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Research and Innovation performance in EU Member States and Associated countries – Innovation Union progress at country level

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

State of the Innovation Union 2012 - Accelerating change

{COM(2013) 149 final}

Ireland

Prioritising increased public investment in research while better exploiting results

Summary: Performance in research, innovation and competitiveness

The indicators in the table below present a synthesis of research, innovation and competitiveness in Ireland. They relate knowledge investment and input to performance or economic output throughout the innovation cycle. They show thematic strengths in key technologies and also the high-tech and medium-tech contribution to the trade balance. The table includes a new index on excellence in science and technology which takes into consideration the quality of scientific production as well as technological development. The indicator on knowledge-intensity of the economy is an index on structural change that focuses on the sectoral composition and specialisation of the economy and shows the evolution of the weight of knowledge-intensive sectors and products and services.

	Investment and Input	Performance/economic output
Research	*R&D intensity* 2011: 1.72% (EU: 2.03%; US: 2.75%) 2000-2011: +4.07% (EU: +0.8%; US: +0.2%)	*Excellence in S&T* 2010:38.11 (EU:47.86; US: 56.68) 2005-2010: +5.39% (EU: +3.09%;US: +0.53)
Innovation and Structural change	*Index of economic impact of innovation* 2010-2011: 0.69 (EU: 0.612)	*Knowledge-intensity of the economy* 2010:65.43 (EU:48.75; US: 56.25) 2000-2010: +1.94% (EU: +0.93%; US: +0.5%)
Competitiveness	*Hot-spots in key technologies* Food and agriculture, Medical technologies, Nanotechnologies, Biotechnology, ICT, New production technologies	*HT + MT contribution to the trade balance* 2011: 2.57% (EU: 4.2%; US: 1.93%) 2000-2011: +26.26% (EU: +4.99%; US:-10.75%)

Ireland has expanded and consolidated its research and innovation system over the last decade. Investments in research and innovation have grown substantially. Public investment in research and innovation grew considerably until the financial crisis. Business enterprise investment in R&D continued to grow over the period 2000-2010 albeit at a lower growth rate than public investment.
The considerable increase in public and private R&D expenditure over the decade 2000-2010 has resulted in a clear shift to a knowledge-based economy including a shift towards services. The Irish economy has a high proportion of knowledge-intensive products and services, and this structure has not changed substantially over the last decade. Although the recession hit Ireland particularly hard, the economy has since partly recovered because of the strength of exports by firms in the high-tech sectors. These firms are mainly affiliates of MNEs.

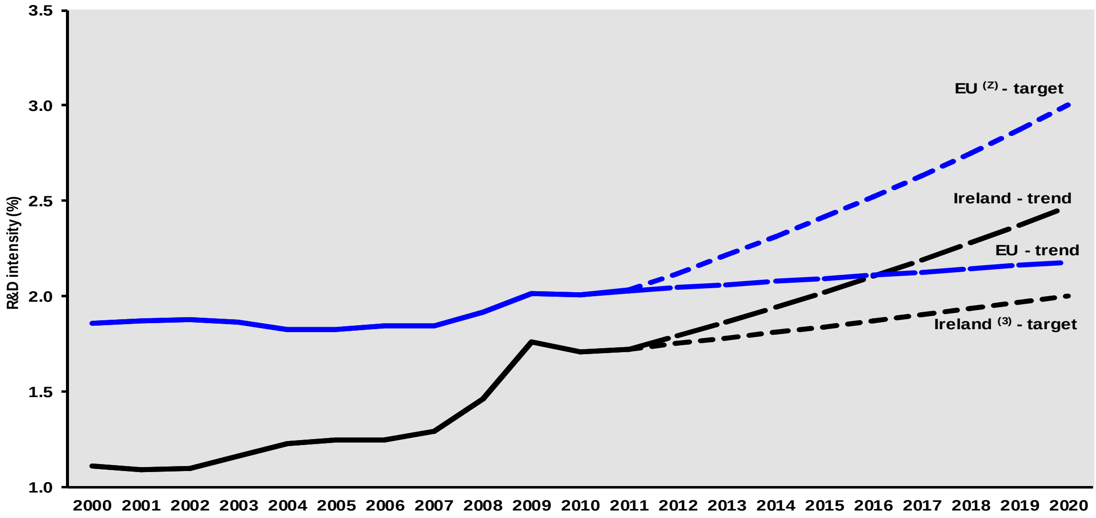
In contrast, domestic firms in a number of sectors which do not have a propensity to export have struggled. Accordingly the main challenges are to return to the previous policy of increasing public R&D expenditure and to complement the policy of promotion of procurement of innovation with budgetary allocations to procurement authorities.[1]

Prior to the crisis, policy was based on a Strategy for Science, Technology and Innovation which articulates the ambition to be a leading knowledge economy. More recently the focus has been on accelerating growth and job creation. The government has also adopted the report of a research prioritisation group which recommended targeted research investment in 14 priority areas as well as a new IP protocol on putting public research to work for Ireland.

[1] Concrete measures were presented in Commission Communication Europe 2020 Ireland, June 2012

Investing in knowledge

Ireland - R&D intensity projections, 2000-2020 (1)



Source: DG Research and Innovation - Economic Analysis Unit
Data: DG Research and Innovation, Eurostat, Member State
Notes: (1) The R&D intensity projections based on trends are derived from the average annual growth in R&D intensity for 2000-2011.
(2) EU: This projection is based on the R&D intensity target of 3.0% for 2020.
(3) IE: This projection is based on a tentative R&D intensity target of 2.0% for 2020.

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.

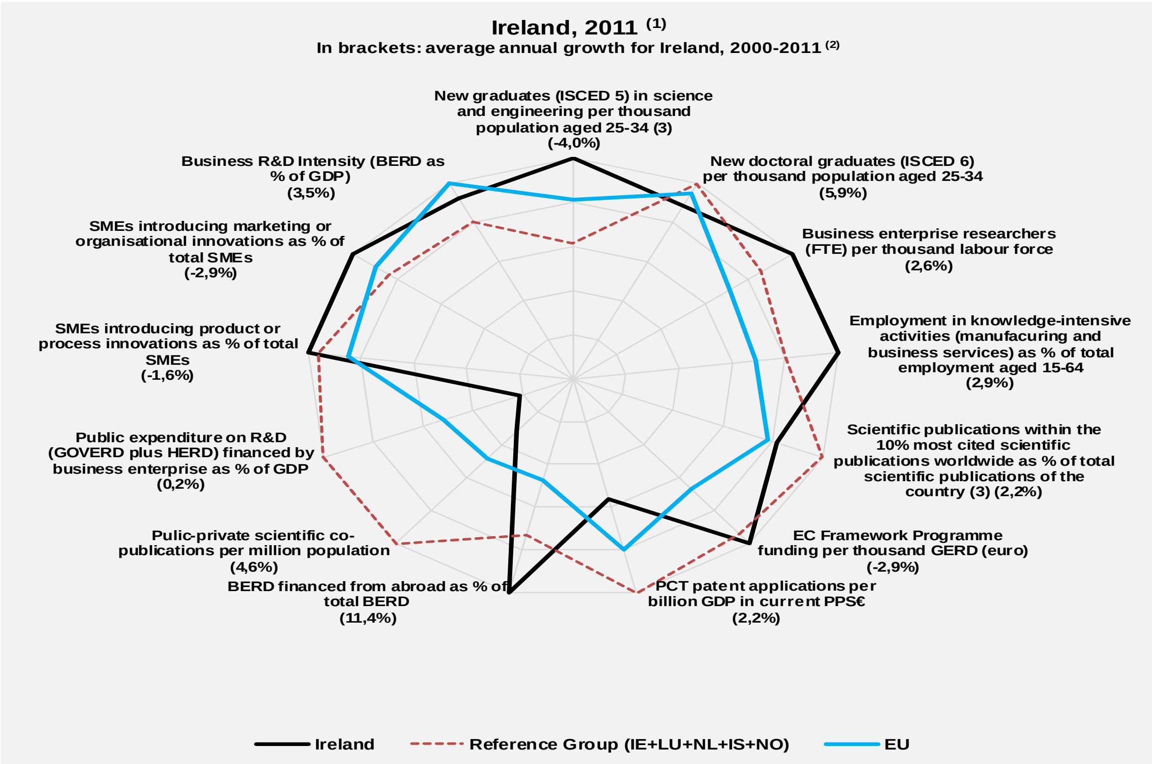
In absolute terms, public R&D funding reached a peak in 2008. R&D investment by firms appears not to have been seriously affected by the economic crisis. Where BERD is supported by government, Ireland has a relatively low level of direct support, according to the OECD. Indirect support was almost 3 times 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 €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 €412 million[2] of which €85 million went to SMEs. Overall, Irish applicants had a close to average success rate.

[2] According to CORDA 6 Nov 2012 I-cf. national estimate of €438 M in June 2012.

An effective research and innovation system building on the European Research Area

The graph below illustrates the strengths and weaknesses in the Irish R&I system. Reading clockwise, the graph provides information on human resources, scientific production, technology valorisation and innovation. Average annual growth rates from 2000 to the latest available year are given in brackets.



Source: DG Research and Innovation - Economic Analysis Unit
Data: DG Research and Innovation, Eurostat, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard
Notes: (1) The values refer to 2011 or to the latest available year.
(2) Growth rates which do not refer to 2000-2011 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2000-2011.
(3) Fractional counting method.

The graph shows in broad terms that the increase in funding for R&D (2000-2010 average annual growth) has triggered a stronger scientific production with increases in business expenditure on R&D, the number of new doctoral graduates, employment in knowledge-based activities and scientific publications in the most highly cited journals. The number of researchers employed in business has also grown. The relative weaknesses of the Irish R&I system are the relatively low (but growing) numbers of PCT patent applications and public-private co-publications as well as falling levels of SMEs introducing different forms of innovation.

Ireland had in 2010 a net inflow of students and engineers from the United States. According to UNESCO data, in 2010, 1201 students at graduate, masters or doctoral level left Ireland for studies in the United States, while 2545 students from the United States chose to study in Ireland. Ireland has engaged in the ESFRI process from the beginning and is supportive of 20 of the 44 areas identified in the original roadmap as well as being a participant in seven FP7 funded research infrastructure preparatory phase projects.

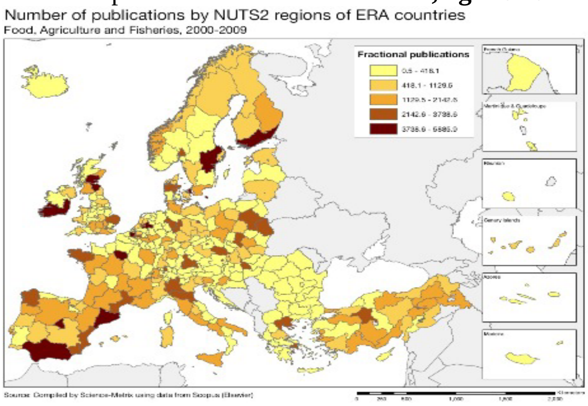
On knowledge transfer, Ireland has a relatively high efficiency with regard to the amount invested to generate each patent application, licence agreement and spinoff.

