European Commission

JRC SCIENCE AND POLICY REPORTS

ERAWATCH Country Reports 2013: Italy

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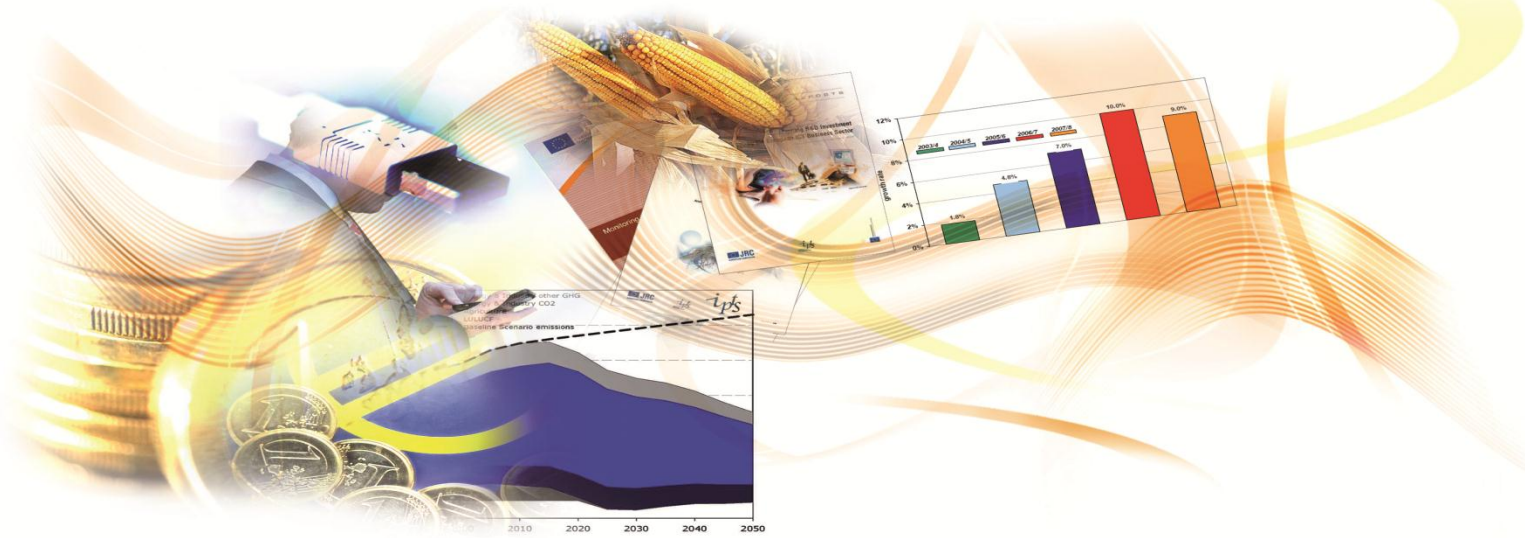
2014



Report EUR 26751 EN

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JRC91155

EUR 26751 EN

ISBN 978-92-79-39485-0 (PDF)

ISSN 1831-9424 (online)

doi:10.2791/94000

Luxembourg: Publications Office of the European Union, 2014

Abstract

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.
The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). ERAWATCH is a joint initiative of the European Commission's Directorate General for Research and Innovation and Joint Research Centre.

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions from Andrea Conte from JRC-IPTS. The contributions and comments from DG-RTD are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

EXECUTIVE SUMMARY

The evolution of the research and innovation (R&I) system in Italy has been heavily affected by the economic crisis, the reduction in public expenditure associated to austerity programmes, and the fall of private R&D and investment efforts. Italy's GDP has fallen in 2012 (-2.5%) and in 2013 (-1.8%); Eurostat forecasts a slight growth of GDP in 2014, but at a lower rate than the EU28 average.

The share of R&D in GDP in 2012 is 1.27%, as opposed to a EU28 average of 2.06. Italy's level continues to be far from the 1.53% share of GDP stated as the target for 2020 by Europe 2020 and by the National Research Programme (PNR). The modest improvement – the share was 1.25% in 2011 – is the result of a 0.1% increase of GERD (in nominal terms) from €19,811m in 2011 to €19,834m in 2012, combined with a fall in GDP. Total R&D (GERD) per capita in 2012 was €326.1 in Italy and €525.8 in the EU28 average.

Considering total R&D expenditure for 2012, Istat estimates a 1.5% fall in real terms over the previous year. Public R&D funds for 2012, based on Istat data on budget appropriations, were €8,822m as opposed to €9,161m in 2011. Business funded R&D as a share of GDP in Italy remains about half the EU28 average.

Since the start of the crisis in 2008, the evolution of Italy's GERD in real terms has experienced a limited decline. Over the same period however, Italy's industry has suffered a loss of 25% of its output, leading to a weakening of its production capacity. Such a loss of industrial capacity is particularly serious in high technology industries that are more vulnerable to business cycles.

In spite of such difficult context, several policy changes have been introduced in 2013. The international and European dimensions of R&I are increasing. Research funding from abroad – both private and public, including EU funds - has reached 9.1% of GERD in 2011, with a slowdown from the 9.8% of 2010 due to the economic crisis. Framework Programmes (FP) are becoming a relevant channel for the European funding of research in Italy. The participation to FP7 calls is widespread with a success rate of Italian proposals of 18.5%; Italy is the fourth highest financed country in FP7; nine Italian firms are among the top 50 business recipients of grants in 2007-2011.

In March 2013 MIUR released HIT2020, a document on R&I for 2014-2020 for implementing the EU2020 strategy. The main goals include simplification, effectiveness and efficiency of investment in R&I; greater researchers' mobility and ability to attract larger shares of EU financing since it envisages a constant flow of resources from the national budget. Other major policy changes have included the streamlining of public R&D competitive funding, the reform of firms incentives, the earmarking of resources for young researchers, the consideration of research quality in public research funding, the support for demand driven innovation.

The structural challenges pointed out in previous reports continue to affect the operation of Italy's R&I system, and have been addressed by current policies.

First, resources for Higher Education remain insufficient; in recent years and in 2013 budget cuts have led to a reduction of resources, staff and students of universities. The "budget stabilization" laws introduced in 2011 and 2012 resulted in a general reduction of institutional budgets - FFO for HEI and FOE for PROs. Resources for the competitive funding PRIN projects decreased

from €100m in 2009 to €87.5m in 2010 and 2011 and to €38.2m in 2012. Resources for the competitive funding FIRB projects in the call launched at the end of 2012 are €29.5. In real terms, FFO funding of universities has been reduced by 5% per year since 2009; the 2013 budget is about 20% lower than in 2008. Between 2006 and 2012 the number of full and associate professors in Italian universities has fallen from 39,000 to 30,000, with a 22% reduction. In 2003-2004 the number of new students registering in universities was 338,000; in 2011-2012 it has fallen to 280,000, with a 17% fall; the reduction is particularly strong in the Centre and Southern regions.

A growing share of institutional funding has been attributed on the basis of universities' performances - in 2012, €910m (out of a total of €7,081m), in 2013 €819m out of a total of €6,222m. Performance criteria are based for 34% on the results achieved by the university in training and for 66% on the research output according to the quality assessment of research VQR 2004-2010, implemented by ANVUR. MIUR guidelines pointed out, however, that no "virtuous" university could receive more than the funds obtained in 2012 and that funding cuts for "less virtuous" should never exceed 5% of the 2012 transfer. The share of university funding based on "merit" is expect to increase from 13.5% of 2014, to 20% in 2016, until the 30% share is reached.

By the end of 2013 the first "Abilitazione Scientifica Nazionale" was close to completion, introducing quality-based peer-review, foreign evaluators and relevance of objective indicators of research performance and publications. Out of 90,000 applications to the 2012 "habilitation" call, several thousand candidates are expected to obtain the "habilitation" that will last for four years; it is not clear yet how many positions of Full and Associate Professors will be offered in the near future.

Second, Italy's low share of skilled human capital is directly affected by developments in university education, as the reduction in the number of university students is likely to limit the improvements of past years in this regard. Policy actions has offered earmarked resources for recruiting researchers from abroad, in order to increase the quality of researchers, extend international cooperation and offer opportunities for a return to Italy to the large number of Italian scholars that have emigrated. There are limitations, however, in the resources available and in the temporary nature of jobs offered. Two more specific initiatives – the Rita Levi Montalcini and Messengers programmes – are additional efforts to attract researchers from abroad.

Third, the low R&D intensity and specialization of firms in low technology activities have been further weakened by the economic crisis. Policy action in this field has included the reform of firms' incentives for R&D with the Fondo per la Crescita Sostenibile (FCS) and the streamlining of procedures. Measures for innovative start-ups encourage the extension of R&I activities and support firms in their access to credit. The Italian Digital Agenda, to be implemented by the Digital Italy Agency (AgID), established in 2012 but not yet fully operational, is an important policy development, filling a gap in Italy's ICT activities, coherently with EU priorities.

Fourth, the size distribution of firms is a persistent characteristic of Italy's economy, dominated by very small firms. Industrial Innovation Projects have been launched with public-private cooperation in order to build a critical mass of resources for R&I. Larger R&I efforts have also

been supported by tax credits for businesses financing university projects, in public-private partnerships, or employing highly skilled workers in R&I.

A fifth structural challenge is emerging - increasing territorial inequalities within Italian regions. R&D and innovation have traditionally been concentrated in four large regions of the North and in Lazio, Rome's region. According to Istat data, in 2011 R&D increased in the North, while remaining stable or falling in Central and Southern regions. Disparities are particularly serious in business R&D; for each euro spent in the South, €5.7 are spent in the North-West and €3.1 in the North-East of Italy. The main policy initiatives addressing this challenge include the National operational programme 'Research and Competitiveness', integrating the R&I dimension in local development and social cohesion policies. The programme granted funds for €4,342m to 2855 projects in the period 2007-2013 in Italy's four Objective 1 regions. The creation of the Agency for territorial cohesion - not yet operational – will also increase the effectiveness of EU Structural funds. Finally, the Smart specialisation strategy is helping regions to increase the impact of innovation on their local system, integrating regional and national efforts.

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1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

Italy's research and innovation (R&I) system is characterized by a persistent gap compared with the performance of EU28 (European Union Including 28 Member States); some problems have become more serious as a result of the prolonged economic crisis. The share of R&D in GDP in 2013 is 1.27%, as opposed to a EU28 average of 2.06 in 2012.[1] Total R&D (GERD) per capita in 2012 was €326.1 in Italy and €525.8 in the EU28 average. Business funded R&D in 2011 was 0.57 of GDP in Italy and 1.12% in the EU28 average.

In 2012 Italy's total R&D personnel (in full time equivalent units) amounted to 233,927, of which 110,823 researchers. The share of R&D personnel on total employment was 1.02% in Italy, as opposed to a EU28 average of 1.22%; the share of researchers was 0.48% in Italy as opposed to 0.76% in the EU28 average.[2] Expenditure for universities accounts for 1% of Italy's GDP, as opposed to 1.5% of the EU average.[3]

The governance structure of Italy's R&I system maintains a top role of the Council of Ministries which defines priorities and outlines policies in the National Research Programme (PNR), the main government document for R&D planning.[4] The Horizon Italia 2020 (HIT2020) document reports government R&D planning within the European framework.

The Ministry for education, research and universities (MIUR) is the main player in R&I, in charge of coordinating national and international scientific activities, supervising the academic system, funding universities and research agencies, and supporting public and private research and technological development. MIUR coordinates the preparation of the three years National Research Programme (PNR) in consultation with other Ministries, Regions and other stakeholders.

The Inter Ministry Committee for Economic Planning (CIPE) has the role of coordinating science and technology policy - focusing on medium and long term actions - and releases the three year PNR proposed by MIUR. CIPE also reviews the Economic and Financial Document (DEF) which includes the National Programme of Reform, relevant for monitoring the policy agenda and its impact on the R&I system.

The Ministry for economic development (MISE, previously Ministry for Production Activities) manages industrial innovation. The Department for Competitiveness within MISE is in charge of technological innovation and responsible for industrial policy, industrial districts, energy policies, policies for SMEs, and instruments to support the production system.

The Department of development and social cohesion (DPS) within MISE is in charge of the planning, coordination and management and the structural funds and it has outlined in the multiannual programme Quadro Strategico Nazionale 2007-2013 (QSN) specific actions for

[1] Istat 2013b, p.1; Eurostat, 2013, New Cronos database.
[2] Eurostat, 2013b, New Cronos database.
[3] CUN 2013.
[4] Legislative Decree no. 204/1998

research and innovation. DPS and MIUR jointly coordinate Italian participation to Horizon2020 according to the HIT2020 strategy, and coordinate the Smart specialisation strategy.

Other Ministries (Health, Agriculture, Defence, etc) manage research funds in their specific fields. Regions, under the concurrency principle, develop local initiatives in R&I and contribute to policy making on R&D; in some cases, research organisations are funded and managed by Regions.

A few recent developments have emerged in the governance of the research system. The National Agency for the Evaluation of Universities and Research Institutes (ANVUR) has published in 2013 the first report evaluating the quality of Italian university research.[5] The Digital Italy Agency (AgID), established in 2012 but not yet fully operational, is in charge of the Italian Digital Agenda (IDA) under the control of the Prime Minister's office.

Public research is based on Universities and Public research organisations. In 2013[6] 95 universities were active, of which 67 are public institutions and 11 are telematic based. The National Research Council (CNR) is the largest public research organisation (PRO) under the supervision of MIUR. The National Agency for New Technologies, Energy and Sustainable Development (ENEA) has the mission to develop R&D on energy and environmental fields.

