboration between biomedical researchers, clinicians and medical practitioners.

The following table summarises programmes designed to develop boost collaboration between academia and industry, and to foster doctoral training in cooperation with industry.

[42] "Entitlement to health services in Ireland is primarily based on residency and means, rather than on payment of tax or pay-related social insurance (PRSI). Any person, regardless of nationality, who is accepted by the Health Service Executive (HSE) as being ordinarily resident in Ireland, is entitled to either full eligibility (Category 1; medical card holders) or limited eligibility (Category 2) for health services." More info available at:
http://www.citizensinformation.ie/en/health/entitlement_to_health_services/entitlement_to_public_health_services.html

[43] http://www.enterprise-ireland.com/en/researchers/technology-transfer-support-system/technology-transfer-offices-contact-details-.html

Table 7: Collaboration between academia and industry

Measure	Description
ELEVATE scheme (2013 to 2018)	The Irish Research Council (IRC) has secured Commission co-funding to develop the ELEVATE scheme. This scheme will allow experienced researchers to spend two years at an enterprise/industry host laboratory outside Ireland, followed by a return year at an Irish Higher Education Institution. The Scheme offers researchers the opportunity to develop skills and gain additional beneficial experience and insight into the commercial arena while completing their research. It provides industry with flexible and easy access to an exceptional pool of competitively selected, high calibre researchers and the opportunity to build links with relevant academic research groups. The Council aims to offer 45 3-year fellowships via two calls for proposals.
Enterprise Ireland Commercialisation Fund (ongoing)	The Enterprise Ireland Commercialisation Fund Programme aims to convert the outputs of state funded research into innovative new products, services and companies. The Programme supports researchers in Higher Education Institutions and Research Performing Organisations to undertake research that has the potential to result in the commercialisation of new innovation by way of licences to improve the competitiveness of Irish Industry or through the spin-out of new start-up ventures.
Enterprise Ireland Applied Research Enhancement (ARE) Centre Programme (ongoing)	The Enterprise Ireland Applied Research Enhancement Centres initiative has now been re-launched as the Technology Gateway programme with a funding commitment for a further five years. This funds applied research activity across 13 (currently) specialist research centres based in Institutes of Technologies. The programme can fund a specialist Centre Manager, Research Engineer/Post-Doc Researchers, Research Technicians, Teaching Replacement Costs and other associated centre costs. The model uses small innovation voucher supports to engage SMEs in innovation projects for the first time. There is evidence that longer-term research activities subsequently develop and that industry is prepared to make a significant contribution to funding these activities.
Enterprise Ireland New Frontiers Programme (ongoing)	This programme is a successor to the Institutes of Technology (IoT) Enterprise Platform Programme and aims to start up innovative businesses on campus, linking with the innovation centres in place across all of the IoTs. There is strong evidence of the success of this 'spin-in' model, where new and growing firms which locate on campus are then supported by research teams to become more innovative and achieve sustainable growth[44].
Enterprise Partnership Scheme (ongoing)	The Enterprise Partnership Scheme is an innovative initiative whereby the Irish Research Council, in partnership with private enterprises and public bodies, awards co-funded postgraduate scholarships and postdoctoral fellowships to the most promising researchers in Ireland. The Scheme offers researchers the opportunity to gain additional beneficial experience and insight into the commercial arena while completing their research. It provides industry with flexible and easy access to an exceptional pool of competitively selected, high-calibre researchers and the opportunity to build links with relevant academic research groups. It facilitates the establishment of new relationships and the strengthening of existing ones between enterprise and academia while offering financial support to researchers at an early stage of their career development.
HRB-SFI Translational Research Awards (TRA) (ongoing)	Fundamentally, Translational Research involves the translation of scientific discoveries into practical applications in order to improve human health. The Translational Research Award (TRA) joint initiative aims to support the research funding strategy of both the Health Research Board (HRB) and Science Foundation Ireland (SFI), with reference to the Department of Health's Health Action Plan 2009. In keeping with the strategic goals of HRB and SFI, these awards fund investigator-driven research projects with clear milestones and realistic deliverables, focus resources in areas which offer the greatest potential for translation into impacts and benefits for health and long term economic development, as well as foster more efficient and effective collaboration between researchers based in an academic setting and those working in a service delivery/clinical setting who are engaged in translational research.