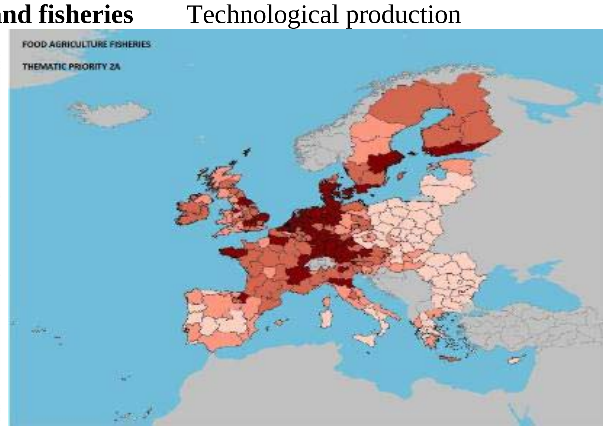
Ireland's scientific and technological strengths

The maps below illustrate several key science and technology areas where Irish regions have real strengths in a European context. The maps are based on the number of scientific publications and patents produced by authors and inventors based in the regions.

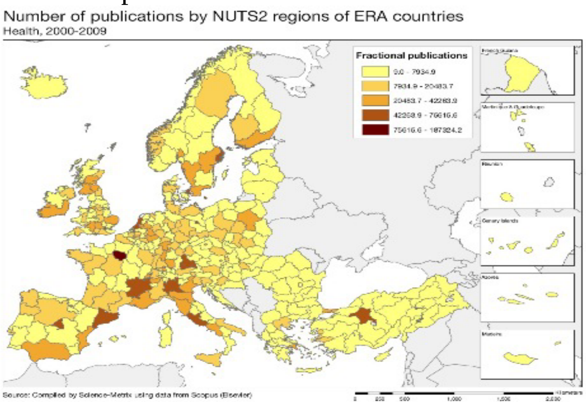
Strengths in science and technology at European level

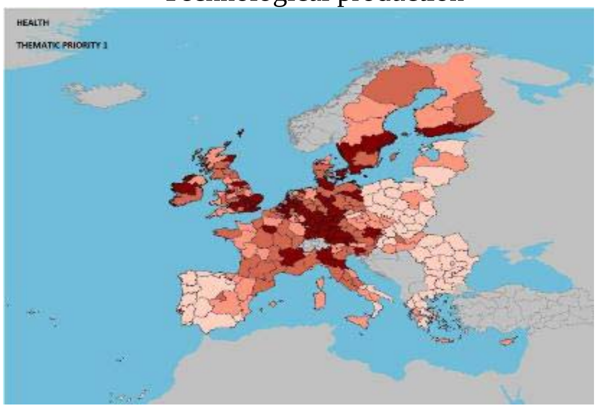
Scientific production **Food, agriculture and fisheries** Technological production



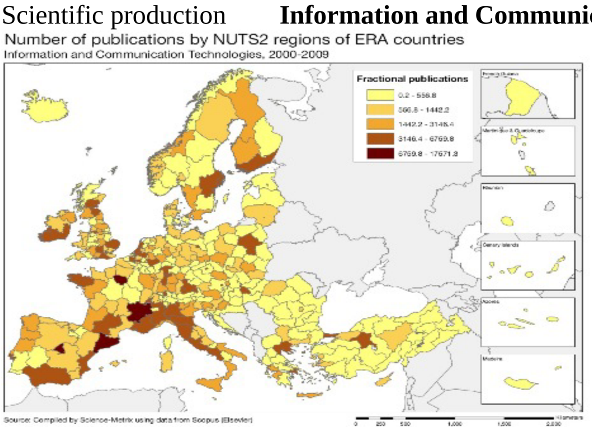


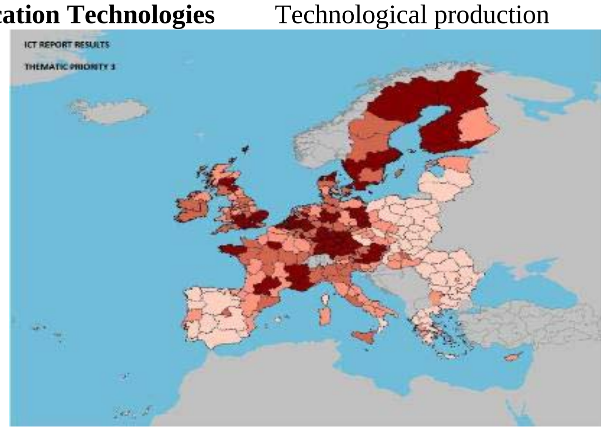
Scientific production **Health** Technological production





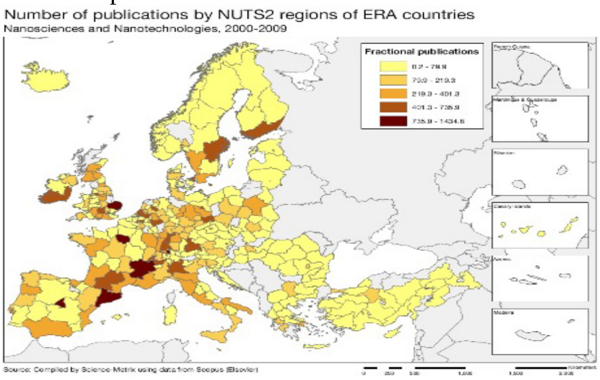
Scientific production **Information and Communication Technologies** Technological production

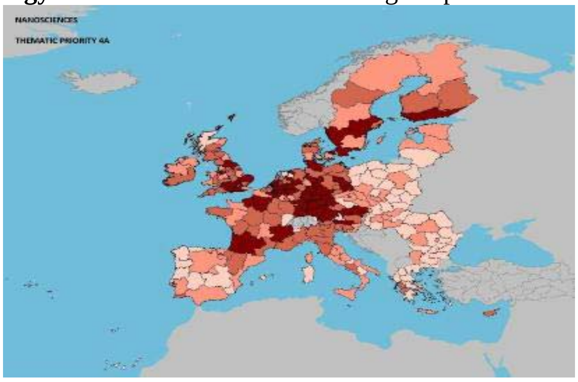




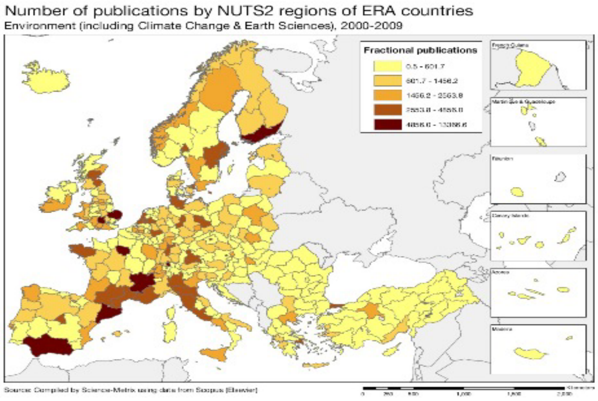
Source: DG Research and Innovation – Economic Analysis unit
Data: Science Metrix using Scopus (Elsevier), 2010; European Patent Office, patent applications, 2001-2010

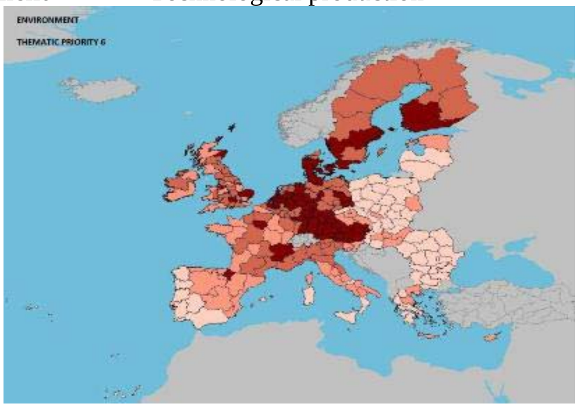
Scientific production **Nanotechnology** Technological production



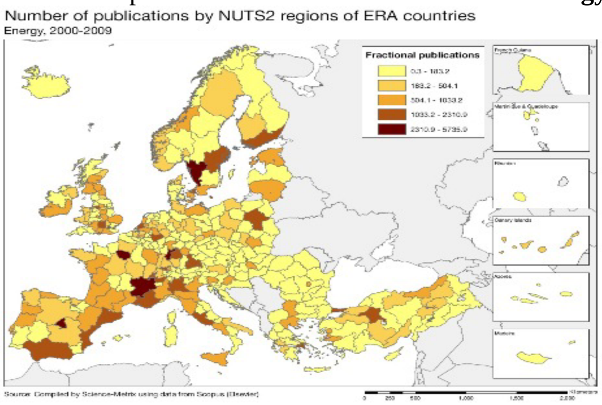


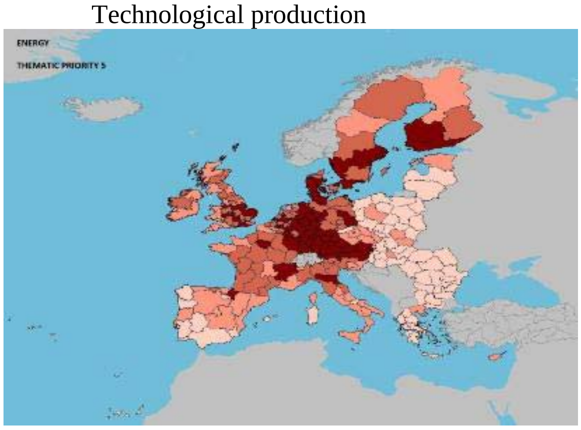
Scientific production **Environment** Technological production





Scientific production **Energy** Technological production





As illustrated by the maps above, in absolute numbers, in terms of scientific capacity, Ireland has strong regional clusters in the fields of food, agriculture and fisheries, ICT and nanotechnology. In terms of technology specialisation, Ireland is particularly strong in ICT. In fact, Ireland has a technological advantage in ICT comparable to that of the United States and well above the EU average and surpassed in the EU only by Sweden and Finland. In nanotechnology Ireland is third behind Singapore and the Czech Republic.

The main technology sectors in which the number of patent applications and patents granted by the EPO are in the 75-100 percentile are telecommunications, digital communications, computer technology, IT methods for management, medical technology, thermal process and apparatus, manufacture of medical and surgical equipment, and services for computer and related activities. These findings illustrate the comparative strengths and suggest the focus for R&I and industrial policies.

