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JRC105882

EUR 28493 EN

PDF	ISBN 978-92-79-66107-5	ISSN 1831-9424	doi:10.2760/8608
Print	ISBN 978-92-79-69867-5	ISSN 1018-5593	doi:10.2760/165638

Luxembourg: Publications Office of the European Union, 2017  
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How to cite this report: Martin, T, Fákó, P; *RIO Country Report 2016: Ireland*; EUR 28493 EN;  
doi:10.2760/8608

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#### **Research and Innovation Observatory Country Report 2016 Ireland**

The 2016 series of the RIO Country Report analyses and assesses the development and performance of the national research and innovation system of the EU-28 Member States and related policies. It aims at monitoring and evaluating the EU policy implementation as well as facilitating policy learning in the Member States.

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## **Foreword**

This report offers an analysis of the R&I system in Ireland for 2016, including relevant policies and funding, with a particular focus on topics of critical importance for EU policies. The report identifies the main challenges of the Irish research and innovation system and assesses the policy responses implemented. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports and online publications. The quantitative data are, whenever possible, comparable across all EU Member State reports. Unless specifically referenced, all data used in this report are based on Eurostat statistics available in January 2017. The report contents are partly based on the RIO Country Report 2015 (Martin, La Placa, 2016).

## **Acknowledgements**

This report has benefited from the comments and suggestions of Koen Jonkers (JRC), Giovanni La Placa (JRC), Marta Truco Calbet (DG Research and Innovation). Comments from the Irish authorities (Department of Jobs, Enterprise and Innovation), DG Regional and Urban Policy are also gratefully acknowledged.

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## HIGHLIGHTS

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- Following the general election of February 2016, while still focusing on job creation, the political agenda of the new minority government has switched to addressing social issues such as housing and health.
- The Irish R&I system is fairly centralised with the bulk of R&I budgets being controlled by ministries.
- Manufacturing is still the leading sector in terms of GVA thanks to pharmaceuticals and food & beverage products. R&D spending is the highest in ICT, wholesale & retail trade and technical & scientific activities, in manufacturing of computer, electronic and optical products and that of pharmaceuticals.
- The weight of MNCs in the economy is very large exposing the country to cyclical swings and external shocks.
- GERD intensity was 1.52% of GDP in 2014. BERD is the main component and has been stable during the last 5 years (2014: 1.14%).
- The downward trend in direct public R&D funding came to halt in 2013 and is now on an upwards trajectory. The decline was compensated by increases in indirect funding, particularly through the R&D tax credit.

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## MAIN R&I POLICY CHALLENGES

- **Improving the take-up and performance of R&D by indigenous enterprises.** Ireland performs relatively well in terms of innovation outputs. However, BERD is dominated by MNCs. A high share of SMEs have a limited capacity to innovate and to absorb innovations. A range of recent policy responses aim to increase the number of indigenous enterprises engaged in R&D activities.
- **Increasing R&D in the FDI sector.** The engagement of MNCs needs to be deepened so that they move up the value chain. Attracting new MNC investments in R&D is an important policy objective. Developing the research base and fostering closer enterprise-HES linkages are key policy responses.
- **Increasing public sector funding of R&D (addressed also by the European Council, CSR 2016).** Reductions in the public R&D budget weighed heavily on the HES via falling numbers of R&D personnel and PhD enrolments. As a response the government has focused on maximising the impact of public research funding, getting the highest possible return from Horizon 2020 and eliminating duplications in research funding.
- **Business-academia collaboration and knowledge transfer.** The low degree of business-academia collaboration has been recurrently highlighted. A range of direct funding schemes targeting collaborative research are provided. Yet, Ireland would benefit from the rationalisation of the wide range of small scale grant-based schemes. There is also a need to invest in near-to-market research centres/RTOs to address gaps in the provision of RDI support.

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## MAIN R&I POLICY DEVELOPMENTS IN 2016

- Launch and implementation of [Innovation 2020](#) (new national RDI strategy)
- Introduction of the [Knowledge Development Box](#) (patent box)
- Launch and implementation of [Enterprise 2025](#) (jobs and enterprise strategy)
- Publication of [Ireland's ERA Roadmap](#)
- Update of the [National IP protocol](#)
- Launch of the [National Skills Strategy 2025](#)
- [Health Innovation Hub Ireland](#)
- Clustering Program, Business Innovation Initiative – [Enterprise Ireland](#)

## 1. Main R&I policy developments in 2016

### [Innovation 2020](#)

Innovation 2020 is the new national RDI strategy, launched only in December 2015 (the previous RDI strategy ended in 2013). It sets out action terms of Ireland's current R&I policy specifying an ambitious target for GERD (2.5% of GNP by 2020) and for doubling the level of private support for R&D performed in the public research system. It focuses on enterprise innovation, education for innovation, innovation for social progress, the role of IP in innovation, and innovating with the EU and the wider world.

### [Knowledge Development Box](#)

The Knowledge Development Box (patent box) was introduced in 1 January 2016 with a total estimated exchequer cost for 2016 of €50m. The KDB involves the application of a preferential corporate tax rate of 6.25% on income from IP resulting from R&D carried out in Ireland.

### [Enterprise 2025](#)

Enterprise 2025 is the jobs and enterprise strategy. It aims to achieve productivity growth across the economy to levels ranking amongst the top five EU countries averaging 2.0-2.5% p.a. over the long term.

### [Ireland's ERA Roadmap](#)

Published in May 2016, the Roadmap sets out how Ireland will deepen its engagement with the ERA which it will do as an inherent part of implementing Innovation 2020

### Update of the [national IP protocol](#)

In January 2016, the Department of Jobs, Enterprise and Innovation published an updated national IP protocol to assist companies to access knowledge in the public research sector.

### [National Skills Strategy 2025](#)

Launched in 2016, it aims at evolving towards an education system that fully supports lifelong learning and is more responsive to the changing needs of participants, enterprise and the community. It notes the need for a solid pipeline of research skills development that supports early-stage researchers, researcher mobility into industry and internationally, as well as the development, retention and attraction of advanced researchers.

### [Health Innovation Hub Ireland](#)

Seeks to encourage collaboration between the health services and the business sectors so as to facilitate the development and commercialisation of new healthcare technologies, products and services.

### New RDI initiatives from [Enterprise Ireland](#)

Clustering Program (support for SMEs and MNCs to maximise the opportunities from collaboration), Business Innovation Initiative (support for developing new innovative business processes).