[44] Case study examples of this programme helping new companies to become more innovative and grow are available at: http://www.ioti.ie/rdi/delivering-impact-for-industry. This also provides examples of other industry-academia partnerships across the Institutes of Technology in Ireland

Measure	Description
Industry-led Research Networks Programme (ongoing)	Enterprise Ireland's Industry-Led Research Networks Programme supports medium-term 'shared agenda' research activity among groups of companies that could not afford to fund such research on their own. The model used engages a wide spectrum of companies with a common interest. This leads to success because the risks and benefits associated with large research projects are shared, as are the skills and knowledge built up through working with academic researchers. Projects generally take between nine months and two years to complete, and the research is contracted out to a publicly-funded research institution with significant funding available from Enterprise Ireland. The amount of funding awarded depends on the scale of the proposal and the potential of the research project.
Innovation Partnerships (ongoing)	Enterprise Ireland's Innovation Partnership Programme encourages Irish-based companies to work with Irish research institutes resulting in mutually beneficial co-operation and interaction. Companies can access expertise and resources to develop new and improved products, processes, services, and generate new knowledge and know-how. The participating company benefits in terms of its growth, the evolution of its strategic research and development and the creation of new knowledge that it can use to generate commercial advantage. The research institute benefits in terms of developing skillsets, intellectual property and publications. Grants of up to EUR 250 000 are available for collaborative projects between companies and higher education research teams.
Innovation Vouchers (ongoing)	Enterprise Ireland's Innovation Voucher initiative was developed to build links between Ireland's public knowledge providers (i.e. higher education institutes, public research bodies) and small businesses. Innovation Vouchers worth EUR 5 000 are available to assist a company or companies to explore a business opportunity or problem with a registered knowledge provider.
IRC Employment-based Postgraduate Programme (2012)	This programme was launched as a pilot programme in late 2012 to fund postgraduate research opportunities at both PhD and Masters level to be undertaken within companies or other external organisations under the supervision of higher education authorities. It offers the dual benefits of helping industry to become more innovative while increasing the employment potential of postgraduates. The pilot call for the scheme received an excellent response and it is intended to roll-out this programme from 2013 onwards.
SFI Research Centres Programme 2012 (ongoing)	Consolidating SFI's earlier Centres for Science, Engineering & Technology (CSETs) and Strategic Research Clusters (SRCs), and launched in 2012, SFI's new Research Centres Programme was designed to 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 and its economy, and expand educational and career opportunities in Ireland in science and engineering. Research proposals under this new programme are required to have substantial industry participation. The programme launched in 2012 will run over 6 years (2013-2019). It will create new research centres, or to extend the activity of existing research centres, and will generate opportunities for growth during the lifetime of each centre by enabling them to apply for funding for additional targeted projects, on the lines of a 'hub-and-spoke' model. The SFI Research Centres Programme aims to deliver excellence-oriented research results and discoveries in research areas informed by, and of interest to, Ireland-based technology companies, and hence to deliver significant economic or societal impact during the lifetime of the programme[45].
SFI Industry Fellowship (2013 onwards)	SFI will launch an Industry Fellowships Programme in 2013 to facilitate the exchange of people at all levels between academia and industry (both SME and multinational company). Fellowship funding is provided across the entire academic salary scale for awards for up to 1 year.
SFI Investigators Programme (IvP)	Arising out of the earlier Principal Investigators (PI) programme, the overriding objective of SFI's Investigator Programme (IvP) is to continue the development of world class research capability and human capital in areas of science, engineering and mathematics that demonstrably support and underpin enterprise competitiveness and societal development in Ireland. In particular, IvP awards made by SFI have the objectives of building research capacity, expertise and reputation, promoting links amongst researchers and partnerships with industry, as well as the support of technology development. To cater for the wide spectrum of researchers within the research community, the IvP comprises two streams:

