

# ERAWATCH Country Report 2009

Analysis of policy mixes to foster R&D investment  
and to contribute to the ERA

## Italy

Bianca Potì and Emanuela Reale



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ERAWATCH Network – Institute for Economic Research on Firms and  
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Bianca Potì and Emanuela Reale

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## Executive Summary

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As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs. This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. This report aims at supporting the mutual learning process and the monitoring of Member States efforts. Its main objective is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The report builds on the analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

Italy has R&D expenditure underdeveloped when compared with its economic profile. In 2006 GERD/GDP is 1.14% and BERD/GDP is 0.56% with a trend that for both measures during 2000s has remained more or less stable. Private funding of GERD is even lower, 0.40%. The higher level of BERD/GDP (0.60%) have been reached in the past '80s, while the higher level of GERD financed by firms (0.48%) have been reached at the end of '90s (1997). In Italy there is a convergence of opinions on the fact that the competitive situation of the country is highly deteriorated, diagnosis from which started also the National Research Plan (2005-2007). Elements related to this diagnosis, largely shared, are the weakness of the productive and technological specialisation of our country (traditional sectors and medium low technologies), which didn't change or worsened in recent years. Even within traditional sectors Italy shows a gap in comparison with other countries, which can be interpreted as a low propensity of firms, as attitudes and strategic choices, to invest in R&D. The last available Innovation survey results (CIS 2002-2004, ISTAT 2006) show that the percentage of innovating firms on the total number of manufacturing Italian firms (36.4%) is slightly decreased compared to the previous period (1998-2000) in all dimensional area. In the high tech sectors the number of patent application to EPO per million inhabitants was 8 for Italy (28 for EU15) at the beginning of 2000s. As to market funds for innovation, in Italy venture capital to early stages as % of GDP was 0.002 in 2005, while it was ten times (0.022) in EU15. Financial market in Italy is less developed than in other industrialised countries and there is a low firms' demand of capital equity. The rate of birth of high tech oriented firms has had an increase during the second half of '90s, but after 2000 it has strongly decelerated. Italian financial system is closely associated with the banking sector and there is a need of re-drawing the rules these institutions apply to assess the viability of innovative projects, in order to combine the current rating methods based on financial and balance sheet performance with forms of technological rating.

Summarising the main national barriers to Lisbon process are:

- R&D expenditures have not grown substantially

- Securing long term investment through institutional funding suffered for the lack of continuity from one year/government to the next
- Weak R&D private investments as well as innovative financial instruments to R&D
- Low career perspectives for researchers and for attracting foreign scholar

The dialogue between research and industry is still not satisfactory, given the large number of SMEs and their still low absorptive capacity. EIS indicators show poor performance of Italy in international comparison: the cooperation between firms or between firms and research centers registers an indicator which is half the EU average, showing a persisting difficulty of the SMEs' Italian system to activate virtuous exchange processes to acquire research results and external knowledge

The Italian total State aid showed a slight upward trend in the most recent years (+1.1%), even if lower than the average EU25 (+1.8%). This upward of the State aid for research and development is given to additional R&D funding brought by Large Strategic Programmes managed by MIUR and by the Industria 2015 initiative, launched by 2007 Financial law. These two instruments represent a change in the direction of a more top down oriented R&D policy.

Since 2005 Italian R&D State aid has been interested by reforms and innovations, which have been introduced mainly by Financial Laws, NRP and the last QSN. Governance coordination has been pursued through the unification of different funds and measures under three main Funds: FIRST (for scientific, basic and industrial applied research) under MIUR; Fund for the Competitiveness (for development and innovation projects) and Fund for Enterprise Financing, both under the Ministry of Economic Development. At present only the second is operative. Moreover Structural Funds and the national Fund for underdeveloped regions (FAS) have been unified and the reinforcement of a unitary regional policy is pursued by the QSN (2007-2013). "Innovation and research", one of the priorities of the QSN (2007-2013), has been reinforced and represents 14.0% of the total appropriation for the Mezzogiorno regions, while appropriation for "Competitiveness" represents 16% and 9% is for "Education".

The main components of the present policy mix are: stimulating higher R&D investment in R/D performing firms and increasing extramural R&D carried out in cooperation with public sector. As to this last policy, it has received attention since the reform (L.46/1982) of the Fund for Applied research, but with scarce results. More recently, within the last (L. 297/1999) reform of the Fund for applied research financial incentives include facilitations (higher quota of grants) when the project is in collaboration with the public sector and a first evaluation shows a relevant increase of collaborative projects from one to the other policy cycle (L.46/82 and L 297/99). Moreover the fiscal measure (art 14, included within the Fund for Applied Research) concern the support to SMEs collaborating with public research institutions, but its implementation has been regulated only by 2007 Budget Law and an evaluation is still lacking.

Three important changes in the Italian policy mix have to be underlined

- an increasing orientation towards targeted and mission oriented programmes;
- an emerging attention and support to new technology based firms;
- a recommended (QSN, 2007-2013) linkage between the development policy and the R&D and innovation policy, a relevant aspect, since a high bulk of resources in Italy is devoted to Mezzogiorno and underdeveloped areas.

A still less developed aspect of the policy mix is stimulating firms that do not perform R&D yet; this “Route 3” lacks a clear cut strategy and it is left to the horizontal measures of financial support (within Fund for Applied research and within L 488 Research) which, even if can perform well (but an evaluation of this two measures is still lacking) doesn’t seem changing significantly the R&D effort within Italian SMEs. The present policy mix, as it results from recent changes and reforms, is moving in the right direction, facing some of the national system weakness. What is to be remarked, nevertheless, is that Italy is far away from the Lisbon target and that a strong pro active Government behaviour is asked, including an efficient implementation of the measures (availability of resources, less time gap between demand and fund allocation), continuity of policy and revisions based on an empirical evidence and systemic evaluation (i.e. regular and including the evaluation of mix of measures devoted to similar aims). Two specific aspects, more related to policy mix governance, have to be underlined: the coordination between the Ministry of University and Research and the Ministry of Economic Development interventions needs to be improved, overcoming the traditional separation within the country’s national system between research and innovation; the Structural Funds play a key role in the present policy mix and a good monitoring of their use towards more R&D based initiatives needs to be assured. A new and more structured interest for the financial institutions role in R&D activities has emerged and this shows a cultural change in the national policy making. The national RDI system needs to be pushed out of its simple reproduction; what cannot be forgotten is that a modernisation of the country’s productive and technological specialisation needs the contribution of a large number of actors and that the forgotten side of the policy mix, the non performing R&D firms, are a large part of the system, needing to be re-oriented towards product and R&D based innovation.

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Low number of SMEs performing R&D	The policy mix lacks still a clear strategy toward improving SMEs investment towards research activity; fiscal measures, devoted to this scope can reproduce the present specialization of the country
Low number of start ups in high tech sectors; need of seed and risk capital	The reorganization of the policy towards start ups and venture capitalists offers good opportunities. But two weak aspects concern the time (the foreseen fund is not operative yet), the generally low treatment of capital gains, which doesn’t incentive risk investments and the duplication of efforts, since there are specific measures for high tech firms in South regions.
Large weight of resources invested in underdeveloped areas, asking for a better focus on Research and innovation	The QSN 2007-2013 has focused on research and innovation (second priorities): this represents an important opportunity of addressing the large amount of resources available for underdeveloped regions in a non contrasting with the rest of the country direction.
Separation between productive specialization and research specialization	The policy mix in the past has shown low selective capacity, in terms of a low role for the State in orienting the RDI investments and selecting best projects. In presence of scarce public resources more targeted and selective initiative are now part of the policy mix. The important aspect relate now to their implementation.

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Knowledge transfer policy of university still more oriented to contracts or licensing patents instead than on collaborations	The relation between TTOs and local initiatives such as technology park or incubator (where the gap between knowledge supply and demand can be matched) is still not enough developed. The new University transfer policy can be too less oriented towards the needs of SMEs. The scarce differentiation of University in Italy can reduce linkages with local productive demand.
Under developed national patent system	The National Patent Office is in an on going reform that represents a fundamental step towards a more diffused culture and use of IPRs

The awareness about ERA issues is growing up in Italy. It goes with the reinforcement of the importance given in the policy documents to the internationalisation of research, to the promotion of young brilliant researchers, to the pursuing of excellence of institutions and programmes as well as to the mobility of people around Europe.

The contribution of national policy to ERA is mainly focused on the implementation of policies on research labour market and related to the autonomy of research institutions. As to the first, the foreseen evolution is towards enhancing inward and outward mobility as well as to implementing a salary differentiation based on merit. As to the latter one, excellence of research institutions is pursued through improving efficiency and effectiveness of the management, as well as the quality of the research recruitment and output.

At present policies promoting national research programmes, which need a more intensive monitoring of the implementation strategies, have minor importance.

Main challenges for the R&D system towards ERA development are represented by the traditional low investment of Italy in R&D; in addition the present economic crisis does not allow substantial mobilisation of resources. Italian government intends to face the financial constraints through measures aimed at rationalise the system, at saving resources through eliminating inefficiencies, avoiding duplication of research effort, as well as concentrating resources on the most promising initiative in terms of integration at European level. The financial crisis and the lack of adequate funding resources to sustain the reform process toward a higher integration of labour market, research infrastructures, research institutions and national programmes, represent strong barriers for the realisation of ERA policies.

	<b>Short assessment of its importance in the ERA policy mix</b>	<b>Key characteristics of policies</b>
Labour market for researchers	<ul style="list-style-type: none"> <li>• Policies for opening up the national labour market of researchers through enhancing inward and outward mobility have a relevant place in the government programme</li> <li>• Promotion of employability of women is almost non-existent in the government priority setting</li> <li>• Salary differentiation based on merit is an important issue of the government agenda still to be implemented</li> </ul>	<ul style="list-style-type: none"> <li>• Good legislative framework for the social security, pension, health assurance and visa for third countries.</li> <li>• Weak incentives for attracting non-national researchers (attractiveness mainly based on research institutions' own budget)</li> <li>• Ineffective uptake of the Charter of researchers</li> </ul>
Governance of research infrastructures	<ul style="list-style-type: none"> <li>• Good participation to the EUFP initiatives in order to open RI to international participation</li> <li>• Difficult to assess the national investment on RI because there is not a dedicated fund</li> </ul>	<ul style="list-style-type: none"> <li>• Italy has traditionally a bottom-up strategy, but not a dispersed one, since participation is mainly driven by the sectors more integrated at international level</li> <li>• Lack of government initiatives for governance arrangements of RI</li> </ul>
Autonomy of research institutions	<ul style="list-style-type: none"> <li>• Strong importance of measures aimed at shaping autonomy of universities through competitive funding and evaluation</li> <li>• Making excellent research institutions competitive at European level is a key government priority</li> </ul>	<ul style="list-style-type: none"> <li>• Emphasis on efficiency and effectiveness in the use of resources</li> <li>• Reinforcing the linkages between resource allocation and evaluation is a fundamental instrument for enhancing the merit</li> </ul>
Opening up of national research programmes	<ul style="list-style-type: none"> <li>• Opening up strategies not yet well developed at government level</li> <li>• Monitoring of the strategies implementation is weak</li> </ul>	<ul style="list-style-type: none"> <li>• Policies are mainly concentrated at the ministerial level</li> <li>• Difficult to involve firms in new joint initiatives for their low propensity to invest in research activities</li> </ul>



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## 1 Introduction

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As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs.<sup>1</sup> This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. For the period 2008 to 2010, this focus is confirmed as main policy challenge and the need for more rapid progress towards establishing the European Research Area, including meeting the collective EU target of raising research investment to 3 % of GDP, is emphasised.

A central task of ERAWATCH is the production of analytical country reports to support the mutual learning process and the monitoring of Member States' efforts in the context of the Lisbon Strategy and the ambition to develop the European Research Area (ERA). The first series of these reports was produced in 2008 and focused on characterising and assessing the performance of national research systems and related policies in a comparable manner. In order to do so, the system analysis focused on key processes relevant for system performance. Four policy-relevant domains of the research system have been distinguished, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain has been guided by a set of generic "challenges", common to all research systems, which reflect possible bottlenecks, system failures and market failures which a research system has to cope with. The analysis of the ERA dimension still remained exploratory.

The country reports 2009 build and extend on this analysis by focusing on policy mixes. Research policies can be a lever for economic growth, if they are tailored to the needs of a knowledge-based economy suited to the country and appropriately coordinated with other knowledge triangle policies. The policy focus is threefold:

- An updated analysis and assessment of recent research policies
- An analysis and assessment of the evolution of national policy mixes towards Lisbon R&D investment goals. Particular attention is paid to policies fostering private R&D and addressing its barriers.
- An analysis and assessment of the contribution of national policies to the realisation of the ERA. Beyond contributing to national policy goals, which remains an important policy context, ERA-related policies can contribute to a better European level performance by fostering, in various ways, efficient resource allocation in Europe.

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<sup>1</sup> COM(2007) 803 final, "INTEGRATED GUIDELINES FOR GROWTH AND JOBS (2008-2010)", [http://ec.europa.eu/growthandjobs/pdf/european-dimension-200712-annual-progress-report/200712-annual-report-integrated-guidelines\\_en.pdf](http://ec.europa.eu/growthandjobs/pdf/european-dimension-200712-annual-progress-report/200712-annual-report-integrated-guidelines_en.pdf)

## 2 Characteristics of the national research system and assessment of recent policy changes

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### *2.1 Structure of the national research system and its governance*

#### **Main actors and institutions in research governance**

In Italy the Ministry for Education University and Research<sup>2</sup> (MIUR) coordinates national and international scientific activities, distributes funding to universities and research agencies, and establishes the means for supporting public and private research and technological development (RTD) funding. MIUR coordinates the preparation of the triennial National Research Programme (NRP), the main governmental document for R&D planning that sets the strategic lines for the national system. It does this by interacting with all other interested stakeholders, including other Ministers. Since 2007 MIUR has been included in the Inter-ministerial Committee for Economic Planning (CIPE).

CIPE is the highest level of S&T policy coordination, especially competent on inter-sector and medium-term interventions; its role became more effective after a special section dedicated to research and education was created during the last decade. CIPE examines the document of economic and financial policy (DPEF). The document establishes strategic direction and priorities for scientific and technological research, financial resources and coordination among different public administrations, universities and research institutes. It includes the economic and financial measures for the following year, and is submitted by the Ministers' Cabinet to the Parliament each year.