### New actions of [Science Foundation Ireland](#)

Development of challenge-based funding, open calls to support individual investigators at different career stages, the attraction of top talent to Ireland, a new Research Centres call, and support the development of research capability in Advanced Manufacturing.

## 1.1 Focus on National and Regional Smart Specialisation Strategies

**Description and timing:** the National Research Prioritisation Strategy (NRPS) published in March 2012 serves as the basis for the development and implementation of Ireland's RIS3 (DJEI, 2014c). It prioritises competitive public funding for research in 14 areas and in 6 underpinning technology platform areas that are estimated to generate the highest economic and societal impact. A detailed "Framework of Metrics and Targets for Monitoring Public Investment in Science, Technology and Innovation" (DJEI, 2014c) has been drawn up to measure the outputs and impact of the funding provided.

**New developments:** an independent assessment of the NRPS (DJEI, 2015a) undertaken by a panel of national and international experts in 2015 recommended the re-positioning of research priorities in a broader, strategic research framework, recognising the need to fund excellent research in other areas, in order to underpin the wider skills agenda, to meet broader societal goals and to further enhance Ireland's reputation for outstanding science. It also stated that a concerted, system-wide initiative was required to engender greater engagement (meaningful, risk-sharing collaborations) between firms (particularly SMEs) and the public research system. The Panel's report recommended that the proposed initiative should actively simplify and streamline processes and remove obstacles to collaboration. The initiative should also disseminate information to the enterprise sector to improve its understanding of the public research system and the raft of opportunities and supports available.

The Panel also stated that further steps were needed to streamline and strengthen the governance structure for research prioritisation/Smart Specialisation; these were announced in the Innovation 2020 the new national R&D&I strategy document launched in December 2015 (DJEI, 2015c). The Research Prioritisation Action Group (RPAG) charged with overseeing the implementation of the NRPS, has been subsumed into the Innovation 2020 Implementation Group.

**Outstanding issues:** as outlined in Innovation 2020 (DJEI, 2015c), the main changes proposed for Research Prioritisation actions in 2016 are:

- (1) To give extra priority to stimulating public research in Manufacturing and Services. Following international expert peer review, three offers have been made in the field of Manufacturing Competitiveness as part of the SFI Targeted Research Professorship programme. SFI has analysed national and international challenge-based funding schemes in preparation to creating a similar Irish support measure. Finally, through Irish Research Council programmes, the number of projects in this area has slowly increased and in 2016 there are eighteen new research projects that could be considered as in this thematic area;
- (2) To initiate a new Research Prioritisation exercise. DJEI started the development of Terms of Reference for a market-led horizon-scanning exercise to identify strategic areas of commercial opportunity in global markets for Irish-based enterprises as the basis for the next cycle of Research Prioritisation, due in 2018 (DJEI, 2016c). A Foresight Futures Study will be undertaken to provide an informed assessment of technologies that are or will be critical to Ireland's economic and social development and how they will evolve over a 20-year timeframe (DJEI, 2016b).

## 2. Economic Context<sup>1</sup>

Ireland has been severely hit by the economic crisis, which deteriorated seriously its public finances, leading to the agreement with EC, ECB and IMF upon an Economic Adjustment Programme. This included a financing package of €85b covering the period 2010-2013. The reforms under the programme focused principally on the financial sector, but included also structural and competitiveness measures. Their successful implementation is at the base of the remarkable recovery in 2013-14 driven by exports, private investment and consumption. GDP growth jumped to 26.3% in 2015 driven by tax inversions of US companies<sup>2</sup> and it has a little impact on the domestic economy (EC, 2016b). Without this factor, the 2015 real GDP growth estimate of the EC is at around 4-5%. A gradual slowdown to 3.5% is expected by 2018 due to heightened risks related to net exports following the UK referendum. Government deficit and debt figures are expected to continue their improvement due to the expected robust GDP growth. The main challenge for Ireland is to ensure the sustainable and balanced growth.

Total factor productivity growth has more than tripled during 2008-2014 (2014:1.8%p.a.) despite decreasing capital expenditures (both public and private) on R&D and decreasing total GERD intensity. However, while predominant in number (99.7% of all firms), indigenous SMEs represent less than half (2012: 46.7%) of the GVA indicating the extremely high productivity of MNCs. Data on labour productivity show that large firms (>250 employees) are about three times more productive than micro companies (<10 people).

### 2.1 Structure of the economy

Ireland is a modern knowledge economy focusing on services and high-tech industries and dependent on trade, industry and investment. In terms of GDP per capita the country is one of the wealthiest in the OECD<sup>3</sup>. While services account for almost 3/4<sup>th</sup> of the GDP and employment, and industry for ca. the remaining 1/4<sup>th</sup> of GDP and 19% of employment, the role of agriculture is marginal both in terms of GDP (1.5%) and employment (5%) (World Factbook). The main categories of services are ICT (2014: 16.5%), wholesale and retail trade (14.1%), and financial services (12.1%). Manufacturing of food and beverages (7.6%) as well as of pharmaceutical products (6.7%) are the main industrial activities (Eurostat).

Ireland is one of the most open economies in the EU. Total exports from Ireland were ca. 124% of GDP in 2015. The country exports mainly pharmaceuticals, medical devices and software-related goods and services. The overwhelming majority of exports (95% in 2014) are goods and services produced by foreign-owned firms. The country is a significant exporter also to non-EU countries (24.1% of GDP).

In 2014, there were ca. 238,000 active enterprises in Ireland employing about 1.2mln people. The overwhelming majority of them are SMEs of which more than 90% employ less than 50 people. There are ca. 2,200 foreign-owned entities, mostly active in pharmaceuticals, medical and dental instruments and computer, electronic & optical equipment. In 2015 MNCs were employing in total 187,056 people (IDA Ireland 2015b).

Manufacturing appears to be the leading sector in terms of GVA (ca. 20% of total GVA) thanks mainly to the pharmaceuticals and food & beverage products. R&D spending is the highest in services sectors such as ICT, wholesale & retail trade and technical & scientific activities as well as in manufacturing of computer, electronic and optical products and that of pharmaceuticals. The weight of MNCs in the economy is very large

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<sup>1</sup> This section is based on European Commission, (2016b)

<sup>2</sup> These deals typically involve US companies acquiring a foreign-based firm and relocating their headquarters to where these firms are incorporated. The impact of this one-off spike on GDP related R&D indicators is unclear for the moment

<sup>3</sup> However, its GNP is significantly lower (below the OECD average) due to the repatriation of profits and royalty payments by the very large number of multinational firms based in Ireland.

and it exposes the country to cyclical swings and external shocks. SMEs continue to face development challenges.