[45] Note: The existing SFI CSET and SRC programmes will not terminate immediately when the new Centres come into being, and all three programmes will run concurrently to ensure smooth progression into the future

Measure	Description
	– **Investigator Projects:** smaller research awards for which senior researchers are eligible, while also designed to provide funding for researchers at earlier stages of their careers; and – **Investigator Awards:** funding on a more significant scale, catering specifically for established researchers with innovative research programmes that may require larger teams and longer durations. The Investigators Programme covers areas of science, engineering and mathematics that underpin Ireland's competitiveness and development, and which address challenges and opportunities in the broad areas of bio, ICT and energy. In order to encourage researchers to engage actively in thinking about how their research can be maximised to benefit Ireland's economy and society, an Impact Summary and/or an Impact Statement for research proposals submitted to the Investigators Programme.
SFI/EI Technology Innovation Development Award (TIDA)	The objectives of TIDA are to facilitate greater interaction of SFI- funded researchers with industrial partners, and to enhance the generation of new applied technologies. The initiative was introduced to bridge the gap that exists between basic and applied research activities. TIDA has a threefold focus, on: – Further enhancing the commercial value of PI-like and RFP; – Getting PhD students and Post Doctorates industry-relevant experience; and – Further influencing "bottom-up" investigations by Industry. TIDA is based around a recognition that making SFI-funded researchers more industry-aware, and encouraging them to interact with industry collaborators, benefits both the researchers and the industrial sector. And by stimulating such interactions through TIDA, the potential opportunities to further develop technologies arising from SFI-funded research along a more applied or commercial path are enhanced. Due to its nature, the TIDA programme is open to existing SFI award holders under selected programmes.
Technology Centres (ongoing)	As outlined in the current Programme for Government, introducing companies to the research expertise in Irish Higher Education Institutes with the aim of generating innovative technologies leading to job creation is of the utmost importance. In line with this commitment to generating economic value from publicly-funded research, the Government has provided funding to establish industry-led Technology Centres. These centres are collaborative entities established and led by industry. They are resourced by highly qualified researchers associated with research institutions, who are empowered to undertake market-focused strategic R&D for the benefit of industry. This is a joint initiative between Enterprise Ireland and IDA Ireland[46] allowing Irish companies and multinationals to work together in these centres.
The National Research Prioritisation Exercise	A key economic goal in the implementation of the Research Prioritisation process is a significantly enhanced focus on collaborative research with enterprise and on commercialisation by growing the number of researchers in enterprise and enhancing the flow of researchers between academia and enterprise.
The Programme for Research in Third-Level Institutions (PRTLI) (ongoing)	The PRTLI was initiated in 1998, under the responsibility of the Department of Education and Skills, and responsibility for the Programme transferred to the Department of Jobs, Enterprise and Innovation in 2010. Currently in its fifth cycle, which commenced in 2011, the PRTLI is administered by the Higher Education Authority on behalf of the Department of Jobs, Enterprise and Innovation. The PRTLI enhances PhD education and training, so as to deliver PhDs with skillsets for working across the spectrum of the public and private sectors. In addition, many of the structured PhD programmes funded through the PRTLI and other sources ensure that the PhD students are trained in a high quality research environment with opportunities for acquiring both transferable/generic skills and experience in a related employment sector. For example, the Bio AT (BioAnalysis and Therapeutics) Structured PhD is a collaboration between three universities and three Institutes of Technology in partnership with hospitals and pharmaceutical companies. In summary, PRTLI reflects the capacity needs of the entire policy and research system across a range of sectors including enterprise, new technologies, energy, agriculture, marine, health and creative domains. As a coherent package of projects, PRTLI Cycle 5 is addressing both immediate and short-term PhD education, as well as research infrastructure requirements.
US-Ireland R&D Partnership Programme	The US-Ireland R&D Partnership is operated under an arrangement between Science Foundation Ireland (SFI), the National Science Foundation (NSF) in the USA, and Invest Northern Ireland (Invest NI) and the Department for Employment and Learning (DEL) in Northern Ireland. The scope of the jointly funded programme is to support research and