The Minister for Economic Development (previously called Ministry for Production Activities) supports and manages industrial innovation. In 2007 there was a reform of the Minister, which is now organised in three Departments, corresponding to the Minister's three missions: competitiveness promotion; development and cohesion; market regulation. The Department devoted to Competitiveness is in charge of technological innovation and responsible for industrial policy, industrial districts, energy policy, policies for SMEs and support instruments for the productive system. Moreover a new department with the mission of evaluating the support instruments managed by the Ministry has been set up at IPI (Institute for Industrial Promotion) which gives technical assistance to the Ministry.

Other Ministries (Health, Agriculture, etc) manage research funding in their specific fields.

Public Research Organisations (PROs) play a very significant role in the research sphere. There are ten PRO's acting in the Italian scenario with a major role, out of which the most significant are:

- The [National Research Council](#) (CNR), the main national research organisation working in all scientific disciplines, which acts both as research performer and

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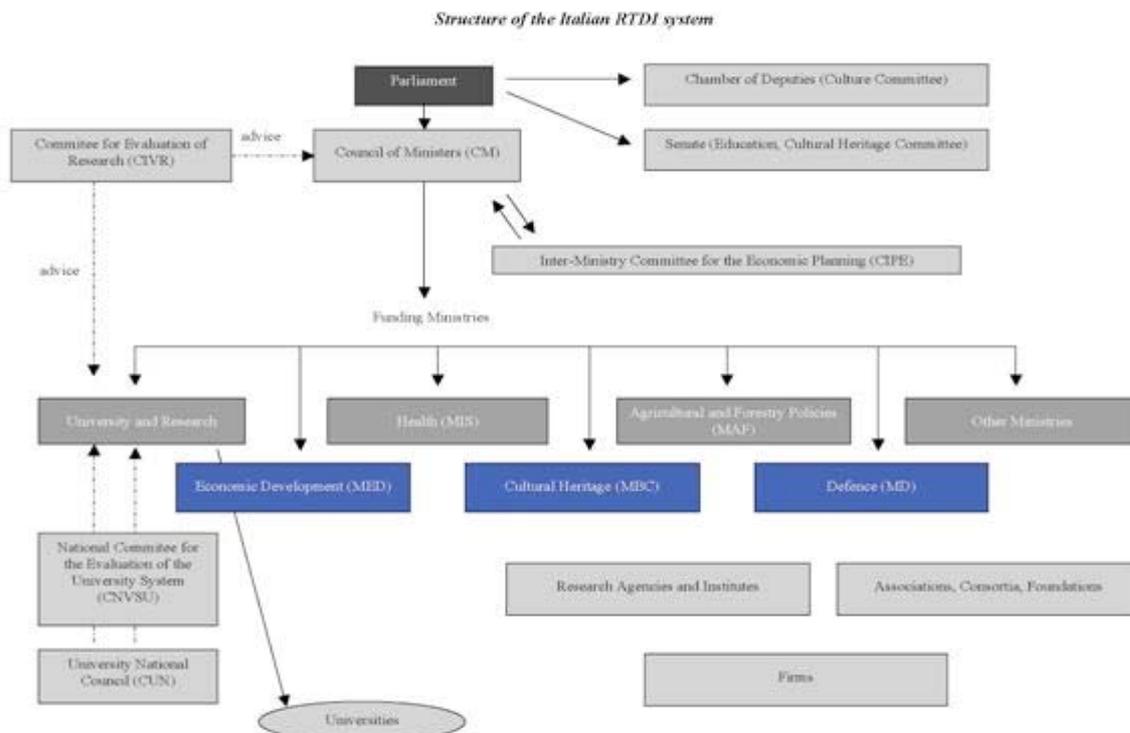
<sup>2</sup> After general political elections in April 2006, MIUR (Ministry for Education, University and Research) has been divided into two separate Ministries: the Ministry for University and Research (MiUR) and Ministry for Public Education. The new centre-right coalition merged again the two Ministries

funder (although its funding role has considerably diminished after 1989, when MiUR became the main actor in R&D).

- The [National Agency for New Technologies, Energy and Environment](#) – ENEA-, operating in the fields of energy, the environment and new technologies to support national competitiveness and sustainable development.
- The [National Institute for Nuclear Physics](#) –INFN- dedicated to the study of the fundamental constituents of matter and conducting theoretical and experimental research in the fields of subnuclear, nuclear, and astroparticle physics. It manages large scale equipments and participates in CERN activities.
- The [Italian Space Agency](#) – ASI- in charge of coordinating all national efforts and investments in the space sector.

The national committee for the evaluation of the university system (CNVSU), belonging to MIUR, is an advisory body in charge of the evaluation of the university system; the committee for evaluation of research (CIVR) is an independent body in charge of the evaluation of research. CNVSU and CIVR committees will be replaced in their role and functions by a National Agency for the Evaluation of the University and Research (ANVUR), established by the 2007 Financial Law with a budget of €5m. The Agency's regulation and operational functioning have been recently defined by the Decree n.64/2008, but ANVUR is not yet operative: the Ministry of University and Research has blocked its implementation, since the present ANVUR design is considered too expensive and scarcely flexible. Waiting for a revision of Agency, CIVR and CNVSU are reconfirmed as the operational bodies devoted to the evaluation of research.

A National Innovation Agency, foreseen in the 2006 Budget Law, has been officially set up in January 2008. Its role is to evaluate (*ex ante* and *in itinere*) the industrial innovation projects related to Industria 2015.

**Figure 1: Overview of the governance structure of the Italian research system**


Source: [ERAWATCH Research Inventory](#)

### The institutional role of the regions in research governance

The division of competences between State and regions in the R&D field is based on the concurrency principle: both central and regional authorities can legislate, however a series of interventions are exclusive competence of the central State,

Three typologies of intervention can be identified:

1. exclusively regional interventions, i.e. those mainly related to local development;
2. exclusively state interventions, those related mainly to the support of universities and public research institutions, as well as to large strategic programmes and their coordination;
3. some simultaneous responsibilities, in the area of regional interventions with larger scope (such as technological districts).

Co-ordination between State and regional policy activities is ensured through the work of a permanent State-Regions committee.

Regional policy at national level, including R/D activities as critical component (horizontal measures for competitiveness), are additional to ordinary budget and consists of co-funding of structural funds (national and regional operational programs, PONs and PORs) and a fund for under-exploited areas, FAS (recently included by the 2007 Financial Law within a new larger "Fund for competitiveness and development").

The National Strategic framework for the regional policy (QSN 2007-2013), which has been approved by CIPE in December 2006, is the product of a long process of

interaction among central Administrations, Regions, other Local authorities and representatives of socio-economic stakeholders, followed by a formal negotiation with the European Commission (the QSN final version is of 12 June 2007). This regional policy governance includes actions of strategic coordination between State and Regions and activities of monitoring, evaluation and strategic reporting. One of the aims is to avoid effects of crowding out or competition between geographical areas or incentives.

### Main research performer groups

Universities in Italy carries out a high share of national R&D activity, larger than the EU average (30.2% of total R&D national expenditure in 2006, while at EU-27 it is 21.9) (Eurostat, 91/2008). There are 89 universities in Italy, of which the majority is public (54 State universities). Also public research institutions perform a share of the national R/D (17.3% in 2006) higher than the EU-27 average (13.5%). Public research institution expenditure in 2006 was equal to approximately €2.701m.

Italy traditionally faces the problem of low business R&D investment, highly concentrated in large firms. 82% of intra-muros R&D expenditure is made by enterprises with over 250 employees (ISTAT, 2006). The role of the large industrial groups is crucial for the innovative performance of the national system. The top six private Italian R&D investors are: Fiat, Finmeccanica, ENI, Enel, Pirelli, Telecom Italia. Since 2000 R&D the activity of two privatised state monopolies (Telecom and Enel) has decreased. Some medium size group show now an increasing R&D intensity (Mariotti et al., 2006). The % of the national R&D expenditure carried out by business enterprises is 50.36% in 2006, far from the EU-27 average (63.67%).

**Table 1: Overview of R&D funders and performers (as % of GERD) in 2006 in Italy and in EU 27**

	Italy	EU 27
<b>GERD financed by GOV (% of total GERD)</b>	48.3	34.2
<b>GERD financed by enterprise (% of total GERD)</b>	40.4	54.5
<b>GERD financed by abroad (% of total GERD)</b>	8.3	9.0
<b>R&amp;D performed in Business Sector (BERD as % of GERD)</b>	50.36	63.67
<b>R&amp;D performed in Higher Education Sector (HERD as % of GERD)</b>	30.2	21.89
<b>R&amp;D performed in Government Sector (GOVERD as % of GERD)</b>	17.3	13.5

Source: Eurostat 2008 Statistics in focus

## 2.2 Summary of strengths and weaknesses of the research system

The analysis in this section is based on the ERAWATCH Analytical Country Reports 2008 which characterised and assessed the performance of the national research systems. In order to do so, the system analysis focused on key processes relevant for system performance. Four policy-relevant domains of the research system have been distinguished, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain has been guided by a set of generic "challenges", common to all research systems, which reflect possible bottlenecks, system failures and market failures a research system

has to cope with. The Analytical Country Report for the specific country can be found in the [ERAWATCH web site](#).

The main strengths of the national research systems can be summarised in:

- the good quality of scientific production;
- the large openness to international collaborations;
- the strength of the central policy institutions and the emerging role of some well performing local governments;
- the good resource mobilization for European research initiatives.

The main weakness affecting the country research system deals with resource mobilisation: in particular the system doesn't assure enough resources for long and short term research investment. Notwithstanding a good normative system, recently improved through simplification, the implementation of policy measures suffer for the unavailability of adequate new resources from public actors. The stop and go in financially supporting the new policy instruments, summed with the correlated delays in the instruments implementation produce uncertainty and distrust within private actors, who are mainly SMEs. A relevant system failure is the reciprocal distance between the (still low developed) financial institutions and SMEs or start up initiatives. The mix of these behaviours produces blocking effects on the system and reduces both the quality and the exploitability of knowledge production.

**Table 2: Summary assessment of strengths and weaknesses of the national research system**

Domain	Challenge	Assessment of strengths and weaknesses
Resource mobilisation	Justifying resource provision for research activities	Research is a widely recognised policy priority but R&D expenditures have not grown substantially
	Securing long term investment in research	Capability to mobilise resources for European research initiatives is strong, but securing national long and short term investment through institutional funding suffered for the lack of continuity from one year/government to the next
	Dealing with barriers to private R&D investment	R&D private investments as well as innovative financial instruments to R&D are weak
	Providing qualified human resources	Lack of career perspectives for researchers and for attracting foreign scholars.
Knowledge demand	Identifying the drivers of knowledge demand	Good capacity of society and research sector as drivers of knowledge demand. Scarce participation of private stakeholders in knowledge demand articulation and low level of public procurement
	Co-ordination and channelling knowledge demands	Strong central set of policy instruments aimed to coordinate and channelling knowledge demand, go with weak links between assessments/evaluations and inputs into knowledge demand
	Monitoring of demand fulfilment	Weak tradition of evaluation and foresight practices can be overcome through the policy initiative of an Agency for the Evaluation of university and research (ANVUR). At present the Agency implementation has been stopped by the Minister of Research and the previous organizations (CNVSU and CIVR) continue to be operative, but the impact on a quota of the FFO allocation (7%) has been introduced.

Domain	Challenge	Assessment of strengths and weaknesses
Knowledge production	Ensuring quality and excellence of knowledge production	Good quality of scientific production, but there is still a difference between quantity and quality recognition; Good openness to international collaboration.
	Ensuring exploitability of knowledge	Gap between scientific and research specialisation on one side and technological/economic specialisation on the other.
Knowledge circulation	Facilitating circulation between university, PRO and business sectors	Scientific community has shown interest for TT incentives Growing participation in international research programmes.
	Profiting from international knowledge	The international mobility of researchers is low
	Enhancing absorptive capacity of knowledge users	SMES absorbing capacity is still low

### 2.3 Analysis of recent policy changes since 2008

The contribution of research and research policies to Lisbon goals (as well as to other societal objectives) goes beyond the fostering of R&D investment. It is therefore important to also analyse how other remaining shortcomings or weaknesses of the research system are addressed by the research policy mix. The focus of the section is on the analysis of main recent policy changes which may have a relevant impact on the four policy-related domains.

#### 2.3.1 Resource mobilisation

The 2008 Financial Law did not introduce significant new provisions for R&D, apart from establishing the overall budget for public funding and upgrading the R&D tax allowance for firms performing research activity in collaboration with University to 40% (instead of 15%) and upgrading the ceiling of tax reduction to 50 millions per firm per year (instead of 15 millions). All the other measures of interest (which can impact on R&D) are “non bringing additional public expenditures”.

A new three year Plan for the Development passed<sup>3</sup> on 18/06/08, which stated an enlargement of fields coverage of the “Industria 2015” Programme. Three Industrial Innovation Projects have been officially announced in the areas of energy efficiency (endowed with €200m) sustainable mobility (€180m), and new technology for the “made in Italy” (€190m of which €25m for SMEs).

A new DPEF (2009-2013) passed the 18 June 2008. It stated the creation of a Fund of Investment for infrastructure and its introduction in the provisional budget of the Ministry for the Economic Development since 2009. This fund is finalised to financing intervention of national strategic infrastructures empowerment, including telecommunication and energy. The fund is fed by the national appropriation for the implementation of the QSN (2007-2013) devoted to national strategic programmes, with the constraint of concentrating 85% of national investments in Mezzogiorno regions. The measure aims to reduce the dispersion and to concentrate the resources of the national Fund for underdeveloped areas (FAS), one of the two financial components of the Italian “regional policy” on strategic investments.

<sup>3</sup> See [http://www.governo.it/GovernoInforma/Dossier/piano\\_triennale\\_sviluppo](http://www.governo.it/GovernoInforma/Dossier/piano_triennale_sviluppo)

### Changes in National Reform Programme regarding the role of research in the broader economic growth strategy

A simplification and concentration of funds is pursued through the unification of Structural Funds and the national Fund for under-utilised regions (FAS) in the QSN (2007-2013). The reinforcement of a unitary regional policy is pursued. One of the priorities of the QSN (2007-2013) is “Innovation and research”, which has been reinforced and represents 14% of the total appropriation for the Mezzogiorno regions, while appropriation for “Competitiveness” represents 16% and 9% is for “Education”. QSN (2007-2013) investments are €124b of which €1.016b are devoted to Mezzogiorno regions and around €21b to North Center regions.