## 2.2 Business environment

In 2016 Ireland ranks 18th regarding the overall of the World Bank's Doing Business indicators, down by three places compared to 2015 (15<sup>th</sup> place) (World Bank, 2016). Its ranking declined slightly with respect to most of the indicators, except for dealing with construction permits and starting a business, where the improvement is important (9 places up from the last year's 19<sup>th</sup>).

Ireland's Small Business Act (SBA) profile and performance has been strong and improving in recent years (EC, 2016d). Ireland features among the top performers with regard to "Skills & innovation of SMEs" and the "Single market" and is above the EU average for "Entrepreneurship", "Second chance" and "Responsive administration".

## 2.3 Supply of human resources

The general tendency throughout the last 4-5 years was an increase in all categories of R&D personnel due to the general increase in R&D activity particularly in the business sector. In 2013 around 60% of total R&D personnel (24,785 persons) were employed by businesses, followed by the higher education (15,281), and government sector (1,022).

Innovation 2020 commits to increasing number of research masters and PhD enrolments by 500. It also sets a target of increasing the share of PhD researchers transferring from SFI research teams to industry from 25% in 2014 to 35% by 2020. Achievement of the enrolment targets, particularly for PhDs, will be quite challenging, as recent (2016) data published by the Higher Education Authority (HEA) show that PhD enrolments have slightly fallen during the last five years (2015: 8,158). This decline was apparent across all disciplines (Royal Irish Academy, 2016).

## 3. Main R&I actors

The Irish R&I system is fairly centralised with the bulk of R&I budgets being controlled by ministries aka Government Departments. The **government** is involved in R&I policy development and implementation through two key ministries: the Department of Jobs, Enterprise and Innovation (DJEI) and the Department of Education and Skills (DES). They accounted for 77% of GBAORD in 2013. The new STI strategy for Ireland Innovation 2020 led to the creation of the Innovation 2020 Implementation Group through the merger of the Inter-Departmental Committee on Science, Technology and Innovation, the Prioritisation Action Group and the Horizon 2020 High Level Group. The Chief Scientific Adviser<sup>4</sup> is a member of the Group. The main actors in the **higher education sector** (HES) are the seven universities, accounting for approximately 80% of research funding in the HES, and are represented by the Irish Universities Association. The Institute of Technology Ireland represents the 13 Institutes of Technology. Dublin Institute of Technology (DIT) stands alone. The HEA is an agency of the DES charged with the responsibility for the effective governance and regulation of the HES. It is also the funding body for the universities and Institutes of Technology. Knowledge Transfer Ireland<sup>5</sup> is the national structure to promote technology transfer in the HES. The HES is the second largest research performing sector after the business sector (22% of total research performed in 2014). The Public Research Organisation (**PRO**) sector is small by EU standards (4.5%). The **business sector** accounted for 73.5% of expenditure on research performed in 2014. BERD is dominated by a very small number of mainly foreign owned MNCs (100 companies accounted for 70% of BERD in 2013) (CSO, 2015), which are concentrated in a number of high tech sectors such as life sciences and ICT. The research activity of the indigenous business sector is small but growing. IBEC, American Chamber of Commerce Ireland and the Industry Research & Development

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<sup>4</sup>The Chief Scientific Advisor, Mark Ferguson, is also the Director General of Science Foundation Ireland.

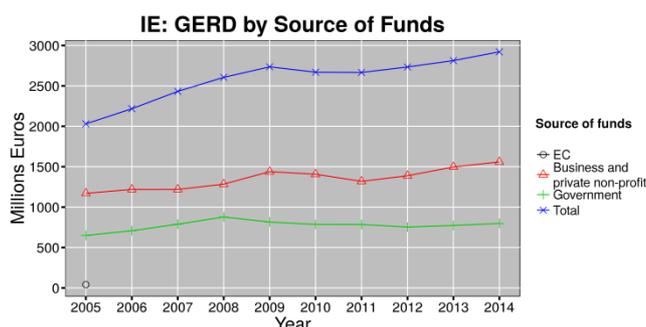
<sup>5</sup>previously called: the Central Technology Transfer Office (CTTO)

Group (IRDG) are the main representative bodies for the business sector in Ireland. The **private non-profit sector** in Ireland does not undertake research activity of any significance.

## 4. R&I trends

In 2014 Ireland's total GERD was estimated at €2,921b, +4% compared to 2013. GERD intensity was 1.51% of GDP (EU-28: 2.04%). There are three main sources of R&D funding (Figure 1, below): the business sector (€1,542m), the government (€797m), and foreign funding (€544m). Direct funding from the government goes to R&D in the business enterprises (€126m), the government (€123m), and the higher education sector (€549m).

5. Figure 1 Development of funding of the total GERD in Ireland



Data source: Eurostat, November 2016

### 4.1 Public allocation of R&D and R&D expenditure

The declining trend of the total appropriations (GBAORD) has changed in 2013. However, due to the massive decreases in the aftermath of the crisis, in 2015 current prices they are still at their 2005 levels. Government funded GERD followed a similar trend stabilising in 2013-14 on its 2006 level. As the main recipient of government funded GERD the public sector (GOV+HES) was clearly affected by the post 2008 cuts.

Public R&D capital expenditure has also been declining strongly both in absolute terms (2008: €139mln, 2014: €85mln – Eurostat) and as a share of total public R&D (GOVERD+HERD), which declined from its 2008 level of 13.9% to 10.4% in 2014, which is below the EU28 average (rank 15) and places the country in the midfield of the "strong innovators" group.

The R&D tax credit scheme is a corporate profit tax credit of 25% of qualifying R&D expenditure. The Finance Act 2013 provided that the first €200,000 spending on R&D qualifies for the credit on a full volume basis. The 2015 Budget removed the base year restriction, effective from 1 January 2015. Since then the credit has applied to all qualifying R&D expenditure.

Ireland's Knowledge Development Box (KDB) was introduced on 1 January 2016. Its total estimated exchequer cost for 2016 is €50m. The KDB involves the application of a preferential corporate tax rate of 6.25% on income from IP resulting from R&D carried out in Ireland. The amount of profits that can avail of the relief will be determined by the proportion that the Irish company's R&D costs bear to the total R&D costs incurred in developing the qualifying assets.