[46] IDA Ireland is the Government agency tasked with attracting foreign direct investment in Ireland

Measure	Description
	education, particularly in the areas of Nanoscale Science & Engineering, Sensors & Sensor Networks, Telecommunications, Energy and Sustainability, and Health, through competitive awards via existing (core) programmes in the case of SFI and NSF, and via the R&D funding mechanisms of the two Northern Irish organisations. Every successful proposal is required to have a minimum of one Principal Investigator (PI) from each jurisdiction. Proposals are evaluated not only in terms of intellectual merit, but also in broader terms to assess the international collaboration in terms of mutual benefits, true intellectual collaboration among the international partners, benefits to be derived from the expertise and specialist skills and resources of the international counterparts, and (where applicable) active research engagement of students and early-career researchers. The Partnership: – Helps to link scientists and engineers in partnerships across academia and industry to address crucial research questions; – Fosters new and existing industrial research activity that could make an important contribution to the respective economies: and – Expands educational and research career opportunities in science and engineering.

Source: Deloitte

There is strong evidence of the success of the Enterprise Ireland funded Applied Research Enhancement (ARE) centre programme (see table above). Since its launch in 2008, the level of industry collaboration has increased fourfold, there has been a deepening of the level of research engagement with companies from short-term projects to longer-term partnerships, the numbers of directly funded industry research projects has increased fivefold and the level of the industry contribution to overall project activity is over 40%, comparing very favourably with other industry/academia research centre programmes. Full results are shown below.

Table 8: Industry Impact from IoT Applied Research Enhancement Centres (ARE)

	2008	2009	2010	2011	Total
Industrial Collaborations	36	69	117	150	**372**
Innovation Voucher Projects	20	45	70	52	**187**
Innovation Partnership Projects	2	7	13	19	**41**
Projects directly funded by industry	14	17	34	79	**144**
Income from collaborative projects	EUR 570 000	EUR 451 000	EUR 1 550 000	EUR 3 200 000	**EUR 5 771 000**
Industry contribution to Collaborative Projects (EUR)	EUR 226 000	EUR 102 000	EUR 615 000	EUR 1 500 000	**EUR 2 443 000**
Industry Contribution (%)	39.7%	22.2%	39.7%	46.7%	**42.3%**

Source: Enterprise Ireland

8. Mobility and international attractiveness

In 2010, the percentage of doctoral candidates (ISCED 6) who were citizens of another EU-27 Member State was 16.0% in Ireland compared with 17.8% among the Innovation Union reference group and an EU average of 7.8%[47]. In the same year, the percentage of non-EU doctoral candidates as a percentage of all doctoral candidates was 22.3% in Ireland compared with 16.4% among the Innovation Union reference group and an EU average of 20.0%[48].

[47] See Figure 1 "Key indicators – Ireland"
[48] Ibid

Measures aimed at attracting and retaining 'leading' national, EU and third country researchers

There are no nationality restrictions associated with applying for either research funding or research positions in Ireland. As an example, the post-doctoral fellowships offered by the Irish Research Council are open to researchers of all nationality, including those who are resident outside Ireland at the time of application.

Across the seven universities, positions are advertised internationally and recruitment is based on the quality of the candidates.

The table below summarises key measures implemented by SFI to attract and retain leading national, EU and third-country researchers.