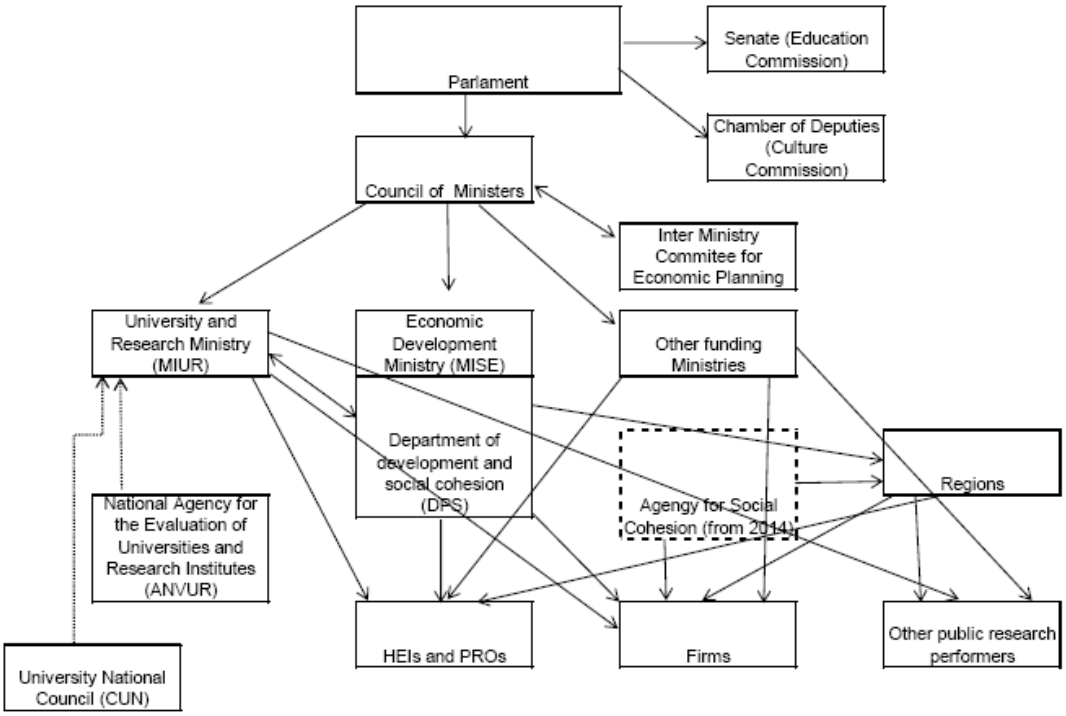
In the private sector Fiat (automotive), Finmeccanica (aerospace and military), Telecom Italia (telecommunications), Unicredit and Intesa San Paolo (banking) are the most relevant R&D players, included in the top 100 EU companies ranked by R&D[7].

Funding decisions for R&I are included in the government budget and in the "stability law" approved by Parliament at the end of 2013, where funds for research and innovation are budgeted, including a three year planning. Ordinary funds for universities and public research organisations are provided by two budget lines (FFO and FOE). FIRB and PRIN are the competitive funding programmes for research activities by HEI and PROs.

Business R&D is financed through the Research support fund (FAR) managed by MIUR, while innovation is financed by the FIRST fund managed by MISE. Regulations for allocating these resources have been revised in 2012 and 2013 in order to streamline access. Tax credits and low interest loans are tools for supporting private R&D. The National operational programme for research and competitiveness 2007-2013 (PON) managed by MISE and MIUR provided additional funding to public and private research.

[5] ANVUR 2013.
[6] The full list can be downloaded from the MIUR portal http://cercauniversita.cineca.it/;
[7] 2013 EU Industrial R&D Scoreboard http://iri.jrc.ec.europa.eu/scoreboard13.html

Table 1: The structure of the Italian R&D system



2. RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political context

At the end of 2012, after the approval of the budget law, the Mario Monti government resigned. Elections followed in February 2013, leading to a deadlock as no coalition obtained a clear majority in the Senate. In May 2013 a "large coalition" among centre-left, centre and centre-right parties elected the government of Enrico Letta. Political turmoil between the coalition parties and within them has marked policy action in the rest of 2013. The policies of the new government on budget austerity, economic reforms and R&I – with the new Minister of education, universities and research Maria Chiara Carrozza - broadly continued the approach of the previous government.

The research and innovation (R&I) system of Italy has been seriously affected by the economic depression that has hit the country since the crisis of 2008. After the slump of 2009 (-5.5%), Italy's GDP stagnated in 2011 (+0.5%), fell in 2012 (-2.5%) and in 2013 (-1.8%). Eurostat forecasts a slight growth of GDP in 2014 and 2015 but at a lower rate than the EU28 average. This fall in GDP follows a decade when growth and economic performance were below the EU average.

The result is that in 2008 the Italian GDP per capita in Purchasing Power Standard, (PPS), was 26,100 euros, higher than the EU28 average of 25,000, but in 2012 it has fallen to 25,200 PPS below the EU28 average[8]. With a large population (59.7m in 2013), Italy accounts for 11.8% of the EU28 population[9]. In 2008 Italy produced 12.6% of the EU28 GDP, in 2013 the share has fallen to 11.8%; according to Eurostat forecasts for 2015 Italy's GDP will account for 11.7% of the total EU28 GDP.

The fall of GDP affects a number of R&I indicators. Italy's R&D intensity continues to be far from the 1.53% of GDP stated as the target for 2020 by the National Research Programme (PNR) and by EU2020. The intensity of R&D, as indicated by the total intramural expenditure on R&D (GERD)/GDP ratio, increased in 2012 to 1.27% - against 1.25% in 2011 – because the fall in GDP was combined with a 0.1% increase of GERD (in nominal terms) from €19,811m in 2011 to €19,834m in 2012. The gap grew larger with the EU28 average, which increased GERD by 2.9% over the same years. Italy's GERD per capita in 2012 is €326.1, lower than the EU28 average (€525.8), and lower than Italy's 2011 value (€326.8).

Considering the evolution of GERD in real terms since the start of the crisis in 2008, we find a limited decline[10] and an overall stability in its composition; in 2012, GERD is mainly performed by the private business sector (54.5%), followed by the higher education institutions (28.6%) and the government sector (13.7%). In basic research the fall in funding has been most serious (-

[8] Eurostat 2013a (New Cronos database);
[9] Eurostat 2013a (New Cronos database);
[10] Istat 2013b

5.7% in 2011 compared to 2010), while applied R&D and development have recorded increases.[11]

Italy's innovation system is affected by several consequences of the economic crisis. Since the start of the depression in 2008, Italy's industry has suffered a loss of 25% of its output, leading to a weakening of its production capacity. With 2010 industrial production equal to 100, in June 2013 Italy's index was 96.9, with lower values only in the South European countries worst hit by the crisis; conversely, output has increased in most Northern European economies.[12] Such a loss of industrial capacity is particularly serious in high technology industries that are more vulnerable to business cycles and lose larger shares of value added and jobs during recessions.[13] Little technological upgrading of industry is evident, as the share of employment in high and medium-high technology sectors and in knowledge based sectors did not increase from 2009 to 2011.[14]

Polarization in industry and innovation is emerging within both Europe and Italy. Considering R&D expenditure across Italian regions, Istat (2013) showed that in 2011 it increased in the North, reaching €12,005m, while remaining stable or falling in Central and Southern regions, where expenditure accounted for €4,678m and €3,127m respectively. Disparities are particularly serious in business R&D; for each euro spent in the South, €5.7 are spent in the North-West and €3.1 in the North-East of Italy.[15]

2.2 Funding trends

2.2.1. Funding flows

Italy's budgetary policy in 2012 and 2013 has continued to reduce public expenditure, and business expenditure has been contained by the economic depression. Considering total R&D expenditure for 2012, Istat estimates a 1.5% fall in real terms over the previous year. Public R&D funds for 2012, based on Istat data on budget appropriations, were €8,822m as opposed to €9,161m in 2011.[16] Considering government R&D appropriations, (GBAORD), expenditure fell from €9,711.4m in 2009, to €8,824.9m in 2011, with a further estimated decrease in 2012 to €8,759.1m.[17]

From 2009 to 2011 the composition of the sectors funding R&D has recorded only marginal changes, with an increase of 1% of the ratio of private R&D on GDP; the distribution of sectors performing R&D showed a shift of two percentage points from HEIs to private business. In total funds for R&D, private business accounts for 45.1% in 2011, with public sector accounting for 41.9%.

[11] Istat, 2013b, p.3.
[12] Eurostat 2013b.
[13] See Lucchese and Pianta 2012.
[14] IUS 2013.
[15] Istat 2013 p.6.
[16] Istat 2013.
[17] Eurostat 2013a, New Cronos database.

Regional policies for R&I have acquired greater relevance. The National operational programme 'Research and Competitiveness' (PONREC) has been financed with €4,424.3m for 2007-2013[18]. The integration of research and innovation as a pillar of such initiatives and the joint management by MIUR and MISE of the PONREC have led to an increase in the R&I dimension in local development and social cohesion policies. PONREC granted funds for €4,342m to 2855 projects in the period 2007-2013 in Italy's four Objective 1 regions[19].

Research funding from abroad – both private and public, including EU funds - has become a significant source for Italy's R&I, reaching 9.1% of GERD in 2011, with a slowdown from the 9.8% of 2010.

Framework Programmes (FP) are becoming a relevant channel for the European funding of research in Italy. The participation to FP7 calls is widespread with a success rate of Italian proposals of 19.9%. Italy is the fourth highest financed country in FP7, after the UK, France and Germany and business presence is strong, with nine Italian firms among the top 50 recipients of signed grants in 2007-2011 [20]. Within FP7 Italian collaborative links were mainly with Germany, France and the United Kingdom.

Table 1. Basic indicators for R&D investments*

	2009	2010	2011	2012	EU (2012)**
GDP growth rate	-5.5	1.7	0.5	-2.5	-0.4
GERD (% of GDP)	1.26	1.26	1.25	1.27	2.06 (e)
GERD (euro per capita)	319.9	325.2	326.8	326.1	525.8 (e)
GBAORD - Total R&D appropriations (€ million)	9.711,4	9.484,7	8.824,9	8.759,1	86.309,497
R&D funded by Business Enterprise Sector (% of GDP)	0.56	0.56	0.57		1.12(2011)
R&D performed by HEIs (% of GERD)	30.3%	28.8%	28.6%	28.6%	23.8%
R&D performed by Government Sector (% of GERD)	13.1%	13.7%	13.4%	13.7%	12.4%
R&D performed by Business Enterprise Sector (% of GERD)	53.3%	53.9%	54.6%	54.5%	63%
Share of competitive vs. institutional public funding for R&D*	N/A	N/A	1%	0.8%	N/A
Venture Capital as % of GDP (*Eurostat table code tin00141)*	0.004	0.004	0.003	0.004	0.025(EU15) **
Employment in high- and medium-high-technology manufacturing sectors as share of total employment *(Eurostat table code tin00141)*	4.3	4.3	4.1		5.6 (2011)
Employment in knowledge-intensive service sectors as share of	34.2	35	34.5		38.9 (2011)

[18] Available resources were reduced in October 2012 after the reprogramming round of MISE and MIUR. The funding from the European Regional Development Fund (ERDF) is €3,102m. The budget available can be downloaded from http://www.ponrec.it/programma/risorse-finanziarie/;

[19] Data updated at 10/30/2013. The list of projects can be downloaded from http://www.ponrec.it/open-data/progetti/

[20] EC 2012

total employment (*Eurostat table code tsc00012)*					
Turnover from Innovation as % of total turnover *(Eurostat table code tsdec340)*	16.4(2008)				13.3 (2008)

:ratio of the sum of FFO and FOE on PRIN and FIRB. Data on accrual basis. The ratio does not include other competitive calls. Eurostat data (New Cronos database) except for competitive and institutional funding data.: (EU does not include EE, HR, CY, LV, LT, MT, SI, SK)*

2.2.2. Funding mechanisms

2.2.2.1 Competitive vs. institutional public funding

In a context of budgetary austerity, modest change has been possible in the R&I system. Institutional funding continues to play a major role, with efforts to increase coherence with EU research policy and integration of research and innovation with economic policies. Major recent changes include the streamlining of public R&D competitive funding, the reform of firms incentives, the earmarking of resources for young researchers, the consideration of research quality in public research funding, the support for demand driven innovation.

Public research and academic institutions are financed mainly through institutional funding rather than through competitive funding. The "budget stabilization" laws introduced in 2011 and 2012 resulted in a general reduction of institutional budgets - FFO for HEI and FOE for PROs. Resources for the competitive funding PRIN (National Interest Research Program) projects decreased from €100m in 2009 to €87.5m in 2010 and 2011 and to €38.2m in 2012. Resources for the competitive funding FIRB (Basic Research Investment Fund) projects in the call launched at the end of 2012 are €29.5[21].

Within the institutional funding of FFO to HEI a growing share has been attributed on the basis of universities' performances both in education and research, using the results of the quality assessment review published by ANVUR in 2013.[22] In 2011, out of a total FFO of €6,911m, €832m were allocated on the basis of performances criteria. In 2012, €910m (out of a total of €7,081m) were allocated on performances criteria. In 2013 out of a total of €6,222m, €819m are allocated on education and research performance criteria, based for 34% on the results achieved by the university in training activities and for 66% on the research output according to the quality assessment of research VQR 2004-2010, implemented by ANVUR. MIUR guidelines pointed out, however, that no "virtuous" university could receive more than the funds obtained in 2012 and that funding cuts for "less virtuous" should never exceed 5% of the 2012 transfer. The effects of such measures were a concentration of budget cuts in weaker universities, mostly located in Southern Italy.[23] Government plans – outlined in a previous Decree - include an increase of the share of university funding based on "merit" from 13.5% of 2014 funds, to 18% in 2015, 20% in 2016, until the 30% share is reached, in a scenario of greater differentiation among universities.

[21] The Prin 2012 call can be downloaded from http://prin.miur.it/documenti/2012/BANDO_PRIN_2012.pdf; the FIRB 2013 call is available at http://futuroinricerca.miur.it/documenti/2013/BANDO_F_Ric_2013.pdf;
[22] ANVUR 2013.
[23] MIUR, D.M. 20 December 2013, n. 1051

Such developments in university policy have alarmed the Consiglio Universitario Nazionale (CUN) – an elected representative body with a consultative role – who pointed out in its 2013 statement that the university system is facing an "emergency situation".[24] The document argued that universities account for 1% of Italy's GDP, as opposed to 1.5% of the EU average. The Fund for ordinary financing (FFO) of universities has been reduced by 5% per year in real terms since 2009; in 2013 the budget in real terms was about 20% lower than in 2008.

The cuts in resources have been combined to the lack of personnel turnover; between 2006 and 2012 the number of professors in Italian universities – full and associate professors – has fallen from 39,000 to 30,000, with a 22% reduction. The number of researchers has also slightly diminished to 25,000, while only the number of temporary research assistants ("assegnisti di ricerca") has increased; however, they have an extremely low compensation (a net income of about 15,000 euros per year) and highly uncertain employment and research prospects. As a result, the number of young researchers moving abroad has rapidly increased. The recruitment of new university research personnel has long been set by the government to 20% of the number of retiring staff; some additional resources for new hirings have been distributed to universities in the 2013 budget.

