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Working paper

Innovation policy in the European Union: instruments and objectives

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Introduction

We provide an overview of the specific innovation policies that are implemented at European level, highlighting, where possibile, the connections between these policies and the guidance documents issued by the Community's institutions. We describe the kinds of policy interventions that are implemented, providing at the same time some useful elements in order to understand the assumptions and theories that underpin them.

The paper is organized as follows. In section 1, we present a brief survey of the documents through which European institutions, in particular the Council and the Commission, describe the principles to which they refer in order to guide their choices concerning community innovation policy. The interventions that are performed in practice, however, are often different from those that are advocated by these institutions, since the relationship among these actions is mediated by numerous institutional levels and by processes that take place on different time and social scales. Therefore, in section 2, we discuss the main interventions that have been carried out in the last ten years, through the financial instruments that Community institutions have at their disposal. We describe these instruments, the actors involved in their preparation, the actions undertaken – both those explicitly identified as “innovation policy” and those that, although promoted in the context of other policies, affect the same channels or pursue similar aims. With respect to these policies, we also provide some quantitative data. In section 3 we present some remarks on the connection between the view of the innovation process that is held by the Commission, as it emerges from public documents, the theoretical assumptions that we think underlie it, and the interventions that Community institutions perform in practice.

1. The European institutions' approach to innovation policy

Community institutions have explicitly included innovation policies in their public documents only starting from the early 1990s. In 1995, the first step in this direction was taken with the Green Paper on Innovation, followed by the First Action Plan for Innovation in Europe (1996) that presented a few policy suggestions. The actions suggested by the Plan identified a set of policy directions that have been confirmed in subsequent documents. The proposed actions were divided into three groups according to whether their purpose was to “foster an innovation culture”, “establish a framework conducive to innovation” or “better articulate research and innovation”, on the basis of the claim, often stated in the Commission's documents¹, that the European Union suffers from a paradox such that a satisfactory research performance is not matched by an adequate innovation performance, where the main term of comparison was - in this instance as well as in others - the United States.

The Lisbon European Council (2000) was an important milestone for the Community's approach to innovation policy. The Presidency conclusions identified ambitious objectives to be pursued by the Union in the coming decade. The so-called Lisbon strategy² requires the Union to become, by 2010, “the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion” (quoted in COM(2000)256, p.2). With the Lisbon strategy, innovation gains increasing importance in the EU policy framework; the argument that firms' competitiveness in a globalized economy is increasingly dependent on the introduction of new products and services is emphasized. Innovation policies, previously framed within the context of research policy, begin to be considered as essential components of enterprise and industrial policy strategies – a change that reflects a shift in theoretical perspective. Especially in the last ten years, in fact, the main European institutions have been influenced by several heterodox approaches (evolutionary economics, national systems of innovation, learning regions, economics of complexity) to the analysis of innovation and technological change (Mytelka

¹ See for example COM(95)688, COM(2000)6 and COM(2000)567

² The main references for the Lisbon strategy are: the Presidency Conclusions (European Council, *Presidency Conclusions. Lisbon European Council*, 23-24 March 2000) and the yearly Spring Reports of the Commission concerning progresses made each year towards the attainment of the strategy (European Commission, *Spring Report 2003: Choosing to grow: knowledge, innovation and jobs in a cohesive society*, COM (2003) 5; European Commission *Spring Report 2002: The Lisbon Strategy. Making change happen*, COM (2002) 14; European Commission *Spring Report 2001: Realising the European Union's potential consolidating and extending the Lisbon strategy*, COM (2001)79; European Commission *Spring Report 2000: An agenda of economic and social renewal for Europe*, COM (2000) 7). See also the recent Communication *Delivering Lisbon - Reforms for the enlarged union*, COM (2004) 29.

and Smith, 2002)³; this, in turn, has led to the development of a more holistic approach to innovation, with a theoretical shift - away from linear descriptions and in favour of systemic views of the innovation process - that has been stated quite explicitly in some of the Commission's documents. For example, COM(2003)112 remarks that: "The evolution of the innovation concept - from the linear model having R&D as the starting point to the systemic model in which innovation arises from complex interactions between individuals, organisations and their operating environment - demonstrates that innovation policies must extend their focus beyond the link with research" (p. 4). The need for a "broad and systemic" approach to innovation is acknowledged, whereby "measures to encourage investment in research must go hand in hand with measures to foster enterprises' motivation to innovate and their capabilities to draw concrete benefits from research – measures that are implemented through industrial, entrepreneurship and innovation policies" (COM(2003)226, p.6).