Policies and reforms for research and innovation

The Irish research system is centralised and regions and while research policies are set nationally they address regional aspects and needs and take account of effects of clustering which have led to regional specialisation. The significance of structural funds for Ireland has reduced and EDRF funds amounting to € 163.5 million for research, innovation and entrepreneurship over the period 2007-2013 represent less than 20% of the annual government budget for R&D. Ireland comprises two NUTS II regions. The Border, Midland and Western region's key challenge is to develop its Institutes of Technology as well as enhance the research, innovation and ICT infrastructure to promote enterprise development. The Southern and Eastern region has a commitment to developing incubator spaces in close proximity to the institutes of Technology

Prior to the crisis policy is based on a Strategy for Science, Technology and Innovation 2006-2013 which articulates the ambition to be a leading knowledge economy. Following the onset of the economic crisis this policy is being implemented in the context of the Framework for Sustainable Economic Renewal which, through an Action plan for Jobs, involves actions to deliver reform and create economic growth and which includes measures related to science technology and innovation. The Government's programme for national recovery stresses increased emphasis on delivering value from the State's investment in research with the approach being to fund the full spectrum of research in priority areas as identified in the National Research Prioritisation exercise. In addition a portion of funding will be retained for research for policy and research for knowledge.

Fiscal measures involving R&D tax credits were introduced in 2004 and provided a 25% tax credit for qualifying incremental expenditure covering the full spectrum from basic to applied research and experimental development. According to the OECD surveys on tax incentives, indirect support of business R&D in Ireland is almost three times higher than direct support. The fiscal incentives for carrying out R&D were complemented by an expansion of tax credits in 2010 to enhance investment in intellectual property (including software) by excluding royalty income from withholding tax.

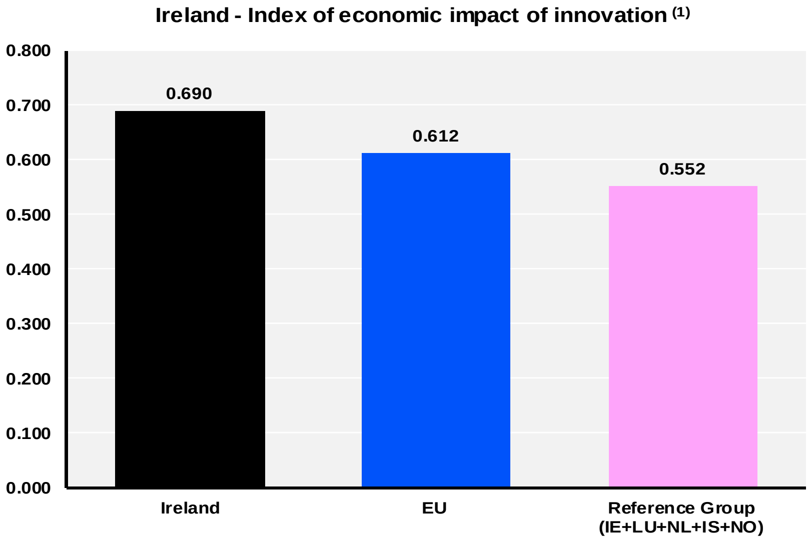
More recently the Government has accepted a proposal for the prioritisation of research funding for activities related to areas of industrial strength. In addition emphasis is placed on increasing the innovation potential of indigenous firms and improving links between industry and higher education institutions.

The existing national policies on IPR were reviewed by a task force and were found to be in line with international practice including that emerging at EU level from the Commission Recommendation C(2008)1329 and the Responsible Partnering initiative of the key stakeholders. This has recently been updated with a new IP protocol to clarify the rules on knowledge transfer in the context of collaboration between industry and higher education institutions.

In 2012 an Innovation task force was adopted Key areas for action include a better matching between supply and demand for innovation, a financial framework fostering innovation, high quality and broad human capital, and international projection. It also includes promotion of public procurement for innovative products and services. However, due to the need for strong fiscal consolidation, the implementation of this has been limited to the issuance of guidance.

Economic impact of innovation

The index below is a summary index of the economic impact of innovation composed of five of the Innovation Union Scoreboard's indicators[3].



Source: DG Research and Innovation - Economic Analysis Unit (2013)
Data: Innovation Union Scoreboard 2013, Eurostat
Note: (1) Based on underlying data for 2009, 2010 and 2011.

The high score of Ireland on this summary index is linked to its economic structure, with high volumes of activities both in several high-tech manufacturing sectors and in knowledge-intensive services. The share of the Ireland's employment in knowledge-intensive activities (19.8 %) and the share of knowledge-intensive services in services export are both the second highest of all EU Member States, after Luxembourg.

Foreign multinational firms perform a large part of the activity in the knowledge-intensive sectors, and in the last decade, foreign direct investments have continued in the more technology-intensive sectors. According to the OECD, Ireland has at 17.9% by far the highest technology balance of payments as a percentage of GDP and at 20% the fifth highest growth rate among the OECD countries for which data are available. This can be largely attributed to the high level of foreign direct investment in Ireland and the resultant intra-group transfers of technology.

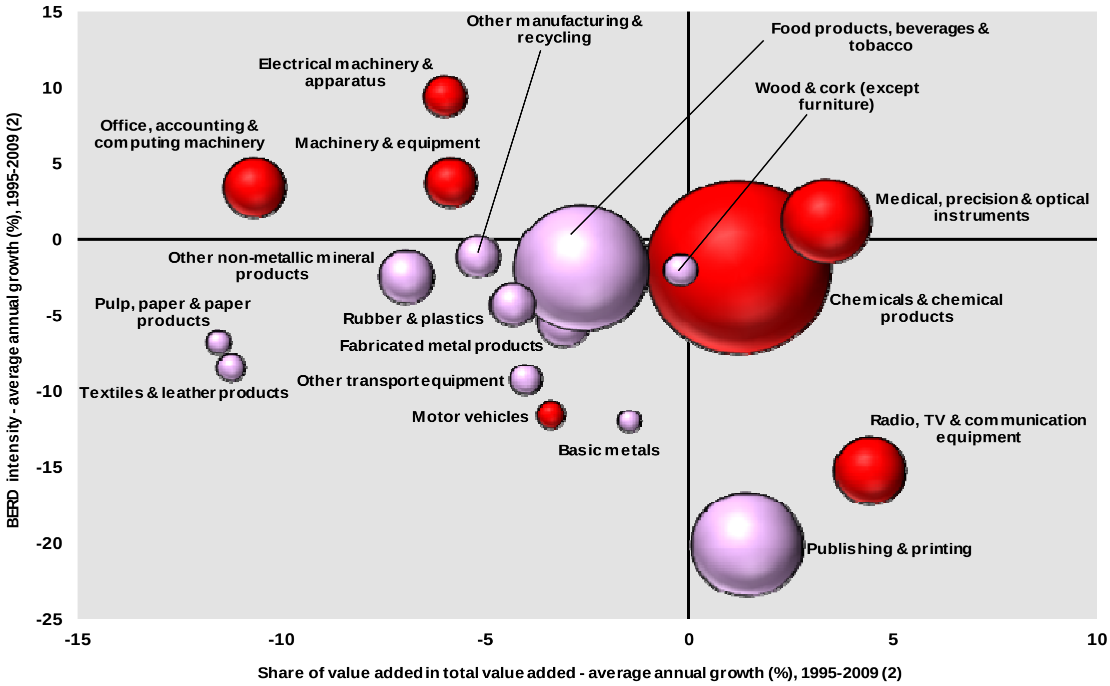
Ireland generally has favourable framework conditions for innovation, in particular in terms of time taken to start a business, barriers to entrepreneurship, and corporate taxation. In contrast it is below the OECD average in terms of percentage of self-employed persons, women entrepreneurs and entrepreneurs under 45 years of age. According to the OECD, barriers to entrepreneurship (including regulatory, administrative burdens and barriers to competition) were lower than in many other EU Member States. However, following the financial crisis, in 2010 the ease of access to capital in Ireland was the lowest of all OECD countries whereas previously Ireland had been ranked in 11th place. In contrast, in 2009 Ireland was still in 5th place in the OECD and 2nd in the EU (behind Sweden) in terms of venture capital investment as a percentage of GDP. Regarding the number of business angel networks and groups, Ireland is 3rd in a group of smaller and medium sized countries.

3 See Methodological note for the composition of this index.

Upgrading the manufacturing sector through research and technologies

The graph below illustrates the upgrading of knowledge in different manufacturing industries. The position on the horizontal axe illustrates the changing weight of each industry sector in value added over the period. The general trend to the left-hand side reflects the decrease of manufacturing in the overall economy. The sectors above the x-axis are sectors whose research intensity has increased over time. The size of the bubble represents the share of the sector (in value added) in manufacturing (for all sectors presented in the graph). The red-coloured sectors are high-tech or medium-high-tech sectors.

Ireland - Share of value added versus BERD intensity - average annual growth, 1995-2009



Source: DG Research and Innovation - Economic Analysis unit
Data: OECD
Notes: (1) High-Tech and Medium-High-Tech sectors are shown in red. 'Other transport equipment' includes High-Tech, Medium-High-Tech and Medium-Low-Tech.
(2) 'Basic metals', 'Fabricated metal products', 'Motor Vehicles', 'Other manufacturing and recycling', 'Other transport equipment', 'Publishing and printing', 'Pulp, paper and paper products', 'Wood and cork (except furniture)': 1995-2005; 'Electrical machinery and apparatus', 'Medical, precision and optical instruments', 'Office, accounting and computing machinery', 'Radio, TV and communication equipment': 1995-2007.

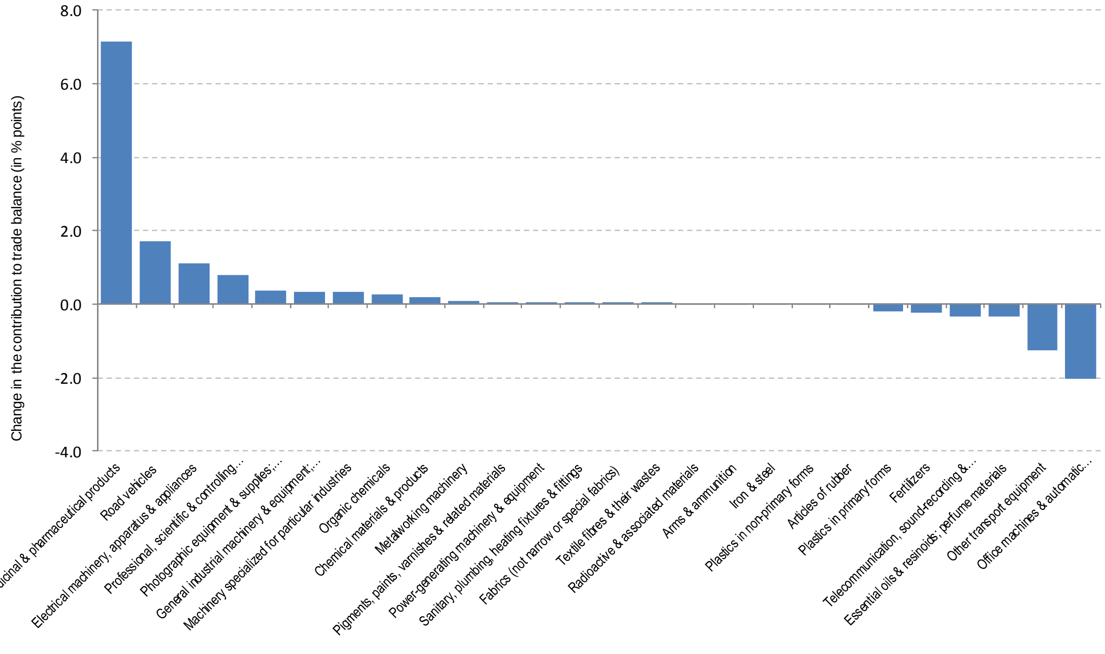
As recognised in Irish economic and industrial policy, the medium-term avenue for a more sustainable economy is to upgrade and move up on the value chain and internationalise its outreach. Compared to other countries, Ireland has scope to further increase both the R&D intensity in existing high-tech and medium-high-tech sectors and to increase knowledge intensity in more traditional sectors of the economy.