The total indirect funding to R&D has significantly expanded its share of the overall public support to the Irish R&D in the years from 2006 to 2012. The annual costs of the tax incentive scheme in terms of foregone tax revenues are estimated to have risen from €71m in 2004 to €554m in 2014 (Revenue Commissioners, 2016).

The OECD, in its Economic Review of Ireland 2015 (OECD, 2015a), noted that future innovation requires a stronger contribution by Ireland's domestic firms and suggested that the government can help by rebalancing its innovation policies towards direct support.<sup>6</sup> In this context, and as committed to in Innovation 2020, in 2016 DJEI initiated a review of the full range of state financial and RDI supports for enterprise.

## 4.2 Private R&D expenditure

The Irish BERD intensity was stable in the period 2009-2014 at around 1.1% of GDP in 2014. Services and manufacturing account for more than 95% of BERD expenditure. Services are the leading macro-sector of the Irish BERD with almost constant intensity in the last seven years at around 0.65% of GDP. BERD intensity in manufacturing has been around 0.4-0.5% of GDP during the same period.

The business sector is the main funder of BERD, but the gap between the total BERD intensity and the business sector (BES) contribution has been increasing over time. This is a consequence of both the stagnation of the business contribution (at ca. 0.8% of GDP since 2009) and the increasing contributions from the government and from abroad (mainly EU funding).

In 2013 R&D spending of foreign owned enterprises was around 65% of total R&D expenditure. Ca. €1.2b (93% of total) are current expenditures, whereas remaining €90m (7%) is capital expenditure. In comparison, indigenous enterprises spent ca. €700m on R&D with current expenditures of €645m (CSO, 2015). There is a polarisation between Irish and foreign owned enterprises also in terms of number of R&D active companies, size, and level of expenditure: "there were 1,574 Irish owned enterprises engaged in R&D activities in 2013 which equates to 80% of all R&D active enterprises compared to 405 foreign owned enterprises which accounts for the remaining 20%. Over 80% of all Irish owned enterprises spent less than €500,000 on research and development compared to 45% of all foreign owned enterprises" (CSO). The largest 100 enterprises in terms of R&D expenditures accounted for over €1.4bn, or 70%, of the total R&D expenditure in 2013. Out of these top 100 enterprises, 80% of the expenditures can be attributed to foreign owned enterprises (CSO).

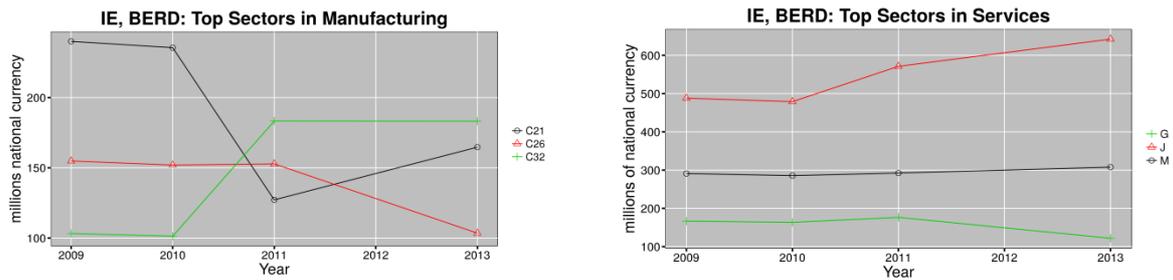
Even more striking is the analysis of the data included in the EU Industrial R&D Scoreboard (EC, 2015a): 25 Irish-registered companies appear in the 2014 ranking of top-1000 EU R&D investors. The Irish BERD was €2,871m in 2014, whereas the sum of the total R&D spent by top R&D performers registered in Ireland was €6,389m. This shows that a lot of R&D-active companies headquartered in Ireland do not actually perform their R&D activities in the country.

According to Figure 2, below, computer, electronic and optical products and pharmaceutical manufacturing industries are the top R&D performing sectors in Ireland. In services ICT, wholesale and retail trade and technical and scientific activities are the top R&D performing sectors. The business expenditure for research related to wholesale and retail trade decreased significantly in 2011-2013.

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<sup>6</sup> For example in 2013, R&D tax credits accounted for 70% of all government supports (R&D investment as a % of GDP).

**Figure 2. Top sectors in manufacturing and services BERD in Ireland**



Data source: Eurostat, November 2016. (C21: manufacture of basic pharmaceutical products and pharmaceutical preparations; C26: manufacture of computer, electronic and optical products; C32: other manufacturing; G=wholesale and retail trade; repair of motor vehicles and motorcycles, M=professional, scientific and technical activities)

In terms of gross value added (GVA), manufacturing is the leader with a fairly relevant contribution to the Irish GVA (ca. 20%), thanks mainly to the manufacture of pharmaceuticals as well as food and beverage products, which in recent years has been comparable in value to the one of wholesale and retail trade — the leading sectors in services).

### 4.3 Public sector innovation and civil society engagement

According to DESI indicators (EC, 2016a) in 2016 Ireland ranks the 9<sup>th</sup> in Digital Public Services with a score of 0.64, well above the EU average of 0.55. Active eGovernment use is 56% (EU average: 32%). However, provision of pre-filled forms in online services was relatively low (35 out of 100 vs. EU average of 49), ranking the country the 17<sup>th</sup> in the EU. The Government is progressing with the implementation of the National Broadband Plan under which it is expected to provide broadband access with a speed in excess of 30Mbs to over 900,000 rural homes and businesses with the roll-out starting in late 2017.

According to the Public Services Reform Plan 2014-2016 the Government’s ICT Strategy will be focused on Digital Government. Officials responsible for policy must ensure that all new information and services must be “born digital” and, where appropriate, a “digital by default” approach must be adopted. Two reports have been published on progress in implementing the reform. Key outcomes include the launch of the Public Service ICT Strategy, “Delivering better outcomes and efficiency through innovation and excellence in ICT”, the implementation of which the Office of the Government Chief Information Officer is leading in conjunction with Departments and agencies across the Public Service and the issuing of over 1.9 million Public Services Cards which allows holders an efficient and secure means to access government services including social welfare services and for the purposes of free travel on public transport.