QSN (2007-2013) appropriation in € billions

	Structural Funds	National co-funding	FAS	Total
North Center regions	4.9	7.5	9.7	
Mezzogiorno	23.0	23.9	54.7	
				124

Source: QSN in DPEF 2008-2011

Actions that could improve the system’s quality (foreseen in previous budget laws, but becoming operative now and newly introduced measures) are:

- Rationalisation of various existing funding instruments (foreseen in the 2007 Budget Law). Among the new three Funds, the Fund for investment in scientific research and development (FIRST), which was endowed with €300m per year for 2007 and 2008 and €360m for 2009, has not become operative yet. The Fund for Competitiveness has become operative in 2008 through a Ministerial decree and it was endowed by 2007 Budget Law with €1.1b for the period 2007 to 2009. The Fund for Enterprise Financing, aimed to facilitate the access to credit by SMEs and to rationalize the functioning of the public guarantee funds and risk (venture) capital funds, also foreseen in the 2007 budget law and endowed with €300m for the period 2007-2009, has not become operative yet.
- Procedures for placing young researchers into university roles have been introduced under the Extraordinary Plan for Recruitment of Researchers contemplated by the 2009 Budget Law, for which €40m has been allocated;
- Tax exemption for high tech enterprises has been included in the 2008 Budget law, consisting in a reduction of social security payments for R&D personnel employed in high tech start ups; but it is not operative yet.
- The creation of Funds for investments, with the participation of public, institutional and private investors and through an integrated system of national and local investment funds, is devoted to the development of investment programs in productive initiatives with a high content of innovation (Budget law 2009). A decree of the Ministry of Economic Development, in accordance with the Ministry of Economics and Finance will regulate the modalities of implementation of the investment funds. The management of the intervention will be given, through a specific agreement, to a new national “Agency for attracting investments and for the development of firms” under the control of the Ministry of Economic Development. It is foreseen that private investments will be complemented by functional infrastructural investments.

**Table 3: Main policy changes in the resource mobilisation domain (since 2008)**

Challenges	Main Policy Changes
Justifying resource provision for research activities	<ul style="list-style-type: none"> <li>The role of research is recognised in the recent policy documents (NRP and DPEF 2008-2013).</li> </ul>
Securing long term investments in research	<ul style="list-style-type: none"> <li>Establishment of a Fund for infrastructure investments in the provisional budget of the Ministry for the Economic Development, since 2009, fed by the resources for the QSN (2007-2013) devoted to strategic programmes.</li> <li>Implementation of the new strategic planning of structural funds</li> </ul>
Dealing with uncertain returns and other barriers	<ul style="list-style-type: none"> <li>An upward of fiscal credit for R&amp;D when firms collaborate with university (2008 Financial Law);</li> <li>Funds for investment devoted to productive investments with a high content of innovation (Budget Law 2009)</li> </ul>
Providing qualified human resources	<ul style="list-style-type: none"> <li>Extraordinary Plan for Recruitment of Researchers contemplated by the 2009 Budget Law goes with a limitation of the possibility of Universities to decide positions to be opened using the resources made available through the turn-over</li> </ul>

### 2.3.2 Knowledge demand

Major changes (since 2007) looking at a better coordination of knowledge demand have been:

- the formulation of a more integrated industrial and innovation policy through the mandate to the Ministry of Economic Development of giving the innovation policy direction and the implementation of large industrial innovation projects in sectors considered strategic for the country competitiveness (Industria 2015, budget law 2007); the 2008 activity has been concentrated on the operational start up of tender procedures
- a better coordination of innovation and convergence policy has been indicated as a key goal in the new National Strategic framework for the regional policy (QSN 2007-2013). The regional policy governance includes also actions of strategical coordination between State and Regions.

A more diffused action of monitoring is foreseen and implemented in different Programs:

- L 297/99 (Fund for Industrial Applied Research. FRA): an *ex ante*, *in itinere* and *ex post* evaluation is foreseen, even if without a dynamic character, i.e. without direct consequences on the evaluated project;
- A new department with the mission of evaluating the support instruments managed by the Ministry of Economic Development has been set up at IPI (Institute for Industrial Promotion) which gives technical assistance to the Ministry
- Activities of monitoring, evaluation and strategical reporting are foreseen for the regional policy (QSN 2007.2013). One of the aims is to avoid effects of crowding out or competition between geographical areas or incentives.

**Table 4: Main policy changes in the knowledge demand domain**

Challenges	Main Policy Changes
Identifying the drivers of knowledge demand	<ul style="list-style-type: none"> <li>No recent changes in this area</li> </ul>
Co-ordinating and channelling knowledge demands	<ul style="list-style-type: none"> <li>The top-down system for coordinating and channelling knowledge demands was implemented through the up to date of DPEF (2008-2013) and the annual budget laws 2007 and 2008</li> </ul>
Monitoring demand fulfilment	<ul style="list-style-type: none"> <li>Decree 64/2008 established the internal regulatory scheme of the National Agency for evaluation of university and research. The Ministry of Economic Development has improved its system of monitoring and evaluation of industrial and innovation incentives.</li> </ul>

### 2.3.3 Knowledge production

Recent (2008-2009) policy changes deal with a higher attention to supporting the high tech start ups and to improve the national patent system.

Establishment of a fund for public participation in risk capital of enterprises operating in high technology sectors (information technology, electronics, nanotechnologies and micro technologies, electromedical instruments, high technology mechanics for industrial automation). Announced in the Second Action Plan for ICT launched in 2005 (IT 55, High-tech funds for SMES) the measure become operative in 2008. The available fund amounts to €86m.

The Italian Patents and Trademarks Office coordinates a project for the re-qualification of national patents, thanks to the introduction of the anteriority search (operative since 1 July 2008) left up to the European Patent Office (EPO). The introduction of this new, important element has been flanked by other developments to ensure the efficiency of the process.

A 2008 initiative deals with channelling towards the national Fund for basic research projects (FIRB) national projects positively evaluated by the ERC- IDEAS programme, but not funded.

The rules for the organisation of the Agency for the evaluation of the University and Research System (ANVUR) was established by the law 286/2006 and approved with the decree of the President of the Republic n. 64/2008. The Agency should be charged with the task of evaluating the quality of the research activities carried out by universities and public and private research entities. At present the Agency implementation has been blocked by the Minister of Research and the previous organizations (CNVSU and CIVR) are still operational. The results of their assessment will serve as the criterion of reference for the allocation of state financing to universities and research entities. The objective is to reward the most meritorious entities and to highlight the value of excellence, allowing the R/D evaluation becoming a more effective instrument, by driving the allocation of an additional amount of resources (representing 7% of FFO).

Since 2005 there has been the implementation of the mission oriented or targeted measures, foreseen in the National Research Plan (2005-2007), such as the large Strategic Programmes. This line (top down R&D funding) has been further improved by the Industrial Innovation Projects (Industria 2015).

**Table 5: Main policy changes in the knowledge production domain**

Challenges	Main Policy Changes
Improving quality and excellence of knowledge production	<ul style="list-style-type: none"> <li>• Measures for supporting high tech start ups and the national patent system;</li> <li>• The national strategic programme Firb-Ideas aimed at financing national projects positively evaluated by ERC-Ideas programmes but not funded</li> <li>• The empowerment of the evaluation of academic and research system</li> </ul>
Ensuring exploitability of knowledge production	<ul style="list-style-type: none"> <li>• Promotion of mission oriented programmes.</li> </ul>

### 2.3.4 Knowledge circulation

The 2008 budget law has raised the ceiling of the R&D tax credit for research contract assigned by firms to universities and public research organizations: the aim is to promote closer networking between the business and science communities. The instruments became operative the 17 April 2008. This indirect instrument (tax credit) has more generally the aim of enhancing the SMEs R/D level and their capacity of (external knowledge) absorbing.

A National Innovation Agency, foreseen in the 2006 Budget Law, has been officially set up in January 2008. Its role is to evaluate (ex ante and in itinere) the industrial innovation projects related to Industria 2015. The Agency will have also the aim of identifying and diffusing knowledge, technologies and patents among enterprises with a special focus on SMEs. The purpose is to strengthen the dialogue between industry and research world.

The three year Development Plan (approved by the Council of Ministries the 18 June 2008) has included an extension of the measures supporting the geographical based industrial districts to networks of firms (free aggregations of firms). The regulation will be established in accordance with the Permanent Conference for the relations between State and Regions.

**Table 6: Main policy changes in the knowledge circulation domain**

Challenges	Main Policy Changes
Facilitating knowledge circulation between university, PRO and business sectors	<ul style="list-style-type: none"> <li>• Fiscal measures sponsoring the linkages between academia and industry (art 14/law 297,1999) have been reinforced</li> <li>• Extension of supporting measures for industrial districts to networks of firms (three years Development Plan 2008)</li> </ul>
Profiting from access to international knowledge	<ul style="list-style-type: none"> <li>• No relevant changes</li> </ul>
Absorptive capacity of knowledge users	<ul style="list-style-type: none"> <li>• R&amp;D fiscal measures aimed at enhancing the general (and specifically of SMEs) R&amp;D level</li> </ul>

## 2.4 Policy opportunities and risks related to knowledge demand and knowledge production: an assessment

Following the analysis in the previous section, this section assesses whether the recent policy changes respond to identified system weaknesses and take into account identified strengths.

The main weakness affecting the country research system deals with resource mobilisation: in particular the system doesn't assure enough resources for long and short term research investment. Notwithstanding a good normative system, recently improved through simplification, the implementation of policy measures suffer for the unavailability of adequate new resources from public actors.

**Table 7: Summary of main policy related opportunities and risks**

Domain	Main policy related opportunities	Main policy-related risks
Resource mobilisation	<ul style="list-style-type: none"> <li>• A rationalisation of the policy mix, driving to reducing inefficiency and giving a better coordination</li> </ul>	<ul style="list-style-type: none"> <li>• Low investment in R&amp;D and lack of additional resources.</li> </ul>
Knowledge demand	<ul style="list-style-type: none"> <li>• Top down measures channel a research demand that can have a positive impact on structural change</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination between Ministers (of University and Research and of Economic development) is still weak and can bring duplications.</li> </ul>
Knowledge production	<ul style="list-style-type: none"> <li>• Mission oriented programmes, including public-private collaborations can produce quality results.</li> </ul>	<ul style="list-style-type: none"> <li>• The evaluation of research activities and projects is not enough implemented and don't support enough policy design</li> </ul>
Knowledge circulation	<ul style="list-style-type: none"> <li>• The public-private collaborations have been improved</li> </ul>	<ul style="list-style-type: none"> <li>• The separation between the transfer policy of research public institutions based on patents and licenses and SME's demand. The absorptive capacity of SMEs needs to be further improved.</li> </ul>

### 3 National policy mixes towards R&D investment goals

The aim of this chapter is to deepen the analysis of national policy mixes with a focus on public and in particular **private R&D investment**. The Lisbon strategy emphasises an EU overall **resource mobilisation objective** for 2010 of 3% of GDP of which two thirds should come from private investment. R&D investment is seen as important yardstick for the capacity of an economy to turn the results of science and research into the commercially viable production of goods and services and hence knowledge into growth. Corresponding investment policies are mainly pursued at national level and determined with a national focus.

The chapter is structured around five questions:

1. What are the specific barriers in the country that prevent reaching the Lisbon goal? What barriers exist in the country to prevent reaching the specific targets, particularly related to the private sector R&D investments?
2. Given the above, what are the policy objectives and goals of the government that aim to tackle these barriers?
3. What Policy Mix routes are chosen to address the barriers and which specific instruments and programmes are in operation to implement these policies?

4. What have been the achievements in reaching the above mentioned R&D investment objectives and goals?
5. What are the reasons for not reaching the objectives, adaptation of the goals?

The chapter aims to capture the main dimensions of the national policies with an emphasis on private R&D investment. The chosen perspective of looking at investments in R&D is the concept of Policy Mixes. The analysis and assessment follows a stepwise approach following the five questions mentioned above.

### ***3.1 Barriers in the research system for the achievement of R&D investment objectives***

The first barrier to reaching Lisbon target is the starting level of resource mobilisation in the country: in 2006 GERD/GDP is 1.14 and BERD/GDP is 0.56 with a trend that for both measures during 2000s has been more or less stable. In Italy there is a convergence of opinions on the fact that the competitive situation of the country is highly deteriorated, diagnosis from which started also the National Research Plan (2005-2007). Elements related to this diagnosis, largely shared, are the weakness of the productive and technological specialisation of our country (traditional sectors and medium low technologies), which didn't change or worsened in recent years. Starting from the half of '90s the process of convergence of our country to the European Union has been reversed (Sapir, 2005). Analyses (MIUR, 2005; Mariotti et al, 2006) put into evidence that even within traditional sectors our country show a gap in comparison with other countries, which can be interpreted as a low propensity of firms, as attitudes and strategic choices, to invest in R&D.

Two main barriers in the Italian research system are:

- the low number of SMEs doing R&D activity;
- the low number of New Technology Business Firms (NTBFs): the rate of birth of new firms oriented to R&D based innovation (NTBFs) grew in the second half of '90s until 2000, followed by a strong reduction (RITA Observatory, Politecnico, Milano, 2005).

As to human resources, Italy has one of the lowest share of researchers in the OECD area: 3.4 per 1000 total employment compared to 7.3 for OECD area and average annual growth for researchers was negative from 1996 to 2005 at -0.1%. (OECD, MSTI, 2008).

Another barrier is represented by the firms' innovation behaviour: process innovation is confirmed as the prevailing typology (17.4% in manufacturing firms). The last available Innovation survey results (CIS 2002-2004, Istat 2006) show that the percentage of innovating firms on the total number of manufacturing Italian firms (36.4%) is slightly decreased compared to the previous period (1998-2000) in all dimensional area. Moreover Italy has a weak position as to SMEs involved in innovation co-operation (Innovation Scoreboard, 2005).

Venture capital, sustaining more risk and innovative private initiatives, in Italy has a very marginal role representing only around 1% of total funding ([Poti B. and Reale E., 2009](#)). In Italy, venture capital tends to be involved in business expansion and replacement activities, rather than early stage growth (European Commission, 2007). A systemic failure in Italy is represented by a financial market less developed than in other industrialized countries and by a very low firm demand of capital equity.

(Mariotti et al, 2006). This failure asks for a policy intervention. The systemic failure is partly due to specific features of our industrial system, characterized by a strong cultural resistance of firms to enlarge or open their ownership structure and by the negative expectations of private equity investors towards national investment opportunities. These structural aspects constrain the firms' capacity of innovation and growth.

In 2005 the bank credit intensity, measuring the bank credit support to non financial firms, given by the percentage ratio between bank credits and GDP was 50% (ISTAT), while investment in risk capital (early stage) as percentage of GDP was 0.002.

In recent years some Region tried to compensate this weakness focusing on risk and seed capital financing ([Poti B. and Reale E., 2009](#)). But the impact of Regional policy measure favoring the access of SMEs to the bank and risk capital did not find enough interest from firms. In particular in the South regions the demand was very low, while in the North Center regions the measures were used only at 50%. The propensity of firms to growth (and to innovate) remains on average low.