The graph above illustrates the structural change of the Irish economy over the last decade. It shows that the economic expansion over the period 2000-2006 was mainly related to chemicals and chemical products, medical, precision and optical instruments, and radio, TV and communication equipment. There have been increases in R&I investment in electrical machinery and apparatus, machinery and equipment, and office, accounting and computing machinery. This knowledge injection has translated into an increasing share of value added in medical, precision and optical instruments and chemicals and chemical products.

Competitiveness in global demand and markets

Investment in knowledge, technology-intensive clusters, innovation and the upgrading of the manufacturing sector are determinants of a country's competitiveness in global export markets. A positive contribution of high-tech and medium-tech products to the trade balance is an indication of specialisation and competitiveness in these products.

Evolution of the contribution of high-tech and medium-tech products to the trade balance for Ireland between 2000 and 2011



Source: DG Research and Innovation - Economic Analysis unit
Data: COMTRADE
Notes: "Textile fibres & their wastes" refers only to the following 3-digits sub-divisions: 266 and 267.
"Organic chemicals" refers only to the following 3-digits sub-divisions: 512 and 513.
"Essential oils & resinoids; perfume materials" refers only to the following 3-digits sub-divisions: 553 and 554. "Chemical materials & products" refers only to the following 3-digits sub-divisions: 591, 593, 597 and 598. "Iron & steel" refers only to the following 3-digits sub-divisions: 671, 672 and 679.
"Metalworking machinery" refers only to the following 3-digits sub-divisions: 731, 733 and 737.

Ireland has a positive trade balance in high-tech and medium-tech products and has achieved a considerable growth with a fourfold increase over the last decade, which constitutes an impressive record. Total trade balance in the economy has also grown continuously. The graph above shows that most high-tech and medium-tech products and in particular medicinal and pharmaceutical products, road vehicles, and electrical machinery and apparatus have increased their contributions to the Irish trade balance over the period 2000-2010. A relative concern is the falling weight of products in office machines and telecommunications, and other transport equipment, which have also decreased their exports in real terms over the period 2000-2009. Looking at the previous graph, it is clear that since 1995, the radio, TV and communication equipment sector has not substantially upgraded its knowledge intensity in terms of average annual growth of business R&D. On the other hand, electrical machinery and apparatus has a lower average growth in value added but a higher average growth in R&D.

Total factor productivity growth in Ireland is in 2012 back to the pre-crisis level. The employment rate is below the EU average, it has also increased and subsequently fallen clearly with the crisis after 2009. The share of population at risk of poverty or social exclusion has risen as result of the economic crisis and is above the EU average. Regarding the other Europe 2020 targets in environment and education, greenhouse gas emissions have fallen but are still much higher than the EU average, and the share of renewable energy has increased but is still much lower than the EU average. Innovation has contributed to a rising number of patents in environmental and health-related technologies, with Ireland ranking respectively 11th and 7th within the EU.

Key indicators for Ireland

IRELAND	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average annual growth [1] (%)	EU average [2]	Rank within EU
ENABLERS																
Investment in knowledge																
New doctoral graduates (ISCED 6) per thousand population aged 25-34	0.89	0.98	0.85	1.06	1.06	1.20	1.38	1.37	1.40	1.54	1.58	:	:	5.9	*1.69*	10
Business enterprise expenditure on R&D (BERD) as % of GDP	0.80	0.77	0.76	0.78	0.81	0.82	0.83	0.85	0.94	1.16	*1.17*	*1.17*	:	*3.5*	*1.26*	10
Public expenditure on R&D (GOVERD + HERD) as % of GDP	0.32	0.33	0.34	0.38	0.42	0.43	0.42	0.44	0.52	*0.60*	0.54	*0.56*	:	*5.3*	*0.74*	16
Venture Capital [3] as % of GDP	0.21	0.11	0.08	0.06	0.04	0.06	0.05	0.17	0.04	0.04	0.03	0.03	:	-15.9	0,35 [4]	18 [4]
S&T excellence and cooperation																
Composite indicator of research excellence	:	:	:	:	:	29.3	:	:	:	:	38.1	:	:	5.4	47.9	11
Scientific publications within the 10% most cited scientific publications worldwide as % of total scientific publications of the country	9.6	10.7	9.8	8.2	9.8	10.6	10.8	11.5	11.4	:	:	:	:	2.2	10.9	8
International scientific co-publications per million population	319	286	328	469	591	695	740	814	912	1004	1094	1131	:	12.2	300	8
Public-private scientific co-publications per million population	:	:	:	:	:	:	:	29	26	22	29	34	:	4.6	53	12
FIRM ACTIVITIES AND IMPACT																
Innovation contributing to international competitiveness																
PCT patent applications per billion GDP in current PPS€	2.3	2.5	2.3	2.2	2.4	2.4	2.4	2.7	2.9	2.8	:	:	:	2.2	3.9	11
License and patent revenues from abroad as % of GDP	:	:	:	:	0.19	0.38	0.41	0.46	0.57	0.75	1.40	2.29	:	42.9	0.58	2
Sales of new to market and new to firm innovations as % of turnover	:	:	:	:	10.1	:	12.6	:	11.0	:	9.3	:	:	-1.4	14.4	19
Knowledge-intensive services exports as % total service exports	:	:	:	:	36.4	68.7	70.5	67.0	33.7	71.8	73.1	:	:	12.3	45.1	2
Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products	-5.37	-3.10	-1.78	-1.31	-0.27	-1.20	-0.92	-1.33	1.28	2.43	2.38	2.57	:	-	4,20 [5]	11
Growth of total factor productivity (total economy) - 2000 = 100	100	101	104	104	104	105	105	106	102	101	102	105	106	6 [6]	103	11
Factors for structural change and addressing societal challenges																
Composite indicator of structural change	54.0	:	:	:	:	53.9	:	:	:	:	65.4	:	:	1.9	48.7	1
Employment in knowledge-intensive activities (manufacturing and business services) as % of total employment aged 15-64	:	:	:	:	:	:	:	:	18.2	19.2	19.5	19.8	:	2.9	13.6	2
SMEs introducing product or process innovations as % of SMEs	:	:	:	:	50.1	:	43.8	:	27.3	:	45.5	:	:	-1.6	38.4	8
Environment-related technologies - patent applications to the EPO per billion GDP in current PPS€	0.10	0.04	0.07	0.04	0.10	0.05	0.08	0.09	0.24	:	:	:	:	11.5	0.39	11
Health-related technologies - patent applications to the EPO per billion GDP in current PPS€	0.52	0.74	0.50	0.61	0.54	0.54	0.40	0.60	0.59	:	:	:	:	1.5	0.52	7
EUROPE 2020 OBJECTIVES FOR GROWTH, JOBS AND SOCIETAL CHALLENGES																
Employment rate of the population aged 20-64 (%)	70.4	71.1	70.7	70.6	71.5	72.6	73.4	73.8	72.3	67.1	65.0	64.1	:	-0.8	68.6	20
R&D Intensity (GERD as % of GDP)	1.11	1.09	1.10	1.16	1.23	1.25	1.25	1.29	1.46	*1.76*	*1.71*	*1.72*	:	*4.1*	*2.03*	13
Greenhouse gas emissions - 1990 = 100	123	127	124	124	123	126	125	124	122	112	111	:	:	-12 [7]	85	22 [8]
Share of renewable energy in gross final energy consumption (%)	:	:	:	:	2.2	2.7	2.9	3.3	3.9	5.1	5.5	:	:	16.5	12.5	21
Share of population aged 30-34 who have successfully completed tertiary education (%)	27.5	30.6	32.0	35.1	38.6	39.2	41.3	43.3	46.1	48.9	49.9	49.4	:	5.5	34.6	1
Share of population at risk of poverty or social exclusion (%)	:	:	:	:	24.8	25.0	23.3	23.1	23.7	25.7	29.9	:	:	3.2	*24.2*	21 [8]

Source: DG Research and Innovation - Economic Analysis Unit

Data: Eurostat, DG JRC - ISPRA, DG ECFIN, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard

Notes: (1) Average annual growth refers to growth between the earliest available year and the latest available year for which compatible data are available over the period 2000-2012.

(2) EU average for the latest available year.

(3) Venture Capital includes early-stage, expansion and replacement for the period 2000-2006 and includes seed, start-up, later-stage, growth, replacement, rescue/turnaround and buyout for the period 2007-2011.

(4) Venture Capital: EU does not include EE, CY, LV, LT, MT, SI, SK, These Member States were not included in the EU ranking.

(5) EU is the weighted average of the values for the Member States.

(6) The value is the difference between 2012 and 2000.

(7) The value is the difference between 2010 and 2000. A negative value means lower emissions.

(8) The values for this indicator were ranked from lowest to highest.

(9) Values in italics are estimated or provisional.

Italy

The challenge of structural change for a more knowledge-intensive economy

Summary: Performance in research, innovation and competitiveness

The indicators in the table below present a synthesis of research, innovation and competitiveness in Italy. They relate knowledge investment and input to performance or economic output throughout the innovation cycle. They show thematic strengths in key technologies and also the high-tech and medium-tech contribution to the trade balance. The table includes a new index on excellence in science and technology which takes into consideration the quality of scientific production as well as technological development. The indicator on knowledge-intensity of the economy is an index on structural change that focuses on the sectoral composition and specialisation of the economy and shows the evolution of the weight of knowledge-intensive sectors and products and services.