Although there is no specific citizen science policy, citizens play an active data collecting role in research projects such as Sunspotter and BirdWatchIreland and there is also a growing interest in the involvement of citizens in research projects as evidenced by Irish participation in the [European Citizen Science Association](#). The HES is promoting a new initiative called [Campus Engage](#), to assist HEIs to undertake “third mission” activities i.e. interactions with society. The project initially focuses on the development of tools, processes and best practice guides for the HEIs and societal groups interactions. The outputs will be useful for citizens’ groups to develop pathways and methodologies for participating in academic research. Senior citizens are also involved in the [Tilda Project](#), firstly as contributors of data and, secondly, through their participation in conferences/workshops, as contributors to the development of research and policy

implications.<sup>7</sup> Science Foundation Ireland (SFI) undertook a significant public research project “SFI Science in Ireland Barometer” to analyse the public’s perception and awareness of the importance of STEM research for the Irish economy & society.

## **5. Innovation challenges**

### **5.1 Challenge 1: Improving the take-up and performance of R&D by indigenous enterprises**

#### **Description**

Ireland performs relatively well in terms of innovation outputs on the European Innovation Scoreboard 2016 (EC, 2016c) and as far as the [Innovation Output Indicator](#) is concerned. BERD intensity is 1.1% of GDP (2014) and is financed mainly by the business sector (0.81% of GDP). However, BERD is dominated by MNCs (CSO, 2015) with limited spill-overs to SMEs (EC, 2016b), an area that the government is seeking to address. The R&D performance of the indigenous enterprise sector has been improving, but it still lags the MNCs in terms of R&D capabilities and expenditures. Despite the increase in the number of indigenous SMEs engaging in R&D, a significant share of them do not innovate at all (DJEI, 2015b) and the levels of investment in innovation is low even for those that do.<sup>8</sup> A high proportion of these companies is small and has a limited capacity to innovate and to absorb innovations. There are shortages in manpower and skills at technician and technologist-level grades (IRDG, 2015). The majority (ca 70%) of R&D expenditure in Irish-owned firms is done in sectors that export less (Finfacts, 2015) The UK is the main market for SMEs (DJEI, 2016a), which may become a risk factor following the Brexit referendum.

#### **Policy response**

Enterprise 2025 (DJEI, 2015b), Ireland's national enterprise policy, and Innovation 2020 outline a range of policy responses aimed at increasing the number of indigenous enterprises engaged in R&D activities as well as their R&D expenditures.

Enterprise Ireland (EI) provides a comprehensive range of support instruments to assist indigenous companies in the manufacturing and tradable service sectors to develop and enhance their R&D capabilities. Adjustments were made to its existing suite of measures to address gaps in initiatives to assist SMEs to interact with knowledge producers in the public sector.

EI is piloting the Clustering Programme, a national cluster initiative to assist industry-led groups comprising a mix of SMEs and MNCs to maximise the opportunities for collaboration through clusters and networks, as well as the Business Innovation Initiative, which is a business process improvement initiative that is particularly relevant in assisting service companies to innovate. EI also offers a Small Business Innovation Research (SBIR) support measure to encourage the supply of innovative products and services to the public sector.

In terms of its cost to the Exchequer, the main RDI support measure for the enterprise sector (SMEs and MNCs) is the R&D tax credit which was introduced in 2004 and provides a 25% credit on corporate profits tax for qualifying R&D expenditure. A Knowledge Development Box (patent box) scheme was introduced in 2016 allowing for a preferential corporation tax rate on income from IP resulting from R&D carried out in

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<sup>7</sup> A longitudinal study collecting data on the health, economic and social circumstances of 8,000 people aged 50 and over.

<sup>8</sup> The report states also that progress towards targets set out in the Strategy for Science, Technology and Innovation 2006-2013 in terms of the numbers of indigenous companies with minimum and significant scale R&D expenditure was slower than envisaged.

Ireland. The Government is undertaking a review both of direct and indirect RDI supports in terms of the level of support available and eligibility rules.

EI and IDA jointly target also innovation spill-overs from MNCs towards SMEs via the Global Sourcing Initiative programme. Since its 2012, 21 new contracts have been secured by Irish companies valued at €10.5m (EI, 2016).

### **Policy Assessment**

Although Irish businesses can benefit from a large number of support schemes for R&I purposes, there have been a number of calls for their rationalisation. For example, OECD suggested (OECD, 2014) the consolidation of funding into a drastically smaller number of agencies clustered around two groups: science and basic research, as well as applied research and innovation. The Industry Research & Development Group, a representative body for research performing organisations has pointed out that the range of RDI support measures were perceived by industry as confusing (IRDG, 2015).

According to the OECD September 2015 Economic Survey of Ireland, public supports for business R&D were increasingly skewed towards R&D tax credits and recommended that innovation support be rebalanced towards direct support (OECD, 2015b). Given the importance of the services sector to the Irish economy, policy-makers could consider the allocation of increased resources to support measures such as Enterprise Ireland's Business Process Innovation Initiative is particularly suitable for supporting service companies to improve their innovation performance.

Increased resources could be provided to initiatives such as the Global Sourcing programme and the networks of Research Centres and Technology Centres/Gateways in order to provide opportunities for indigenous enterprises to benefit from the strong investing power of MNCs and their access to global value chains.

## **5.2 Challenge 2: Increasing R&D in the sector of multinationals**

### **Description**

MNCs in Ireland are important contributors to BERD with an expenditure of €1.4b on R&D in 2013. A small number of MNCs in a range of high tech sectors such as ICT and pharma account for circa 70% of BERD. MNCs employ over 11,500 people who are engaged in R&D activities.

The main challenge of policy-makers in relation to the FDI sector is to deepen their engagement in Ireland so that their activities move them up the value chain. This means encouraging those existing MNCs that are not yet engaged in RDI to invest in a R&D unit – as 54% of MNCs in Ireland do not carry out R&D – (Inter-Departmental Committee on Science, Technology and Innovation, 2015) and facilitating existing MNCs that have an Irish R&D unit to expand their activities. Achieving this would help to better anchor these MNCs in Ireland and secure sustainable employment and related benefits to the economy.

A second challenge is to continue to invest in RDI facilities/infrastructures and human capital skills in order to attract new multinational investment in R&D to Ireland, given the level of international competition for this type of FDI investment.