Another factor of weakness is the decreasing trend followed by the resources mobilisation for University research activities in the first half of 2000s (see chapter 4).

As to the education system, the total expenditure for tertiary education in percentage of GDP is 1% in 2002, lower than the average EU27, as well as the financing of the tertiary education demand through bursaries and loans: 0.14% of the GDP (Education at a glance, 2005). This last, together with a non targeted policy of bursaries, represents a constraint in enlarging the supply of qualified human resources for supporting relevant processes of innovation. The intensity of scientists and engineers (expressed as percentage of labour force) in 2005 was 3.1 (4.8 the average EU27). In the same year the percentage of graduates in science and engineering was 23%, at a significant distance from other large European countries such as France, Germany and UK. Other indicators of an education system not open to innovation and that reproduces itself are: the average age of university professors is about ten years higher than the aforementioned European countries and the foreign students in percentage of total students, who were about 2% in 2003, while the same value was over 10% in France, Germany and UK.

The role of private sector towards absorbing tertiary educated people is ambiguous. On the one hand Confindustria, the main Italian representative of firms, highlights the need to enhance the production of high qualified human resources in S&T fields; on the other hand, the number of graduates hired by firms is one of the lowest in Europe. In 2005, business enterprise R&D personnel per thousand employment in industry is 3.9 in Italy, 7.1 in UK, 11.2 in Germany and 5.4 in Spain ([Poti B. and Reale E., 2009](#)).

The gap is between scientific and industrial R/D specialisation on one side and technological/ productive specialisation on the other. For achieving better results in terms of knowledge exploitation and economic growth it should be necessary to use a complex of measures aimed at changing the national industrial structure

The increased internationalisation of high tech firms in Italy is a signal of the raising importance of external drivers of knowledge demand. In 2004, 384 Italian firms in high tech sectors had foreign participation (14.8% of the total); the number of foreign investors was 281 (19.7% of the total foreign investors). The comparison between European countries of the added value generated by these high tech firms

highlighted a very good performance of Italy (27.6%) which is higher than France (25.6% and UK (21.2%). Nevertheless the number of high tech firms with foreign participation on the total is decreasing in the last ten years (from 21.1% to 14.8%) and their contribution to the industrial added value is lower than in other European countries ([Poti B. and Reale E., 2009](#)).

The problem of better exploiting and connecting public research and industrial actors is still a relevant open question. Although scientific specialisation (expressed by publication in SCI journals) is compatible with the structure of government funding, it does not fit with BERD and industrial specialisation. The separation between scientific and industrial research doesn't concern large firms and the presence of a long lasting participation of scientific inventors in industry owned patents is a good example of this collaboration.

Many Italian universities have set up technology transfer offices and started promoting circulation of knowledge into the private sector. The first technology transfer office was created in 1997. The valorisation of scientific activity has two main components: intellectual property rights use for scientific inventions (patents and licenses) and the creation of public research spin-offs, which are high tech companies including almost one scientist and where the academic or public research organization participate to the equity. The TTO functions are IPRs management (83% of TTO), spin offs creation (80.9%) followed by the management of R/D collaborations with industry (57.4%), which is a traditional function of the university Departments. One problem is represented by the low number of licenses on public patents, therefore the effective valorisation and transfer of R/D results. Licenses are mainly given to national firms. Often linkages between University and the industrial local context are low and ask for Regional/local policies. At present, many regions (Campania, Veneto, Emilia Romagna, Puglia, Lombardia, Sicilia, Toscana) have developed their own plans regarding R&D and innovation. The BICs (Business Innovation Centres) cover the whole country and are particularly active in the Southern regions, supporting the development of local economic systems. The Innovation Relay Centres spread over the territory also support innovation and transnational technology transfer. In Lazio the regional innovation agency FILAS, Finanziaria Laziale di Sviluppo, plays a central role: The Agency combines its public mission to foster regional development with an entrepreneurial organisational and management set-up. BIC Lazio is the regional development agency in charge of promoting new enterprises, their development and consolidation, especially in the 'take-off' phase. Emilia-Romagna has endorsed a regional policy for R&D and Innovation focused on the promotion of industrial research, technological development and on the transfer of new technologies from knowledge production centres to the regional industrial system, which is shared by all stakeholders. The Regional Programme for Industrial Research, Innovation and Technology Transfer started in 2003 and it includes measures such as creation of new entrepreneurial and professional activities with a high technological content, actions for the transfer of knowledge and of technological competencies, development of networks, research and technology transfer laboratories and services for the development of a research network.

In Italy, starting from 1993, there have been a regular yearly creation of spin offs, which increased since 2000 (the number of new spin offs have doubled, from 22 new spin offs in 1999 to 43 in 2000), linked to the new incentive system, which introduced a Government support for spin-offs creation. In the last three years the number of new spin offs have been 75 in 2004, 63 in 2005 and 65 in 2006 (NETVAL, 2006). At

present there are in Italy 454 spin offs, mainly localized in North (62.1%) and Centre (24.01%).

Summarising the main national barriers to Lisbon process are:

- R&D expenditures have not grown substantially
- Securing long term investment through institutional funding suffered for the lack of continuity from one year/government to the next
- Weak R&D private investments as well as innovative financial instruments to R&D
- Low career perspectives for researchers and for attracting foreign scholar
- The dialogue between research centres and industry is still not satisfactory, given the large number of SMEs and their still low absorptive capacity. EIS indicators show poor performance of Italy in international comparison: the research cooperation between firms or between firms and research centres registers an indicator which is half the EU average, showing a persisting difficulty of the SMEs' Italian system to activate virtuous exchange processes for acquiring research results and "external" knowledge.

### **3.2 Policy objectives addressing R&D investment and barriers**

The Italian total State aid to R&D was €726m in 2006, showing a slight upward trend in the most recent years (+1.1%), even if lower than the average EU25 (+1.8%). State aid to R&D represents a relatively small quota of public funding (0.05% of GDP in 2006), similar to the EU25 average value (0.06%). An upward of the state aid for research and development is registered since 2005, through additional R&D funding, for twelve Large Strategic Programs managed by MIUR and foreseen in the National Research Plan (2005-2007) and the Industria 2015 initiative launched by 2007 Financial law ([Poti B. and Reale E., 2009](#)).

Since 2005 Italian R&D State aid has been interested by reforms and innovations, which have been presented mainly in the Financial Laws and in the two official documents: NRP and QSN. The main goals stated within official documents and related directly or indirectly to increasing (private) investments in R&D have been:

1. To reduce normative and funding fragmentation, through the creation of two new Funds regrouping different sources and objects of funding under a common framework and resource pool: The Fund for Competitiveness managed by the Ministry of Economic Development, has been foreseen by the Budget Law 2007 and endowed with €1.1b for the period 2007 to 2009, but became operative in 2008. It regroups the Fund for underdeveloped areas (FAS) and the previous "Incentive" Fund and is devoted mainly to financially sustain the "Industria 2015" programme and to the continuation of some pre-existing measures, such as the Fund for technological Innovation (FIT/ law 46/1982). The Fund for Investment in Scientific and Technological Research (FIRST) to be managed by MIUR and foreseen by the budget law 2007, but not yet operative. It should regroup different funds: FIRB (fund for mission oriented and basic research, devoted mainly to public beneficiaries); FAR (the fund for applied research, which is a combination of different instruments) mainly devoted to private beneficiaries; PRIN (Fund for free, basic research), devoted to public beneficiaries, mainly academic ones.

2. A major effort has been made for improving the regional policy: Structural Funds and Cohesion Policy (2007-2013). The new regional policy planning has been aimed to implement a unified policy scheme at country level, pulling together structural funds, national funds for underdeveloped areas and other regional resources for local development. There is a change in the strategic orientation. A multilevel type of governance is expected in the new 2007-2013 Framework, requiring stronger coordination and cooperation among different policy making levels.
3. The new Structural Funds schemes and the Lisbon Reform Programme were both conceived to assign Priority 2 to initiatives addressing R&D. They represent the second priority after the consolidation and development of the productive system. Regional initiatives should be strictly linked to policies for innovation and competitiveness to ensure a coherent industrial policy strategy. Emphasis will be put in developing instruments that can foster private research investments and human capital valorisation; automatic incentives schemes will be reduced (from 50% in the period 2000-2006 to 30% in the new framework, since they can be better managed by the national policy, due to their more general nature.
4. A policy more based on mission oriented/targeted interventions, addressed to modify structural weakness has been promoted: main instruments are Large Strategic Programmes (National Research Plan 2005-2007) and the Industrial Innovation Projects (Industria 2015), together with mission oriented instruments (projects) included in the Fund for basic research (FIRB). Moreover five specific thematic projects have been also launched by the Ministry of Productive Activity (now Ministry of Economic Development) in 2005 within the Fund for Technology Innovation. The targeted programmes aim to a concentration of resources in key strategic areas and to enhance public-private links.
5. An improvement of the network relations and cooperation between universities, public research organizations and firms has been stressed in the Italian National Reform Programme, which foresees the reinforcement of the Industrial Liaison Office (ILOs). Moreover an upward of fiscal credit for R&D is given to firms when collaborate with university.
6. Direct financial interventions have been complemented by fiscal measures (credit tax to enterprises that invest in research and pre competitive development) with the aim of upgrading the SME's general level of R&D spending;
7. Attention has been given to innovation financing (National Reform Programme), to: "rationalise, coordinate and update market oriented venture capital instruments and the creation of a fund for investment in risk capital of high tech enterprise". Budget Law 2007 has foreseen the creation of a Fund for Enterprise Financing (with €300m for the period 2007 to 2009) with the objective of facilitating the access to credit for SMEs and to rationalise the functioning of public guarantees funds and risk capital funds. The Fund is not operative yet.
8. The reform of the public incentives system- that foresee the active participation of the private banks to the system of access to credit- going with the reform of the banking system, is seen as a way for improving the bank-firms relations. The access to incentives now ask for a firms' co-funding through bank credit (repayable loans system, which now complement capital grants incentives); banks are also involved in the economic financial evaluation of R&D projects

- (within Fund of Applied Research and Industria 2015). The effect of the financial crisis on these provisions is not evident yet.
9. To improve the education performance in terms of general quality and of producing more research oriented and more science and technology oriented scholars The L 1/2008 includes measures finalised: to favour the recruitment of young researchers in Universities; to support Universities showing good performance in terms of research and teaching performance; to foresee parameters for the evaluation of professors and researchers; to rationalise tertiary courses. The Centre-Left's government encouraged with special incentives the setting up of doctoral schools within universities, aimed to favour a simplification of the PhDs courses supply, the internationalisation processes of the courses, and the involvement of the private sector. The new Centre-Right's government follows the same policy.
  10. To encourage cluster leveraging policies: the intent to pursue a policy towards grouping and agglomeration processes is demonstrated by the launch of the Industria 2015, which gives priorities to the development of big projects including grouping of different actors and competencies in different industrial fields. Other cluster policy is the creation of technological districts, technological poles and national strategic research programmes. These kinds of initiatives in most cases are carried out by central government in cooperation with local governments. Another initiative is the extension of the financial and fiscal advantages from the technological districts to networks of enterprises (DPEF 2009).
  11. Attention to SMEs: the new incentive system for Applied research (L 297/99 and DM 593/2000) includes higher financial incentives for SMEs; fiscal measures rewarding small firms that collaborate with university or public research organizations or hire researchers; moreover the law includes measures for promoting the creation of new high tech companies (spin offs).
  12. To improve the efficiency of the national patent system.
  13. For helping the birth of new firms (and the firms' activity transformation: transfer, closure) the art 38 of the budget law 2009 reduces the bureaucratic burdens,
  14. Policy evaluation is still a weakness of the Italian system, characterised by a growing need of evaluation. Policy evaluation is carried out by several institutions, but most of evaluation exercises are limited to monitoring or auditing instead of systematic assessment of the results of policy making. Attempts have been made of generating learning processes and to review existing measures on the basis of the past experience (case of FIT fund and L 488/92). Among recent policies is the creation of the National agency for evaluation of research (ANVUR), to promote the quality of universities and research organisations through evaluation activities, data collection, training and promotion of a cultural change within the system, The Agency will also help to coordinate two previously separate components, namely the evaluation of teaching and the research activities carried out by universities and PROs. The Agency is not yet operational and its establishment is taking longer than expected. Recent novelties are: the establishment of a National Innovation Agency with the mandate to evaluate the industrial innovation projects foreseen in Industria 2015; the creation of a new department within IPI with the mission of evaluating the support instruments managed by the Ministry of Economic Development; at local level evaluation and impact assessment are a necessity for the utilisation

of Structural Funds and are adopted by some local government for doing an appraisal of the local policy mix.

The policy goals (above presented) have been accompanied by other stakeholders' initiatives going in the same direction or by critical debate.

Innovation financing is a matter recently receiving lively attention. From one side it is accompanied by critical observations on the past bad performance of a measure (art 106, Law 388/2000 managed by the Ministry for Productive Activity) consisting in a scheme of public co funding of investments in equity capital of young firms (less than three years) with innovative projects. The evaluation of the measures committed by the Minister of Productive Activity showed that only a minimal part of the budget was used. Critical observations concerned the "double nature" of the measure, devoted both to young firms with innovative project or localised in underdeveloped regions (Ob1 and2) and the necessity of better bridging the gap between weak demand and supply of equity capital through initiatives of technology parks and funds of guarantees. An initiative going in the direction of promoting innovation financing (capital market for micro/small sized firms) has become operative at the beginning of 2007 to provide access to risk capital market, promoted by a cluster of banks and institutions managed by the Italian Stock Exchange. Another initiatives going in the direction of supporting a more transparent evaluation of innovative firms helping their access to credit and risk capital have been undersigned by the Minister of Economic Development, the National Bank Association (ABI), Confindustria (the national Association of industrial companies) and CRUI (the Conference of the Italian University Deans) the 21 Oct. 2008. The implementation of this protocol will allow firms to calculate the value of their IPRs with a known and shared evaluation methodology helping to reduce the funding gap between financial market institutions and innovative firms.

As to the goal of enhancing the number of students with insufficient notions of mathematics and science an initiative has been promoted by MIUR, Confindustria and the National Conference of the Deans of the S&T Faculties, which funded training activities in 38 universities aimed to enhance competences of graduates in S&T fields (Progetto Lauree Scientifiche -Projects for Scientific degrees). ([Poti B. and Reale E., 2009](#))

### ***3.3 Characteristics of the policy mix to foster R&D investment***

This section is about the characterisation and governance of the national policy and instrument mix chosen to foster public and private R&D investment. While policy goals are often stated at a general level, the policy mix has a focus on how these policy goals are implemented in practice. The question is what tools and instruments have been set up and are in operation to achieve the policy goals? The following sections will each try to tackle a number of these dimensions.