	Investment and Input	Performance/economic output
Research	*R&D intensity* 2011: 1.25% (EU: 2.03%; US: 2.75%) 2000-2011: +1.69% (EU: +0.8%; US: +0.2%)	*Excellence in S&T* 2010:43.12 (EU:47.86; US: 56.68) 2005-2010: +3.56% (EU: +3.09%;US: +0.53)
Innovation and Structural change	*Index of economic impact of innovation* 2010-2011: 0.556 (EU: 0.612)	*Knowledge-intensity of the economy* 2010:35.43 (EU:48.75; US: 56.25) 2000-2010: +1% (EU: +0.93%; US: +0.5%)
Competitiveness	*Hot-spots in key technologies* Automobiles, Food and agriculture, ICT, Biotechnology, New production technologies	*HT + MT contribution to the trade balance* 2011: 4.96% (EU: 4.2%; US: 1.93%) 2000-2011: +8.13% (EU: +4.99%; US:-10.75%)

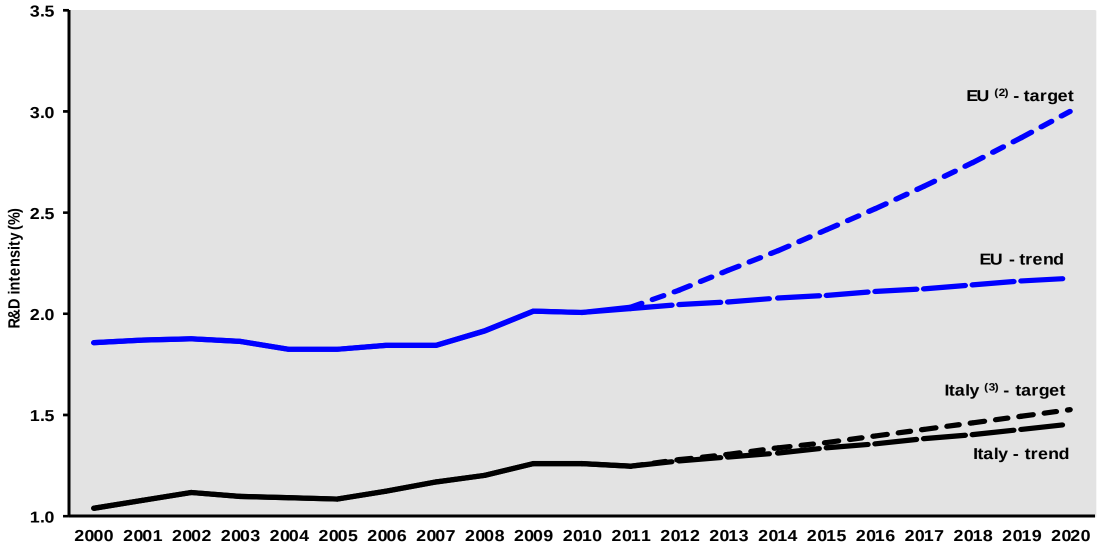
Over the last decade, Italian R&D intensity increased moderately, reaching 1.25% in 2011. Overall, the R&D intensity of both the public and private sectors increased over the last decade, but only to reach levels that remain very far from those of the countries at the technology frontier, thus suggesting a trend towards a specialisation in low technology-intensive products.

Without any doubt, the first priority for Italy in the field of R&I is to generate a strong momentum and commitment towards increasing its R&D intensity based on improved business framework conditions for innovation and economic structural change. The low degree of adjustment of the education system to the economic structure of the country and to the specific needs of industry is a structural weakness. There is also a lack of effective and timely implementation of the overall policy mix for R&I and education, in particular measures to support innovation and more specifically SMEs. Major challenges include the underinvestment of the private sector in R&D and innovation, largely due to the fact that the Italian economy is characterised by a large number of SMEs and micro firms in low knowledge intensity sectors (bearing in mind also the large differences between the North and the South of the country) as well as the low level of skills and insufficient performance of the higher education system in many regions.

To address these challenges, public support measures and framework conditions for R&D have been put in place (e.g. grants for industrial research, simplification of the IPR system) and a new governmental structure has been created to coordinate national R&D activities and links with R&D stakeholders. Since 2011, the new government has incorporated the objectives and priorities of EU 2020 in their main policies, with specific roles for R&D, innovation and human resources. A reduction of taxation for R&D activities is foreseen, extending regulation to intramural R&D (until now applied only to extramural R&D). A "Cohesion Action Plan" was launched in November 2011, aiming to improve the use of structural funds to create growth and jobs by concentrating resources on key domains (education, broadband, employment and transport networks) following the restructuring of the Operational Programmes.

Investing in knowledge

Italy - R&D intensity projections, 2000-2020 (1)



Source: DG Research and Innovation - Economic Analysis Unit
Data: DG Research and Innovation, Eurostat, Member State
Notes: (1) The R&D intensity projections based on trends are derived from the average annual growth in R&D intensity for 2000-2011.
(2) EU: This projection is based on the R&D intensity target of 3.0% for 2020.
(3) IT: This projection is based on a tentative R&D intensity target of 1.53% for 2020.

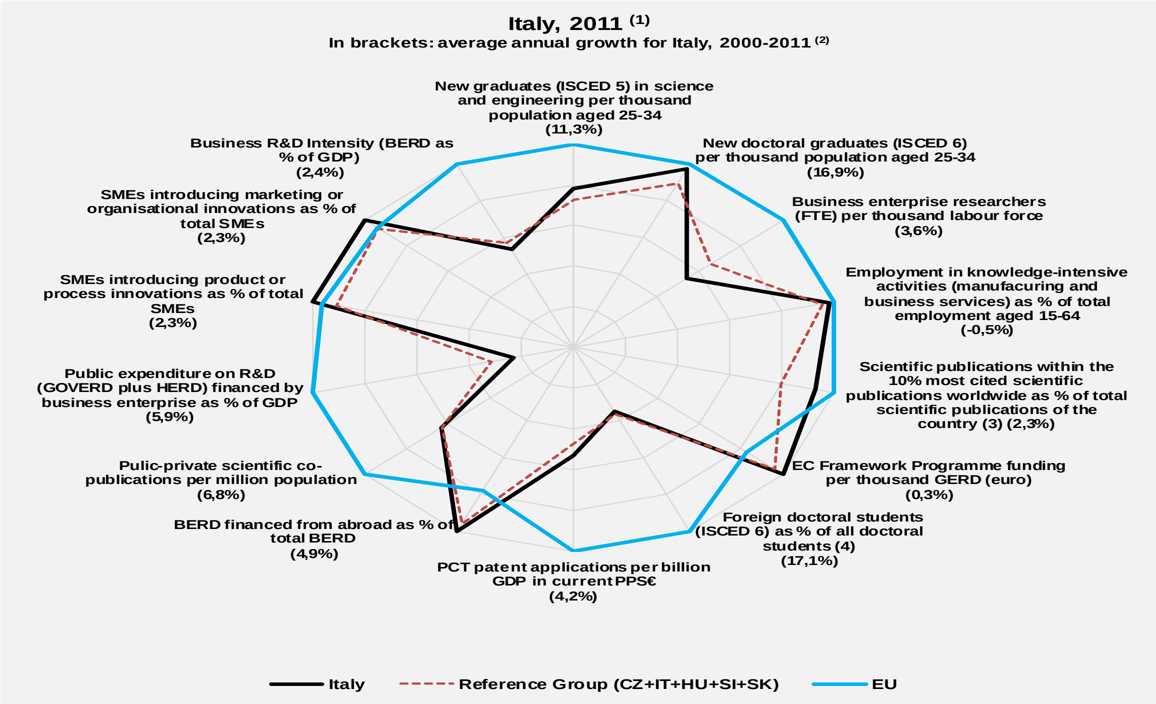
The Italian national R&D intensity target will be achieved if the current trend continues, but the target is not very ambitious. Italy set an R&D intensity target of 1.53% in the context of the Europe 2020 strategy, well below the current EU average, thus running the risk of the country falling far behind a moving technology frontier in some sectors of its economy. Over the 2000-2011 period, R&D intensity in Italy increased by an average of 1.69% annually, passing from 1.04% in 2000 to 1.25% in 2010. Both public sector and private sector expenditure on R&D have grown during the period, but at modest rates. The difference between Italy's R&D intensity and the EU average is mainly due to lower industrial R&D. In 2011 business R&D intensity in Italy was 0.68% compared to an EU average of 1.26%. Public sector R&D intensity is also lower than the EU average (0.53% for Italy compared to an EU average of 0.74% in 2011).

Public funding for R&D as a percentage of GDP has been decreasing over the last eight years, after a period between 2000 and 2004 in which a substantial increase was registered. The need to reduce the public deficit has imposed budgetary constraints. The trend shows also a decreasing public R&D budget in 2011 and 2012. Likewise, Italy has one of the lowest levels of public expenditure on education as a % of GDP in the EU (4.7% in 2009). In addition, Italy faces the problem of very low business investment in R&D. The low level of business R&D intensity is partly linked to the structural composition of the economy which has a low share of high-tech industries in total manufacturing, and partly the result of low R&D investment by Italian firms. The small size of Italian firms, 95% of which are small or micro enterprises, aggravates this situation. There is also a low presence of foreign-owned firms which has remained unchanged over the period 2001-2008.

Italian R&D performers have received almost € 2.2 billion in EC contributions under the 7th Framework Programme (8.27% of the total EC contributions). Italy counts three universities (Bologna, Milan and Rome) among the top 50 participant HES organisations in FP7 and two research institutes among the top 20 participant REO organisations. For the ERDF programming period 2007-2013, Italy has been allocated a total of € 27 billion for research, innovation, support for SMEs, information technologies and other measures to stimulate innovation and entrepreneurship. These funds will be crucial for the development and catching up of some of the regions. However, by January 2012 only 34% of the available structural funds for research and innovation related themes had been allocated.

An effective research and innovation system building on the European Research Area

The graph below illustrates the strengths and weaknesses of the Italian R&I system. Reading clockwise, the graph provides information on human resources, scientific production, technology valorisation, and innovation. Average annual growth rates from 2000 to the latest available year are given in brackets.



Source: DG Research and Innovation - Economic Analysis Unit
Data: DG Research and Innovation, Eurostat, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard
Notes: (1) The values refer to 2011 or to the latest available year.
(2) Growth rates which do not refer to 2000-2011 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2000-2011.
(3) Fractional counting method.
(4) EU does not include DE, IE, EL, LU, NL.

Italy scores above the EU average for innovative SMEs introducing marketing, organisational and product or process innovations. Other positive aspects are the high growth rates observed for shares of new doctoral graduates (ISCED 6) (16.9%) and non-EU doctoral students (17.1%). Between 2000 and 2010, the total number of researchers (FTE) per thousand labour force has grown at an average annual rate of 4.2%.

However, Italy is suffering a net outflow of students and engineers to the United States.[4] The number of business researchers per thousand labour force in Italy has grown between 2000 and 2010, but is still well below the EU average highlighting the need to enhance the quality of the higher education system and to improve the correspondence between curricula and labour market needs. The Italian research and innovation system is relatively public-based, with only 53.6% of research performed by the business sector (compared to an EU average of 61.5% in 2010) and has a low level of knowledge transfer from public research institutions to firms.