Table 9: SFI measures to attract and retain leading national, EU, and third-country researchers

Measure	Objectives
E.T.S. Walton Visitor Awards Programme (Science Foundation Ireland) (ongoing)	The E.T.S. Walton Visitor Awards Programme enables high-profile international academic and industrial researchers to visit and collaborate with Irish research groups for a fixed period of time. The programme also aims to support the transfer of skills and knowledge to Irish research groups, develop international networks as well as facilitate links with industry. SFI is strategically enhancing research links – apart from with the EU and the US – with other countries such as Australia, Brazil, Canada, China, India, Japan, Russia, Singapore and South Korea.
Research Professor Programme (Science Foundation Ireland) (ongoing)	The Research Professor Programme aims to attract outstanding research talent from abroad to Ireland. The Programme is intended to support national strategic priorities by assisting research bodies in their recruitment of world-leading researchers for professorial chairs, or similar research leadership positions in targeted scientific areas within the life sciences, information and communication technology, and energy sectors. Funding of up to EUR 5 million is being provided in total to successful applicants for a five-year programme of work. This also includes a contribution towards the SFI Research Professor's remuneration package for each year of the award.

Source: Deloitte

Inward mobility (funding)

To facilitate the inward migration of third country researchers, Ireland has implemented the Hosting Agreement (the Scientific Visa) scheme. By availing themselves of a hosting agreement, researchers' entry visas are fast-tracked and researchers can work in Ireland without recourse to the usual work permit or Green Card. This scheme also allows the researcher's immediate family to live in Ireland for the duration of the agreement, and entitles their spouse and dependents to apply for a work permit allowing greater ease of access to employment in Ireland. This has most certainly helped in attracting non-EU researchers to both the public and private sectors. Between the commencement of the scheme in October 2007 and 30 April 2013, the EURAXESS office processed 1 750 hosting agreements, with a total of 42 accredited organisations. This includes the seven Irish universities, twelve Institutes of Technology, ten other research institutions and fourteen industrial organisations. The number of researchers working in Ireland on hosting agreements varied from 500 to 550 in the first quarter of 2013. This marks an increase of an average 100 researchers or 23% since 2011. 86 per cent of the researchers on Hosting Agreements are employed are employees of the seven universities (as of May 2013).

The researchers on hosting agreements in Ireland come from 78 different non-EEA countries. The top two nationalities with hosting agreements are Indians, with 352 issued in total (100 employed currently, as of May 2013) and Chinese, with 324 in total (94 employed currently, as of May 2013) agreements. They are followed by US nationals issued with a total of 186 hosting agreements to date (43 currently employed under the scheme, as of May 2013). There are at present 27 Pakistani, 25 Iranian and 20 Canadian and 18 Russian nationals with hosting agreements in Ireland (May 2013).

By May 2013, a total of 758 researchers (43% off all hosting agreement holders) had availed themselves of the immediate family unification opportunity, and at present (May 2013) 219 have their dependants with them for the duration of their research projects in Ireland. The Hosting Agreement Extranet contains constantly updated details of agreements issued to all researchers under the scheme, and has been regularly used by immigration authorities in Ireland as well as by Irish embassies abroad (e.g. Beijing, New Delhi, Moscow and Abuja) for verification purposes. This minimises the visa application process for the researchers. Ireland is also taking part

in the Science without Borders programme,[49] aiming to attract a significant number of students from Brazil to undertake their doctoral degree in Ireland. This initiative is advertised via a dedicated page on euraxess.ie.

The table below summarises the funding measures to support researchers' inward mobility offered by the main research funders.