In fact, the Commission's post-Lisbon approach to innovation policy seems to unfold along two axes – industrial and enterprise policy on the one hand, research policy on the other. This dual approach is mirrored in some organizational choices⁴ as well as in the interventions that are performed, and it raises coordination issues among different policies.

With respect to research policy, the Lisbon Council explicitly acknowledged the objectives set by Communication COM(2000)6 "Towards a European Research Area" which argued for the need to create a market for supply and demand in knowledge and technology – an objective which has guided numerous decisions about the structure and shape of the interventions of the sixth Framework Programme. In 2002, the Barcelona European Council set a twofold objective requiring the Union to reach, by 2010, a level of R&D expenditure equal to 3% of European GDP (compared with 1.9% recorded in 2000), within which the level of private funding should increase up to two thirds of community R&D investments. Again, at the root of this recommendation was a perceived gap in research expenditure

³ According to these authors, some heterodox economic theories have played an important role in influencing the policymakers' thinking within institutions like the European Commission and OECD, but not within others, such as the World Bank.

⁴ With the reorganization of the Commission's structure in 1999, of a new "innovation policy unit" has been created within the Enterprise Directorate General, responsible for the design and management of innovation policies (and specifically for the implementation of the fifth framework's "promotion of innovation" horizontal programme). However, as it will be clearer from the next section, the range of Community policies that, in various ways, support innovation processes much exceeds the set of interventions that are directly promoted and managed by Enterprise DG.

between the European Union and the United States⁵, due in particular to under-investment in research and development on the part of European firms. This, in turn, was presented as the cause of the slow growth in labour productivity, starting from the mid-1990s, and of the low competitiveness of EU firms in many high-tech industries. An articulated plan in order to reach the expenditure objectives set in Barcelona was introduced in Communication COM(2003)226 “Investing in research: an action plan for Europe”, which outlined four broad sets of proposals, directed at: promoting coordination between national and Community-level policies⁶; improving the efficiency of public expenditure in research; supporting research, both through macroeconomic policies (increasing the level of public expenditure) and microeconomic ones (provision of information on possible firm aids that do not countervene Community competition rules, support for new technologies through public procurement); improving “framework conditions for private investment in research” (a set of indications that largely overlapped with those presented in the Communications on enterprise policy).

After the Lisbon Council, two Communications were explicitly intended to guide the Community’s thinking on innovation policy. The first was Communication COM(2000)567 “Innovation in a knowledge-driven economy” where - after a summary of the actions undertaken in order to promote innovation after the First Action Plan of 1996 - five policy objectives⁷ in line with the Lisbon Strategy were identified, which were broadly similar to those already indicated in the First Action Plan and in the various Communications on research. The second was the aforementioned Communication COM(2003)112 “Innovation policy: updating the Union’s approach in the context of the Lisbon strategy”, which included a discussion of the theoretical premises that underpin policy development. The main arguments proposed were the following:

⁵ “Comparison of R&D expenditure in the EU and in the US shows a massive and rapidly growing gap, both in value and as a share of GDP. The gap reached 124 billion current euro in 2000 and it has doubled at constant prices since 1994. R&D intensity in the EU, measured as the percentage of GDP accounted for by total investment in R&D, stagnated at around 1.9% over the last ten years, while in the US it grew continuously from 2.4 % in 1994 to 2.7 % in 2000” (COM(2002)499, p.6).