Another structural weakness is the disparity between Northern and Southern regions in terms of innovation performance (the most innovative regions are Lombardia and Emilia Romagna). However, Italy is well integrated in the European research and innovation system. Together with Germany, France and the United Kingdom, Italy is among the highest producers of cross-border scientific co-publications (in absolute numbers).

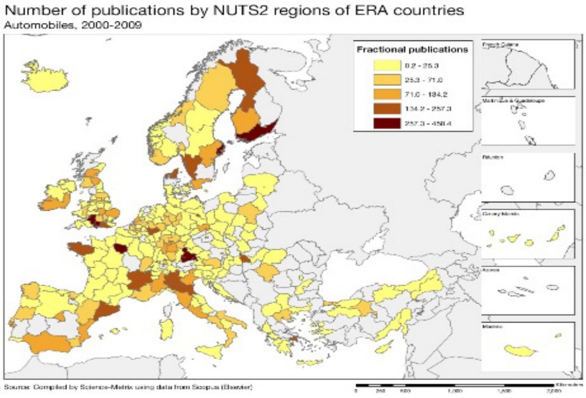
[4] In 2010, 4.036 students at graduate, master or doctoral level left Italy for studies in the United States, while only 423 students from the United States chose to study in Italy (UNESCO data, 2009),

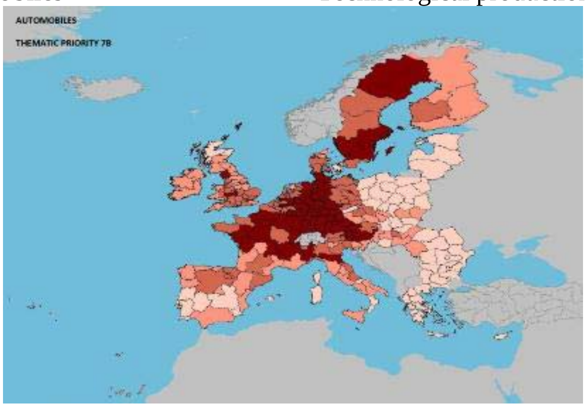
Italy's scientific and technological strengths

The maps below illustrate six key science and technology areas where Italy has real strengths in a European context. The maps are based on the number of scientific publications and patents produced by authors and inventors based in the regions.

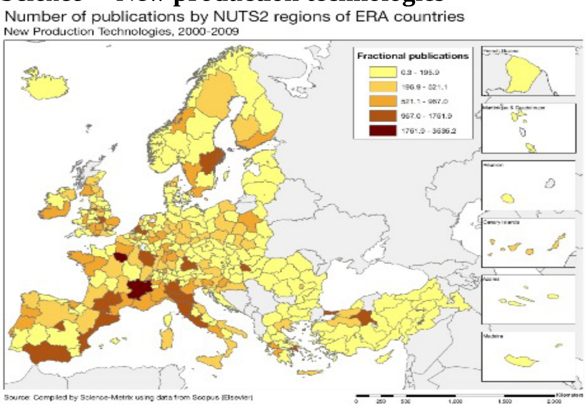
Strengths in science and technology at European level

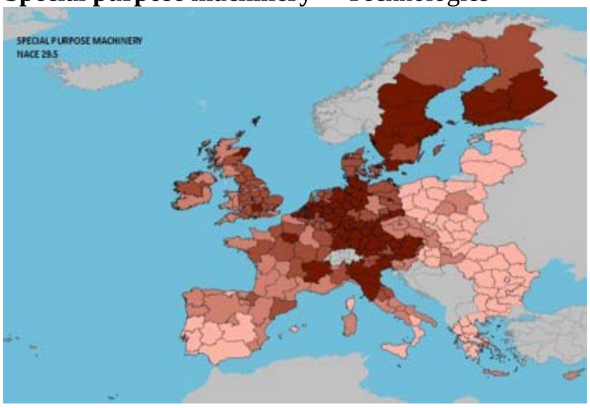
Scientific production **Automobiles** Technological production



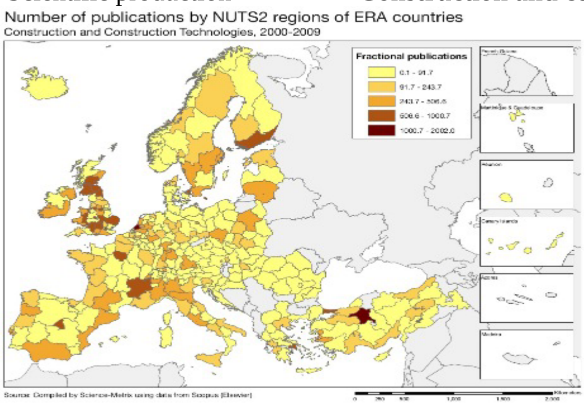


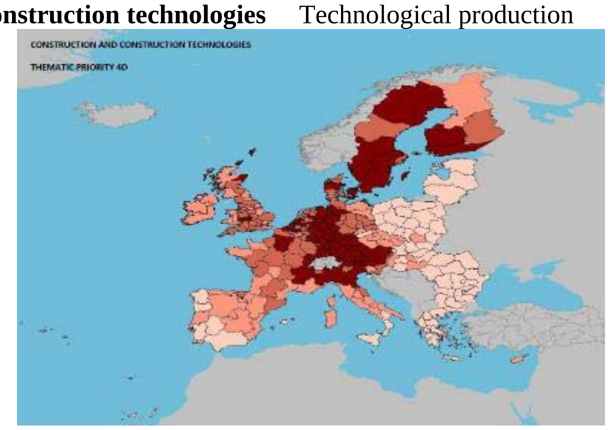
Science **New production technologies** **Special purpose machinery** Technologies





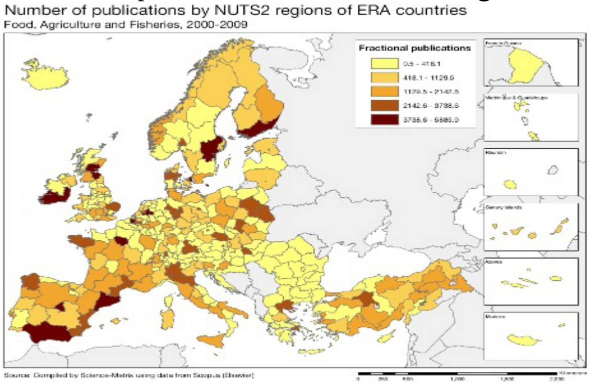
Scientific production **Construction and construction technologies** Technological production

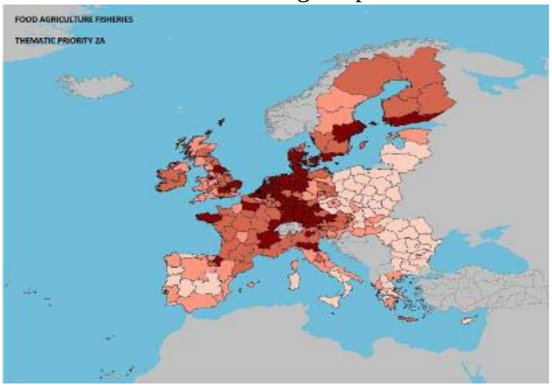




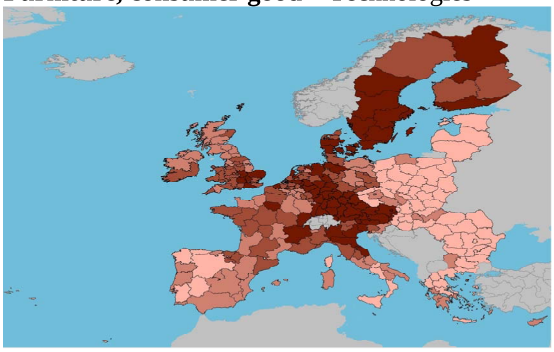
Source: DG Research and Innovation – Economic Analysis unit
Data: Science Metrix using Scopus (Elsevier), 2010; European Patent Office, patent applications, 2001-2010

Scientific production **Food agriculture and fisheries** Technological production

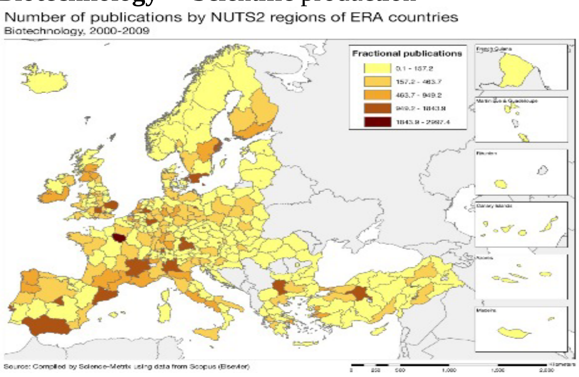




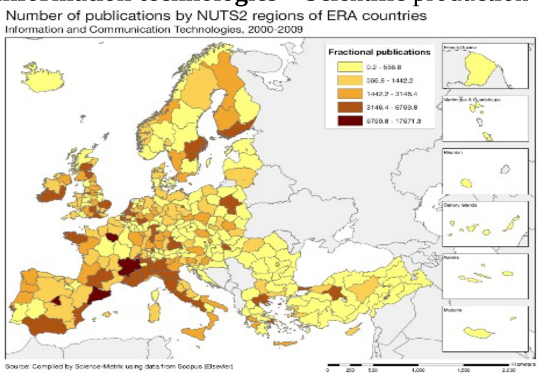
Furniture, consumer good Technologies



Biotechnology Scientific production



Information technologies Scientific production



Italy is still below the EU average in terms of scientific production and technology development. Some regions have strong scientific capacity in the fields of automobiles, food, agriculture and fisheries, construction and construction technologies, furniture and consumer goods, special purpose machinery and chemicals. Italy reveals science quality and technological specialization mainly in energy, automobiles and transport. Relative strengths in patenting reflect the weight of the traditional sectors together with construction.

A cluster policy has been in place in Italy since the 1990s. Italian industrial clusters have been concentrated in the low-tech and medium-tech sectors, but new clusters are also emerging in aerospace, biotechnologies (highly concentrated in Lombardia), renewable energies and mechatronics (in close collaboration with automotive and transports in general). The relative scientific and technological dynamics of the clusters can be observed from the publication and patenting activity at regional level, as illustrated by the maps above. Strengths in science and technology provide the potential for structural change towards more knowledge-intensity by injecting knowledge into existing and new industrial and services sectors. But in general, Italy has large and diversified innovation and science bases with only partial correspondence between science output and technological specialization. There is room for improvement in the matching of the science base with the needs of the industrial structure of Italy.