#### **3.3.1 Overall funding mechanisms**

The main source of funding for the public academic and non academic research system are block grants (FFO), but public project funding is grown up over time.

Private R&D is financed directly through public project funding and indirectly through fiscal measures. The BERD financed by industry is about 76.7% (2005). Sources of funding for private R&D include public subsidies (6%) and fiscal incentives (5%), bank loans and Government backed loans (5% and 3% respectively) ([Poti B. and](#)

[Reale E., 2009](#)). The OECD ST&I Scoreboard 2007 ranked Italy in 17th position (out of 19th) in terms of availability of venture capital funds as a percentage of the GDP. In Italy, available venture capital funds are 0.031% of GDP whereas in countries like Denmark, Sweden or the UK this value is around 0.3% to 0.4%.

While in the past (until the end of '90s) there were two sources of public funds, central Government and the national research Council (CNR, with a double mission of R&D performer and funding agency), at present only central and local governments are the sources of R&D public fund.

70% of public project funding (only from central government) benefits to private companies, while the share of universities is below 15% (Poti, Reale, 2007); in the past ('70s) project funding devoted to private sector was 61%.

R&D Project funding can include at least three types of instruments:

- free projects to public or private beneficiaries (an example are PRIN funds devoted to basic public research and mainly to academic researcher teams);
- horizontal or bottom up schemes: incentives to private or public beneficiaries aimed to upgrading the level of research activity (an example is the FAR funds for bottom up projects);
- targeted projects/programmes, to public or private beneficiaries (example can be the Large Strategic projects or the Programme Agreements within the Structural Fund schemes).

Over time in Italy there has been a strong reduction of free projects and a relevant growth of the other two types of project funding.

Until the end of 90's the horizontal (non targeted) funding schemes in Italy have been largely predominant: the weight of the National Research Programmes, managed by the Minister of Research was relatively low on the total project funding (the weight in 1990, at half way of the life cycle of the instrument, which stopped around 1996, was only 4.1% ). (Potì and Reale, 2007) This policy approach has been criticized since it doesn't modify the distribution of research demand nor the current R&D specialisation.

The end of '90s is a turning point. Project funding grew up significantly, the portfolio diversified and Government reinforced its pro active role, through more targeted and mission oriented instruments and also with the creation of special bodies in charge of activities of selection and evaluation. FIRB, a fund for Basic research, managed by the Minister of Research, where thematic areas are established by Government, starts in 2000 and in 2002 its weight on total project funding is about 20%.

R&D Networks are a more recent instrument: excellence R&D centres within FIRB scheme represented 2.2% in 2002 (Potì and Reale, 2007).

Within the R/D public project funding going to industrial research the largest quota goes to structural funds and Mezzogiorno regions (in 2002-2004 the appropriation for the L 488<sup>4</sup> -Research is twice the appropriation to the national Fund for Applied Research). Given the scarcity of resources and the problem of sustainability of the public budget, the aim of the regional policy could conflict with the upgrading of the industrial R&D level of firms in the rest of the country. There is a critical need of

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<sup>4</sup> The Law 488 is articulated in 5 components: Industry, Tourism, Craft, Trade, and Research

coordination between “competition” and “cohesion” aim, as established in the recent National Reform Framework.

Looking at the relation between R&D policy instruments and other policy areas, the weight of the interregional re-balancement is twice that of the R&D focused instruments and the reinforcement of the productive systems is largely the first aim in regional policy.

**Table 8: National, decentralised and regional intervention allocations (Millions of Euro) 2000-2006**

Aim	National level	Decentralised type	Regional level
R&D (including repayable loans)	13506 (27%)	1420 (36%)	717 (11%)
New enterprises	4434 (8.9%)		297 (4.5%)
Reinforcement and development of productive systems	313 (0.6%)	2229 (56%)	4588 (69%)
Inter regional re balancement	25957 (52%)	220 (5.6%)	
Access to credit and financial reinforcement	1161 (2.3%)		389 (5.9%)
Internationalization	3062 (6.2%)	51.6 (1.3%)	139 (2.1%)
Environment/energy	6.6 (0.0)	19.9 (0.5%)	131 (0.2%)
Sector restructuring	835 (1.7%)	19 (0.5%)	131 (0.2%)
Other			
Total	49784 (100)	3960 (100)	6627 (100)

Source: Minister of Economic Development, 2007

The distribution of the total national funding grants of €33,025m (2000-2006) (including all types of R&D and non R&D instruments) by geographical areas and type of instrument is the following<sup>5</sup>:

- 72% goes to Mezzogiorno regions and it includes: 22.5% L 488/92 Industry; 21% tax credit; 15.7% Programs agreements/PON)
- 27.6% goes to North Center regions and it includes: 21% FIT (Fund for technological innovation); 13% FRA (Fund for Applied Research), 15% Fund to aerospace industry.

The public financial appropriation Minister of Research and University for FRA (Fund for Applied Research) in 2006 was €1,790m.

Notwithstanding the introduction of the Large Research Programs within FRA, these targeted instruments started to be funded only in 2005, due to the lack of public financial resources between 2002 and 2005. Between 2000 and 2005 (available data) resources have been granted mainly to bottom up (horizontal) projects (85.5%), while targeted projects have got 13.2% (PON Research in 2002 and Large Strategic

<sup>5</sup> The source of information is the Minister of Economic Development

Programs in 2005); the tax credit (fiscal measure) in the same period weighted 1.5% (MIUR, 2005).

The rationalisation process — often claimed at different levels to better coordinate objectives and instruments — pursued through the creation of three major funds (foreseen by 2007 budget law) bring the following distribution:

FIRST (not yet operative) under the Ministry of University and Research collecting four operating funds: for academic basic research – PRIN-, for strategic basic research – FIRB, for applied industrial research- FRA- and one part (art 61 L. 289/2002) of the fund for underdeveloped areas- FAS. FRA from 2003 includes also the law 488 –Research.

Competitiveness Fund under the Ministry of Economic Development, which substitutes two previous funds: Fund for underutilized areas –FAS- and Fund for incentives – Law 448/2000. The 2007-2009 financial appropriation given to the Competitiveness Fund distributes the new funds €1,112m between Industrial Innovation Projects (Industria 2015) €990m and “still alive” previous interventions €122m of which €60m goes to FIT (Fund for Technological Innovation).

Fund for Enterprise Financing, the third newly foreseen Fund, is devoted to enterprises financing. This Fund substitutes various previous instruments, such as L. 266/97; L.350/2004; art 106 L 388/2000 and art 1 L 311/2004. However it has not become operative yet. A fund endowed with €86m for the public participation in risk capital of enterprises operating in high-tech sectors has been activated in the Mezzogiorno.

Finally this is the distribution of policy instruments between horizontal, targeted and mission oriented (currently operative):

- *Mission oriented instruments*: Technological Districts; FIRB projects; Large Strategic Programs (FRA); Industrial Innovation Projects (Industria 2015);
- *Targeted instruments*: spin off (FRA); L. 488/92 (for underdeveloped regions); fund for aerospace industry; finalized projects of Health Minister; finalized projects of Agriculture Minister.
- *Horizontal instruments*: FRA bottom up projects, art 5 and 6 (FRA); FIT;

### 3.3.2 Policy Mix Routes

The “Policy Mix Project” identified the following six ‘routes’ to stimulate R&D investment:

1. promoting the establishment of new indigenous R&D performing firms;
2. stimulating greater R&D investment in R&D performing firms;
3. stimulating firms that do not perform R&D yet;
4. attracting R&D-performing firms from abroad;
5. increasing extramural R&D carried out in cooperation with the public sector or other firms;
6. increasing R&D in the public sector.

The routes cover the major ways of increasing public and private R&D expenditures in a country. Each route is associated with a different target group, though there are overlaps across routes. The routes are not mutually exclusive as, for example,

competitiveness poles of cluster strategies aim to act on several routes at a time. Within one 'route', the policy portfolio varies from country to country and region to region depending to policy traditions, specific needs of the system etc.

### **Route 1: Promoting the establishment of new indigenous R&D performing firms**

The establishment of new R&D performing firms (NTBF) has a critical role in the advanced industrialised countries, since they push incumbent firms to innovate and brings the radical innovation in the system. This is a point of weakness for Italy. In the past there has not been a well organised public support, but a fragmentation of interventions. The national NTBFs have used a very differentiated kind of measures: 24.9% of NTBFs have used central government and 25.55 from regional administrations (survey on 550 NTBFs, Politecnico di Milano, 2005). NTBFs used measures for innovation and R&D, measures of territorial re-balancement, support to investments and to employment. The performance of these interventions has been very low in terms of quality and selection giving probably room to substitution effects. A direct support to NTBFs has come from L 388/2000 (art 103 and 106) managed by the Ministry of Production Activities. This was a scheme of public co-funding to equity capital for young firms (less than three years of life) with innovative projects. This measure started very slowly and their effect has been evaluated as marginal and scarcely effective (only a very low number of firms used the measure). At present the budget law has foreseen the creation of a specific Fund for Enterprise financing, that is not yet operative. A new measure (High tech fund for SMEs) foreseen since 2005, became operative in 2008. It is a fund for public participation in risk capital of firm operating in high tech sectors. The beneficiaries of the measure are start-ups in high-technology sectors, venture capitalists and institutional investors in Southern Italy, and the available funds amount to EUR 86 million. The action is intended to promote investments in risk capital during the initial phase of a company's activity, including funding the analysis, valuation and development of the original business idea prior to the phase of launching the business. Investments may also be directed towards financing the development and first sales of a product.

Another recent measure is the Tax exemption for high-tech enterprises. This measure has been included in the 2008 Budget Law and consists on a reduction of social security payments for R&D personnel employed in high-tech start-ups. This measure has the objective of fostering the creation of high-tech companies, but despite its importance it has not become operative yet.

Finally it is to quote the introduction of 'novelty assessment' for patents submitted to the Ufficio Italiano Brevetti e Marchi (Italian Patent Office) as a way to reinforce and protect intellectual property. The search for "originality" is now outsourced to EPO by the Italian Patent Office.

### **Route 2: Stimulating greater R&D investment in R&D performing firms**

This is the more traditional and developed area of policy mix in Italy. It includes horizontal and mission oriented instruments of public funding, partly managed by MIUR and partly (technological innovation) by the Minister of Economic Development. There is not a coherent evaluation of the performance of this kind of measures. Results of different types of evaluation do not converge on the "additionality" effect of these interventions. In the period from 2000 to 2005 the bottom up measures of the Fund for Applied research funded mostly large firms (more than 60% of the intervention), but with a slight increase of SMEs over time.

Firms of underdeveloped regions have progressively absorbed more resources (from very low percentage in 2000, to 46.7% in 2003 and 59.2% in 2005). As to the relation between mission oriented, bottom up and automatic (fiscal) measure for applied research in the same period, the allocation to bottom up initiatives has represented the largest quota: 85.3%, while mission oriented interventions represented 13.2% and fiscal measures 1.5% (MIUR, 2006). The large bottom up projects (>€7.5m) follows the new procedures, foreseen by the European State aid rules, which check firstly the “additionality” content of the projects, before starting the standard procedure of selection.

### **Route 3: Stimulating firms that do not perform R&D yet**

This identifies a very critical aspect of the Italian system. Policy measures devoted to this kind of firms are considered to be the automatic, fiscal, instruments, such as the art 14 within FARA fund. It is estimated that the past fiscal intervention for R&D (art 1 DI 269/2003, “TecnoTremonti” ) didn’t perform well since it was not at all selective, including a too large set of investments, together with the fact that the measure was foreseen only for a short period.

### **Route 4: Attracting R&D-performing firms from abroad**

There is no specific intervention devoted to attracting R/D performing firms from abroad; the measure to support bottom up applied research is open also to foreign firms, within a certain threshold of investment. The fiscal treatment of the capital gain in Italy is lower than in other European countries, but this can have a perverse effect on high tech and risky investment: other European countries (UK, Belgium, France, the Netherlands) have higher fiscal share for capital gains but fiscal incentives, creating “positive” asymmetries between ordinary and alternative and risky options of investment. Finally the “general environment” including heavy administrative regulations or inefficient implementation of the policy incentives (lack of fund, stop and go) can produce low attractiveness.

### **Route 5: Increasing extramural R&D carried out in cooperation with the public sector**

This is an area of the national policy mix which received large attention of policy makers. In the past (‘80s) public –private collaborations received support specifically within mission oriented measure, such as national research programmes, managed by the Minister of Research; the collaborations involved mainly large firms. A specific financial measure was foreseen to support the extra-mural research of SMEs within the L. 46/82; the measures supported the demand of research or technical services from SMEs to public and private external laboratories, within a list of organizations checked by the Minister, but it did not receive enough attention from firms.

At present the financial incentives for applied research (FRA L.297/99) include facilitations (higher quota of grants) when the project is in collaboration with public sector and a first evaluation shows a relevant increase of collaborative projects between the two regimes (L.46/92 and L 297/99).

The fiscal measure within FRA (art 14) includes also a higher support to SMEs collaboration with public research institutions.

## Route 6: Increasing R&D in the public sector

The trend in public sector R&D has been characterised by a decreasing ordinary fund and an increase of the project funds. R&D public institutions can participate to different measures: since 2000 PRIN (basic research), FIRB projects and public-private labs. The reform of FAR fund (L. 297/99) has included public entities as eligible contractors in collaborative projects with private firms and for the creation of spin offs. More recently Industria 2015 foreseen the participation of public R&D organization within the Industrial Innovation Projects devoted to specific thematic areas.

### Assessment of the importance of policy mix routes and their balance

**Table 9: Importance of routes in the national policy and recent changes**

Route	Short assessment of the importance of the route in the national policy	Main policy changes since 2008
1	Fragmentation and failure in the past. Now (budget Law 2007) receive a specific attention	Fund for Enterprise financing, not jet operative; High tech fund for SMEs in the South regions (operative since 2008). Tax exemption for high tech enterprises: not jet operative.
2	The traditional measures, well developed and used, mainly by large firms.	A reorganization of the FAR (L.297/99) and of the support to innovation (Industria 2015)
3	Fiscal measures for SMES: An appraisal is still lacking	Art 14 within FRA, recently regulated (2008).
4	Lack of specific measures	
5	A diffused encouragement within horizontal and mission oriented instruments, with good results in terms of increasing number of collaborations	L 297/99 (FRA); Industrial Innovation Projects (Industria 2015).
6	A large set of opportunities for public research organizations, including the direct involvement in entrepreneurial initiatives (spin offs)	L 297/99 (FRA); Industrial Innovation Projects (Industria 2015).