⁶ In particular the adoption of a “European coordination process” among institutions was advocated. The document called for increased sharing of experiences between regions and nations and for the creation of interaction mechanisms (called “European technology platforms”) able to involve various stakeholders, interested in specific technologies and in policy design

⁷ These were: coherence of innovation policies; a regulatory framework conducive to innovation; encouraging the creation and growth of innovative enterprises; improving key interfaces in the innovation system; a society open to innovation.

- the EU's disappointing innovation performance (measured on the basis of indicators from the European innovation scoreboard⁸ and the Global Competitiveness Report 2002-2003) is the main cause for the slow rise in productivity, it is partly responsible for the slowdown of economic growth, and it may delay or even prevent the attainment of the Lisbon objectives;
- the central role of companies in innovation processes and the need for a systemic approach to innovation are emphasized;
- it is acknowledged that rhetoric statements on the system nature of innovation phenomena have not been matched by interventions that are consistent with these premises⁹.

On the basis of these remarks, the Communication suggested that innovation policies should impact: (a) the propension to entrepreneurship, through appropriate training policies; (b) the immediate environment where firms operate, promoting “a set of interactions with other enterprises, organisations and public bodies that are essential for innovation (...) Considerations of this nature are behind the growing importance of policies in support of clusters – geographic concentrations of complementary, interdependent, yet competing enterprises, their suppliers, service providers and associated institutions” (p.8); (c) the macro and microeconomic conditions that sustain innovation, including highly competitive markets, well functioning capital markets, a supportive regulatory environment, and flexible, mobile and skilled human resources; (d) the education system, which affects attitudes toward innovation and creates the competencies that are required in order to innovate.

The following table provides a synthesis of the many innovation policy proposals that are included in the above-mentioned Communications, in order to attempt a comprehensive reconstruction of the Commission's proposed view of innovation. We obtain a taxonomy of policy areas and of specific actions that are proposed as theoretical “guidelines” for the Commission itself and for member states.

⁸ The “European Innovation Scoreboard”, published annually since the Lisbon European Council (2000), is an evaluation exercise of the innovative performance of the Union's member states. This initiative is part of the broader project “The European Trendchart on Innovation”, funded by the fifth framework programme and managed by Enterprise DG. In order to better illustrate what “innovation” is according to the Community's institutions, Appendix 1 reports the set of indicators that are used in the European innovation scoreboard.

⁹ “Although it is the systemic model that now dominates in policy discussions, many measures put into practice with the intention to promote innovation still appear to owe more to the linear view (..) the systemic model has yet to be fully reflected in the way that innovation policy is devised and implemented (...) These models also colour measurements of the innovation process and innovation performance, which are usually biased towards indicators of technological innovation” (COM(2003)112, p.7).

Table 1. A taxonomy of policy recommendations proposed by the European Commission