Policies and reforms for research and innovation

Italy has set an R&D target which is realistic, but lacking in ambition in view of the country's potential and challenges. The situation may improve under the new national programme for research and if successful at the occasion of the mid-term review of the Europe 2020 National targets (2014/2015). Procedures will be simplified while the approach will be more “market” oriented. The new “network contracts” could represent a positive element for supporting innovative clusters and stimulating cooperation. Positive steps have been taken in relation to the careers of researchers and in relation to increasing the numbers of graduates in science and engineering (as for example the case of Politecnico di Torino offering free tuition for female students, to incentivise female participation in scientific and technological education). The 2009-2013 National Research Programme acknowledges the obstacles that have made the development of a research policy in Italy difficult, and proposes an array of actions dedicated to removing those obstacles, while also making the best use of the positive characteristics of the existing productive structure. It provides a national framework for research activity carried out in Italy and assigns strategic value to public-private partnership for the development of the products and processes needed to maintain and improve the nation's competitiveness and level of exports, and to reduce national, economic and political dependence in sectors such as energy, environment and healthcare.

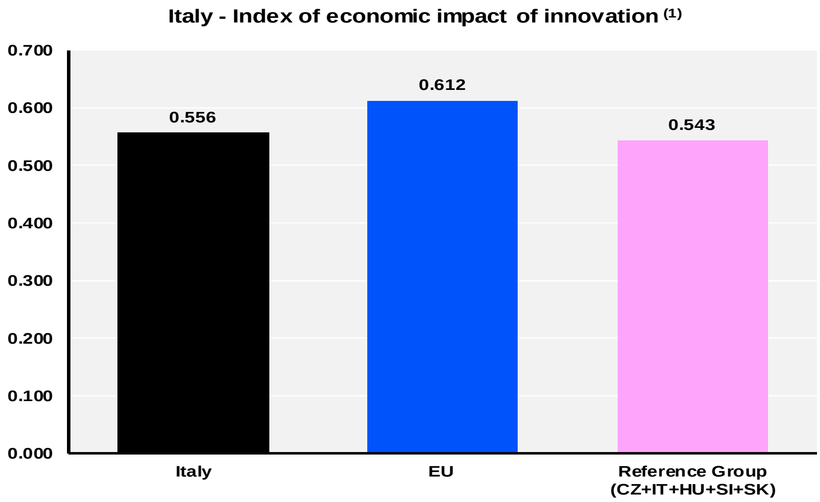
Some public support measures and framework conditions for R&I are in place (e.g. grants for industrial research, simplification of the IPR system). A new governmental structure has been created to coordinate national R&D activities and links with R&D stakeholders. In the higher education sector a recent reform of universities towards more performance based funding is being implemented. The new National Agency for the Evaluation of the University and Research (ANVUR) will evaluate research and education institutions. A five year evaluation exercise was launched to assess the research performance of universities and public research institutions. The reform of the public administration is on-going, aiming at better linking pay with performance, increasing mobility and introducing further competitive elements in the appointment of public managers. Furthermore, the *e-Government 2012 Plan*, launched in 2009, aims to modernise the public administration and to promote innovation through ICT. The information concerning the resources made available for R&D and innovation for 2011-12 is positive. Several interesting initiatives have been launched: 185 new JTIs projects involving 400 companies; agreement between MIUR and Agencies on venture capital for SMEs; contracts between networks of companies (to improve industrial collaboration); green public procurement, among other measures.

Since 2011, the new government has incorporated the objectives and priorities of EU 2020 in their main policies, with specific roles for R&D, innovation and human resources. With the aim of enhancing private R&D investment the government has introduced fiscal incentives such as a 35% tax credit, with a maximum of € 200.000 per firm and year, to encourage recruitment of highly-skilled young people. Support for public-private partnerships is foreseen in key sectors. In the context of economic change a larger company or a sector in crisis can receive support for projects of industrial conversion, and instruments have been put in place for the re-training of human resources. These policies have been implemented in the petrochemical and the chemical sectors.

Following the launching of a "Cohesion Action Plan", November 2011, aiming to improve the use of structural funds to create growth and jobs, resources are being concentrated on key domains (education, broadband, employment and transport networks) as part of the restructuring of the Operational Programmes. The biggest Operational Programme for R&D and innovation, PON, has been concentrated in three domains, with a budget of € 1150 million (data of March 2012). In relation to the European Digital Agenda, a task force from the ministry in charge of research and the regions is studying the economic viability of the project. Examples of focus include smart cities and communities aiming to strengthen synergies at regional level. An important step has been taken in the field of governance with the abolition of the need for a double evaluation (at national level) of the projects approved at community level. Progress towards the ERA and improving the impact of the structural funds for research and innovation, in the context of the 2011 Cohesion Action Plan, is dependent on implementation capacity.

Economic impact of innovation

The index below is a summary index of the economic impact of innovation composed of five of the Innovation Union Scoreboard's indicators[5].



Source: DG Research and Innovation - Economic Analysis Unit (2013)
Data: Innovation Union Scoreboard 2013, Eurostat
Note: (1) Based on underlying data for 2009, 2010 and 2011.

The slightly lower level of economic impact of innovation in Italy is partly linked to an economic structure that has a relatively low concentration of knowledge-intensive sectors. In particular technology production and the share of knowledge-intensive services in total service export are clearly lower than the EU average. This effect concerns mainly the R&D-based innovation, as the Italian economy consists to a large extent of low knowledge-intensity sectors: e.g. footwear, textiles and clothing and mainstream manufacturing industries such as fabricated metal products, domestic appliances, and bicycles. However, Italy also has some specializations in technology-intensive sectors such as machinery, automotive and aerospace.

The Italian financial sector has done well since the beginning of the economic crisis, but a main issue of concern is the access to credit for SMEs. Italy has adopted important measures to liberalise services, in particular professional services, and to improve competition in the network industries. Nevertheless, the business environment in Italy remains complex due to inefficiencies in resource utilisation, procedures and institutional organisation. These have repercussions in particular on the time required to apply and concretise specific measures reducing drastically their potential benefits to the economy.

Concerning the business environment, SMEs also have to deal with heavy administrative burdens. The reduction of the administrative burden is therefore a priority and the target is 25% in line with the EU strategy. Several initiatives have been proposed to cut the burden and should be implemented in 2012. These aim at improving the ease of doing business. At the moment Italy is among the less attractive Member States in the EU in terms of ease of doing business (in fact, Italy is ranked 80th in the world) and is also one of the Member States that has improved its framework environment the least in the period 2006-2011.[6]

The complexity of the administrative procedures involved in supporting programmes for R&D and innovation causes significant delays which can have a very negative impact in the specific case of innovation when market advantages are considered.

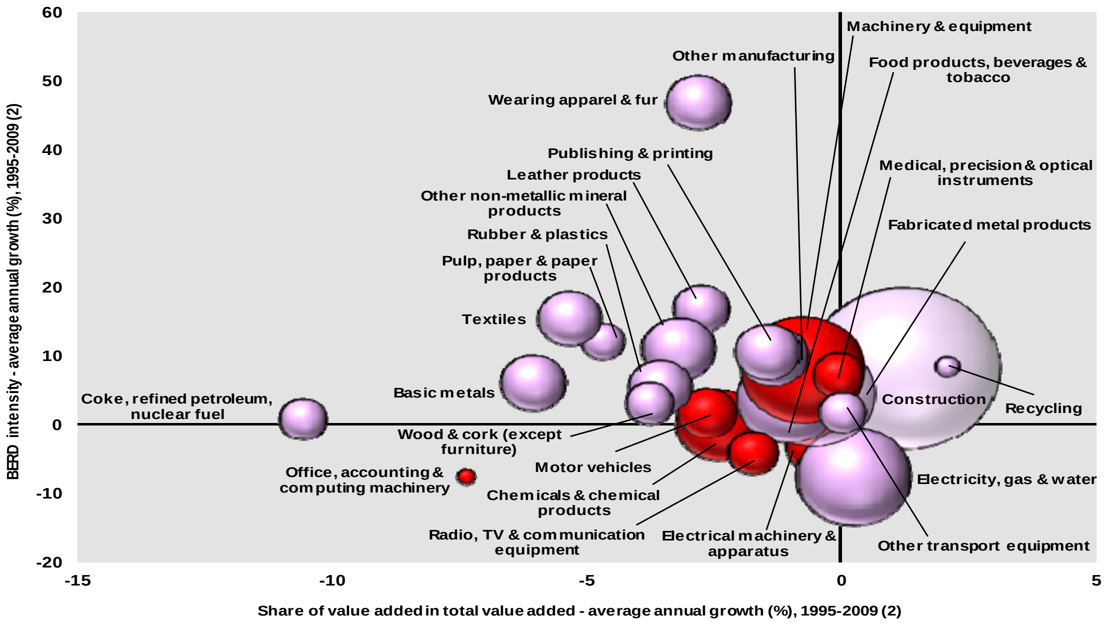
5 See Methodological note for the composition of this index.

[6] Commission Staff Working Document "Industrial Performance Scoreboard and Report on Member States Performances and Policies", 2012

Upgrading the manufacturing sector through research and technologies

The graph below illustrates the upgrading of knowledge in different manufacturing industries. The position on the horizontal axis illustrates the changing weight of each industry sector in value added over the period. The general trend to the left-hand side reflects the decrease of manufacturing in the overall economy. The sectors above the x-axis are sectors whose research intensity has increased over time. The size of the bubble represents the share of the sector (in value added) in manufacturing (for all sectors presented on the graph). The red-coloured sectors are high-tech or medium-high-tech sectors.

Italy - Share of value added versus BERD intensity - average annual growth, 1995-2009



Source: DG Research and Innovation - Economic Analysis unit
Data: OECD
Notes: (1) High-Tech and Medium-High-Tech sectors are shown in red. 'Other transport equipment' includes High-Tech, Medium-High-Tech and Medium-Low-Tech.
(2) 'Electrical machinery and apparatus', 'Other manufacturing', 'Radio, TV & communication equipment', 'Recycling': 1995-2008.

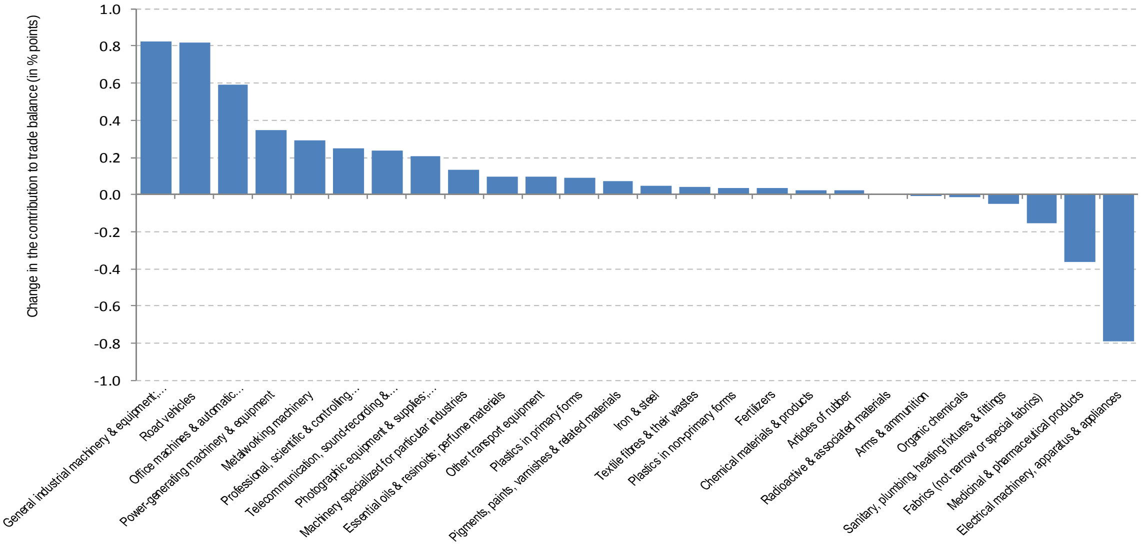
The graph above synthesises the structural change of the Italian economy over the last fifteen years. It shows that the economic expansion over the period 1995-2007 has not resulted in a general increase in knowledge-intensity in the manufacturing sector. The Italian economy has in parallel moved towards a higher share of services (illustrated by the left-ward move of the bubbles). Considering both manufacturing and services, employment in knowledge-intensive activities as percentage of total employment aged 15-64 has not increased over the period 2000-2010. Likewise, the combined share of value added in high-tech and medium-high-tech manufacturing and in knowledge-intensive services (KIS) in total value added actually decreased from 11.7% in 2000 to 10.3% in 2009.