As a result of such a reduction in university activities, also the number of students has fallen. In 2003-2004 the number of new students registering in universities was 338,000; in 2011-2012 it has fallen to 280,000; the reduction is particularly strong in the Centre and Southern regions. According to the Almalaurea survey, the average cost per student in Italy's universities is 31% lower that the EU average. Budget reductions have hit financial support for students. The share of student entitled to scholarship who has received them has fallen from 84% in 2009 to 75% in 2011.[25]

The scaling down of Italy's university system is all the more worrying as the country maintains a substantial lag in the share of citizens with university education. According to Eurostat data, in the 30 to 40 age bracket, only 19% of Italians have a university degree, as opposed to 30% in the EU average; moreover, the Europe 2020 strategy has set the target of 40% for such an indicator.[26]

Besides universities, public research is carried out in Italy also by Public Research Organizations (PRO) which are financed by the FOE fund, where 7% of the budget (€125.1m in 2011, €124.5m in 2012 and €139.3m in 2013) is allocated on the basis of an assessment of the research projects. Each year the allocation of FOE is finalized after a Parliamentary consultation to ensure publicity and transparency to the process.

The move towards greater relevance of competitive funding of public research and universities appears to be a strategic policy direction; it may encourage greater efficiency and effectiveness of research and higher education activities. However, when such moves are introduced in parallel to

[24] CUN argued that "such emergencies, if they are not immediately addressed with solutions that are adequate, sound and well-informed, would lead to an irreversible crisis; as a consequence, universities and academic ciommunities would not be any more in the position to perform their institutional tasks, educate the young generations, promote scientific research and contribute to the development and diffusion of culture" (CUN, 2013, p.4).
[25] Almalaurea, 2013.
[26] Eurostat, 2012.

cuts in core institutional funding and in a context of substantial reduction of university staff and students, the risk of an overall weakening and scaling down of the university and public research system could emerge, widening Italy's gap with EU28 standards.

2.2.2.2 Government direct vs indirect R&D funding[27]

In the funding of private R&D subsidies are more relevant than indirect funding, that however is acquiring more relevance through the provision of tax credit incentives and financial warranties for obtaining low interest loans. The 2012 reform of firms incentives changed the approach of government funding for technological innovation, moving towards thematic areas (linked to EU programmes), indirect incentives and simplification. Indirect incentives shifted from a general R&D tax credit in 2007, to a tax credit allocated through the 'click day', a selection process that awarded funds to firms according to the arrival order of the electronic request for years 2008 and 2009. Since 2011 tax credits have been reintroduced only for businesses financing university research projects or projects in partnership with public research entities and for firms employing highly skilled workers in innovation and research. The reintroduction of tax credit concerns a small share of Italian firms and has had limited financing.

2.2.3 Thematic versus generic funding

The policy of funding concentrates mainly on thematic/targeted projects. The thematic approach is the preferred solution both for large negotiated R&D programmes, such as Industrial Innovation Projects (PIIs), and for large projects funded by public research institutions and universities (FIRB). Thus, Flagship projects, financed by 8% of FOE, are implemented in accordance with the PNR research priorities. Funds are targeted towards the same themes of EU programmes such as Horizon 2020 or European Digital Agenda and European Grand challenges[28].

[27] *Government direct R&D funding* includes grants, loans and procurement. *Government indirect R&D funding* includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

[28] MIUR summarizes the following priorities:
Climate and the environment
- Energy
- Health
- Cultural heritage
- Security
- Urban areas

2.3 Research and Innovation system changes

In 2013 changes in the R&I system have included the revision of the Italian Digital Agenda (IDA), the proposal of the Agency for territorial cohesion, the new role of Invitalia in the R&I system.

The Italian Digital Agenda is implemented by the Digital Italy Agency (AgID), established in 2012 but not yet fully operational due to the lack of the necessary regulations required by the law 221/2012. Under the control of the Prime Minister's office, the Italian Digital Agenda is expected to coordinate the digitalisation of public administration, the diffusion of broadband all over Italy, digital divide programmes and other ICT-based initiatives.

The Letta Government proposed in September 2013 the institution the Agency for territorial cohesion in order to ensure the governance of EU structural funds in the period 2014-2020. Regulations for its activities and mission are under discussion and the Agency is not yet operational; a key issue concerns the forms of control over the allocation of structural funds – that may be a key source for funding R&I - and the potential conflicts with regional governments.

Invitalia is an agency controlled by the Italian government with the mission of attracting foreign direct investments and supporting business development. In 2013 Invitalia has been involved in the project for the Regional Smart Strategy and manages the operational tasks of the project. The inclusion of Invitalia in the R&I system is due to the relevance Invitalia will have in the next years in monitoring the use of EU funds for SMEs and start-ups in the framework of the Regional Smart Strategy.

2.4 Recent policy developments

The "budget stability" law for 2013 released in December 2012 affects the financial framework of the R&I system until 2015 since provided some budget cuts to the relevant ministries. The total budget for MIUR decreased from 2013 to 2015 (€51.1b in 2013 and €50b in 2015), including some budget cuts for university expenditures (€7.8b in 2013 and €7.5b in 2015), research (€1.91b in 2013 and €1.9b in 2015) and international cooperation for research (€127.2m in 2013 and €127.1m in 2015). The budget for MISE for scientific research showed a decrease in research expenditures (€165.4b in 2013 and €164.1b in 2015).

A number of R&I policy documents were introduced by the Monti government in the last months of its mandate in early 2013.

The 'Atto indirizzo concernente l'individuazione delle priorità politiche del MIUR per l'anno 2013' produced by MIUR in March 2013 identifies the policy priorities for 2013-2015 and confirms the approach outlined in the 2012 National research programme (PNR).

In March 2013 MIUR also released HIT2020, a document on the research and innovation strategy in Italy in 2014-2020. The main goals of HIT2020 include a focus on simplification, in order to increase effectiveness and efficiency of investment in R&I; an aim to increase

researchers' mobility and to attract larger shares of EU financing since it envisages a constant flow of resources from the national budget and a greater reliance on EU funding. HIT2020 supports the inclusion of the EU research priorities into the national framework, embracing joint programming through a re-organisation of the national governance of research and the implementation of Smart Specialisation Strategies for the whole system, including the management and development of R&I, with the aim of ensuring social cohesion.

In February 2013 MIUR released the new regulation for doctoral programmes[29] that will be fully implemented by the academic year 2014-2015. The regulation meets the ERC principles of innovative doctoral training and aims to increase quality and attractiveness of doctoral schools in Italy especially for foreign students; partnerships with foreign universities are also encouraged. Multidisciplinary doctorates are allowed and Ph.D. courses can include interdisciplinary training through common modules. Cooperation with firms in encouraged, including opportunities such as high level apprentices within the business world. The typical training for doctorates will include issues related to international research, research organisation and IPRs. MIUR will allocate additional funding according to the performance of doctoral schools on the basis of their research performance, international activities and business partnerships. ANVUR will monitor periodically that each course meets the minimum requirements of the law.

Recruitment in universities has also undergone major changes. In 2013 the government announced a gradual increase of the turnover rate for HEI from the current (2013) 20% up to 60% in 2016. Additional funds for the recruitment of professors and researchers were introduced.

By the end of 2013 the first "Abilitazione Scientifica Nazionale" was close to completion. For the first time candidates to positions of Full and Associate Professors are first required to pass an "habilitation" test. Evaluation in each scientific field has been carried out by a Committee made by four Italian Full Professors with a publication record above the national median and by one foreign expert; members of the Committees have been randomly selected from a list of voluntary candidates. Out of 90,000 applications to the "habilitation" (candidates could apply to more than one scientific field), several thousand candidates are expected to obtain the "habilitation" that will last for four years; it is not clear yet how many positions of Full and Associate Professors will be offered in the near future.[30]

On the innovation side, in March 2013,[31] MISE reformed the system of firms' incentives with the aim to favour innovation for competitiveness and to support enabling technologies that imply a huge amount of investment in R&D from firms. Firms' incentives will be financed by the "Fondo per la Crescita Sostenibile" (FCS) that will include all the resources for technological innovation. FCS is linked to Horizon 2020 guidelines and definitions. FCS substitutes the former "Fondo rotativo per sostegni alle imprese e gli investimenti in ricerca" (FRI), simplifying regulations and redefining the scope and the beneficiaries and the mix of the incentives that will be available for indirect financing. On March 2013 MISE took over the management of FCS with the allocation of €600m.

[29] D.M. 8 February 2013 n.94
[30] Information and results are provided by the Ministry website http://abilitazione.miur.it/public/index.php
[31] MISE D.M. 8 March 2013.

In May 2013 MIUR released the regulation for the FIRST fund that will finance incentives for industrial and fundamental research.

On the SME side, Consob, the regulatory board for stock exchanges, released the guidelines for equity crowd funding for innovative firms, while Invitalia will act as funding agency for start-ups and innovative SMEs.

The Letta government also announced a revision of R&D indirect incentives with the introduction of incremental R&D tax incentives on a permanent basis in order to provide stability to firms' business plans.

Italy's policy changes in 2013 in the field of R&I showed some advancement towards EU commitments and progress in terms of quality improvements, SME inclusion and Smart Specialisation Strategies. However, several institutional changes are not yet operational and a critical issue is the limitation of the public resources available in context of austerity policy.

2.5 National Reform Programme 2013 and R&I

The National Reform Programme (NRP) for 2013 highlights the efforts made to reach EU2020 targets under the framework of financial stabilization. A key target for the R&I system is the increase of the R&D intensity on GDP, where little progress has been made.

The target of greater transparency has led to the reform of research incentives; the creation of the "Fondo per la Crescita Sostenibile" and other measures have streamlined the funding of strategic projects in coherence with Horizon2020. Similar improvements have been made in the government institutional fund for PROs (FOE), ensuring the funding of the flagship projects described in the PNR.

The target of financing innovative project with a transparent selection method based on the participation of foreign experts has been taken into account in the competitive calls for research, including the FIRB and PRIN programmes – which however suffered major budget reductions - and the smart cities innovation programme.

In the field of territorial cohesion the government achieved relevant results financing (€915m) initiatives as high tech clusters, network of innovative firms and public private partnership projects and a specific call for strengthening R&I in Objective 1 regions.

NRP2013 details the initiatives for promoting start-ups and innovative firms that will be the key feature for achieve a better performance for competitiveness of the industrial system.

The NRP emphasises the release of the HIT2020 which outlines the strategies for the R&I system until 2020 in the framework of Horizon2020.

The government tried to improve the attractiveness of the HEI system with calls aimed to attract leading foreign researchers (Messaggeri programme) and young foreign researchers (Rita Levi Montalcini programme) offering 3 year contracts.

The NRP also introduces two schemes of indirect incentives for R&D in firms. First, R&D tax credits are offered to businesses that finance university research projects or projects in partnership with public research entities. The available resources were €55m in 2011, €180.8m in

2012, €157.2m in 2013 and €91m per year by 2014. Second, R&D tax credits for firms employing highly skilled workers in innovation and research were offered financed with €25m in 2012 and €50m from 2013.

In terms of greater cooperation within the R&I system, improvements have been achieved in the in the relationships between HEIs and PROs. Public-private cooperation was supported by a permanent partnership between the largest PRO, Consiglio Nazionale delle Ricerche, and Confindustria, the main business association, for promoting knowledge transfer and competitiveness of the industrial system.

In a specific section, the NRP focuses on the results achieved on structural funds. In 2012 Italy had strongly improved past performances in the design of projects, spending of resources and compliance with the reprogramming for 2014-2020. The smart specialization strategy is the key initiative for the use of structural funds for R&I.

2.6 Recent evaluations, consultations, foresight exercises

The more relevant recent evaluations of Italy's R&I system include the HIT2020, the Anvur research quality assessment, the report by CUN on universities and the assessment on structural funds (PON assessment report).

HIT2020 SWOT analysis

HIT2020 includes a SWOT analysis of the Italian R&I system, starting from the IUS report that assesses Italy as a "moderate innovator" who takes limited advantage from its R&I activities.

In Italy the business sector carries out limited R&D investments (57.5% of total R&D in 2010) in comparison with countries like Germany (67.2%), United Kingdom (63.4%) and France (62.3%). R&D is concentrated in Northern and Central regions, with growing territorial imbalances. In 2010 patent intensity was far from the OECD average (11.7 patents per million people in Italy and 38.7 in the OECD average), with a lower degree of internationalisation of patenting. Cooperation between private business and institutions is much lower than in the EU average where public private partnerships and networks of firms increase the degree of cooperation in the R&I system.

The analysis of Italy's scientific research outputs showed a good performance at the international level, recording also high cooperation rates of Italian researcher with the international community. Participation to EU Framework Programmes by the Italian system recorded a decrease in the ability to attract funding from FP6 to FP7, where the Italian contribution to FP7 exceeded the funds obtained, although the success rate of Italian projects is above the EU average. In FP7 Italian researchers recorded a higher than average mobility towards other European countries

The low performance of the R&I system affects the competitiveness of Italian firms, as witnessed by the low share of high tech exports and by the low performance of labour productivity that not increased in the period 2000-2011. HIT 2020 identify as aims of the R&I system greater efficiency and an orientation towards economic welfare and social cohesion.

ANVUR research quality assessment

In 2011 a new MIUR regulation (DM 15 July 2011) was adopted for the assessment of the quality of research over the period 2004-2010 ("Valutazione Qualità della Ricerca", VQR). ANVUR, the agency in charge of evaluating the Italian research system, carried out the assessment focusing on the performance of Universities and Departments – not on individual researchers - with a complex methodology that involved the participation of experts for each discipline (with the involvement of foreign experts) in peer-review processes, lists of scientific journals for ranking research quality and other assessment tools. The final report was released in June 2013.[32]

The main aim of the report is to rank HEIs and PROs in each scientific field according to 'objective' indicators, focusing on the output of research activity in the period 2004-2010.

The report underlines that the growth of the share of Italian publications is one of the fastest in Europe, above the EU average, and a strong performance is also found for cooperation with foreign institutions. In the same years the Italian share of top publications (those receiving the top ten citations in each field) is also above the world average. Total Italian publications are lower than those from Germany, the Netherlands, the United Kingdom, Sweden and Switzerland, but Italy's output productivity for both universities and Public research organisations ranks among the best countries. The impact, after 5 years, of scientific publications is below the European average except for Health and Psychology. In the reference period Italy increased its scientific specialisation in Industrial Engineering, Mathematics and Computer science, Agriculture and Earth sciences, and recorded lower shares in Physics, Chemistry, Health and Biology.

The CUN report

The Consiglio Universitario Nazionale (CUN), the representative body of universities within MIUR, released in 2013 a report outlining the emergencies within the university system. The document emphasises the critical situation of Italy's universities; key findings of this report have already been discussed in section 2.2.2 on funding mechanisms above.