General objectives	Strategies proposed in order to achieve the general objectives	Specific actions suggested in Commission documents
Promote coordination among regional, national and community- level innovation policies and other types of policies	Activate procedures based on target setting, ex ante and ex post evaluation, interim monitoring, benchmarking	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> Implement periodic target-setting, monitoring, evaluation and peer review of regional and national programmes for enhancing innovation and of the bodies which implement them Stimulate and co-ordinate regional initiatives and regional actors to devise and implement integrated research and innovation programmes at regional level <p>Measures suggested by COM (2003)112</p> <ul style="list-style-type: none"> (The Commission should) launch a pilot initiative offering independent evaluations (on a voluntary basis) of programmes, schemes and support agencies for the promotion of innovation <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> Set up an open process of co-ordination on actions for developing human resources in science and technology, with particular emphasis on the implications of the 3% objective, as an extension of the existing process focusing on mobility
	Harmonize indicators among member states and between member states and Commission	<p>Measures suggested by COM (2003)112</p> <ul style="list-style-type: none"> Member states should build and strengthen their national innovation strategies, define their own sets of policy objectives, set their own targets and have their own sets of indicators compatible with European and international statistics (they should) cooperate with the Commission by making information available on innovation policies and performance, produce further data and indicators and stimulate national statistical offices in their efforts in collecting and providing comparable statistical data in the area of innovation <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> (The Commission should) set up an open process of co-ordination on actions for increasing investment in research, involving Member States(...), based on the light methodology and the set of existing indicators proposed in the annex to the present action plan
	Promote exchange of information among institutions at different levels	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> Encourage diffusion of "good practice" and transnational cooperation among regions regarding research and innovation policies Implement a framework for dialogue, coordination and benchmarking of Member State innovation policies and performances <p>Measures suggested by COM (2003)112</p> <ul style="list-style-type: none"> Member states should participate actively in the mutual learning process initiated by the <i>Trend Chart on Innovation in Europe</i> and in analysis of the innovation phenomenon. (The Commission should) build an improved framework for the mutual learning process in innovation policy on the basis of the present <i>Trend Chart on Innovation in Europe</i> (and) cooperate with Member States in analysis of the innovation process, policies and performances. Member states and commission should ensure that mechanisms are in place for "vertical" coordination, so that policies in support of innovation interlock at EU, national and regional levels <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> Improve the effectiveness of public actions to promote research and innovation by designing policy mixes using in a coherent way various policy instruments, and by developing the interactions with policies put in place by other countries and at European level, notably on the basis of information shared and lessons learned through the open process of co-ordination Establish a mutual learning platform to help regions in the further development of their research strategies, taking into account their specific situation and needs. Building on existing activities, the platform will be supported notably by the development of a typology of regions, a methodology for the comparative assessment of regional performance, and specific actions to promote the use of science and technology foresight at regional level
	Activate exchanges of information among the various Community institutions that carry out programmes connected with innovation	<p>Measures suggested by COM (2003) 112</p> <ul style="list-style-type: none"> The Commission should increase the coherence of the various policy benchmarking exercises falling under the competence of the Competitiveness Council (European innovation scoreboard, enterprise scoreboard, science and technology key figures) strengthen existing processes, in the framework of the <i>Trend Chart on Innovation in Europe</i>, enabling Member States to learn from each other's experience in innovation policy development and implementation Intensify their cooperation and create a common framework for the strengthening of innovation in the EU, including assessment mechanisms taking stock of the progress achieved <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> Further development of complementarity and synergies between European financing instruments : the Sixth research framework programme, structural funds, EIB/EIF and Eureka (joint working groups) Mid-term review of the structural funds instruments, highlighting the potential benefits for regions of actions under the research and innovation priority

	Activate exchanges of information among Community institutions and external <i>stakeholders</i>	Measures suggested by COM (2003)226 <ul style="list-style-type: none"> Set up European technology platforms on a number of key technologies, following the criteria and methodology indicated in the Commission staff working paper attached to the present communication (where "technology platforms will be mechanisms to bring together all interested stakeholders to develop a long-term vision, create a coherent, dynamic strategy to achieve that vision, and steer its implementation")
Promote public research and "technology transfer" from the centres where research takes place, often universities, to firms that develop new products or services	Increase and improve direct public investment in research	Measures suggested by COM (2003)226 <ul style="list-style-type: none"> Increase the participation of industry and other stakeholders in the determination of priorities for public research Eliminate rules and practices in national programmes that impede European cooperation and technology transfer, and allow funding of organisations from other Member States where appropriate Enhance the innovation impact of R&D programmes by encouraging and supporting the integration of innovation-oriented activities in research projects (e.g. knowledge management and diffusion, training activities, take-up measures for SMEs)
	Encourage public research to achieve better innovation performance by granting intellectual protection to the results achieved	Measures suggested by COM (2000) 567 <ul style="list-style-type: none"> Adapt the rules for the diffusion of research results from publicly-funded research (licensing, access to foreground knowledge, etc), to encourage exploitation and transfer of results so as to foster innovation Measures suggested by COM (2003)226 <ul style="list-style-type: none"> Develop European guidelines for the management and exploitation of intellectual property rights in public research institutions and public-private partnerships. These guidelines will help public research institutions to develop and enforce, on a voluntary basis, charters setting out the main principles to be applied regarding e.g. the ownership and licensing of research results, the sharing of revenues, etc. Develop guidelines to help Member States review – and, where appropriate, adapt – their national regimes governing the ownership, licensing and exploitation of IPR resulting from publicly-funded research, with the aim of promoting technology transfer to industry and spin-off creation
	Foster the creation of relationships between universities and business	Measures suggested by COM (2003)226 <ul style="list-style-type: none"> Pursue or initiate necessary regulatory and administrative reforms, and support measures, to enable public research institutions to develop more effective links with industry, in particular SMEs, while safeguarding their public mission in education and fundamental research. Issues to address include notably the establishment of incubators, science parks, seed funds and new types of public-private partnerships and the performance appraisal of researchers. Use of existing instruments in the research framework programme to support temporary exchanges of technology transfer professionals between research organisations
	Create a "European market" for research	Measures suggested by COM (2003)226 <ul style="list-style-type: none"> Implementation of the Mobility strategy for the European research area, especially initiatives aiming at improving access to the European research labour markets, such as the launching of information tools for researchers, the full application of the co-ordination of social security schemes, including the improvement of the take up of complementary pensions, and the implementation of the European health insurance card
Promote private firm research and stimulate innovation processes within firms, particularly SMEs	Design intellectual property laws that encourage company innovation and ensure that they are applied	Measures suggested by COM (2003)226 <ul style="list-style-type: none"> Negotiation of a proposal for a directive on the enforcement of intellectual property rights Negotiation of a proposal for a directive on the patentability of computer-related inventions, taking into account the need to avoid stifling competition and open-source development Rapid implementation of Directive 98/44/CE relating to the patentability of biotechnological inventions and Directive 2001/29/CE relating to copyright and related rights in the information society