Nevertheless, manufacturing still accounts for a larger share of the economy in Italy than in the EU, even if employment in manufacturing industries has decreased by 5% while employment in the services sector has increased by 23% over the period 1995-2009. The relatively high share of employment in manufacturing industries is mainly due to specialisation in some traditional sectors such as footwear, textiles and clothing and machinery, basic metal products and non-metallic mineral products. However, these sectors have lower R&D intensities in Italy than in other countries. According to the EU Industrial R&D Investment Scoreboard, Italy has been successful in maintaining its position in some strategic sectors. In the last 5 years, Italian firms in sectors such as automotive and parts, and aerospace, have remained among the top R&D investors, with only Germany and France showing more R&D investment in these sectors.

Competitiveness in global demand and markets

Investment in knowledge, technology-intensive clusters, innovation and the upgrading of the manufacturing sector are determinants of a country's competitiveness in global export markets. A positive contribution of high-tech and medium-tech products to the trade balance is an indication of specialisation and competitiveness in these products.

Evolution of the contribution of high-tech and medium-tech products to the trade balance for Italy between 2000 and 2011



Source: DG Research and Innovation - Economic Analysis unit
Data: COMTRADE
Notes: "Textile fibres & their wastes" refers only to the following 3-digits sub-divisions: 266 and 267.
"Organic chemicals" refers only to the following 3-digits sub-divisions: 512 and 513.
"Essential oils & resinoids; perfume materials" refers only to the following 3-digits sub-divisions: 553 and 554. "Chemical materials & products" refers only to the following 3-digits sub-divisions: 591, 593, 597 and 598. "Iron & steel" refers only to the following 3-digits sub-divisions: 671, 672 and 679.
"Metalworking machinery" refers only to the following 3-digits sub-divisions: 731, 733 and 737.

Over the last 15 years, the Italian economy has slightly regressed in competitiveness. The efforts made in research and innovation to increase the knowledge base of the economy have been cancelled out by a decrease in total factor productivity (-5% since 2000) and by the stagnation of employment in knowledge-intensive activities. Nevertheless, Italy succeeded in keeping a positive trade balance until 2003. In 2004, the Italian trade balance deteriorated due mainly to the loss in competitiveness of low-tech products. The trade balance in all high-tech and medium-tech products together remained positive in Italy over the last decade, thus helping to redress the negative trend but not sufficiently to cancel it.

Indeed, most knowledge-intensive products and services have increased their contributions to the trade balance since 2000, as indicated on the graph above. However, electrical machinery, apparatus and appliances as well as medical and pharmaceutical products have decreased their contribution to the trade balance thus indicating a relative loss in world competitiveness. The previous graph has shown that although R&D intensity increased for most manufacturing sectors over the last 15 years, value added for these sectors has decreased. Considering the still important weight of the traditional manufacturing sectors in the Italian economy and the relative specialisation in these sectors, there is a clear need to upgrade the knowledge intensity of manufacturing sectors.

Relevant factors positively influencing structural change of the Italian economy are shown in the table below. The share of SMEs introducing product or process innovations is above the EU average while the share of employment in knowledge-intensive services slightly decreased and reached the Eu average. Italy is making efforts to develop technologies addressing societal challenges, in particular environment-related technologies (7,2% growth since 2000). Italy has registered good progress on all the Europe 2020 targets with the exception of a slightly falling employment rate, evident since the start of the economic crisis in 2007. The indicators on the Europe 2020 objectives illustrate the need to make the most of resources and to foster growth by investing in R&D, education and renewable energies.

Key indicators for Italy

ITALY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average annual growth [1] (%)	EU average [2]	Rank within EU
ENABLERS																
Investment in knowledge																
New doctoral graduates (ISCED 6) per thousand population aged 25-34	0.45	0.45	0.51	0.73	0.98	1.12	1.21	1.29	1.56	:	:	:	:	16.9	*1.69*	11
Business enterprise expenditure on R&D (BERD) as % of GDP	0.52	0.53	0.54	0.52	0.52	0.55	0.55	0.61	0.65	0.67	0.68	*0.68*	:	*2.4*	*1.26*	18
Public expenditure on R&D (GOVERD + HERD) as % of GDP	0.52	0.55	0.57	0.57	0.55	0,52 [3]	0.54	0.52	0.52	0.55	0.54	*0.53*	:	*0.4*	*0.74*	18
Venture Capital [4] as % of GDP	0.13	0.09	0.08	0.06	0.04	0.05	0.08	0.11	0.20	0.09	0.06	0.07	:	-5.2	0,35 [5]	15 [5]
S&T excellence and cooperation																
Composite indicator of research excellence	:	:	:	:	:	36.2	:	:	:	:	43.1	:	:	3.6	47.9	10
Scientific publications within the 10% most cited scientific publications worldwide as % of total scientific publications of the country	8.4	8.3	8.6	8.5	9.0	9.5	9.6	9.9	10.1	:	:	:	:	2.3	10.9	12
International scientific co-publications per million population	192	178	198	276	315	343	368	407	423	449	476	500	:	9.1	300	19
Public-private scientific co-publications per million population	:	:	:	:	:	:	:	26	26	29	32	33	:	6.8	53	14
FIRM ACTIVITIES AND IMPACT																
Innovation contributing to international competitiveness																
PCT patent applications per billion GDP in current PPS€	1.4	1.5	1.7	1.8	1.9	2.1	2.3	2.2	2.0	2.1	:	:	:	4.2	3.9	13
License and patent revenues from abroad as % of GDP	:	:	:	:	0.04	0.06	0.06	0.05	0.17	0.18	0.18	0.17	:	21.5	0.58	15
Sales of new to market and new to firm innovations as % of turnover	:	:	:	:	11.9	:	9.1	:	11.8	:	14.9	:	:	3.8	14.4	8
Knowledge-intensive services exports as % total service exports	:	:	:	:	20.0	21.6	23.7	23.9	27.3	24.7	27.2	:	:	5.3	45.1	16
Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products	2.10	1.88	1.79	2.04	2.38	3.31	4.49	4.36	5.04	4.14	4.02	4.96	:	-	4,20 [6]	4
Growth of total factor productivity (total economy) - 2000 = 100	100	100	99	98	99	99	99	100	98	94	96	96	95	-5 [7]	103	26
Factors for structural change and addressing societal challenges																
Composite indicator of structural change	32.1	:	:	:	:	33.1	:	:	:	:	35.4	:	:	1.0	48.7	20
Employment in knowledge-intensive activities (manufacturing and business services) as % of total employment aged 15-64	:	:	:	:	:	:	:	:	13.6	13.5	13.7	13.4	:	-0.5	13.6	15
SMEs introducing product or process innovations as % of SMEs	:	:	:	:	34.8	:	33.0	:	36.9	:	39.8	:	:	2.3	38.4	12
Environment-related technologies - patent applications to the EPO per billion GDP in current PPS€	0.14	0.14	0.16	0.22	0.21	0.19	0.20	0.22	0.24	:	:	:	:	7.2	0.39	10
Health-related technologies - patent applications to the EPO per billion GDP in current PPS€	0.41	0.42	0.43	0.42	0.43	0.44	0.42	0.36	0.37	:	:	:	:	-1.1	0.52	12
EUROPE 2020 OBJECTIVES FOR GROWTH, JOBS AND SOCIETAL CHALLENGES																
Employment rate of the population aged 20-64 (%)	57.4	58.5	59.4	60.0	61,5 [8]	61.6	62.5	62.8	63.0	61.7	61.1	61.2	:	-0.1	68.6	25
R&D Intensity (GERD as % of GDP)	1.04	1.08	1.12	1.10	1.09	1.09	1.13	1.17	1.21	1.26	1.26	*1.25*	:	*1.7*	*2.03*	17
Greenhouse gas emissions - 1990 = 100	106	107	108	111	111	111	109	107	104	95	97	:	:	-9 [9]	85	17 [10]
Share of renewable energy in gross final energy consumption (%)	:	:	:	:	5.3	5.3	5.8	5.7	7.1	8.9	10.1	:	:	11.3	12.5	15
Share of population aged 30-34 who have successfully completed tertiary education (%)	11.6	12.2	13.1	13.9	15.6	17.0	17.7	18.6	19.2	19.0	19.8	20.3	:	5.2	34.6	27
Share of population at risk of poverty or social exclusion (%)	:	:	:	:	26.4	25.0	25.9	26.0	25.3	24.7	24.5	28.2	:	0.9	*24.2*	12 [10]

Source: DG Research and Innovation - Economic Analysis Unit

Data: Eurostat, DG JRC - ISPRA, DG ECFIN, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard

Notes: (1) Average annual growth refers to growth between the earliest available year and the latest available year for which compatible data are available over the period 2000-2012.

(2) EU average for the latest available year.

(3) Break in series between 2005 and the previous years. Average annual growth refers to 2005-2011.

(4) Venture Capital includes early-stage, expansion and replacement for the period 2000-2006 and includes seed, start-up, later-stage, growth, replacement, rescue/turnaround and buyout for the period 2007-2011.

(5) Venture Capital: EU does not include EE, CY, LV, LT, MT, SI, SK, These Member States were not included in the EU ranking.

(6) EU is the weighted average of the values for the Member States.

(7) The value is the difference between 2012 and 2000.

(8) Break in series between 2004 and the previous years. Average annual growth refers to 2004-2011.

(9) The value is the difference between 2010 and 2000. A negative value means lower emissions.

(10) The values for this indicator were ranked from lowest to highest.

(11) Values in italics are estimated or provisional.

Country-specific recommendation in R&I adopted by the Council in July 2012:
"Improve access to financial instruments, in particular equity, to finance growing businesses and innovation".