University funding has been decreasing constantly from 2008, leading to fewer professors, fewer students, fewer courses. The number of new students in 2011-2012 decreased dramatically from 2003-2004 (-17.2%) and in 2012 the university system reported nearly 15,000 young researchers with non-permanent positions and little opportunity to compete for permanent ones. University work is no longer attractive due to the level of wages, frozen by law since 2011, and the low probability of obtaining a permanent position. With reduced public funding, universities have been under pressure to increase student fees, further reducing new enrolments. The progressive reduction in the budget of the two funds which provide money for basic and "not targeted" research (PRIN and FIRB) is a further limitation of the activities of Italian universities.

[32] ANVUR 2013.

PON assessment report

In 2012 the PON assessment report was available for Objective 1 regions (Southern regions),

highlighting strengths and weaknesses. Strengths of such regions include the dissemination of universities and public research organisation, a growing number of new graduates, availability of a skilled labour force, and evidence of moves towards new sectors of specialisation. The main weaknesses were a low level of business R&D, an uncompetitive business system due to the lack of managerial skills and a modern business culture, and the negative impact of too many fragmented tools for providing incentives. The report argues for the need of an integrated approach to technology and competitiveness and the promotion of inter-regional agreements.

2.7 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)

Within the activities of the MISE for competitiveness, innovation and cohesion, the action of the DPS in recent years has led to progress towards a more systematic approach under the requirements of the National Strategic Framework QSN 2007- 2013. The PON 'Research and Competitiveness' 2007-2013 is the key instrument for implementing regional policy on R&D and innovation. In 2013 the project 'Support and definition of regional R&I policies (Smart Specialisation Strategy)', managed by MISE in cooperation with MIUR, identified the smart specialisation strategy for Italian regions. DPS supports regions in setting up their smart specialisation strategy within an harmonised framework, in order to avoid duplications.

The project supports regions by providing information, surveys and statistics, supporting knowledge transfer from best performing regions, sharing methods and tools and ensuring consistency at national level. Emilia Romagna and Puglia are considered as the best performing regions in knowledge transfer.

The project is based on the consultation of stakeholders at the regional level - both institutions than private business – aiming at identifying an effective smart specialisation strategy. The strategy uses SWOT and proximity analyses at the regional level and harmonises regional initiatives in a national strategy. In October 2013 Invitalia, the operational arm of the project, released a first mapping of sectoral specialisations which will contribute to the design of the regional and national strategy.

The governance structure relies on the central government to coordinate regional efforts and specialisations, while regions propose their strategy and offer feedbacks to national initiatives. The project is focused with the programming documents for the 2014-2020 EU funding cycle. The action plan identifies public-private partnerships as a modality to trigger private investments. The project structure is based on monitoring and evaluation methods for the whole period 2014-2020.

2.8 Policy developments related to Council Country Specific Recommendations

The European Council Country Specific Recommendations in 2013 refer marginally to the Italian R&I system. Recommendations identify improvements in the ability to take advantage of European structural funds due to the implementation of the Social Cohesion Action Plan. The greater relevance of structural funds to complement national funding is outlined in the HIT 2020 strategy; nonetheless, the Council recommendations include some criticism to the lack of ambition for the 2014-2020 reprogramming of structural funds. The planned creation of a public agency for structural funds ("Autorità per la coesione sociale") is the policy development aimed to ensure their more efficient management. The Agency is expected to become operational in 2014 and will monitor cohesion initiatives at the regional level and support local governments running national and EU projects.

The traditional low share of labour force with tertiary education, is pointed out as another problem for Italy's R&I system. On this regard – as discussed above with reference to the CUN report - budget cuts to HEIs, increases of student fees and the prolonged recession have led to a strong fall in the number of university students; in the future, this may lead to a further worsening of the overall quality of Italy's human capital.

3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1 National Research and Innovation policy

The Innovation Union Scoreboard 2013 (IUS2013)[33] provides a ranking of the overall performance of EU member's states according to the joint analysis of 24 indicators. Italy falls into the group of "moderate innovators"[34] with a performance below the EU27 average, even if Italy is considered the best within the group.

Some indicators on input and output of the R&I system, however, show a better position of the country. The HEI system has a good performance due to the increasing number of new doctoral graduates and of the increasing attraction for non-EU doctoral students, reducing the gap with the EU27 average. Scientific output, measured by the publications indicators of IUS2013, is high and shows a faster growth than in the EU27 average. SME's innovative attitude appears as an emerging strength of the Italian R&I system for the high percentage of innovative SME and for their good performance, higher than the EU28 average in 2010 both for technological and non-technological innovations. Finally, the increase of exports of medium and high-tech products, and their positive contribution to Italy's trade balance, suggests that some structural change is under way, reducing the traditional reliance on low tech exports.

However, the analysis of the Innovation Union Scoreboard highlights Italy's persistent weaknesses in R&I. They include a low R&D intensity, a low level of skilled human capital (with a tertiary education), a negative performance for R&D financing and support from the public sector and a low level of knowledge-intensive services exports. In patenting activities, an overall negative pattern is counterbalanced by the relatively high number of patent applications in fields associated to societal challenges, which are growing at an higher rate than the EU27 average.

The analysis of IUS2013 is confirmed by other documents and studies. The ISTAT report on wellbeing (BES)[35] points out Italy's low ranking in research and patents among EU27, but also the high ranking in terms of technological and non-technological innovation performance of firms. The CUN report, discussed in chapter 2, highlights how budget cuts and the implementation of HEI reforms resulted in a decrease in the number of university students, affect the future quality of human capital.

Significant positive outcomes concern the quality of Italian scientific research. The Research quality assessment (VQR) report of ANVUR, detailed in chapter 2, points out the good quality of the HEI research output at the international level. In 2013 a study on the International Comparative Performance of the UK Research Base based on the Scopus database carried out by SciVal Elsevier, ranks Italy as the top country – among the most advanced economies - for research output of HEIs measured by the number of citations and scientific publications. The productivity of Italy's HEI research, measured by the number of articles per unit of GERD and

[33] EC 2013b

[34] The other moderate innovators are: Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain.

[35] ISTAT 2013a;

by the citations obtained per unit of GERD is at the same level of top performing countries such as the UK and Canada.[36]

Table 2 IUS 2013 indicators for Italy

HUMAN RESOURCES	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	1.50 (2011)
Percentage population aged 25-64 having completed tertiary education	20.3(2011)
Open, excellent and attractive research systems	
International scientific co-publications per million population	499.8 (2011)
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	10.1 (2008)
Finance and support	
R&D expenditure in the public sector as % of GDP	0.53 (2012)
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)	
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	0.69 (2012)
Venture capital and seed capital as % of GDP	0.019 (2012)
Linkages & entrepreneurship	
Public-private co-publications per million population	33.4(2011)
Intellectual assets	
PCT patents applications per billion GDP (in PPS€)	2.1 (2010)
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0.6 (2009)
OUTPUTS	
Economic effects	
Medium and high-tech product exports as % total product exports	4.96 (2011)

[36] SciVal Elsevier 2013

Knowledge-intensive services exports as % total service exports	27.19 (2010)
License and patent revenues from abroad as % of GDP	0.17 (2011)

In Italy R&I is considered as a key element for competitiveness of firms and job creation and in the last five years many policy measures have been designed accordingly.

Governments outline strategies in multiannual documents, such as the PNR and HIT2020, but the lack of financial commitments have often resulted in unrealistic targets. R&I policies are designed and implemented by the central government, with a growing role of regions in consultation and implementation of actions associated to local development. Policy change, however, is often slowed down by the need for regulations after government decisions and approval by Parliament.

In 2013 the smart specialisation policy speeded up, after some years of duplication and fragmentation of local measures, under the coordination of MIUR and MISE. Policy monitoring and ex post evaluation methods are increasing, though they are not yet widespread in the Italian framework.

Recent measures look at innovation as a broader concept, going beyond the technological dimension, both for business and for institutions. Social innovation and demand driven innovation have been included in some competitive calls, such as Smart cities.

However, the budget cuts pointed out in chapter 2 represent major limitations for more effective policies. Concerning public R&D expenditure, according to Eurostat data[37] GBAORD as percentage of public expenditure in Italy was 1.11 % in 2012, below the EU28 average of 1.42%, and is following a negative trend since 2005. The largest component of GBAORD 'R&D financed from General University Funds' has a lower intensity in Italy - 50.3 euro per capita in 2012 - than in the EU 28 average (61.4%). Also the intensity of Higher Education R&D, HERD, as percentage of GDP was 0.36% in 2012, below the EU27 average of 0.49%.

Business R&D (BERD) as a share of GDP has long been below the EU27 average; in 2002 the ratio was 0.54% in Italy and 1.2% in EU27; in 2012 data were 0.69% in Italy and 1.3% in the EU27 average. In 2013 FAR, the main fund for industrial research, stopped its activities for lack of resources[38], while PRIN and FIRB, the two competitive research programmes, have not been regularly budgeted over the last five years, with major cuts in their financing, as seen in chapter 2. In this context, progress towards EU2020 R&D targets has been very limited.

Various efforts have been developed to increase efficiency of the R&I system. A greater role has been played by ANVUR, the agency in charge of assessing the quality of public research. The reform of HEIs and PROs under MIUR's supervision have revised regulations, combined autonomy with guidelines, and opened up their governance to business and local actors.

The conditions of researchers remain a major problem, a reduction in total numbers, limited turnover, wages frozen by law, and much below the EU average, temporary contracts increasing widely; researchers in the business sector do not have a specific labour contract and are usually employed under other job profiles. Funding cuts have also affected the reform of doctoral

[37] Eurostat 2013a (New Cronos database);
[38]The MIUR press release on FAR can be downloaded at http://hubmiur.pubblica.istruzione.it/web/ricerca/dettaglio-news/-/dettaglioNews/viewDettaglio/24402/11213

programmes, with a higher share of new doctoral positions without grants and funds for mobility.

Knowledge transfer from HEIs and PROs towards business has long been a factor of weakness in Italy's R&I system and several measures have been introduced to promote public-private partnerships to foster innovation. Since 2011 policies made an effort to streamline access to public funds for R&I, especially for SMEs, and to introduce new forms of innovation financing. The scarce availability of risk capital for R&D is another traditional weakness of Italian business; banks do not fund innovative projects easily and venture capital plays a very limited role: in 2012 venture capital as a share of GDP is 0.004% in Italy, as opposed to 0.025% in the EU15[39] average[40].

3.2 Structural challenges of the national R&I system

On the basis of the information emerging from the IUS 2013, from the national assessments examined in chapter 2 and from the National research programme (PNR) five main structural challenges appear to be relevant for the Italian R&I system:

- Insufficient resources for Higher Education.
- Low share of skilled human capital.
- Low R&D intensity and specialization of firms.
- The size distribution of firms.
- Increasing territorial inequalities.

Insufficient resources for Higher Education

The HE system in Italy has long been characterized by lower financial and human resources in comparison with other European countries, but the budget reductions associated to austerity policies have made problems more serious, widening the gap with European averages. Chapter 2 has already documented the extent of the reduction in funding, staff and students; the 'Ordinary fund' (FFO) providing institutional funding to universities in 2012 was lower in real terms than in 1996[41]. Budget cuts to universities are expected to continue in the future and, as pointed out by the OECD, Italy's expenditure on university education is now 1% of GDP, one third less than the EU27 average (1.5%)[42].

At the same time, however, output indicators are showing positive trends. Despite the low level of resources for the HE system, the scientific output demonstrates a positive performance and high productivity compared to the most advanced countries[43].

[39] EU15 does not include EE, HR, CY, LV, LT, MT, SI, SK;
[40] IUS2013;
[41] CUN 2013;
[42] OECD 2012;
[43] SciVal Elsevier 2013.

Low share of skilled human capital

A traditional weakness of the Italian R&I system is the low share of citizens with higher education; recent patterns suggest that a worsening is now under way also in this matter. IUS 2013 data shows that in 2011 in Italy the proportion of people aged 30-34 with tertiary education attainment was 20.3%, well below the EU27 average of 34.6%. However, the proportion of people aged 20-24 having completed upper secondary education in Italy in 2011 - 76.9% - was not far from the EU27 average of 79.5%. The conditions for an improvement in tertiary education therefore exist, but the effects of the crisis and the downsizing of the university system have created new problems.

Istat labour force data indicate that 197,000 people under 35 holding a tertiary degree were unemployed in 2012 (+43% compared to 2008), with a total number of graduated unemployed of 307,000. Public budget cuts resulted in an increase of university fees, a lower availability of grants, leading to a fall in the number of students. As already pointed out in chapter 2, the number of new students admitted to Italian universities is falling and in 2011-2012 universities reported 280,144 new students, with a decrease of more than 58,000 units from 2003-2004[44].

Such a fall in university enrolment may widen the gap in the share of citizens with higher education between Italy and the EU28 average. Moreover – besides the broader social implications - an inadequate skill level of the workforce can become a barrier in efforts to shift Italy's economic activities from traditional, low technology industries, towards activities with greater relevance of science and innovation.

Low R&D intensity and specialization of firms

Studies on the low R&D intensity of Italian firms have long identified the country's specialization in low technology industries as a key determinant of such a weakness. Italy remains non-specialized in high-tech sectors, with the exception of the industrial machinery sector and, in part, of the chemical industry, while traditional industries dominate current production and trade specialization.

S&T activities, on the other hand, show a significant scientific specialization (based on publications) in pharmaceuticals and a high concentration of patents in the field of 'other machinery and electrical equipment'. Translating such relative strengths in research and innovation into economic activities and employment, however, is a long and complex process that involves firms' investment decisions, provision of credit, favorable market conditions, etc.

over the years.

The challenge of shifting Italian specialization towards higher R&D sectors, however, is made more difficult by the long term decline of Italian manufacturing industry, documented – among others - by the OECD[45]; in twenty years, from 1990 to 2009, the Italian share of world manufacturing value added has decreased substantially. The impact of the current depression, moreover, is heavily hitting Italian industry, with a 25% reduction of production compared to the pre-crisis levels of 2008. As already pointed out in chapter 2, higher technology industries are

[44] CUN 2013 Elaboration on MIUR data;
[45] OECD 2011;

more vulnerable to economic downturns and Italy is risking a substantial weakening of its production capacity, especially in the fields where R&I are more important.

In this context, the preservation of existing industry and the support for the emergence of new firms in activities characterized by higher R&D, innovation, learning processes, in fields with strong demand and environmentally sustainable products and processes appear as policy priorities, in line with the EU2020 targets.