## 3.4 Progress towards national R&D investment targets

### Evolution and state of progress towards R&D targets since 2005

Several signals launched in the past few years seem to go in the right direction both in terms of policy governance (e.g. strengthening coordination as well as several attempts to improve evaluation) and policy instruments (introduction of automatic measures, selective interventions in key areas, rationalisation of funds for R&D). Nevertheless, these attempts are still insufficient to give the necessary impulse to the national innovation actors to encourage further investments in innovation and technological leverage, especially among SMEs (EW/TC, 2008).

Some important weakness deals with the implementation processes: the level and continuity in public funding, the un-balanced relation between public appropriation, outlays and fund allocations, the timing of funding process, the non clear relation between funding schemes for the same beneficiaries, the separation in coordination between basic/applied research and innovation schemes, the systemic failures in the relation between risk market fund supply and new firms oriented to R&D demand (notwithstanding new schemes devoted to the ventures capital funds), the concentration of university technology transfer on IPRs licenses and the frequent

separation from local demand, the relation between the mission and diffusion oriented measures, the coordination between research oriented and convergence oriented policies which receive important amount of resources in Italy, a fiscal system on capital gain that do not give enough incentive to risk investment.

Moreover what is still missing in Italy is an evaluation system able to sustain the policy making process. It is necessary to go beyond monitoring or auditing practices and to implement evaluations that systematically assess the results and provide feedbacks for the allocation of resources. There is a need for dynamic systems of evaluation by each program (with resource allocation distributed along the life of the project and following an *itinere* evaluation) and systemic evaluation applied to mixes of policy instruments.

**Table 10: Main barriers to R&D investments and respective policy opportunities and risks**

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Low number of SMEs performing R&D	The policy mix lacks still a clear strategy toward improving SMEs investment towards research activity; fiscal measures, devoted to this scope can reproduce the present specialization of the country
Low number of start ups in high tech sectors; need of seed and risk capital	The reorganization of the policy towards start ups and venture capitalists offers good opportunities. But two weak aspects concern the time (the foreseen fund is not operative yet), the generally low treatment of capital gains, which doesn't incentive risk investments and the duplication of efforts, since there are specific measures for high tech firms in South regions.
Large weight of resources invested in underdeveloped areas, asking for a better focus on Research and innovation	The QSN 2007-2013 has focused on research and innovation (second priorities): this represents an important opportunity of addressing the large amount of resources available for underdeveloped regions in a non contrasting with the rest of the country direction.
Separation between productive specialization and research specialization	The policy mix in the past has shown low selective capacity, in terms of a low role for the State in orienting the RDI investments and selecting best projects. In presence of scarce public resources more targeted and selective initiative are now part of the policy mix. The important aspect relate now to their implementation.
Knowledge transfer policy of university still more oriented to contracts or licensing patents instead than on collaborations	The relation between TTOs and local initiatives such as technology park or incubator (where the gap between knowledge supply and demand can be matched) is still not enough developed. The new University transfer policy can be too less oriented towards the needs of SMEs. The scarce differentiation of University in Italy can reduce linkages with local productive demand.
Under developed national patent system	The National Patent Office is in an on going reform that represents a fundamental step towards a more diffused culture and use of IPRs

## 4 Contributions of national policies to the European Research Area

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ERAWATCH country reports 2008 provide a succinct and concise analysis of the ERA dimension in the national R&D system of the country. This Chapter further develops this analysis and provides a more thorough discussion of the national contributions to the realisation of the European Research Area (ERA). An important background policy document for the definition of ERA policies is the Green paper on ERA<sup>6</sup> which comprises six policy dimensions, the so-called six pillars of ERA. Based on the Green Paper and complementing other ongoing studies and activities, this chapter investigates the main national policy activities contributing to the following four dimensions/pillars of ERA:

- Developing a European labour market of researchers facilitating mobility and promoting researcher careers
- Building world-class infrastructures accessible to research teams from across Europe and the world
- Modernising research organisations, in particular universities, with the aim to promote scientific excellence and effective knowledge sharing
- Opening up and co-ordination of national research programmes

In the ERA dimension, the *wider context of internationalization of R&D policies* is also an issue related to all ERA policy pillars and is normally present in the dynamics of national ERA-relevant policies in many countries.

### 4.1 Towards a European labour market for researchers

National labour market for researchers shows weaknesses both on the demand side and the supply side.

#### Demand side

Italy has a low investment in R&D comparing with the EU27: 1.14 is the value of GERD as percentage of GDP (1.83 in EU27); 1.26 the value of GBAORD as percentage of general government expenditures (1.5 in EU27). This weak investment goes with a very limited number of people entering the research labour market. Italy has the lowest number of researchers for unit of GDP among industrialised countries and the lowest percentage of researchers on the active population.

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<sup>6</sup> Commission of the European Communities: Green paper: The European Research Area: New perspectives. Brussels 4.4.2007, COM(2007) 161final (see [http://ec.europa.eu/research/era/pdf/era\\_gp\\_final\\_en.pdf](http://ec.europa.eu/research/era/pdf/era_gp_final_en.pdf)).

**Table 11: Researchers and total R&D personnel as percentage of thousand total employment and thousand labour force**

		% per thousand total employment	% per thousand labour force
<b>Total R&amp;D personnel</b>	Italy	7.2	7.0
	EU25	10.5	9.2
<b>Total researchers</b>	Italy	3.4	3.1
	EU25	6.2	5.8

Source: OECD, 2008, year 2005

The total number of researchers per thousand total employment figure out the weakness of Italy (3.4) compared to, for instance, Spain (5.5), France (8.0), or EU27 (5.8). These data show the low availability of research position in Italy, which affect more the private sector than the public one, given the low propensity of the business enterprise to hire graduates (see *infra*).

Other evidences confirm the weakness of the demand side. The average age of university professors is about ten years higher than the aforementioned European countries. The total expenditure for tertiary education in percentage of GDP is 1% in 2002, lower than the average EU27, as well as the financing of the tertiary education demand through bursaries and loans: 0.14% of the GDP (Education at a glance, 2005).

### Supply side

In the academic year 2003-2004, the total number of PhD students was about 37,000 with a relative concentration in the medical field. In 2001, the situation in the Science and Engineering fields showed the weakness of Italy's position, when measured by the ratio of new PhDs per thousand population aged 25-34. While the EU 15 average was 0.55, the Italian ratio came to just 0.18. The Centre-Left's government encouraged with special incentives the setting up doctoral schools within universities, aimed to favour a simplification of the PhDs courses supply, the internationalisation processes of the courses, and the involvement of the private sector. The new Centre-Right's government is supposed to follow a similar policy aimed at reducing the number of courses, and at pursuing the internationalisation of the programs.

According to a special survey delivered by Unioncamere (Indagine Excelsior), in 2005, in total 648,000 persons were hired in the public and private labour market, of which only 57,000 were graduates. Another survey made in 2006 by Almalaurea, a consortium including the Conference of the Dean of the Italian University, shows that one year after graduation 67.2% of the graduates entered the labour market, while 18.1% are unemployed.

The number of foreign researchers who choose Italy as a place to do research is still less than the number of Italian researchers who decide to go abroad. The number of foreign researchers in the Italian system is approximately 1.8% of the total, although in some cases their presence is more significant (e.g. The National Institute for Physics). The share of foreigners among doctoral students is particularly low: in 2001 29,000 foreign students were enrolled on Italian PhD courses, compared with 40,000 in Spain, 226,000 in the UK and 475,000 in France (MIUR, 2005). This seems to be largely due to the fact that courses are mainly given in Italian but also to the scarcity

of interaction with private actors, which makes PhD courses less attractive to foreign researchers.

*Salaries:* According to the EC Report on remuneration of researchers (EC, 2007) in Italy the average weighted total yearly salary adjusted of researchers is €36,201 rather lower than France (€50,879), Germany (€56,132) or United Kingdom (€56,048) and similar to Spain (€34,098). If we look at figures on net country yearly salary average of researchers in terms of PPS (Purchasing Power Standard; the study used this corrective coefficient to salaries in order to reflect the real cost of living), we find Italy at €22,372 and the distance with the values of France, Germany and UK become lower than the previous one (respectively €26,983, €28,687 and €35,372). Considering the country total yearly salary average for researchers per level of experience, Italy is below the EU25 average in all the level selected (0-4 years, 5-7, 8-10, 1-15, more than 15). The ranking of researchers remuneration averages in terms of PPS in Italy, comparing to the EU25, show that the country has the lowest positioning for salaries of researchers with few years of experience (Italy ranks 25 for remuneration of researchers 0-4 years and 22 for 5-7 years of experience), while the ranking is higher for researchers with more than 15 years of experience (17).

*Remuneration* of researchers is not so different between sectors of activity (€34,204 of total yearly salary average (in terms of PPs) in Higher Education, €37,559 in Government labs and €36,575 in the business enterprise sector), although in all sectors it is lower than in France, Germany and UK. Researchers' remuneration in Italy, in comparison with other European countries, can be considered as a proxy of the attractiveness of the country for other researchers, assuming that highest salaries are one factor benchmarking attractive research locations. Considering the total yearly remuneration average, Italy is a medium remuneration level country, while France, Germany, UK are high remuneration level countries. The gaps between the levels of remuneration in each country reduce significantly when considering the cost of living (net yearly remuneration average). Only UK remains a high remuneration country, while the others become medium ones. Thus, Italian remuneration as such does not appear as the sole discouraging factor for researchers coming from other countries.

On the contrary, *salary regulation* at both national and institutional level does not encourage talented young individuals to pursue a research career. Incentives and premium for brilliant high performing researchers are lacking, although few universities (i.e. Milano, Statale and Politecnico di Torino) announced the setting up of measures aimed to supply financial incentives for rewarding good/excellent research performance. A recent opportunity has been given to Italian researchers who participated to the ERC selection with high quality and open to new opportunities proposals, which were selected but didn't get the grant. The Fund for Basic Research (FIRB) has now opened its evaluative procedure to these kinds of projects. At national level, Miur launched in 2009 a new funding instrument, FIRB Futuro in Ricerca (Future of research), dedicated to PhD holders, tenured and not tenured, aimed to fund on a competitive way three-years projects coordinated by early researchers or young researchers (respectively up to 32 years old and up to 38).

A good indicator of openness to scientific opportunities is the international co-authorship in which Italian scientists are involved: their weight on the total of national publications for Italy is not far from that of other European countries such as Germany or UK (National Science Foundation, S&E Indicators, 2008, Tab 5-44).

These collaborations are mainly established with colleagues working in national systems, which are positioned at the frontier of R/D in many fields

*Promotion procedures* are ruled by different institutions and are regulated by law in the public sector. Law 1/2009 recently reformed the Universities procedures. The Government will was to promote a higher transparency of the selection process and of the criteria used, trying to push Universities toward more rigorous competitions based on the quality of the scientific results produced as well as to overcome the privilege for the local candidate, which often affect the public competitions for research permanent positions. The reform obliges to have the selection Committees composed mainly by people external to the university, which launch the competition for a new position. Moreover, standard international parameters for the evaluation of research quality in each disciplinary sector shall be applied.

*Temporary positions* increased during the last five years and they are supposed to remain stable in the forthcoming years because the number of new positions will not be sufficient to replace the number of public researchers retiring in the forthcoming years (for instance Universities can replace only 50% of the vacancies deriving from the turn over). Law 1/2009 recently obliged Universities and public research organisations to reserve at least 60% of new positions for hiring researchers at the early career stage and only 10% can be used for promotion to full professor. The rationale is to contrast the tendency toward using the available new positions for the career of the existent permanent researchers, instead encouraging young researchers to enter the research system.

*Performance indicators* show that Italy in the period 1995-2004 produced 302,730 publications and received 2,640,791 citations. In the same period, data on European Union show a production of 2,849,592 publications with a number of 24,530,825 citations (CRUI, 2005). The low level of investment in human resources for science and technology, impacts on the gap between the quantity of the knowledge produced (4<sup>th</sup> position within EU25) and the quality recognition in terms of ratio between citations received and given (10 position within EU25, above the EU average, see CRUI, 2005).

Thus, in Italy performance indicators are strongly influenced by the low investment in R&D. As an example one can highlight the weakness of the Italian academic system in comparison with European average (HERD as % GDP in 2004 was 0.36 for Italy and 0.41 for EU 15) and there are no signs of change: HERD variation in the last three years if deflated is negative. The weight of GERD performed by HE system in Italy is stronger than the EU average (Italy 30.2%, EU27 21.7%, 2005), but, given the structural weak R/D orientation of industrial system, the performance of the academic system in terms of scientific publications on population is lower than for the European average.

#### **4.1.1 Policies for opening up the national labour market for researchers**

Italy national policy aiming at opening up the national labour market is still at an early stage. A Portal for the mobility of researchers is available at [http://www.fondazionecruui.it/eracareers/eramit\\_project.htm](http://www.fondazionecruui.it/eracareers/eramit_project.htm)

The Portal is devoted to support the ERAMIT project (European Research Area Mobility in Italy), co-financed by the European Commission "Human Resources and Mobility" General Direction. It is part of a EU initiative which aims to create an European network able to provide favourable reception conditions to researchers and

with the aim of contributing to a broader mobility of researchers within the European Union. The project wants to favour an active role of Italy in the European research context by giving broad and updated information and practical assistance to researchers in all the fields related to their experience of mobility. The main purpose of the project is to develop a national network of "Mobility Centres" which can provide information to researchers concerning the entry, stay and residence procedures in Italy (with information on related administrative procedures), as well as giving them the first practical information that they might need once they arrive in the national territory. The grouping of the national networks constitutes the European Network of the Mobility Centres (ERA-MORE). The information is provided by the production of information packages (as the Guide for Foreign Researchers) and *vademecum* for researchers, through the national mobility Portal.

As to the training through research, a greater degree of standardisation of national PhD programmes with those in other countries is still to be achieved. The reform of PhD programmes is an issue in the agenda of the Government, but it has not yet been implemented. Nevertheless, the National Committee for the Evaluation of Universities (CNVSU) uses few indicators for assessing the PhD programmes, which relate to international standards derived from the experiences of other European countries. The last report aimed at assessing the characteristics of the PhD courses (CNVSU, 2007) showed that 90% of the programmes are open to students coming from other national universities and from abroad, and 60% have effectively attracted external students. Nevertheless, the number of students coming from other European countries is still negligible (3% in 2006 for Doctorates; 5.7% for Masters). About 55% of the PhD courses allowed periods for training and working experiences abroad.