	<p>Fiscal measures and direct aids directed at supporting innovation on the part of private firms, particularly SMEs, and the creation of "innovative" start ups</p>	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> Put in place fiscal measures, in accordance with Articles 87 and 88 of the Treaty, to encourage private investment in research and innovation and employment of researchers by the private sector Pursue efforts to create a legal, fiscal and financial environment favourable to the creation and development of start-ups <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> Improve fiscal measures for research on the basis of: formal evaluations, whose results should be disclosed; mutual learning; the application of principles of good design such as simplicity, low administrative cost and stability Encourage a concerted use of fiscal incentives to facilitate fund raising by new or existing foundations supporting R&D activities in Europe Encourage a concerted use of fiscal incentives to encourage the creation and early growth of research-intensive firms Rapid adoption of a revised block exemption for SMEs, encompassing State aid for R&D Collection of data and reporting on the redirection of State aid towards horizontal objectives, including research Forthcoming Commission initiative on the cross-border of ESFting of losses for tax purposes (planned in 2004), which will benefit research activities and contribute to their more efficient allocation within multinational groups, since these activities are almost by definition accounted as loss-making Rapid adoption of the draft directive on the taxation of cross-border payments of interest and royalties, which will abolish withholding taxes on royalties for patents in the EU
	<p>Improve the access of private firms, particularly SMEs and start ups, to Community funding that are available for private research (especially from EIB)</p>	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> Facilitate access by start-ups to public tendering, to Community programmes (and their results) and to the "Innovation 2000 Initiative" of the European Investment Bank (EIB) <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> Launch of the 'innovation 2010' initiative of the EIB Group, as the follow-up to its innovation 2000 initiative, with increased means (investment target of € 20 billion for 2003-2006) and improved instruments to invest in research and innovation activities Consider strengthening and extending future guarantee schemes managed by EIF from its own resources or the community mandate, in order to support the development of national and regional guarantee programmes to improve access to debt and in particular equity financing for research and innovation in SMEs Consider setting targets for the participation of SMEs in national programmes, on the model of the 15% target set in the Community research framework programme
	<p>Increase the availability of private funding for research carried out by private firms, in particular SMEs, and for the creation of "innovative" start ups</p>	<p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> On the basis of experience in some countries, make better use of guarantee mechanisms to improve access to debt and equity financing for research and innovation activities in SMEs Networking activities for risk capital fund managers and business angels, encouraging the emergence of trans-European co-ordinated risk capital activities Increase awareness of research-intensive SMEs about appropriate use of risk capital notably through actions at regional level, in accordance with the Commission guide on risk capital financing Full implementation of the financial services action plan: adapt, where appropriate, the fiscal treatment of risk capital to avoid the double taxation of investors and funds Actions within the research framework programme to stimulate widespread use and harmonisation of guidelines on measuring corporate research and other forms of intellectual capital Development and regular publication of statistics on firms' investment in intellectual capital
	<p>Measures directed at promoting the creation of support structures for private research and the for the creation of "innovative" start ups</p>	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> Foster, at regional level, the creation or reinforcement of adequate support services and structures such as incubators, etc. Reinforce support services with a European dimension, such as the LIFT helpdesk on innovation financing (web portal, online tool box) and investment fora to facilitate interfacing between researchers, enterprises and investors; contribute to the development of methods for evaluating enterprises' intangible resources, in particular to value portfolios of IPR Encourage networking activities such as the network of regions of excellence for the creation of enterprises, the networks for training and support services (incubators seed funds, etc.); development of a European electronic directory of innovative start-ups