The size distribution of firms

The dominance of small firms in Italy is a well-known characteristic of the country's economy, with major consequences for the R&I system. According to Istat data[46], the number of enterprises in Italy is greater than 4.5 million, but only 3,495 firms have 250 employees or more. Firms with 1-9 employees number more than 4.1 million, and account for half of total employment in the business sector. Very small firms – usually with a family ownership structure - are unable to carry out R&D and significant innovative investment, and are unlikely to hire highly educated employees. The evidence is provided by CIS data[47]; in the period 2008-2010, 64.1% of firms with 250 employees or more were innovating firms, whilst this figure was 47.1% for the 50-249 employee class and 29.1% for the 10-49 employee class.

Policies aiming to increase the number of medium size firms may effectively complement efforts to increase R&D, innovation, competitiveness, exports and ensuring a better access to finance. Such a challenge is all the more important in the context of the current economic depression.

Increasing territorial inequalities

The R&I system in Italy is characterized by a high concentration of R&D expenditure and employment in four major Northern regions – Lombardy, Piedmont, Emilia Romagna and Veneto - and in Lazio, the region around Rome. This reflects the historical pattern of industrialization and the polarized economic structure of the country, which has four regions in the South – Sicily, Calabria, Puglia and Campania – eligible for EU Convergence/Objective 1 policies.[48]

Business R&D activities are particularly polarized within regions along these lines, while public policy has reduced such polarization through the localization of both HEIs and PROs. The spread of the HEI system across regions, including Southern ones, has been significant, although several universities located in the South have weaker educational and research performances and are now facing greater than average budget cuts.

Current trends, examined in Chapter 2, have pointed out the greater relative role of business R&D and the cut backs in public R&D. Both these patterns – together with the effects of the economic crisis - are likely to deepen territorial inequalities in R&I at the regional level. This issue could therefore become more relevant for Italy's R&I policy. All the more so if we consider

[46] ISTAT (2012c);
[47] ISTAT (2012b);
[48] These issues are pointed out also in the Istat report on wellbeing, BES (ISTAT 2013a).

the growing divide that the economic crisis has opened within Europe, with Italy as a whole widening its gap with EU averages in R&I as well as in broader economic performances.

3.3 Meeting structural challenges

The ability of R&I policy in Italy to address the structural challenges pointed out above has been limited by the budgetary cuts and the depression of the economy. Difficult trade-offs in the use of limited resources have emerged and the weakness of public-private cooperation may reduce expected outcomes. A number of policy actions, however, are introducing changes in the system.

- **Insufficient resources for Higher Education**

Changes in HEIs have included the Research Quality Assessment carried out by ANVUR; the use of its results for introducing differential treatment between "virtuous" and "less virtuous" universities; the completion of the first "habilitation" process for changing the recruitment of professors; the reform of doctoral studies; the streamlining of FIRB and PRIN funds. These actions are likely to improve the efficiency and transparency of the HEI system. However, in all cases, the reduction of institutional funding and lack of substantial resources for new initiatives have limited the impact of the changes introduced.

- Low share of skilled human capital.

The main initiatives addressing the low level of human capital include the Merit fund and two MIUR programmes to attract researchers from abroad. The programme 'Rita Levi Montalcini', targeted to attract young researchers from abroad regardless of their nationality, and 'Messengers', allowing professors and researchers working in foreign Universities and research centers to spend a teaching term in selected Italian universities. From 2013 a share of FFO (€5m) and FOE (€1.6m) has been earmarked to allow the recruitment of high level researchers from abroad in Italian HEIs and PROs.

- Low R&D intensity and specialization of firms

In order to address the low R&D intensity of Italian firms and their dominant specialization in lower technology fields, a reform of firms' incentives for R&D has been introduced, alongside the promotion of public-private partnerships for knowledge transfer. Measures for innovative start-ups have also been introduced, allowing better access to the financial market and the monitoring and support of their activities. The most relevant question concerns however the Digital Agenda, whose implementation has been delayed and which could fill a gap in the policy action on ICTs.

- Size distribution of firms

The large projects/programmes introduced in the last years- Industria 2015, Technological Innovation Contract and Agreement Contracts for Strategic Research – could address the

fragmentation of R&I efforts by a business system dominated by very small firms. Policies targeting the technological upgrading of SME have included the Investment Fund and the Innovation Fund, supporting also IPR expenditure and the commercialisation of patented inventions. Tax credits for industrial firms collaborating with universities and PROs for R&D and for the hiring of researchers have also been introduced.

- Increasing territorial inequalities

The measure to tackle territorial imbalances is related to the management of EU Structural funds. The introduction of PONREC (see Chapter 2) is a positive development for both R&I and territorial policies. The forthcoming Agenzia per la coesione territoriale should improve the implementation of projects financed by structural funds, in order to deal with territorial problems. HIT2020 stresses the relevance of territorial inequalities as a constraint for improving innovation and productivity and points out the necessity to spend in R&I a relevant share of structural funds. The implementation of the regional Smart specialisation strategies under the coordination of MISE and MIUR should improve the impact of structural funds projects and support the development of new local economic activities.

Challenges	**Policy measures/actions addressing the challenge** [49]	**Assessment in terms of appropriateness, efficiency and effectiveness**
1. Insufficient resources for Higher Education	Supplementary funding according to the performance of HEIs and PROs Research Quality Assessment by ANVUR "Habilitation" recruitment system of professors Reform of doctoral studies Streamlining of competitive funds FIRB and PRIN	The measure plans to reward quality and concentrate resources in excellent universities. General budget cuts, however, meant that in the budget approved at the end of 2013 "virtuous" universities obtained at most the same funds as the previous year, while "less virtuous" universities had cuts of up to 5% of their budget. Expenditure reduction is conflicting with incentive policy. A scaled down and more polarized university system may emerge. The Research Quality Assessment published by ANVUR in 2013 has been used for offering incentives in the funding of universities, but has a broader impact in terms of awareness, transparency and accountability of universities and departments on their research performances. Its results could be used as inputs in the management of HEIs. The "habilitation" process improves the recruitment mechanism, with quality-based peer-review, foreign evaluators and relevance of objective indicators of research performance and publications. At the end of the first round, several thousand candidates are likely to obtain the "habilitation", but much fewer actual academic jobs are likely to be offered in the near future. Moreover, this system is not used for researcher's positions, which will still be directly assigned by the universities on the basis of less clear quality criteria. The doctoral reform has just been introduced; it is based on the principles of innovative doctoral training and could increase the attractiveness of the Italian doctoral schools.

[49] Changes in the legislation and other initiatives not necessarily related with funding are also included.

		FIRB and PRIN procedures have been streamlined and are more transparent. Funds available in 2013, however, are drastically reduced.
2. Low share of skilled human capital.	Merit fund Earmarking of resources for recruiting researchers from abroad Rita Levi Montalcini and Messengers programmes	The Merit fund activity is appropriate but the increase in university fees and rising unemployment rates may hamper the effectiveness of this policy. The number of students is decreasing and the share of new graduates who are unemployed is rising. It is an appropriate measure to increase the quality of researchers, extend international cooperation and offer opportunities for a return to Italy to the large number of Italian scholars that have emigrated. There are limitations, however, in the resources available and in the temporary nature of jobs offered. Appropriate initiatives to attract researchers, launched in 2013 with limited funds; not yet possible to assess their impact.
3 Low R&D intensity and specialization of firms	Firms incentives reform for R&D and measures for innovative start-ups Implementation of the Digital Agenda	The institution of the Fondo per la Crescita Sostenibile (FCS) and the streamlining of procedures has a positive impact on firm innovation. The startup law is under implementation but it seems appropriate to leverage innovation in SMEs, making easier access to credit. The Digital Agenda is an important policy development, filling a gap in Italy's ICT activities, is complementary to other economic policy measures and is coherent with EU priorities. However, its implementation has been delayed by policy changes and lack of regulations.
4.Size distribution of firms	Industrial Innovation Projects of "Industria 2015". Tools include also the Contract for technological innovation and the Agreement contract of strategic research Tax credits for industrial firms collaborating with universities and PROs for R&D and for innovative firms employing researchers	Industrial Innovation Projects are large programmes including collaboration among private and public organizations and between large and small and medium companies. They could help building a critical mass of resources for R&I. They have mobilized new financial and human resources, but funding has been delayed and modest interest in financing them has emerged from the banking system. They could play a role in supporting the growth of high tech sectors and larger firms. Tax credits are conditioned to public private partnership and recruitment of researchers. The measure is appropriate, favours larger firms, but is likely to have a modest impact.
5. Increasing territorial inequalities	The National operational programme PON 'Research and Competitiveness' Agency for territorial cohesion Smart specialisation strategy	This programme is a step towards the integration of R&I and social cohesion. It offers new financial resources and integrates central and regional initiatives. The Agency - not yet operational – will increase the effectiveness of EU Structural funds. The process speeded up in 2013 and helps regions to increase the impact of innovation into their local system. Its implementation is still in progress.

4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

4.1 Strengthening the knowledge base and reducing fragmentation

Promoting excellence in education and skills development

According to Eurostat data, in 2012 0.91% of the active population, in Full Time Equivalent (FTE), was employed in R&D. Researchers were 0.43% of the active population. The total amount of researchers in FTE, 110,823, is concentrated in universities (45,223) and in the business sector (43,073). Human resources in Science and Technology (HRST) recorded higher unemployment from 2011 to 2012 (from 232,000 to 307,000), and rose as percentage of total unemployment too (from 2.8% to 3.6%), mainly due to the recession that increased the overall unemployment rate up to 12%.

Government's financial documents forecast a further increase of the unemployment rate in 2014 (12.4%) with small reductions only from 2015 on.

As reported by HIT2020, the outward flow of Italian researchers is much higher than the inward flow of foreign researchers. According to FP7 Marie Curie data the gap between outflows and inflows is very high: out of total "mobile" researchers, 78% is accounted for by Italian researchers going abroad and 22% by foreign researchers coming in Italy.

According to MIUR data[50], in the academic year 2011/2012 more than 34,300 students attended doctoral courses; among them foreign students were 3,859 recording a slight increase on the previous academic year (3,500). In 2008 public and private universities employed 62,768 researchers which fell to 54,929 in 2012. The decrease is concentrated on grade A positions (Full Professor) which fell from 18,929 units in 2008 to 14,532 units in 2012, due to retirement and the constraints on turnover. In 2011 the stability law had set to 20% the share of retiring personnel that could be replaced with new hirings. In 2013 the Letta government planned a gradual increase of such a share up to 60% in 2016.

The MORE2[51] survey carried out in 2012 provided new information on the mobility of researchers and doctoral students in HEIs. In Italy 25% of researchers have been "mobile" for more than 3 months in the last ten years, and only 8% reported a change of employer in the last ten years. International mobility is due for 78.9% of cases to carrier progression and access to facilities and equipment. Employer related motives are relevant for 21.1% of researchers only.

Italy records the highest share of researchers internationally mobile for more than 3 months during their Phd (56%). The preferred destinations are Spain, Switzerland, the UK and Austria. In Italy only 35.1% of researchers received structured training during PhD. ECTS credits have been available only for 10.9% of researchers which received structured training.

[50] Miur data can be downloaded at http://statistica.miur.it/
[51] Ideaconsult 2013a

In 2012 MIUR started the first wave of selection of university professors based on the "habilitation" system, already pointed out in Chapter 2.[52] The Letta government announced an new call for researchers for 2014. However, since 2011 budget laws have blocked any wage increase and career advancement in the public sector, including Universities and public research organizations with a negative impact on real wages of researchers.

On the university side, Law 240/2010 limits the maximum period of post-doc positions and introduces a tenure track-like path (6 years maximum contract and access to tenure after positive evaluation) for researchers involved in projects with adequate funding. On the research institutions side, D.Lgs. 213/2009 introduced a time limitation to fixed term contracts that cannot exceed 10 years in the same institution.

The set-up of the international doctoral courses Gran Sasso Science Institute (GSSI) by INFN (art. 31bis of Law 35/2012 funded by €12m a year for 2013-2015) may take advantage of the synergy of the RI located in Gran Sasso to attract foreign researchers and it is a relevant step in doctoral reform.

In 2013 MIUR earmarked resources in the institutional funds FFO and FOE to attract international talents from abroad.

In the search for improving research excellence, ANVUR carried out in 2012-2013 the first systematic evaluation of research quality (VQR) (see Chapter 2).

Research Infrastructures

Italy has a wide range of research infrastructures (RIs), widely assessed as a strength of the national R&I system; many of them are involved in EU programmes, demonstrating the positive attitude of the R&I system towards cross-border cooperation.

Italy approved the EU regulation 723/2009 on RIs, as reported in HIT2020, and in 2010 released the last national roadmap (in accordance with ESFRI requirements).

The ordinary fund for research institutes (FOE) is the main source of funds for RIs in the national territory and Italy contributes to the construction of new pan-European RIs with €90m each year. HIT2020 envisages the constitution of a specific fund to finance RIs and to support the mobility of researchers in pan-European RIs.

The envisaged implementation of a specific fund for RIs may increase the funding for mobility of researchers across RIs and it should increase the attractiveness of the RIs located in the Italian territory too.

The Italian strategy, as outlined in HIT2020 is focused on the adoption of smart specializations as methodology to select the location of RIs, considering also the regional, national and European dimensions; national RIs could be aggregated in pan-European ERIC[53].

According to HIT2020 Italy's priorities are to increase the effectiveness and impact of a smaller number of RIs, instead of expanding their number as planned by Horizon 2020 (from the

[52] Ordinary fund for universities (FFO) for 2013 makes available resources to recruit professors (167.6m) and to finance the costs of the selection procedure (5m).
[53] In 2013 MIUR launched a call for the building of RIs in Ob.1 regions, making available €76.5m.

current 550 RIs to 1000 in 2020 for the whole of EU28). HIT2020 points out the guidelines to select strategic RIs under the requirements of ESFRI criteria and envisages the definition of a national plan for RIs with the target of strengthening the cooperation with private business in order to increase knowledge transfer.

Law 35/2012 and Law 134/2012 removed some barriers to access to RIs ensuring the mobility of researchers employed in universities and PROs. The open data law (Law 221/2012) is an opportunity to support RIs to make available their research data on-line and to promote additional cross border partnerships.

4.2 Getting good ideas to market

Improving access to finance

Innovation financing, especially for SMEs, is one of the key challenges of the R&I system. In 2012 DL 179 and L221/2012 introduced a new programme for innovative start-ups amounting to €200m in 2012 and €110m from 2013 onwards; at the end of 2013 1,493 firms are included in the special section of the Chamber of Commerce register listing such firms. [54]

The start-up law introduces fiscal holidays and incentives in terms of simplification, incubators and liabilities in case of bankruptcy. The recipients of the law are young innovative SMEs with a strong technological competence. The start-up law makes available some innovative modalities of financing, tailored for innovative SMEs, such as crowdfunding, work for equity for external suppliers and stock options for SMEs personnel as well as streamlined access to some benefits regarding collaterals for bank credits.