Language might represent a barrier for opening up the labour market of researchers. The Study and Research Unit and the International Relations Office of the Conference of Italian University Rectors (CRUI), in 2007 edited the third edition of the annual survey on the university courses taught in English language. The survey provides a picture of the low availability of first and second cycle degree programmes ("Laurea" and "Laurea Specialistica"), professionally-oriented post-graduate courses ("Master Universitario"), research doctorate ("Dottorato di Ricerca") and winter/summer schools in English language. The analysis could be a helpful tool for foreign students who decide to engage in a pathway of studies in our country. It shows how limited is the number of universities engaged in such courses: 8 universities offer "Laurea" programmes (first-cycle, 180 credits), 14 universities offer "Laurea Specialistica" programmes (second-cycle, 120 credits), 24 universities offer "Dottorati di Ricerca" programmes (research doctorate), 34 universities offer "Master Universitari" (professionally-oriented post-graduate courses), 20 universities offer summer/winter schools (more information at <http://www.cru.it/internazionalizzazione/HomePage.aspx?ref=1258>).

Permanent research positions in the public sector are completely regulated by law in the case of University professors and researchers. Researchers belonging to government labs are regulated in part by law and in part (economic conditions) by collective agreements. The law does not hinder the opening towards non-nationals, but there are not positive measures for encouraging it. Basically it is up to the research institutions (Universities and Public research organisations) to autonomously decide to set up measures aimed at encouraging the participation of non-nationals to competition for hiring researchers, but at this time the system appears basically close.

Regions, especially those in the North, in the last years become more active in order to stimulate the opening up of labour market for researchers. For instance the regional law for research in Piemonte (L.R. 4/2006) open a specific Action for human resource mobility aimed at favouring the brain gain and contrast the brain drain, as well as to attract talented researchers from abroad for carrying out specific research projects. Similar measures are experimented also in other regions such as Lombardia and Lazio.

Italy have clear regulation of social security and health insurance as well as a good information systems on both these aspects, which is suitable to make people aware about the conditions of their status.

The Italian social security system provides some benefits, including retirement pensions and benefits for disabled. The quantification of the benefits is based on two main factors: the number of years during which the worker has paid his social security contributions to the Italian system and the amount of the salary received. The Italian social security system offers to all people that work in Italy (EU citizens or citizens of third countries), who are employed, self-employed, professionals or entrepreneurs, the opportunity to obtain the following benefits by paying the social security contributions: permits for illness/sickness, maternity leave, unemployment and mobility benefits, family cheques and pensions. For non Italian citizens, the possibility to benefit of such opportunities is subordinated to the possession of a residence permit or of residence documents.

Health insurance is guaranteed to all the researchers, with non differences linked to the type of position (permanent, fixed-term contract, occasional workers). As to the pension system, the contribution and rules vary according to the sector (higher education, government, or business) and according to the type of position: permanent researchers or tenured researchers have a more complete social security rights than non-permanent ones.

As to the taxation system in Italy is generally divided into two different categories: direct taxes: i.e. taxes calculated directly on the total income of a company (IRPEG) and on the total income of a physical person (IRPEF); indirect taxes: i.e. on goods, services, importations (VAT), taxation on the production of a region (IRAP), tax on the municipal patrimony of buildings and agricultural lands (ICI), etc. Each person is liable to taxes on his own income deriving from subordinated employment and/or self-employment. Taxes are paid on the income received in Italy and for the income received abroad in case the person is a "permanent resident" in Italy. A foreign citizen, employed and residing in Italy, pays his taxes calculated only on the income received while working in Italy. From a general point of view, foreign citizens who stay in Italy for more than 183 days per year are subject to the Italian taxation system.

The Council Regulation (EC) No 1408/71 art. 17 has been implemented in Italy and regulation has been recently modified by the D.lgs 17/2008; it can also be applied to non-European countries, under certain limitations.

Relevant information on social security agreement is supplemented by the institutions hiring the researchers and by the social security national institutions (INPS is the main one for Italy). A strong role is also played by the trade-unions, which provide assistance and information services to third-country workers.

Contracts/fellowships of researchers are subject to social and health taxes. As to social and health taxes, third countries researchers working in Italy are under the

same rules as the EU ones, with few exceptions. Contributions paid in Italy can now be transferred to the country of origin of the third country researcher when he/she leave Italy.

The EC Directive 2005/71/CE has been applied in Italy under the D.Lgs n. 17/2008. It regulates the admission in the country of researchers coming from abroad for carrying out a research project within an Italian research organisation. Short-stay VISA for these researchers is in place. Long-term admissions are subject to the existence of a temporary position (often linked to a specific research programmes) within a research institution in Italy.

More generally, foreign researchers at their arrival in Italy must request a "Permesso di soggiorno" that legitimates their staying and which must be valid for the same period and the same purposes declared on the visa document; after at least 5 years of regular residence in Italy they can apply for a "Carta di Soggiorno", which will allow them to obtain further rights. Generally, for foreign citizens the entry in the Italian territory is subject to a system of entry quotas established year by year by the Prime Minister depending on the country of origin, on the type of activity and on the nature of the contract. Researchers do not have to respect any quotas.

Although the legislative framework on social security, health assistance, admission of researchers is rather complete, the weakness of specific policies for opening out the labour market for researchers make in practice rare the stay of non-nationals in the country.

#### **4.1.2 Policies enhancing the attractiveness of research careers in Europe**

##### **Uptake of the Charter of Researcher**

All the most important research institutions in Italy accepted to commit themselves to introduce principles and measures of the Charter of researchers and the Code of conduct into their own regulations and statutes. This commitment was formalized during a national congress organized in 2005 by the Conference of the Deans of the Italian Universities (CRUI) with the participation of the most important Italian public research organizations and foundations (see: <http://www.fondazionecrui.it>). This act does not imply the obligation for the institutions to apply principles and rules, but it represents one step forward the implementation of the Charter and the Code. Roughly speaking, the institutions which have accepted to adopt the Charter and the Code represent the 47.5% of the total R&D expenditures in Italy (more or less the whole public sector of research).

The formal implementation of the Charter and the Code was signed in 2008 by the Consorzio Area di Ricerca of Trieste and by ten Universities (Camerino, Ferrara, Foggia, Padova, Palermo, Piemonte orientale, Scuola Superiore Sant'Anna (Pisa), Udine, Urbino, Verona). These institutions represent only a small part of the number of institutes which accepted in principle to implement the Charter. National policies do not support the uptake with specific measures.

##### **Remuneration policies**

Universities and public research institutes (PROs) cannot determine salaries of academic staff, which are regulated by law for professors and university researchers and by collective bargaining for the researchers belonging to the public research organizations. Competition for the most talented researchers is not yet prominent in

Italy. Strategies favouring the hiring of young talented researchers instead of the career progression of the hired researchers can be detected only in few universities, mainly located in the Centre-North of the country (Reale, 2008a). Recently, the reform of the competition rules for hiring new researchers (l.1/2009) is supposed to encourage young talented scholars to enter the system (see above).

In Italy there are not dedicated programs for attracting foreign researchers/professors. Universities and PROs can hire scientists working abroad from at least three years with specific fix-tem contracts, on the base of their own resources. A threshold for the number of contracts allowed is determined by the national law. Law 1/2009 foresees the possibility to hire high level scholars as permanent full professors. A specific proposal should be sent to the Miur, that will authorize to hire the professors on the basis of the CUN advice. Moreover some Government project funding schemes (i.e. FIRB) foreseen the possibility to give a three-year contract to foreign eminent scholars, whose expenditures can be completely covered by the Government funding.

### **Promotion of women**

Italy has a gender gap not really different from the other European countries. The figures show that the proportion of female PhD (ISCED 6) graduates in Italy is 51% of the total (43% in EU25); growth rates of PhD graduates in the period 1999-2003 is 15% for female and 17% for male. The proportion of scientists and engineers in the total labour force in 2004 is 1.2 for women and 2.3 for men. The same values for EU-25 were 1.4 for women and 3.3 for male. In 2003 the number of researchers for thousand labour force were 3 for women and 5 for men (in EU-25 they were 4 for women and 9 for men).

Data evidence that the gender gap in Italy emerged mainly at the performance level. Female academic staff at grade A (the highest) of career position in 2004 is 16.4% (15.4% in EU-25). The percentage of grade A among all academic staff by sex in 2004 was 38 for men and 17 for women (18 for men and 6 for women in EU-25). Research funding success rate differences between women and men in 2004 in Italy was 3.0 (5.9 in Germany, 7.2 in the UK, -3.0 in Norway and -3.3 in the Netherlands); the proportion of women in scientific board was 13, vs 27 in France, 31 in UK and 17 in Germany.

In Italy no specific policy measures or incentives have been implemented aiming at promoting the employability of women in the research labour market. Nevertheless, national laws provide a good level of protection aimed at avoiding detrimental effects on women research career; the restoration back to the same type of work is guaranteed by law, fixed-term contract must be extended due to maternity leave, regulation acts both at national and institutional level in Universities and PROs assure gender representation inside research and academic committees, boards, and governing bodies.

In many Universities and PROs a special Committee for the promotion of equal opportunities for women is in place. This Committee usually has the aim to promote women's participation and career opportunities as well as to oppose any measures which could create discrimination against women.

## 4.2 Governing research infrastructures

Italy has its own research infrastructures as well as participation and access to international research infrastructures in some disciplinary fields, mainly through the activity of some public research organizations and private institutions.

For instance, the infrastructures of the Nuclear and Sub-nuclear Physics of INFN (Gran Sasso, Virgo, in Italy and CERN, DESY, FERMILAB at international level), the multi disciplinary infrastructures for the Science and Technology of Materials, Bio-materials and Nano-structures (CNR-INFN, consortium INSTM and Sincrotrone Trieste: Laboratorio Elettra in Italy and access to international large scale facilities ESRF, ILL, ISIS) are all examples inter-governmental European infrastructure where the Italian participation play a relevant role.

The national strategy is traditionally a bottom up one, but it does not imply a dispersion of initiatives. Participation is basically supported by the sectors more integrated at international level, and it is also strictly shaped by the European strategies. According to the European Strategy Forum on Research Infrastructures (ESFRI) recommendations, each country should assure about €5-6m as contribute for sustaining the dedicated European budget. Italy DPEF 2008-2013 include securing of long term investment for research infrastructures according to these recommendations. Annual budget laws are supposed to implement this measure accordingly.

The European Portal on research infrastructures' services listed 44 RI for Italy, of which 14 are classified in the scientific 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 and no one in social sciences.<sup>7</sup>

As to the national infrastructures, we can signal infrastructures in the engineering sciences (CIRA, ASI e Politecnico di Milano as to the aerospace, ENEA in the anti-seismic engineering, other firms and public research organisations such as OGS, CNR, CONISMA for marine sciences), and infrastructure for the high power parallel calculation (CINECA, CILEA). The governance of national infrastructures is assured through agreements between the institutions in charge and MIUR.

As to the infrastructures for data transmission, GARR programs and the investment of many public institutions and inter-university Consortia allowed to have a very good Italian network for data transmission, which gave rise to poles of excellence in the ICT sector. Most of these infrastructures are still involved in European programmes (VI-VII EUFPs) in order to get resources aimed at implementing their opening at the international level within network of researchers.

Until the nineties a special fund for infrastructures was set up at the MIUR level (about €25m per year, the equivalent of €25m). Then, from 2000s, it is difficult to assess the national research investment for RI.

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<sup>7</sup> The total number is more than 44 because each RI can be classified in more than one scientific domain.

### **4.3 Research organisations**

Italy is a particular case of long-time unchanged organizational assets of universities, where the implementation of reforms has been constrained by policy legacy and academic prominence (Reale and Poti, 2008). In the last five years the need to improve excellence of higher education and at the same time to reinforce the capability of universities to impact on social and economic activities gave rise to a set of reforms of both education and research. Government policies are supposed to impact higher education institutions (HEIs), by using both the funding lever and research evaluation, and maintaining a strong emphasis on University autonomy.

Few indicators can be outlined from recent literature, which allow us to know the level of University autonomy in Italy, in comparison with other countries (EUA, 2007; Reale, 2008b; Paradise et al. 2009). Italian HEIs are responsible, as many other European countries, for defining their own institutional strategy, their internal academic and administrative structure, the structure of their decision making bodies and academic profile. They own most of their real estate, are entitled to buy and sell their real estate independently, as well as to buy and sell other financial assets, with no restriction on how money can be spent. Universities have the power to decide the overall number of students and the number of students per discipline, to admit special categories of students and to decide on the criteria for student admission (EUA, 2007).

Autonomy is always limited, because Universities are subject to the law and depend on public funding, thus enabling the state to circumscribe their space of manoeuvre in order to allow the pursuing of public goals. In Italy universities have partial autonomy for deciding on structure and content of the degree programs, as well as for opening and closing down study programs. In both case they have to comply with “minimum requirements” or “quality requirements” settled by MIUR (by the way of CNVSU), which determine certain level of resources and study content of the curricula that the programs must assure.

Universities suffer also limitations in the power to recruit permanent academic staff (recruitment rules and authorization for hiring new personnel), as well as to establish the salary levels, but gained the power to select researchers directly and to decide positions to be opened using the resources made available through the turn over. Moreover the total cost of the personnel cannot exceed the 90% of the Fondo di finanziamento ordinario (Ordinary Fund, FFO), that is the basic Government funding for Universities, and tuition fees cannot exceed the 20% of FFO. MIUR very recently (law 1/2009) modified few aspects of these rules in a more restrictive way. As to the possibility to use the resources available from the turn over, it was limited up to the 50% of the resources; as to the personnel cost, Universities that do not respect the 90% threshold in the year cannot hire new permanent personnel in the subsequent year.

On the contrary, no specific limitations have been set up for research. Universities can autonomously design their research agenda and topics of research specialisation, although only few of them have a recognizable research strategy as far as available data on funding allocation show us (Reale, 2008a). The Government will is to reinforce excellence of Universities. The quoted recent law 1/2009 modified the rules for the recruitment of researchers and professors in order to overcome the actual privilege to local candidates and reinforce the quality of the selection; it also

enlarged significantly the share of FFO that will be allocated on the basis of the evaluation of the research performance (up to 7%).

Evaluation is a core element of the new reform process. Law 1/2009 foresees evaluation of University researchers and professors activities in order to obtain salaries improvements, and evaluation of the research institutions (both Universities and PROs) as driver of a significant part of funding allocation. Evaluation of public funding programmes is also mentioned as important item of the government programme. The Agency for the Evaluation of University and Research is still to be implemented. Meantime CIVR and CNVSU should assure the support to the MIUR initiatives.