Create the competencies needed for innovation	Promote the creation of specific managerial and scientific competencies, necessary in order to sustain innovation	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> • Set up education and training schemes in entrepreneurship and innovation management, where these do not exist, in higher-education establishments and business schools, and disseminate good practice in this area • Facilitate the implementation of lifelong learning programmes to improve the general assimilation of new technologies and remedy shortages of skills • Encourage universities to give particular attention, in addition to the traditional missions of education and research, to promotion of the diffusion of knowledge and technologies <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> • Implementation of the Science and Society action plan, notably actions to promote the mainstreaming of gender equality and the launch of an initiative to enhance science teaching and bridge the gap between science education and working with science • Consider a concerted use of fiscal incentives to raise the attractiveness of research careers
	Promote innovation awareness in the public sector	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> • contribute to promoting innovation in the public sector by: organising exchanges of experience on the promotion and dissemination of information on innovation in government and public services • promoting training and awareness activities on policies and factors shaping the innovation performance of firms • setting up a web-site to disseminate initiatives and tutorials
Foster the diffusion of innovations	Activate public procurement expenditure in order to support new technologies and innovative products	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> • Promoting dissemination of good practices emanating from the public procurement authorities <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> • Rapid adoption of the procurement package by the Parliament and Council • Progress of the e-procurement initiative • Progress towards the possible creation of a European intergovernmental defence capabilities development and acquisition agency
	Promote networking among firms in order to facilitate the transnational diffusion of innovations	<p>Measures suggested by COM (2000) 567</p> <ul style="list-style-type: none"> • Support EU-level initiatives, such as networking and pilot experiments, to facilitate transnational technology partnerships, as well as the diffusion of nontechnological innovation, in particular for SMEs <p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> • Gear more research programmes towards the constitution of poles and networks of excellence by encouraging clustering or integration of resources at regional, national and European levels
	Foster the creation of technological standards	<p>Measures suggested by COM (2003)226</p> <ul style="list-style-type: none"> • Forthcoming Commission communication on standardisation • Implementation of the General guidelines for co-operation between the European Standards Organisations and the European Commission • Use of the Sixth research framework programme to fund research necessary for standardisation purposes, in particular in the context of integrated projects and networks of excellence

2. Innovation policies: interventions carried out at Community level

Providing a broad overview of Community innovation-supporting interventions requires us to take into account various policy areas and various institutional levels. In order to simplify our analysis, we focus on interventions directly funded from the European Union's budget, leaving aside those funded directly by member states or by individual regions. The funds that the European Commission can mobilize in order to implement innovation policies are, under different rules (see, for example, COM(2003)226): the Framework Programmes for scientific research and technological development (FPs); the Structural Funds; the financial instruments of the European Investment Bank.

Most of these tools are complemented, in each country, by corresponding national and regional funds, so that the actual expenditure for the policy measures is often higher than what is directly included in the Community budget. In this section, we provide a description of

these funds, highlighting in particular the measures that are activated in order to sustain innovation, and we report some quantitative data relating to the funds' allocations.