### **Policy response**

In common with other members of the Small Advanced Economies Initiative<sup>9</sup>, Ireland has a BERD policy objective of attracting foreign R&D and encouraging existing MNCs to

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<sup>9</sup> The other members are Denmark, Finland, Israel, New Zealand, Singapore and Switzerland, <http://www.smalladvancedeconomies.org>

engage in R&D activities or, if they already perform R&D in Ireland, to expand their activities in this area.

According to its Policy Statement on FDI in Ireland published in 2014 (DJEI, 2014a) the DJEI would seek to target FDI that can commercialise and exploit those areas that are prioritised for research investment under the National Research Prioritisation Strategy such as ICT and Health & medical.

The 5-year strategy of IDA Ireland – the agency responsible for the attraction and development of FDI in Ireland – called **Winning Foreign Direct Investment 2015-2019** (IDA Ireland, 2015a), outlines a plan to support its clients in creating 80,000 new jobs and to increase employment in its client portfolio to 209,000 by 2019. IDA Ireland also aims to win €3b in new RDI investment projects, including in-house and collaborative RDI projects with companies and universities, and to encourage 120 additional companies across the FDI portfolio to engage in R&D. In 2015, IDA Ireland was allocated a budget of €62m for RDI supports to attract MNCs to Ireland and to encourage existing ones to engage or expand their RDI activity.

The **R&D tax credit** has been a major tool in attracting new FDI projects and in incentivising existing MNCs to perform R&D in Ireland. The cost of the R&D tax credit to the Exchequer in terms of tax revenues foregone amounted to €556m in 2014 (an increase of 31% on the 2013 figure of €421m), which is predominantly accounted for by large companies. The number of applicants for the R&D tax credit which grew strongly between 2004 and 2012 has levelled off.

The **Knowledge Development Box** was introduced by the Government in January 2016 offering a reduced, 6.25% tax rate (instead of the 12.5% normal corporate tax), on income arising from eligible IPR performed in Ireland. IDA Ireland believes that the KDB will support its marketing efforts to attract more overseas companies to undertake R&D and innovation activities in Ireland.

The planning and design of a new Programme for Research in Third Level Institutions (PRTLII) is being progressed by DJEI to support the provision of research infrastructure and the development of human capital.

### **Policy Assessment**

Ireland has been successful in generating new R&D investment in the MNC sector. This is evidenced by increases in R&D expenditures and by the 35% increase between 2009 and 2013 in the number of people employed in R&D activities in multinational companies.

The R&D tax credit has made a positive contribution to the efforts of IDA Ireland to attract FDI investment in R&D activities in Ireland. Given that the number of applicants for this tax incentive has levelled off the Government could consider undertaking a review of its effectiveness.

The country could review its research capabilities in key sectors such as advanced manufacturing so as to ensure that it is well-placed to attract new MNC investment. To achieve IDA Ireland's target of winning €3b in new RDI investment projects by 2019 it is equally important to continue the development of human capital in STEM research.

## **5.3 Challenge 3: Increasing public sector funding of R&D**

### **Description**

R&D funded by government was 0.41% of GDP in 2014, which is considerably lower than the EU average of 0.66% (throughout 2011-2013) or the OECD median (OECD, 2014). However, the fall of direct public funding due to the 2008-09 economic crisis (e.g. GBAORD: 22% down in 2013 vs. 2008) stopped in 2013 in nominal terms, representing still losses in real terms or as a share of GDP. Public R&D capital expenditure has been declining since 2009 (see section 3.1) and although it is slowly recovering, Ireland is still

behind leading international comparator countries. The reductions in the public R&D budget have impacted negatively on the HES, particularly in terms of falling numbers of R&D personnel employed and declines in PhD enrolments from their peak in 2010-2011, particularly in the STEM disciplines. Obtaining funding for maintaining and upgrading research infrastructures is a major difficulty facing the universities and Institutes of Technology. Therefore, Ireland faces the challenge of returning to a trend of sustained public investment in R&D. This has been addressed also by the European Council in its 2016 Country Specific Recommendation for Ireland by urging the country to "enhance the quality of expenditure (...) by prioritising government capital expenditure in R&D and in public infrastructure" (Council of the European Union, 2016).

This challenge is acknowledged also by Innovation 2020, which keeps the target of increasing public and private investment in R&D to 2.5% of GNP by 2020, a target previously set out in the 2012 National Reform Programme (EC, 2012) and that would require an almost doubling of public funding for R&D. The decline of government funded GERD has been compensated by indirect support.

### **Policy response**

Due to the tight public budget, the government focused on maximising the impact of public research funding and on getting the highest possible return from the participation at Horizon 2020. It also sought to eliminate duplication of research funding. In this context:

- the National Research Prioritisation Exercise (NRPE) identified 14 Priority Areas based on the existing strengths of the public research system and the enterprise base and on opportunities to deliver economic and societal impact;
- the Innovation 2020 and Agenda 2020 (SFI, 2012) strategies award funding to research proposals based on impact evaluation;
- the DJEI has undertaken a comprehensive programme of efficiency evaluations of R&D interventions provided by enterprise development agencies;
- the DJEI is responsible for overseeing the implementation of Ireland's Horizon 2020 strategy to maximise Ireland's participation in H2020. A drawdown target of €1.25b in funding has been set (EC, 2015c).
- the DJEI is undertaking a scoping exercise to develop a replacement to the Programme for Research in Third Level Institutions to support new investment in research infrastructure in the wider research base (DJEI, 2016b).

### **Policy Assessment**

After exiting its Economic Adjustment Programme in December 2013, Ireland is still under Post-Programme Surveillance. This limits its margin of manoeuvre to increase public expenditure in R&D. A first progress report on the NRPE has been released in 2014 showing very good advancement in implementation (DJEI, 2014b). The DJEI commissioned also an independent progress report on the National Research Prioritisation Strategy, which was published in December 2015. The review found that its achievements had been significant (DJEI, 2015a).

An assessment of Ireland's involvement in Horizon 2020 (EC, 2014, Page 20, Chart 9) showed that Irish participants recorded a success rate of 15-16%, which is in line with the EU-28 average of 14.5-16%, but lower than most of the MS in the group of "strong innovators" defined by the IUS 2016 (EC, 2016c). The country's drawdown for the first 29 months (from January 2014 to May 2016) was €275m, which seems to be in line with the achievement of the €1.25b target (DJEI, 2016c:39).