Governance of University does not show strong changes in the last five years. Rectors and most members of the governing bodies (Senato Accademico and Consiglio di Amministrazione) are elected by the professors. The Rector's leadership is based on consensus building, but his/her power significantly increased, in some cases mainly to the introduction of steering tools, such as new governance arrangements, evaluation practices whose results impact resource allocation, new funding rules. Some Universities created a Foundation as separate body, belonging to the University, aiming at improving education and research by catching new resources, improve management and facilitate interactions with external actors.

Faculties remain the teaching management level, defining curricula under a set of accreditation requirements defined by MIUR, based on CNVSU recommendations. Deans are elected by the professors too. Although the academic system is characterised by a high degree of individual freedom in research, Departments are the research management level, and are now expanding their competences for coordinating co-funding of projects, and the purchase of equipment, as well as regulating relationships with external providers (firms, public or local bodies). Also the Directors of the Departments are elected.

Modification of the University governance is another key element of the government programme for the forthcoming years. MIUR guidelines for reforming the higher education sector put great emphasis on transforming Universities and public research organisations into organisation driven by merit criteria in all their activities (teaching, research, services, training, etc). A law proposal (DDL 1387/2009) for the modification of the university governance has been recently presented.

The role of stakeholder substantially improved in all the Italian Universities. Students and local representatives are involved in the university governing bodies (Senato and Consiglio). Firms and non-for-profit organisations gain in some universities a prominent role in funding, thus influencing decision making. At national level, the National University Council (CUN) enlarged to students and technical and administrative staff, asked to make propositions on university planning and new criteria on resource allocation. Industrial association may advice government on HE policies.

Law 133/2008 foresees also the possibility for Universities to transform themselves in public foundations if the majority of the components of the governing bodies would be approved it. This transformation is supposed to give a larger autonomy to universities and to make them stronger organisations. At this moment no university used this possibility mainly because of the uncertainties linked to the effects the transformation could produce.

Italy has a dual university funding system composed by block grant funding (FFO) mainly covering the personnel costs and a competitive funding based on different project funding schemes. FFO's stock depends on its historical sum and, since 2000, on the basis of the standard production cost for student, that depend on the size - environmental conditions of the University and the features of each scientific sector (modello del riequilibrio). From 2003, the incremental share of the FFO is allocated through the new theoretic model for the FFO, which ties funding to the University's performance in teaching demand (number of students for each scientific area), number of graduates and teaching credits (Crediti Formativi Universitari, Cfu), research activity production. The funding "formula" for the FFO allocation<sup>8</sup> was recently partly modified. Law 1/2009 established that 7% of the total FFO will be allocated on the basis of three criteria: quality of the education supply and educational results, quality of scientific research, quality efficiency and effectiveness of the teaching courses. By the end of March a Ministerial decree will set the rules on how to apply the aforementioned criteria, on the base of the CNVSU and CIVR advice. The third criterion will not be applied in the first year.

As to competitive funding, value and types of research project funding grow up and diversify: the number of programs and delegation settings are rather fragmented into different schemes (PRIN, FIRB, FISIR, FRA, Pus, Center for excellence, Mixed Labs). From 2007 government foresee to recombine the all schemes into a unified framework, FIRST, but this provision is still to be implemented.

FFO is assigned yearly through the financial law. The low growth of the total amount of FFO along the last five years (from €6,010m in 2001 to €6,894m in 2005) give a very small support to long term R&D investment of Universities. Although this amount is complemented by the government project funding, even in this case we face a decrease of the R&D funding: from €537m in 2001 to €416m in 2005 (CNVSU, 2007). ([Poti B. and Reale E., 2009](#)). In the forthcoming three years (from 2009 to 2011) Government will reduce FFO (the Ordinary Fund) substantially. L. 133/2008 foreseen a stable value for FFO in 2009, and cuts of -10.2% in 2010 and -12.2% in 2011 with respect to the 2008 amount (€6,866m).

A similar trend can be observed in the financing of public research organizations (PROs): the government block grant funding<sup>9</sup> grew from €1,575m in 2002 to around €1,618m in 2006. L. 133/2008 did not foreseen reductions of the government financing of PROs.

#### **4.4 Opening up national research programmes**

In Italy opening-up strategies of national research programmes are mainly developed at ministerial level and pay more attention to participants coming from other European countries, although a significant interest toward emerging countries (especially China) is in place. Monitoring of the strategies implementation is weak.

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<sup>8</sup> The funding formula is structured as follows: 30% of the FFO is determined on the basis of the existing educational demand (students enrolled and their characteristics); 30% depends on the results of the educational processes (credits acquired); 30% is linked to the evaluation of the university research results; 10% is linked to special incentives.

<sup>9</sup> The main tool for financing public non university R&D in Italy is the Fondo ordinario per ricerca e sviluppo (Ordinary Fund for R&D) which represents the core funding of the non university institutes. The Fund is a framework included in the national yearly financial law, for programming R&D, by areas, domains, themes and institutions.

MIUR initiatives for the coordination of national research programmes and funds mainly related to the aforementioned merging of different project funding schemes under a unified framework named FIRST. The government left coalition announced other forthcoming measures aimed at joining and coordinating national research programmes in order to reach the critical mass needed for making the initiative attractive for research groups coming from abroad. Precise measures have not yet been presented officially.

During the VI EUFP 106 ERANET have been launched with an investment from the Commission of €183m. These projects involved 1047 participants from 40 European countries. 29 Italian participants participated in 47 projects and gained a total support of more than €6.5m. The Italian participation to the ERANET projects involved different institutions; it included Ministers (7), Regions (5), public research agencies national (2) and regional (2), public research organisation (9) and other bodies (4). MIUR participates to 7 ERANET. Under the VII EUFP MIUR entered another ERANET project and one Support Action (COSINE2) which is structured in quite the same way as ERANET. At this moment MIUR participates to the following ERANET projects: ACENET, AIRTN, BIODIVERSA, ERA-PG, EUROPOLAR, HY-CO, MATERA, NET HERITAGE, COSINE2.

In 2007 the Ministry for the Economic development, the Ministry for innovation and MIUR signed an agreement for sustaining the Italian participation to JTIs. In the VII EUFP two JTIs have been launched: ARTEMIS-Advanced Research and Technology for Embedded Intelligence and System, and ENIAC for nanotechnologies. Many initiative were organised in Italy in order to promote and to support the Italian participation both by MIUR (through APRE) and private industrial association, such as Confindustria. Italy also participated to the JTI Fuel Cells and Hydrogen (FCH) call. The most important barriers to enter the JTIs lies on the poor public investment in research and the poor propensity of the national industrial system to take the risk of large investment in R&D.

The Ministry of Foreign Affairs supports cooperation between national scientific and technological research facilities, both public and private, and similar facilities in other countries through the negotiation of Executive Programmes for Scientific and Technological Cooperation. Under these programmes, the parties develop joint research projects in various sectors, which have normally been identified in Framework Agreements. In general, their duration is two or three years. Each scientific and technological Executive Collaboration Project includes a list of joint research projects to be funded bilaterally in those scientific sectors that both countries consider to be a priority. Italy generally takes into consideration the following factors in selecting the sectors: the strategic lines set out in the National Research Programme; the programme guidelines contained in the European Union's Research Framework Programme; the strategic lines of the main research bodies' three-year Programmes; and the internationalisation initiatives adopted by the local government in the scientific and technological research sector.

The number of projects to be included in the scientific and technological Executive Programme depends primarily on the financial resources available. The selection criteria include the quality of the proposals and the need to maintain a balance between the sectors. Foreign researchers taking part in a joint research project as part of a current Scientific and Technological Executive Programme can make one or more paid stays in Italy to implement the project. The duration of their stay in Italy, any payments they receive and the general provisions governing their stay are

defined for each Executive Programme. Two types of stay are envisaged: a brief stay lasting up to 10 days (or less); and long stays, lasting 1, 2 or 3 months.

Moreover, the Directorate General for Cultural Promotion and Cooperation awards grants each year for supporting bilateral scientific and technological projects, in conjunction with MIUR. One condition for the grants is that the project should have been selected when the individual Scientific and Technological Collaboration Programmes were signed and that it should have its own funding.

Interestingly enough is the DAVINCI initiative. DAVINCI is an Internet accessible database set up by the Italian Ministry of Foreign Affairs that gathers data, voluntarily provided by its participants, on the activities, research interests and competences of Italian researchers working abroad. The data supplied are useful for the purposes of making connections, getting information and generating dialogue. The information contained will be made public to all end-users (<http://www.esteri.it/davinci/index.asp?lang=eng>).

#### ***4.5 National ERA-related policies - a summary***

European policies have traditionally a strong importance in Italy since they impacted significantly the national multi-years research planning. Lisbon strategy for instance is quoted in many policy documents as justification of the government objectives to be achieved, which would let Italy to stay and to maintain a competitive positioning within the European landscape.

As to the importance of ERA issues, we can say that from 2008 there is a general improvement of their importance in the policy debate; in some cases we faced also the realisation of a policy design (a reform process for instance), but the implementation of the new measures sometime remain weak.

The weight of the ERA-related policies is different if related to formalised objective strategies, programmes and instruments in place or planned, because some policies are more strictly related to national priorities than others. This is the case, for instance, of autonomy of research institutions and labour market of researcher, which received a greater emphasis than governance of research infrastructures and opening up of national research programmes. A reason for this can also be identified in the need to improve efficiency and effectiveness in the use of available resources, and at the same time to the difficulty of mobilizing new financial public resources for R&D programmes, due to the economic crisis.

**Table 12: Importance of the ERA pillars in the ERA policy mix and key characteristics**

	<b>Short assessment of its importance in the ERA policy mix</b>	<b>Key characteristics of policies</b>
Labour market for researchers	<ul style="list-style-type: none"> <li>• Policies for opening up the national labour market of researchers through enhancing inward and outward mobility have a relevant place in the government programme</li> <li>• Promotion of the employability of women is almost non-existent in the government priority setting</li> <li>• Salary differentiation based on merit is an important issue of the government agenda still to be implemented</li> </ul>	<ul style="list-style-type: none"> <li>• Good legislative framework for the social security, pension, health assurance and visa for third countries.</li> <li>• Weak incentives for attracting non-national researchers (attractiveness mainly based on research institutions own budget)</li> <li>• Ineffective uptake of the Charter of researchers</li> </ul>
Governance of research infrastructures	<ul style="list-style-type: none"> <li>• Good participation to the EUIP initiatives in order to open RI to international participation</li> <li>• Difficult to assess the national investment on RI because there is not a dedicated fund</li> </ul>	<ul style="list-style-type: none"> <li>• Italy has traditionally a bottom up strategy, but not a dispersed one, since participation is mainly driven by the sectors more integrated at international level</li> <li>• Lack of government initiatives for governance arrangements of RI</li> </ul>
Autonomy of research institutions	<ul style="list-style-type: none"> <li>• Strong importance of measures aimed at shaping autonomy of universities through competitive funding and evaluation</li> <li>• Making excellent research institutions competitive at European level is a key government priority</li> </ul>	<ul style="list-style-type: none"> <li>• Emphasis on efficiency and effectiveness in the use of resources</li> <li>• Reinforcing the linkages between resource allocation and evaluation is a fundamental instrument for enhancing the merit</li> </ul>
Opening up of national research programmes	<ul style="list-style-type: none"> <li>• Opening up strategies not yet well developed at government level</li> <li>• Monitoring of the strategies implementation is weak</li> </ul>	<ul style="list-style-type: none"> <li>• Policies are mainly concentrated at the ministerial level</li> <li>• Difficult to involve firms in new joint initiatives for their low propensity to invest in research activities</li> </ul>

## 5 Conclusions and open questions

### 5.1 Policy mix towards national R&D investment goals

The present policy mix, which is the result of recent changes and reforms, is moving in the right direction, facing some of the national system weakness. What is to be remarked is that Italy is far away from the Lisbon target and that a strong pro active Government behaviour is asked, including an efficient implementation of the measures (availability of resources, less time gap between demand and fund allocation), continuity of policy and revision based on a systemic (regular, interesting institutions and projects and open to evaluate the effect of measures devoted to similar aims) evaluation. Two specific aspects can be underlined: the coordination between the Ministry of University and Research and the Ministry of Economic

Development needs to be improved, for overcoming the traditional separation of the national system between research and innovation; the Structural Funds play a key role in the present policy mix and a good monitoring of their use towards more R&D based initiatives needs to be assured. A new and more structured interest for the financial institutions role in R&D activities has emerged and this shows a cultural change in the national policy making. The national RDI system needs to be pushed out of its simple reproduction; what cannot be forgotten is that a modernisation of the productive and technological specialisation needs a larger contribution and that what is the forgotten side of the policy mix, the SMEs which innovate mostly in process, needs to be re oriented towards product and R&D based innovation.

## ***5.2 ERA-related policies***

The awareness about ERA issues is growing up in Italy. It goes with the reinforcement of the importance given in the policy documents to the internationalisation of research, to the promotion of young brilliant researchers, to the pursuing of excellence of institutions and programmes as well as to the mobility of people around Europe.

The traditional low investment of Italy in R&D, the financial crisis and the lack of adequate funding resources to sustain the reform process toward a more integration of labour market, research infrastructures, research institutions and national programmes, represent strong barriers for the realisation of ERA policies.

Because the economic crisis does not allow substantial mobilisation of resources, Italian government intends to face these constraints through policies mainly aimed at rationalise the system. Policies will be aimed at keeping resources to invest through eliminating inefficiencies, avoiding duplication of research effort, as well as to concentrate resources on the most promising initiative in terms of integration at European level. Nevertheless the weak monitoring system as well as the scarce coordination between different Ministries is factor which can inhibit the achievement of good results.

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## List of Abbreviations

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BERD	Business expenditure in Research and Development
CRUI	Conferenza dei Rettori delle università italiane
DPEF	Documento di Programmazione Economico Finanziaria = Economic-financial Plan
FRA	Fund for Applied Research
FAS	Fondo per le aree sottoutilizzate = Fund for Underdeveloped Areas
GERD	Gross expenditure in Research and Development
ISTAT	Istituto italiano di Statistica= National Institute of Statistics
m.	millions
MIUR	Ministry for University and Research
NPR	National Plan of Research
PIA	Pacchetti Integrati di Agevolazione= Integrated Support measures
PRO	Public Research Organisation
PON	Programmi operativi nazionali= National Operational Programs
QSN	Quadro strategico nazionale= National Strategic Frame

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### **Abstract**

The main objective of the ERAWATCH Policy Mix Country reports 2009 is to characterise and assess in a structured manner the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The reports were produced for all EU Member State and six Associated States to support the mutual learning process and the monitoring of Member and Associated States' efforts by DG-RTD in the context of the Lisbon Strategy and the European Research Area. The country reports 2009 build and extend on the analysis provided by analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

This report encompasses an analysis of the research system and policies in Italy.

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