In 2013 the streamlined access to the Fondo di garanzia per le piccole e medie imprese, was introduced, a fund aimed to provide bank guarantees for SMEs managed by MISE[55]. Regulation for equity crowdfunding is also operational since 2013. The administrative burden for innovative start-up has been streamlined. Start-ups are monitored along their life with a feedback from public institutions, in order to find out critical issues and increase the effectiveness of the law.

Protect and enhance the value of intellectual property and boosting creativity

The regulatory framework has been reformed in 2010 (DL n. 131 13th August 2010). The reform introduced some measures to promote creativity and invention by researchers and universities and streamlined the access to patenting procedures. Since 2011 MISE, the ministry in charge for IPRs, has adopted two instruments to boost creativity - a prize competition for patenting firms and benefits for firms introducing innovations for the market. In 2013 measures on intellectual property and creativity focused on financing industrial investments based on patents.

A funding line within the Fondo Nazionale per l'Innovazione (FNI) is available for innovative projects based on patents and the financial fund IPGEST aimed to SMEs that invest on patents made available 40.9m euro.

[54] The list can be downloaded from http://startup.registroimprese.it/;
[55] The secundary regulation is a MISE act DM 26 april 2013 published in the Gazzetta Ufficiale 25th June 2013.

Public procurement

On public procurement in 2013 the focus was on the Digital Agenda and the creation of the agency in charge of its implementation (see Chapter 2) and managing the digitalisation of the public administration. CONSIP has a key role in centralising public procurement in a range of high technology products. The Mercato Elettronico della Pubblica Amministrazione, MEPA, has become operational, with a platform based on a register of suppliers (80% of them are SMEs), which can decide time by time their territorial strategy and the typology of goods and services offered to the public administration. In turn, the public administration may select the more convenient procedures and include specific features, such as calls for goods based on recycled materials or with low environmental impact. MEPA allows simplification of procedures, shorter timing for procurement and greater transparency in the whole contracting process.

In 2013 MIUR and MISE managed a new call for Objective 1 regions, for the development and the research for innovative services not yet available on the market. MISE and MIUR made available 150mil euro for the call.

4.3 Working in partnership to address societal challenges

EIPs participation is not yet a widespread keyword in the strategic documents of MIUR. The PNR (2011-2013) and HIT2020 provide great relevance to transnational cooperation and grand societal challenges but leave EIPs participation on the background. Nonetheless, initiatives like smart cities, one of the thematic areas of EIPs, have been successful for the huge number of proposals and for the methods adopted to award projects.

HIT2020 supports the inclusion of the EU research priorities into the national framework embracing joint programming through a re-organisation of the governance of research; it also favours greater Italian participation in transnational research programmes. The next PNR will be the strategic document that should include EIP as a strategic feature of Italian cross-border research, including the participation in international initiatives such as ERANET and Joint Technology Initiatives (JTI). Since 2012 a share of FAR (Fund for Applied Research), the traditional fund for industrial research managed by MIUR is earmarked for international projects too.

In 2013 MIUR modified operational procedures for the participation in international R&D programmes introducing the simplification and evaluation elements of Law 35/2012 and Law 134/2012. The new operational procedures support flexibility for researchers of Italian HEIs and PROs involved in transnational projects.

4.4 Maximising social and territorial cohesion

The MIUR-MISE project Smart Specialisation Strategy has been set up under the broader strategy of HIT2020 and is a major advancement from past initiatives based on the action of some pioneering regions such as Emilia Romagna on the application of RIS3 methodology. The systemic approach is able to avoid duplication and to find out regional specialisations in accordance with the goals of economic and territorial welfare and competitiveness.

MIUR and MISE adopted a collaborative process with regions in order to set up a common environment of work with the involvement of local stakeholders too. The activity of MIUR-MISE is not only finalised to design consistent regional strategies but also to establish a network of stakeholders able to follow cooperation during the years of structural funds reprogramming and to enable a continuous interaction and feedback to achieve effective results. The project can be considered as advancement towards the new structural fund programmes.

In 2014 the official Smart Specialisation Strategy of each region should be published, integrated into the system of the National Specialisation Strategy. The institution of the Agency of Territorial Cohesion will ensure the monitoring and the consistence with structural funds objectives of the regional Smart Specialisation Strategies.

4.5 International Scientific Cooperation

Traditionally the Italian system of R&I has not been considered attractive for foreign researchers except for the RIs assessed as an excellence at world level. The inflow of foreign researchers is lower than in the other large EU countries such as Germany, France and the United Kingdom.

In the period 2012-2013 the strategy for increasing national attractiveness adopted some measures aimed to attract researchers through specific competitive calls (Messengers and Rita Levi Montalcini calls), the participation of foreign researchers to the evaluation of the system of R&I and to the selection of professors, new English language university and doctoral courses, as well as strengthening the RIs that are the main attraction of foreign researchers in Italy.

The programme 'Rita Levi Montalcini', is targeted to attract young researchers from abroad regardless their nationality, started in 2009 and the last 2012 call made available 24 positions[56]. The programme 'Messaggeri', funded with €5,5m is targeted to attract foreign researchers in the Italian universities for a limited period of time. The main goal is to enable a knowledge transfer process to the Italian students.

The involvement of hundreds of foreign researchers and professors in the ANVUR assessment of research quality and in the committees working in the "habilitation" procedure for the recruitment of professors increased the international openness of the Italian scientific community.

The accreditation from 2013 of English university courses and the doctoral reform significantly increased the attractiveness of the Italian R&I system for students and young researchers. Finally, existing RIs and the synergy with doctoral schools, as in the case of the new doctoral school connected to the Gran Sasso RI may increase the number and the quality of foreign researchers in Italy.

On the other hand, budget cuts, the reduction of job position in HEIs and PROs and the low wages of researchers represent a barrier to foreign researchers, especially for top talents.

[56] In 2013 the FFO allocated €10m for financing the programme.

5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1 More effective national research systems

As indicated in National Reform Programme 2012 (NRP), the research strategy of the country is focused on the achievement of the Europe2020 target, e.g. to increase the ratio of R&D to GDP to 1.53% from the 1.27% level of 2012. The multiannual document that outlines the strategy is Horizon Italia 2020, HIT2020, released by MIUR in March 2013. It presents the multiannual (2014-2020) research and innovation strategy in Italy, but its implementation is still at its beginning.

HIT2020 sets up a long term strategy for securing funds, focused on an increase in European resources and a constant flow of public resources. The reprogramming of structural funds in 2012, the MISE reform of R&D incentives in 2012 and the 2012 MIUR calls are related to HIT2020 targets.

MIUR policies are consistent with the framework of HIT2020 and focused on simplification of the system, introduction of peer review and ex post evaluation of research, two elements that introduce significant novelties in the Italian R&I system. Peer review has been implemented in 2012 for the main competitive calls managed by MIUR (PRIN, FIRB, Technological Clusters and Smart Cities).

Te reforms of HEIs and PROs of 2009-2010 have introduced the principle that a part of the ordinary funding of universities and research institutions is assigned according to the performance in research output and education.

5.2 Optimal transnational co-operation and competition

MIUR is the main actor in the management of the Italian participation in international initiatives such as European Framework Programmes. Trans-national research collaborations are managed on the basis of bilateral and multilateral agreements. In 2013 Italy was involved at EU level also in the participation and co-funding of 9 ERANET initiatives and of 5 Joint Technology Initiatives.

HIT2020 outlines the agenda on transnational cooperation on R&D until 2020. A key role in this context is played by research infrastructures, RIs, many of which are involved in EU programmes. The European Portal on research infrastructure services listed 44 RIs for Italy, 14 classified in the disciplinary domain of humanities, 20 in environmental sciences, 6 in energy, 6 in life sciences, 8 in physics and astronomy, 5 in material sciences, chemistry and nanotechnology, 17 in engineering 5 in ICT and materials. The governance of national infrastructures is regulated through agreements between the institutions in charge and MIUR.

In accordance with the ESFRI strategy report on infrastructures, Italy will coordinate the European Multidisciplinary Seafloor Observatory EMSO, for which construction will begin from 2013, the European Plate Observing System EPOS, under construction from 2015, the

European Marine Biological Resource Centre EMBR, for which construction started in 2010, and Kilometre Cube Neutrino Telescope K3NET, under construction from 2013.

5.3 An open labour market for researchers

Laws 1/2009 and 240/2010 changed the rules for the recruitment and the careers of professors. The new system is based on the "habilitation" process, with annual calls and committees – that include one foreign evaluator – deciding on the granting of the "habilitation" to candidates. Those who obtain them are then qualified to run in the competitive selections that are opened up by individual universities, on the basis of their own needs and regulations. This process introduces more objective criteria in the evaluation process. Applications for "habilitation" are open to foreign researchers. The "habilitation" lasts for 4 years. However, the lack of recruitment in recent years has swelled the number of applicants to the first year of the "habilitation" and several thousand candidates are expected to obtain the "habilitation" in the first round. In the next few years the actual job openings in universities are likely to offer employment opportunities to a small minority of such researchers only.

For young researchers, Law 240/2010 limited the maximum period of post-doc positions and introduced a tenure track-like path (6 years maximum contract and access to tenure after positive evaluation) in some cases. On the research institutions side, D.Lgs. 213/2009 introduced a time limitation to fixed term contracts that cannot exceed 10 years in the same institution. Law 240/2010 introduced evaluation as key element for salary improvements of researchers and professors, but since 2011 budget laws freezed any wage increase in the public sector, including Universities and public research organizations. In universities permanent researcher's contracts are regulated by law, in PROs in part by law and in part by collective agreements.

Foreign researchers can be candidates in public selections for jobs in universities and research institutes. National regulations allow the direct recruitment of a limited number of researchers (high-level scholars) in permanent positions and in 2013 an additional share of the FFO and FOE has been earmarked to attract researchers from abroad.

5.4 Gender equality and gender mainstreaming in research

The Italian R&I system is characterized by serious gender inequalities even if it has achieved better results than the EU27 average for some indicators. The proportion of women on boards of research institutions in 2010 in Italy is much lower (17%) than the EU27 average (36%); on the other hand, the proportion of female heads of institutions in the HEIs is higher (23.4%) than the EU27 (15.5%)[57].

According to MIUR, the percentage of female researchers employed in Higher Education institutions increased in the period 2001-2011, from 29.8% to 35.5%. On the other hand, in 2011 the percentage of females in grade A positions (Full Professors) remained low (20.6%) even though it increased from 2001 (14.6%). The monitoring report of FP7 shows a female participation as coordinator higher in Italy than in the EU27 average.

57 EC 2013c

The main actor at national level for gender issues is the Department for equal opportunities, DPO, of the Labour ministry and the national parity counselor, CNP. MIUR has emphasized the relevance of gender issues for research and in HIT2020 it stressed the relevance of gender balance as a key factor for the competitiveness of the R&I system; it also planned the implementation of indicators measuring the impact of gender policies.

Some gender laws, even though not specific for the research system, are relevant for their impact also in the research community. Law 183/2010 implemented in each public institution the Comitati Unici di Garanzia (CUG) an office aimed to address gender issues. At the end of 2011 the wide majority of HEIs and PROs activated CUGs. Law 215/2012 reformed, according to gender balance, selection panels and boards of public firms.

The academic system is showing interest also on the research on gender issues. Some universities introduced courses on gender issues, also at the doctoral level. Despite the efforts for gender equality in HEIs and PROs, imbalances remain strong in the private sector, also due to the lack of a specific collective agreement for researchers in firms and private organizations.

5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA

Optimal circulation policies in Italy are still based on a mix of voluntary regulations and initiatives by universities and research institutes.

In 2004 the Messina declaration, based on the Berlin declaration, introduced in Italy open access to the agenda of the R&I system. From 2004 CRUI, the conference of University Rectors, established a permanent working group aimed to disseminate open access culture in universities. The CRUI working group released guidelines on open access implementation and promoted the inclusion of open access policies into university statutory regulations. Until 2012, 35 universities (on a total of 97) introduced open access policies into their internal regulations. Open data law in 2012 (Law 221/2012) increased the amount of available data for research from the public sector but there is not yet a national measure for research data.

Data sources for researches in social sciences are coordinated by the SISTAN (Sistema Statistico Nazionale), managed by the National statistical institute (ISTAT), based on a 3 year planning document (Programma Statistico Nazionale). The main actors for the policies on circulation and access to scientific knowledge include MIUR, CRUI, CINECA, CASPUR and Agenzia per l'Italia Digitale. CRUI pioneered open access in Italy since 2004, CINECA and CASPUR, two academic consortia, manage the Pleiadi project, the major resource for open access in Italy. From 2009 CASPUR set up the IDEM federation based on the GARR network. IDEM federation provides Internet access services to the scientific community in Italy and provides the availability of computing and data resources.

MIUR in HIT2020 stressed the necessity to implement an open access policy based in order to achieve the target of 60% of publications coming from public funded programs under open access.