## 5.4 Challenge 4: Business-academia collaboration and knowledge transfer

### Description

The weakness of the Irish R&I system in terms of low degree of collaboration between business and academia has been recurrently highlighted (EC, 2016b; OECD, 2014; DJEI, 2015b). The level of business enterprise funding of public R&D is very low both in nominal terms (barely €13.9m in 2015) and as a share of GDP (0.01%), which is the lowest of the strong innovator group and one of the lowest in the EU (EU average in 2014:0.03% of GDP). According to OECD the percentage of HERD funded by indigenous industry has dropped from 5.3% in 2000 to a very low 1.6% in 2013. Irish indigenous companies show a lower rate of collaboration with academia compared to foreign MNC. The output indicator of the collaboration is also relatively weak: concerning the level of public-private scientific co-publications per million of population Ireland is at around the EU average level (34.3 – IE vs. 33.9 – EU-28), but the lowest among the strong innovators (EC, 2016c).

The main reasons behind these weaknesses include weak absorptive capacity within indigenous SMEs, lack of research centres/RTOs in certain sectors with applied research capabilities and confusion among enterprises over the relatively large number of schemes and research centres.

### Policy response

A range of direct funding schemes targeting businesses–academia collaborative research are provided. Some of these are as follows:

- SFI supports 12 [research centres](#) involving collaboration between HEIs and over 200 companies to support the employment of ca 1,300 researchers;
- EI-IDA Ireland Technology Centres programme supports 15 industry-led Technology Centres to deliver on the research needs of enterprise;
- 3 new EI Technology Gateways were launched in 2016 bringing to 15 the total number based in the Institutes of Technology. The Gateways act as open access points for companies delivering near to market solutions across industry sectors such as ICT & Software, Bio Life sciences & Food, and Materials. The new Gateways will serve the Manufacturing, Medical Devices and Design sectors. The Gateways also act as a portal for businesses to the wider research infrastructure of personnel and specialised equipment within the network of Gateways;
- a new national Health Innovation Hub<sup>10</sup> has been established by the Government to support collaboration between the health system and the business sector;
- Work is underway to develop proposals in the area of advanced manufacturing delivered through a Research Technology Organisation model for the benefit of both indigenous and multinational companies;
- In 2016 a review of the full range of State supports for RDI to ensure that the needs of small and young firms are being catered for as well as those of larger, established firms. Consideration will also be given to streamlining enterprise RDI support programmes where necessary and appropriate to ensure their comprehensiveness and complementarity.

In addition to these schemes, several institutions and measures are aimed at assisting industry in accessing knowledge in the publicly-funded research sector. The two most important of these are: the Technology Transfer Strengthening Initiative (TTSI) managed by Knowledge Transfer Ireland (KTI) and the national IP Protocol (last updated in January 2016 – DJIE, 2016d).

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<sup>10</sup>Participating members: University College Cork, Cork Institute of Technology, National University of Ireland Galway and Trinity College Dublin, <http://hih.ie>

## Policy Assessment

Irish policy makers have clearly addressed the need to improve the framework for public-private cooperation in R&D. A policy shift involving both an increasing leadership by industry in the agendas of the research and technology centres and the contribution of a larger cash element to the financing of the centres by participating enterprises can be observed (Fikkers et al., 2015).

Ireland would benefit from the rationalisation and streamlining of the wide range of small scale grant-based schemes available for business-academia collaboration. In the short term, the Government could continue its efforts to promote awareness of the range of available support measures to foster industry-knowledge producer collaboration.

There is also a need to invest in near-to-market research centres/RTOs to address gaps in the provision of RDI support, particularly in manufacturing competitiveness as well as services & business processes.

Regular reporting by KTI through a series of knowledge transfer indicators including the subjective assessment provided by businesses will allow monitoring the progress of business-academia cooperation.

## 6. Focus on creating and stimulating markets

*This section aims at describing and assessing national level efforts to introduce demand-side innovation policies to stimulate the uptake of innovation or act on their diffusion, including public procurement and regulations supporting innovation. It also analyses policy measures aimed at internationalisation of companies with the aim of increasing the innovativeness of the economy.*

The linear model in innovation policy has not yet been replaced by a holistic approach to innovation (Edquist, 2014). Irish policymakers have taken little action to exploit demand-side instruments such as PCP and PPI as tools to stimulate the innovation capabilities of Irish SMEs and to help the growth of young companies in the more knowledge-intensive sectors of the economy. A comprehensive strategy to boost innovation procurement including the provision of special training (capacity building) to public officials is lacking.

The innovative public procurement instrument has been largely underutilised, despite the recommendations made by the Procurement Innovation Group. Ireland ranked 47<sup>th</sup> out of 138 countries in terms of "Government procurement of advanced tech products" (WEF, 2016). Three projects have been funded under the SBIR programme<sup>11</sup> and EI is planning ten new projects over 2016-2017. The new programme will involve an investment of €1m which must be set in the context of an annual overall public procurement budget of €8.5b on goods and services and €3.4b on capital works.

The government represented by the Office of Government Procurement issued a circular in April 2014 (DPER, 2014) setting out measures to assist SMEs in public procurement.<sup>12</sup>

The Action Plan for Jobs 2015 envisaged the development of additional proposals for innovative procurement related to energy. It calls for examining ways of improving the supply of innovative products and services in public procurement and includes an assessment of innovative procurement practices of other countries.

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<sup>11</sup> It concerned the development of a smart technology solution for charging Electric Vehicles (EVs) in shared access parking areas; <http://www.seai.ie/SBIR#sthash.mNLPB8oY.dpuf>

<sup>12</sup> One of these measures requires public buyers to publish all award details over €25,000 on eTenders as soon as the contract is signed. This provision came into effect from 1 August 2014. Previously it was not possible to enter contract award information in situations where the procurement competition was managed outside of eTenders, as there was no preceding tender notice. From January 2016, this domain contains a summary listing of awards for mini-competitions and standalone agreements where the original tender notice was not published on eTenders, <https://procurement.ie/news/2735>

## **Regulatory background supporting innovation**

Responsibility for Better/Smarter Regulation at central Government level has been divided into six areas and allocated to three Government Departments:

- Reducing red tape/administrative burden (DJEI)
- Competition issues (DJEI)
- Regulatory Impact Assessment (Department of Public Expenditure & Reform)
- Effectiveness of regulators (Department of the Taoiseach)
- Representing Ireland at EU/OECD/International forums (DJEI)
- Transparency/quality of legislation (Department of the Taoiseach (Cabinet Secretariat), Attorney General's Office)

Regulatory Impact Analyses (RIA) are carried out to assess the effects of a proposed new regulation or regulatory change. The latest revision of RIA guidelines was issued in 2009 (Department of the Taoiseach, 2009). In 2016, DJEI published a RIA of proposed new legislation, the KDB (Certification of Inventions) Bill 2016 that would allow for the establishment of a Certification of Inventions Scheme to facilitate smaller companies to access the KDB scheme (DJEI, 2016e). The RIA considered the risks, benefits and impacts on innovation within SMEs if the legislation was not enacted. Also in 2016 the Central Bank has assessed the challenges for the regulatory treatment of technical innovation in the financial services sector where smaller tech-savvy market entrants can gain competitive advantage over larger incumbents (Central Bank of Ireland, 2016).