2.1 The scientific research and technological development Framework Programmes

The Framework Programmes are the instruments through which the Commission implements its scientific and technological research policy. This policy began in the early 1980s, with the introduction of specific research programmes whose purpose was to encourage cooperation among firms in technological innovation projects: for instance, ESPRIT (1984-1988), aimed at promoting industrial cooperation and pre-competitive research in sectors like microelectronics, software technologies, telematics; parallel programmes in other sectors like RACE, BRITE/EURAM, BRIDGE, ECLAIR, COMETT; and the setting up of the EUREKA agency for collaborative research. With the Single European Act (1986) these policies received legitimacy pursuant to the introduction of several articles in the Treaty (art. 130F-130Q) that authorized the Community to operate in the field of research. The research programmes launched since the 1980s were inherently different from the industrial policy programmes that were typical of the 1960s and 1970s, when the Community was trying to foster the creation of strategic industries, in line with the individual member states' efforts to promote "national champions". In fact, the objective was not to create industries *ex novo*, but rather to foster cooperation, innovation and commercialization processes; besides the usual "top-down" interventions, "bottom-up" interventions were also emphasized, where the role of Community institutions was mainly to enable and coordinate policies rather than dictate their contents (Triulzi, 1999).

In 1987, the Commission proceeded to systemize and give greater consistency to these initiatives, by setting up the first multiannual Framework Programme (FP), subsequently renewed for periods of five-years. According to the Single European Act, the main purpose of the FP is twofold: to strengthen the industry's scientific and technological research base and to encourage its international competitiveness, while at the same time promoting research activities supporting other Community policies. For the purposes of the present paper, we focus on the innovation-supporting interventions that have been funded by the three most recent FPs (the fourth, fifth and sixth). The Commission, incidentally, also funds direct research activities through the Joint Research Centre, which is composed of several research

institutions scattered in various European countries. The JRC has Directorate General status, therefore its activities are funded under a separate entry in the budget¹⁰.

The fourth FP (1994-1998)¹¹, whose budget is detailed in Appendix 2, was articulated into four main activities. Of these, the first (“research, technological development and demonstration programmes”) which was assigned 76,88% of the programme budget, sponsored research programmes in 8 main disciplinary fields, or “thematic areas”; while the other three funded “horizontal” programmes (INCO, INNOVATION and TMR) intended to promote, respectively, the internationalization, effectiveness and diffusion of the results of research itself. The remaining share of the budget funded the EURATOM programme’s nuclear research activities.

The interventions that we are mostly interested in are those funded by the INNOVATION programme¹²: the activities and services promoted in this context complemented the results dissemination and exploitation activities envisaged by the individual research programmes, and were designed around three main objectives, as shown in table 2 below. Interestingly, these objectives seem to be classified according to the “stage” of the innovation process which they impact, namely the “technology transfer” stage (objective 1), the “innovation diffusion” stage (objective 2) or the “results dissemination” stage (objective 3).

Table 2. The INNOVATION programme’s objectives

Objective	Actions
1: “Promotion of an environment favourable to innovation and the absorption of new technology by enterprises”	European Innovation Monitoring System (EIMS) Actions to create a financial environment favouring the dissemination of new technologies Regional actions and support for science parks Promotion of innovation management techniques (IMTs) Actions to increase public awareness of research and technology
2: “Stimulation of a European open area for the diffusion of technologies and knowledge”	The Relay Centre network (IRCs) European Networks and Services The OPET network (organisations for promoting energy technologies)
3: “Supplying the European open area with appropriate technologies”	The Community information and dissemination services (CORDIS) Assistance in the protection, the exploitation of RTD results and demonstration

¹⁰ In the budget document, funding for the FP’s activities is partitioned according to the Directorates that are responsible for parts of it. Instead, in the Community’s financial perspective, which forecasts expenditure over a six-year period, the entire FP budget is reported under the entry “internal policies”.

¹¹ Decision of the European Parliament and of the Council of 26. 4. 1994, relating to the Fourth framework programme for research, technological development and demonstration (1994-1998) n. 1110/94/CE.