ANNEX 1. PERFORMANCE OF THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	(+) Policy governance is designed and implemented in a strategic, coherent and integrated framework. (+)Specific programmes are designed are devoted to grand challenges.	(+) The governance mechanisms are based on the activity of MIUR and MISE which coordinates all the initiatives on R&I within a coherent framework. (-) Even though priorities are explicit and included in the strategic documents the lack of funds is still an issue affecting advancements towards grand challenges.
2. Design and implementation of research and innovation policies	(+)There is a multi-annual research plan (PNR) framework in place providing a long-term policy and a multi-annual strategy for dealing with EU research programmes (HIT2020). PNR and HIT2020 (and NRP as well) involve relevant stakeholders in their design. (+) HIT2020 includes a SWOT analysis at national level. (-) The new National Research Plan has been presented on January 31, 2014 (-) Multi-annual strategic documents do not include any financial commitment and a detailed time frame. (+) Strategic documents are focussed on EU priorities. The main goal of HIT2020 is to leverage EU funds. (+)An effective monitoring and review system is in place for the structural funds for research within the PONREC framework. ANVUR in 2013 released an assessment on HEIs based on output indicators and international comparisons too.	(+) HIT2020 design in 2012 and the forthcoming new PNR involve relevant stakeholders. (+) HIT2020 release in 2o12 which includes a SWOT analysis of the R&I system. The Smart specialisation process is still in act and it is not included in HIT2020. (-) Budget policy is included in the stability law which can change the foreseen budget on priorities. (+) From 2011 governments made an effort to increase the degree of integration of the R&I system into the EU framework as indicated by PNR, NRP and HIT2020. Italian documents share the same priorities and target of EU. (+) In 2012 MISE released a review on structural funds policies on research based on output indicators. (-) A monitoring process for all the R&I system is not available.
3. Innovation policy	(+) Innovation is promoted actively and in broad sense.	(+) The start-up law and smart cities are an advancement towards innovation policies both on demand than on supply side.
4. Intensity and predictability of the public investment in	(-)Education, research and innovation are not prioritized in the budget laws and have been underfunded in the last years. Financial	(-) Stability laws introduced budget cuts until 2015 for MIUR. (+) The government released the Start-up law

research and innovation	predictability cannot be ensured (+) Public funding is usually addressed to trigger up private investments. (+) Innovative financing is included in the start-up law. (-) Indirect incentive policies changed often from 2008. Tax credits are still marginal in the R&D financing framework	in 2012 and secondary regulation were in place in 2013 including innovative financing solutions. (+)In 2012 Government introduced Tax credits for R&,D even though they are not available for all firms.
5. Excellence as a key criterion for research and education policy	(-) Even though an increasing share of institutional funding is assigned on the basis of output quality, PRIN and FIRB, the two competitive research programmes, have not been regularly budgeted over the last five years, with major cuts in their financing. (+) ANVUR is in charge of the assessment of HEIs and PROs and from 2013 the assessment results are used for funding. (-) Grant portability is not yet effective, autonomy is effective for education and research. (+) Recruitment procedures of HEIs are based on the "Habilitation" recruitment system of professors. (-) The research carrier lost attractiveness for the block of wages and carriers policy and for the limitations to the recruitment of researchers.	(+)FIRB and PRIN procedures have been streamlined and are more transparent. (-) In 2013 there were not new FIRB and PRIN calls. (+) In 2013 ANVUR released the first assessment on the university system. The results are used for funding. (+) In 2013 ended the first round of the "Habilitation" recruitment system of professors. The "habilitation" process improves the recruitment mechanism, with quality-based peer-review, foreign evaluators and relevance of objective indicators of research performance and publications. (-) At the end of the first round, several of thousands candidates are likely to obtain the "habilitation", but much fewer actual academic jobs are likely to be offered in the near future. (-) In HEIs and PROs the 'frozen' wages policy will last until the end of 2014.
6. Education and training systems	(-) The number of university student is decreasing and in the medium long term the human capital quality will be affected accordingly. (-) Transversal competences and in general 'soft skills' are not focussed in the curricula.	(-) Budget cuts increased university fees and decreased the availability of resources for grants for students. (+) The doctoral reform approved in 2013 is focussed on increasing entrepreneurship education and training and to partnerships with firms as well. The doctoral reform is focused also to the inclusion of the 'soft skills' into curricula.
7. Partnerships between higher education	(+) Cluster and Smart cities calls are aimed to support the commercialization of innovative	(+) In 2011 Cluster calls and in 2012 Smart cities calls were aimed to support the

institutes, research centers and businesses, at regional, national and international level	ideas. The R&I system is addressing towards a more favorable business environment for SMEs. (-) Public –private mobility is not effective. The patent law reform of 2010 promoted the creation of creation of university spin-offs. In 2012 the start-up law reinforced knowledge transfer and innovative venture financing. (+) Current policies encourage transnational partnership but the administrative burden is still relevant	commercialization of innovative ideas. (+) Public private mobility is still not effective, despite some positive measures in 2012. (+) In 2012 the start-up law has been an advancement to support knowledge transfer and innovative venture financing.
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	(+) The Ministry of the economic development is in charge for the policies to promote innovation and it ensures coordination with policies for entrepreneurship and to enhance the quality of the business environment. (+) The start-up law is an appropriate measure, making easier access to credit to SMEs, especially for early stage investments.	(+) In 2012 the start-up law has been an advancement to support knowledge transfer and innovative venture financing.
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(+) The R&I system for a long time has suffered of duplications and excessive administrative burden for firms. In 2012 and 2013 the relevant support schemes have been revised and streamlined in coherence with EU guidelines. (-) The time to contract and payment can be still excessive, especially for SMEs and funding schemes are not benchmarked. (+) During 2012 some measures streamlined transnational cooperation and set up rules and procedures aimed to facilitate participation in EU programmes.	(+) In 2012 two laws (L35/2012 and L7/2012) increased the degree of integration with EU guidelines. (+) In 2013, HIT2020, the strategic document for the participation to Horizon, is an improvement to alignment with EU. (+) In 2012 the start-up law has been an advancement to support newborn innovative firms.
10. The public sector itself is a driver of innovation	(-) The public sector is focussing on innovation but the effective results are still scarce. (+) Innovative solutions, as electronic tenders are spreading in the public sector. Tenders are often based with qualitative criteria and not only at the lowest price. (-) From 2011 the governance bodies of the Agenda Digitale Italiana changed according to law delaying the implementation of the Agenda	(-) in 2013 the Agenda Digitale governing body have been reformed by the government. The continuous revisions delayed the activities of the Agenda Digitale.

	Digitale (+) From 2012 open data law ensured an increase of the free availability of government-owned data.	

Annex 2. NATIONAL PROGRESS IN MEETING INNOVATION UNION COMMITMENTS

		Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	(+) New Law of on HEIs and PROs (2010) Merit based reform of researchers. (+) New Law of on PROs (2009) Merit based reform of researchers. (+) New recruitment procedure for professors (2012) Open to foreign professors (-) National budget for research has decreased (from 2010) Stability laws and 2012 spending review (-) Frozen salaries in HE and PROs from 2011. (+) Simplification laws (2012) Regulation of mobility for researchers involved in international projects (+) Doctoral reform regulation (2013) Industrial doctorates (+) Revision of the regulation for university courses (2013) English based courses	(+) Merit based carriers; (-) Increasing bureaucratic burden; (+) Charter and code principles transposed into statutes; (-)Collective labour agreements do not integrate the Charter); (-) Charter implementation not effective ; (-) Only 4 excellent HEIs for HR charter principles; (-) No funding lines on HR charter; (+) Merit based carriers; (-) Increasing bureaucratic burden; (+) Charter and code principles transposed into statutes; (-)Collective labour agreements do not integrate the Charter); (-) Charter implementation not effective and limited to some PROs; (+) Transparent procedure in accordance with international peer review standards; (+) Open to foreign candidates; (+) The procedure will involve foreign experts; (-)Recruitment regulations and law in HEI may stop the effective achievements; (+) (-) Budget cuts for HEIs and PROs. (-) Limited number of job positions open to recruitment for turnover regulation; (+) In 2013 Letta government lightened the turnover constraint for HEIs and PROs; (-)The merit based approach of the 2009-2010 is not effective; (-) Increase of fixed term contracts for researchers;

			(-) Lower real wages and frozen carrier advancement (-) The system is less attractive; (-)The merit based approach of the 2009-2010 is not effective; (+) Less bureaucratic burden; (-) PROs not under MIUR supervision are excluded (+) More attractive doctoral courses for foreign students (+) Synergies with RIs (-)New doctoral courses will be operative only from 2014; (+) More attractive university courses for foreign students; (-)English courses will be operative only from 2014;
4	**ERA Framework**		
5	**Priority European Research Infrastructures**	National RIs roadmap (2010) National plan for RIs Call for new RIs (2013) HIT2020 (2013) MIUR strategy document	(+) National strategy for RIs confirmed by HIT2020; (+)Construction of new RIs in OB.1 regions;

		Simplification laws (2012) Better access to transnational research projects Adoption of EU directive on RIs (2012) Better pan European integration of RIs	(+)New fund for RIs; (+)RIs policies under the Smart Specialisation Strategy requirements; (+) Support to pan European RIs; (-)The strategy has not a clear scheduling; (+) Less bureaucratic burden; (+) Better access to national and international RIs; (-) Limited to PROs supervised by MIUR; (+) Less bureaucratic burden; (+) Better access to national and international RIs; (+) Merit based access ;
7	**SME Involvement**	HIT2020 (2013) MIUR strategy document	(+) Involvement of SMEs into the decisional processes, as stakeholders, on strategic issues;
11	**Venture Capital Funds**	Venture capital law (2011) Law and call for Start ups (2012) Regulation and funding for innovative SMEs	(+) Promotion of venture capital financing for SMEs; (+) Innovative financing for SMEs; (+) Better access to financial market for SMEs; (+) Introduction of crowd funding; (+) Ex post monitoring of the policy; (+) Innovative financing for SMEs; (+) Ex post monitoring of the policy;
13	**Review of the State Aid Framework**	High tech cluster calls (2011) Funding of high tech clusters	(+) Development of high tech clusters; (+) Coherent with Smart Strategies;

		Incentive reform (2013) Streamlining of procedures	(+) Better access to incentives; (+) Transparent procedures;
14	**EU Patent**		(-)The Agreement on a Unified Patent Court has not been ratified yet;
15	**Screening of Regulatory Framework**	Reform of firm incentives (2013) Exante and expost evaluations	(+) Ex ante and ex post assessment methodology of regulation as general rule; (+) Jointly supported by all new activities of MIUR and MISE; (-) Some relevant measures are still out of scope of the law;
17	**Public Procurement**	ADA regulation (2013) Egovernment MAPE (2012) E-tender platform Call for social innovation (2012) Funding of new services not present on the market	(+) National targets for innovative egovernment services; (-) Delays for the release of operative regulation; (+) Innovative e tender platform; (+) Open to SMEs; (-) Innovative procurements; (+) Design and implementation of social innovation projects; (+) Spillovers on the competitiveness of firms;
20	**Open Access**	Open access law (2012) regulation for open data of the public sector	(+) Data on public funded research are included; (-) Privacy and statistical law are hampering factors; (+) Positive effects on KT; (-) Specific open access policies on research data are not very effective until now;

21	**Knowledge Transfer**	HIT2020 (2013) MIUR Strategic document	(+) KT assessed as a key feature of the system; (+) Smart specialisation strategy as key method; (+) Public Private partnership are supported; (-) No clear scheduling of the measures;
		R&D tax credits (2012) Tax credits for firms cooperating with HEIs and PROs	(+) Incentives to public private cooperation; (-) Limited effectiveness for the low number of eligible recipients;
		CNR-Confindustria partnership (2012) Permanent partnership for KT	(+) Permanent collaboration between public and private bodies;
		Call for social innovation (2012) Funding of new services not present on the market	
		IPGEST and FNI funding line (2012) Firms incentives for patent investments	(+) More effectiveness of KT policies;
		High tech cluster calls (2011) Funding of high tech clusters	
		Reform of firm incentives (2013) Streamlining of incentive funds	(+) Innovative services that may enable KT flows; (+) Transparent procedures open to stakeholders;
			(+) Financial support of patent based innovation; (+) Measures targeted to SMEs; (-) Limited amount of resources over time;

			(+) Development of high tech clusters for triggering KT; (+) The smart Specialisation strategy design can boost the effectiveness of KT; (+) Better and transparent access to firm incentives; (+) Ex ante and ex post assessment methodology of regulation as general rule;
22	**European Knowledge Market for Patents and Licensing**	IPGEST and FNI funding lines (2012) Firms incentives for patent investments MAPE (2012) E-tender platform	(+) Innovation incentives for SMEs; (+) Increase of intangibles investments in SME; (+) Innovative trading platform that can trigger firm investments in intangibles;
23	**Safeguarding Intellectual Property Rights**		(-) Specific measures have not been implemented yet;
24	**Structural Funds and Smart Specialisation**	Smart Specialisation Strategy (2013) Project for designing regional and national Smart Specialisation Strategy	(+)Smart Specialisation Strategy recognised at central level and consistent scheduling with SF reprogramming; (+) Inclusive approach; (+) First results (mapping of specialisation) still achieved;
25	**Post 2013 Structural Fund Programmes**	DPS activities on reprogramming of SF (2012)	(+) Activities for the design of SF reprogramming in progress; (+)consistent scheduling with SF reprogramming;

		Design of new SF programme Agency for territorial cohesion (2014) Public body in charge for SF	(+) Better effectiveness of SF management; (-) Not yet realised; (-) Legislative problems with regional governments;
26	**European Social Innovation pilot**	Call for social innovation (2012) Funding of new services not present on the market Crowd funding for SMEs (2013) Regulation for crowd funding	(+) Design and implementation of social innovation projects; (+) Spillovers on the competitiveness of firms; (+) Innovative financing for SMEs; (+) Better access to financial market for SMEs; (+) Introduction of crowd funding; (+) Ex post monitoring of the policy;
27	**Public Sector Innovation**	Call for social innovation (2012) Funding of new services not present on the market	(+) Design and implementation of social innovation projects; (+) Spillovers on the competitiveness of firms; (+) Public register with relevant data available;
29	**European Innovation Partnerships**	HIT2020 (2013) MIUR strategy document	(+) The Increase of the quantity of international research project is a strategic target; (+) Consistent with EU targets on transnational research; (-) The participation to EIPs is not included in HIT2020; (-) Scheduling is not clear;
30	**Integrated Policies to Attract the Best Researchers**	(+)Call Messaggeri (2012) (+)Call Rita Levi Montalcini	(+) Increased attractiveness of the research system; (-) The calls involve a low number of researchers; (-) The calls do not allow the employment of foreign

		(2012) (+) Budget for recruit foreign professors and researchers in FOE and FFO (+) New recruitment procedure for professors (2012) Open to foreign professors	researchers in permanent positions; (+) Open to foreign candidates; (+) The procedure involves foreign experts; (-)Recruitment regulations and law in HEI may stop the effective achievements; (+) The procedure will include from 2014 researchers too;
31	**Scientific Cooperation with Third Countries**	Simplification Laws (2012) Simplification of the rules of research projects (+) MIUR regulation	(+) Less bureaucratic burden; (+) Better access to national and international RIs; (-) Limited to MIUR supervised PROs; (+) Less bureaucratic burden; (+) Better access to national and international RIs; (-) Limited to MIUR supervised PROs;
32	**Global Research Infrastructures**	Funding of pan European RIs (2012) FOE share earmarked for pan European RIs HIT2020 (2013) MIUR strategy document	(+)Resources of pan RIs ensured; (-) Vulnerable to budget cuts; (+) Specific fund for RIs less vulnerable to general budget cuts;

			(-) No clear scheduling;
33	**National Reform Programmes**	NRP (2011-2013) Evaluation of R&I reforms	(+) Exhaustive description of reforms in the R&I system; (+) EU2020 target and EU recommendations are included and assessed as the benchmark; (+) Description of the measures and of achieved results;

Annex 3. DELIVERING ERA

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
ERA priority 1: More effective national research systems	**MS01**	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	(+) The main competitive calls managed by MIUR (PRIN, FIRB, Technological Clusters and Smart Cities), have been streamlined towards transparent and quality	(+) Competitive funding has been streamlined; international peer review principles implemented for the main competitive calls of MIUR (-) The amount of resources for competitive funding are drastically reduced and in 2013 there were not new PRIN or FIRB calls.
	MS02	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	(+) Peer review has been implemented in 2012 for the main competitive calls managed by MIUR (PRIN, FIRB, Technological Clusters and Smart Cities). (+) L. 134/2012 reinforced the adoption of peer review as standard method for project evaluations.	(+)Peer review is the standard method in many research calls and procedure. (-) PROs which are not under the control of MIUR can adopt other methods than peer review.