Table 10: Measures supporting researchers' inward mobility

Measure	Description
Irish Research Council Suite of Funding Programmes	The funding programmes operated by the Irish Research Council are designed to enable the Irish research community to contribute to the body of global knowledge across a range of disciplines, recognising the importance of research and scholarship for all aspects of social, cultural and economic development. The majority of the post-doctoral fellowship and doctoral scholarship programmes operated by the Irish Research Council are open to researchers of any nationality and residence, as long as the research supported by the award is undertaken at a research organisation in the Republic of Ireland.
Health Research Board Suite of Funding Programmes	The Health Research Board's Research Strategy (2010-2014) will gradually concentrate resources into research that offers the most potential for translation into impacts and benefits for people's health. Their funding programmes will support patient-oriented research, clinical, including applied biomedical research, as well as health services and population health sciences research. HRB Schemes, in the main, have a requirement for the applicant to hold an employment contract with a recognised host institution for the duration of the award: there are no restrictions regarding nationality or residency prior to applying for the award.
President of Ireland Young Research Award (PIYRA) (Science Foundation Ireland) (ongoing)	The President of Ireland Young Researcher Award (PIYRA) is SFI's most prestigious award for recruiting young researchers currently based around the world to carry out their research in third level institutions in Ireland. This programme emphasises the importance that SFI places on the early development of academic careers. The award recognises outstanding engineers and scientists who, early in their careers, have already demonstrated or shown exceptional potential for leadership at the frontiers of knowledge. Awardees are selected on the basis of exceptional accomplishments in science and engineering that underpin biotechnology, ICT, and energy, and on the basis of creative research plans built on work that has attracted international attention. The PIYRA programme also has the aim of encouraging entrepreneurial efforts that couple the research body and Irish-based industry in appropriate ways. PIYRA awards run for a period of five years, and through this award, SFI is able to identify the most promising of a new generation of top-tier cutting edge researchers.
Starting Investigator Research Grant (SIRG) (Science Foundation Ireland) (ongoing)	The SFI SIRG Programme provides an opportunity for excellent early-career-stage investigators to carry out independent research in the fields of science and engineering that underpin biotechnology, information and communications technology (ICT), and sustainable energy and energy efficient technologies. The award also provides funding for a postgraduate student, who will be primarily supervised by the Starting Investigator (SI). The SI works with an associated mentor, who provides the necessary support and infrastructure for the project to take place. SIRG awards run for a period of four years. The objectives of the SIRG Programme are to: – Enable those at an early career stage to establish themselves as independent researchers; – Provide the support and infrastructure to carry out novel research in areas that underpin BIO, ICT and ENERGY; – Gain important experience towards a full-time academic position, including the supervision of the postgraduate student supported by the award; – Enable the award holder, together with his/her postgraduate student, to carry out their work in Ireland's public research bodies, including universities and Institutes of Technology; – Offer funding opportunities that help third-level institutions attract and develop researchers and their careers; – Allow early-career investigators of all nationalities to enhance their experience in Irish HEIs; and – Allow early-career investigators who have been employed outside of Ireland to return to work in an Irish HEI.

Source: Deloitte

[49] http://www.euraxess.ie/page.aspx?SP=176

Outbound mobility

In Ireland, international mobility is perceived as a strongly positive addition to a researcher's track record, and is often necessary to gain a permanent academic position.

SFI programmes (short-term travel fellowships, Walton scholarship scheme) and the IRC's ELEVATE Programme aim to encourage researchers to spend some time as a researcher in another country. See also chapter 7 "Collaboration between academia and industry" as well as chapter 8 "Mobility and international attractiveness".

Promotion of 'dual careers'

The Hosting Agreement scheme, as implemented by Ireland, allows for the spouse of a Hosting Agreement holder to accompany the researcher and to seek work without obligation to satisfy a 'Labour market Needs Test'[50]. Similar exemptions apply in the case of the spouse of a 'Green Card' holder (special categories of skilled workers).

Portability of national grants

Publicly funded R&D grants and fellowships provided via public funding are always linked to Irish R&D centres. The legal and grant beneficiaries are the Irish institutions and consequently, the grants are not portable to other EU countries. However, the research can be carried out in foreign countries, subject to the terms of the relevant call.

Access to cross-border grants

In Ireland, national grants or fellowships are open to non-residents, but research must be carried out in Ireland.

[50] Available at: http://www.djei.ie/labour/workpermits/labourmarketneedstest.htm