The National Standards Authority of Ireland (NSAI) can play an important role by providing information on current and future standards concerning bringing products to market and improving organisational performance. The Department of Public Expenditure and Reform (DEPR) plays a lead role in policy development and implementation activities with relation to the Open Data Initiative across the wider Public Service.

## **Internationalisation**

The Enterprise 2025 policy document argues that the narrow base of exporters and the relative scarcity of Irish owned firms growing internationally is a challenge facing policymakers. The strategy seeks to increase export intensity of Irish owned firms to 55-60% and support geographic market diversification so that Irish owned exports to non-UK markets increase by 50% by 2020. The strategy commits also to increasing the number of indigenous enterprises that export to more than one country.

Enterprise Ireland provides a wide range of measures to support the internationalisation of Irish businesses. Exports from its client companies (indigenous SMEs) have been increasing and reached €20.6b in 2015 (2010: €13.9bn). The UK is the main destination market: in 2015, the UK accounted for 35% (€7.25b) of total export sales. Despite this strong export performance by indigenous enterprises, FDI companies accounted for 90% of Ireland's total export sales in 2014. One of EI's strategic priorities for 2017 is to deliver a new Client Engagement Model so as to provide a more integrated and targeted programme of supports designed to drive a more rapid international scale in companies.

A particularity for the Irish economy is the important impact of the Brexit decision on indigenous exporting companies. A survey by IBEC of over 450 Irish businesses in July 2016 highlights the intense currency strain on exporters following the UK vote, with almost half of respondents (45%) identifying the sharp fall in the value of sterling as the main threat (IBEC, 2016). The Brexit decision is likely to feature prominently in the successor to Trade, Tourism and Investment Strategy 2010-2015 (DJEI, 2010), which is being jointly prepared by the DJEI and the Department of Foreign Affairs and Trade.

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## List of abbreviations and definitions

BERD	Business Expenditure on R&D
CSO	Central Statistics Office
DES	Department of Education and Skills
DESI	Digital Economy and Society Index
DJEI	Department of Jobs, Enterprise and Innovation
DPER	Department of Public Expenditure and Reform
EC	European Commission
EI	Enterprise Ireland
ESIF	European Structural and Investment Funds
FDI	Foreign Direct Investment
FTE	Full Time Equivalent
GERD	Total intramural R&D expenditure
GBAORD	Government Budget Appropriations and Outlays on R&D
GDP	Gross Domestic Product
GNP	Gross National Product
GVA	Gross Value Added
HEA	Higher Education Authority
HERD	Higher Education Expenditure on R&D
IBEC	Irish Business and Employers' Confederation
IDA	Industrial Development Authority
IRC	Irish Research Council
IRDG	Industry Research and Development Group
KDB	Knowledge Development Box
KTI	Knowledge Transfer Ireland
MNC	Multinational Company
NRP	National Reform Programme
NRPS	National Research Prioritisation Strategy
NSAI	National Standards Authority of Ireland
PCP	Pre-Commercial Procurement
PPI	Public Procurement of Innovation
R&D	Research and Development
R&I	Research and Innovation
RDI	Research, Development and Innovation
SBA	Small Business Act
SME	Small and Medium sized Enterprise
SBIR	Small Business Innovation Research
SFI	Science Foundation Ireland
WEF	World Economic Forum

## Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016
GDP per capita (euro per capita)	37,300	36,400	38,000	38,100	39,000	41,000	46,200	
Value added of services as share of the total value added (% of total)	70.91	72.88	70.18	70.92	71.36	71.86	57.33	
Value added of manufacturing as share of the total value added (%)	22.7	21.57	23.91	22.5	21.51	20.89	36.93	
Employment in manufacturing as share of total employment (%)	11.68	11.45	10.43	10.23	10.28	10.1	10.2	
Employment in services as share of total employment (%)	73.7	75.92	77.42	77.75	76.87	76.84	76.14	
Share of Foreign controlled enterprises in the total nb of enterprises (%)	2.05	2.03	2.24	2.27				
Labour productivity (Index, 2010=100)	93.5	100	106.4	105.5	103.3	109.4	134.1	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34		1.15	1.33	1.37	1.55	1.78		
Summary Innovation Index (rank)	9	8	7	6	10	9	7	
Innovative enterprises as a share of total number of enterprises (CIS data) (%)				58.7		61		
Innovation output indicator (Rank, Intra-EU Comparison)			3	4	4	2		
Turnover from innovation as % of total turnover (Eurostat)		9.3						
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						19	17	18
Ease of getting credit (WB GII) (Rank)						22	27	
Venture capital investment as % of GDP (seed, start-up and later stage)	0.027	0.017	0.024	0.043	0.048	0.034	0.041	
EC Digital Economy & Society Index (DESI) (Rank)						9	7	8
E-Government Development Index Rank		21				22		26
Online availability of public services – Percentage of individuals having interactions with public authorities via Internet (last 12 months)	37	37	44	49	45	51	50	52
GERD (as % of GDP)	1.61	1.6	1.54	1.56	1.56	1.51		
GBAORD (as % of GDP)	0.52	0.49	0.45	0.43	0.4	0.38	0.29	
R&D funded by GOV (% of GDP)	0.48	0.47	0.45	0.43	0.43	0.41		
BERD (% of GDP)	1.1	1.1	1.07	1.12	1.12	1.09		
Research excellence composite indicator (Rank)				7				
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		11.79	11.29	12.29	11.69			
Public-private co-publications per million population	24.33	30.55	29.1	32.08	29.62	34.31		
World Share of PCT applications	0.27	0.24	0.19	0.22	0.19	0.2		

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Figure 1 Development of government funding of the total GERD

Figure 2 Top sectors in manufacturing and services BERD

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