ERA priority 2: Optimal transnational co-operation and competition	**MS06**	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	(+) The 2013 MIUR revision of the procedures for evaluation and financing of projects selected in international programmes is an advancement towards the alignment at EU level.	(+) In 2013 MIUR released a new regulation of the procedures for the participation to international programmes.
	MS07	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	(+) The R&I system is moving towards the EU integration, as envisaged by HIT2020. Some measures are still in place but the system has not yet achieved the full mutual recognition of EU evaluations.	(+) L.35/2012 and L. 134/2012 are a progress towards the mutual recognition of evaluations. (+) HIT2020 strategy is focussed on the simplification of the procedures for international programmes, peer review as standard method of evaluation, and a deeper integration towards EU standards.
	MS08	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	(+)The R&I system is moving towards the EU integration, as envisaged by HIT2020. Some measures are still in place but the system has not removed all the	(+) L.35/2012 and L. 134/2012 are a progress towards the mutual recognition of evaluations. (+) HIT2020 strategy is focussed on the simplification of the procedures for international programmes, peer review as standard method of evaluation, and a deeper integration towards EU standards.

			barriers .	
	MS15	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	(+) The national roadmap (2010) and HIT2020 confirm RIs as priority. Financial commitments are ensured by the PROs institutional fund and a specific fund for RIs is envisaged by HIT2020.	(+) HIT2020 confirms RIs as a national priority. (+) During 2013 a call for strengthening of RIs in convergence regions has been launched.
	MS16	Action 5: Remove legal and other barriers to cross-border access to RIs	(+) HIT2020 points out the approval of the EU regulation on RIs; in 2012 simplification laws put in place the legal framework to streamline access to RIs.	(+) L.35/2012 and L. 134/2012 defined the legal basis for removing some legal barriers for the access to RIs.
ERA priority 3: An open labour market for researchers	**MS24**	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	(+)The "habilitation" process improves the recruitment mechanism, with quality-based peer-review, foreign evaluators and relevance of objective indicators of research performance and publications. At the end of	(+) First round of the 'habilitation' process in 2012-2013 and begin of the second round in 2013. (-) Budget cuts are a barrier to recruit professors in the next years.

			the first round, several thousand candidates are likely to obtain the "habilitation", but much fewer actual academic jobs are likely to be offered in the near future.	
	MS25	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants	(+) Some improvement in 2012 but grant portability is not yet effective	(+) L.35/2012 and L. 134/2012 are a progress towards the grant portability
	MS26	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	(+)The points of access to the Euraxess services in Italy are working	
	MS27	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	(+)The doctoral reform has just been introduced; it is based on the principles of innovative doctoral training and could increase the attractiveness of the Italian doctoral schools.	(+) In 2013 MIUR released the regulation for the doctoral reform. An assessment on the effectiveness is not yet possible.

	MS28	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	(+)The university reform introduced their inclusion of the Charter of researchers into statutory regulations of HEIs. Despite the Charter inclusion some trade unions outlined some internal procedures that contrasted to the principles of the charter.	(-) No funding is available for the implementation of the Charter & Code. Researchers in the business sector and in PROs do not falling under the supervision of MIUR are actually excluded.
ERA priority 4: Gender equality and gender mainstreaming in research	**MS39**	Action 1: Create a legal and policy environment and provide incentives	(+) HIT2020 outlines the relevance of gender issues for research	(+)Partnership between MIUR and Labour Ministry- Department equal opportunities
	MS40	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	(+) HIT2020 outlines the relevance of gender issues for research	(+)Partnership between MIUR and Labour Ministry- Department equal opportunities
	MS41	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and	(+) In the public sector the balance of gender representatives is under implementation. Nevertheless, Until 2012,	(+)Law 215/2012 is an improvement towards gender balance. It makes available measures to promote the balance of gender representatives in the councils of local administrations and regional councils and measures for equal opportunities in recruitment commissions of the public administration

		evaluating	even if it was not compulsory by law, the composition of the majority of recruitment/ career progression committees was gender balanced, as demonstrated by the DPO 2012 report.	(-) The private sector is excluded
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA	**MS45**	Action 1: Define and coordinate their policies on access to and preservation of scientific information	(+)The inclusion of open access policies into the statutory regulations of 35 universities ensured a widespread success of online and open access repositories. The CRUI guidelines made available specifications on the preservation of the information and on the promotion of open source software for the management of open access systems. No specific actions are implemented for SMEs	(-)The current framework still needs of a specific regulation in order to ensure a wider participation of research system and in order to implement standard policies on data preservation and modalities of access.

			and for the promotion of joint negotiations with publishers	
	MS46	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	(-) Despite some improvements due to open data law the framework is still far from open innovation. The main goal of the open data law is to increase the knowledge transfer (and competitiveness) to private business but the measure is not specific for research.	(+)Open data law (L. 221/2012) is an advancement to foster knowledge transfer
	MS47	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	(-)Italian Digital Agency developed new projects for cloud and computing services for education but not for research. The implementation of cloud services for education started in 2012, within the Agenda Digitale,	(-) Italy is cumulating some delays in the implementation of the Agenda Digitale for the laws which changed the organisation of the governance system of Agenda Digitale in 2012 and 2013. The governing body will be working not before 2014.

			(which is not yet working) implementation and in the next years Agenda Digitale will develop a common platform for software, contents and communication in the education community.	
	MS48	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	(-)An effective internationalization of the access to digital research services has not been yet implemented and a specific national policy is not yet available.	

REFERENCES

VII Commissione della Camera (2009) Resoconti indagine conoscitiva sullo stato dell'università e della ricerca

Almalaurea (2013) XV Indagine sulla Condizione occupazionale dei laureati- Venezia - Università Ca' Foscari – 12 marzo 2013

Anvur (2013) Rapporto finale ANVUR. Valutazione della qualità della ricerca 2004-2010 (VQR 2004-2010), Roma, 30 giugno 2013

CUN (2013) Dichiarazione del Consiglio Universitario Nazionale per l'università e la ricerca. Le emergenze del sistema, Roma, Gennaio 2013

EC (2012) Fifth FP7 Monitoring Report 2011 29/08/2012

EC (2013) 2013 EU Industrial R&D Scoreboard http://iri.jrc.ec.europa.eu/scoreboard13.html

EC (2013b) Innovation Union Scoreboard 2013 http://ec.europa.eu/enterprise/policies/innovation/policy/innovation-scoreboard/

EC (2013c) She figures. Gender in research and innovation, Brussels 2013

ESFRI (2011) Strategy Report on Research Infrastructures Roadmap 2010

Eurostat (2012) Eurostat Key data on education in Europe.;

Eurostat (2013a) Eurostat New Cronos database, December 2013;

Eurostat (2013b) Eurostat newsrelease 121, Industrial production up by 0.7% in euro area, 13 August 2013; http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/4-13082013-AP/EN/4-13082013-AP-EN.PDF;

Eurostat (2013c): She Figures 2012, EC, Brussels.

Giavazzi F., D'Alberti M., Moliterni A., Polo A., Schivardi F., (2012) Analisi e raccomandazioni sui contributi pubblici alle imprese. Rapporto al Presidente del Consiglio e Ministro dell'Economia e delle Finanze e al Ministro dello Sviluppo, delle infrastrutture e dei trasporti 23 giugno 2012

Ideaconsult (2013a) Higher Education Sector Report MORE2, European Commission,

DG Research and Innovation.Brussels, June 2013

Ideaconsult (2013b) Final report MORE2, European Commission,

DG Research and Innovation.Brussels, August 2013

ISTAT (2012a) Statistica report Anni 2008-2010 L'innovazione nelle imprese 07/11/2012

ISTAT (2012b) Statistica report Anno 2010 La struttura e competitività del sistema delle imprese industriali e dei servizi 29/10/2012

ISTAT (2013a) BES 2013 Il benessere equo e sostenibile in Italia, Rome, March 2013

ISTAT (2013b) Statistica Report La ricerca e sviluppo in Italia. Anno 2011 03/12/2013

Lucchese, M., Pianta, M. (2012): Innovation and employment in economic cycles, Comparative Economic Studies, 54, (341–359)

MEF (2013) Documento di Economia e Finanza DEF Sez. III – Programma nazionale delle riforme 10/10/2013

MEF (2013a) Nota di aggiornamento del Documento di Economia e Finanza 10/08/2013;

MISE (2011) Relazione sugli interventi di sostegno alle attività economiche e produttive anno 2011

MISE-MIUR (2012) Programma operativo nazionale ricerca e competitività Riprogrammazione 3 agosto 2012

MIUR (2011) Programma nazionale della ricerca 2011-2013, marzo 2011

MIUR (2013a) 'Atto indirizzo concernente l'individuazione delle priorità politiche del MIUR per l'anno 2013' 04/02/2013

MIUR, (2013b): Horizon 2020 Italia Ricerca e Innovazione, Roma, marzo 2013

OECD (2011), OECD Science, Technology and Industry Scoreboard 2011, OECD Publishing

OECD (2012) Education at glance 2012, Oecd publishing

Pianta, M., Lucchese, M. (2012): Industrial and innovation policies in the European Union; in: Garibaldo, F., Baglioni, M., Telljohann V., Casey C. (eds.): Workers, Citizens, Governance: Socio-Cultural Innovation at Work, Berlin, Peter Lang.

Poti B., Reale E. (2012): Country Report 2011. Italy, ERAWATCH EWN

SCIVAL-ELSEVIER (2013) International Comparative Performance of the UK Research Base – 2013. A report prepared by Elsevier for the UK's Department of Business, Innovation and Skills (BIS). October 2013.

Senato (2012a) Bilancio di previsione dello Stato per l'anno finanziario 2013 e bilancio pluriennale per il triennio 2013-2015. Tabella n. 7 Stato di previsione del Ministero dell'istruzione, dell'universita` e della ricerca per l'anno finanziario 2013. Atto del Senato 3585/7

Senato (2012b) SECONDA NOTA DI VARIAZIONI al Bilancio di previsione dello Stato per l'anno finanziario 2013 e bilancio pluriennale per il triennio 2013-2015. Tabella n. 7 Stato di previsione del Ministero dell'istruzione, dell'universita` e della ricerca per l'anno finanziario 2013. Atto del Senato 3585/7-ter

LIST OF ABBREVIATIONS

AgID	Digital Italy Agency
ANVUR	National Agency for the Evaluation of Research
ASI	Italian Space Agency
BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
CINECA	Inter University Consortium for Computational Applications
CIPE	Inter-Ministerial Committee for Economic Planning
CIS3	Third community innovation survey
CIVR	Committee for Evaluation of Research
CNR	National Research Council
CNVSU	National Committee for the Evaluation of the University System
COST	European Cooperation In Science And Technology
CRUI	Conference Of Italian University Rectors
CUN	National University Council
DDL	Law Proposal (Disegno di Legge)
D.lgs	Legislative Decree (Decreto Legislativo)
D.M	Ministry Decree (Decreto Ministeriale)
DG-RTD	Directorate-General for Research And Innovation
DEF	Document of Economic and Financial Policy
DPS	Dipartimento per lo Sviluppo e la Coesione economica
EC	European Commission
EIS	European Innovation Scoreboard
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ERA-PG	ERA-NET on Plant Genomics
ERC	European Research Council
ERC-IDEAS	European Research Council Programme for Investigator Driven Research
ERDF	European Regional Development Fund

ESA	European Space Agency
ESF	European Social Fund
ESFRI	European Strategy Forum On Research Infrastructures
EU	European Union
EU27	European Union Including 27 Member States
EU28	European Union Including 28 Member States
EUFP	European Union Framework Programme
EURATOM	European Atomic Energy Community
FAR	Fund for Applied Research
FCS	Sustanaible Growth Fund
FDI	Foreign Direct Investments
FFO	Ordinary Fund for Higher Education
FOE	Ordinary Fund for Public Research Organisations
FIRB	Basic Research Investment Fund
FIRST	Scientific and Technological Research Investments Fund
FP	Framework Programme
FP7	7th Framework Programme
FTE	Full-time equivalent
GARR	Italian Research & Education Network (Gestione Ampliamento Rete Ricerca Consortium)
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HE	Higher Education
HEI	Higher Education Institutions
HERD	Higher Education Expenditure on R&D
HES	Higher Education Sector
HIT2020	Horizon Italia 2020 (HIT2020)
HRST	Human Resources In Science And Technology
ICT	Information and Communication Technologies

IPR	Intellectual Property Right
ISCED	International Standard Classification of Education
IUC	Innovation Union Competitiveness
IUS	Innovation Union Scoreboard
IDA	Italian Digital Agenda
JRC-IPTS	Joint Research Centre - Institute for Prospective Technological Studies
KT	Knowledge Transfer
MAE	Ministry of Foreign Affairs
MISE	Ministry of Economic Development
MIUR	Ministry of Education, University and Research
NRP	National Reform Programme
NETVAL	Network For The Valorisation of University Research
OB1	Objective Area of The Structural Funds
OECD	Organisation for Economic Co-Operation and Development
PNR	National Research Program
PONs	National Operational Programs
PONREC	National Operational Program 'Research and Competitiveness'
PORs	Regional Operational Programs
PRIN	National Interest Research Program
PROs	Public Research Organisations
QSN	National Strategic Reference Framework
R&D	Research and Development
R&I	Research and Innovation
RI	Research Infrastructures
RTDI	Research Technological Development and Innovation
S&T	Science And Technology
SCI	Science Citation Index
SF	Structural Funds
SME	Small And Medium Sized Enterprise
STC	Science, Technology and Competitiveness
STI	Science, Technology and Industry
VQR	Five-Year Research Evaluation Exercise

European Commission
EUR 26751 EN – Joint Research Centre – Institute for Prospective Technological Studies

Title: **ERAWATCH Country Reports 2013: Italy**

Author(s): Leopoldo Nascia and Mario Pianta

Luxembourg: Publications Office of the European Union
2014 – 64 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1831-9424 (online)
ISBN 978-92-79-39485-0 (PDF)
doi:10.2791/94000

LF-NA-26751-EN-N

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doi:10.2791/94000
ISBN 978-92-79-39485-0

Publications Office