¹² This programme was managed by Directorate General XIII “Enterprise Policy, Distributive Trades, Tourism and Cooperatives” (which in 1999 became Enterprise Directorate General) and in particular by Unit D “Dissemination and exploitation of R&D results, technology transfer and innovation”.

The structure of this programme appeared to reflect some of the indications included in the 1996 First Action Plan; objective 1 is consistent with the suggestion to “establish a framework conducive to innovation”, while the objective to create an “open area” for knowledge sharing is anticipating the themes that have then been subsequently developed by the Lisbon European Council and that have then been included within the sixth FP.

In practice, the INNOVATION programme funded several kinds of interventions, as can be seen from table 2. First, a set of actions were promoted in order to provide information services and create opportunities for exchange and interaction for the actors involved in scientific and technological research policies. Among these: the “European Innovation Monitoring System” (EIMS)¹³; the “Financing Innovation” initiative¹⁴; and numerous information centres on EU research and innovation policies (the CORDIS website, newsletters and magazines on research and innovation). A tool that addressed coordination needs among policies was the “European Trend Chart on Innovation”, collecting and disseminating information about the innovation policies implemented in the various member states and at Community level. The Trend Chart included the European innovation scoreboard, a collection of studies on innovation policy, and a “policy database” about the innovation-supporting initiatives carried out in member states. Among the initiatives directed at supporting the protection and exploitation of research results was the IPR Helpdesk, a service which provided FP participants with information on intellectual property issues. Among the initiatives directed at stimulating a “European open area for the diffusion of technologies and knowledge” was the network of Innovation Relay Centres (IRCs)– mostly localised within organizations like university technology transfer centres, chambers of commerce, regional development agencies – which provided information and support services to companies that wished to purchase or market new technologies.

¹³ The aim of EIMS, which had already been set up in the context of the SPRINT programme in the early 1990s, was to provide firms, intermediaries, researchers and policy makers with information, analysis and enquiries into the factors that characterize, spur or inhibit business innovation in Europe. Among the activities of this project were a collection of studies on innovation (EIMS studies) and the Community Innovation Survey (CIS) jointly performed by Eurostat and Enterprise DG. The CIS is a statistical survey, collecting information from companies about their innovation activities, which was first carried out in 1991, and then again in 1996 and 2001. The data from CIS are one of the sources that are currently used in order to complete the European innovation scoreboard.

¹⁴ In the context of this initiative, two programmes were activated, I-TEC (pilot initiative launched in 1997, aimed at supporting venture capital funds that financed small innovative firms) and FIT (aimed at funding projects directed at spreading “good practices” in the development of relationships among “finance, innovation and technology”). The website “Business Incubators on Cordis”, which allowed companies to locate the nearest “incubators”, science parks, Business Innovation Centres (BICs), was also launched.

Secondly, research and intervention projects were funded in specific interest areas, as can be seen from table 3 below.

Table 3: Specific interest areas funded by the INNOVATION project

Programme name	Objectives:	N. funded projects
"Technology Validation and Technology Transfer" (TV&TT)	Projects aimed mainly at small and medium size industrial, services and crafts firms in order to demonstrate good practices in technology transfer, promote an "innovation culture", improve the firms' capability of to set up transnational partnerships	246
"Regional Innovation and Technology Transfer Strategies" (RITTS)	To support regional policy makers in the evaluation and improvement of regional innovation and technology transfer strategies and infrastructures	70
"European Networks and Services" (ENS)	To fund experimental transnational actions carried out by organizations like business services providers and innovation and technology transfer centres	n.a.
"Innovation Management Techniques" (IMT)	To foster knowledge exchange and help national institutions to spread innovation management techniques in SMEs	23

The fifth Framework Programme (1998-2002)¹⁵, whose budget is detailed in Appendix 3, maintained in many ways the structure of the previous programme. In particular, it too was divided into main activity blocks, of which some dealt with "technological research, development and demonstration" in 4 specific thematic areas (in the fifth FP these were in fact called "thematic programmes" and were assigned 72,48% of the budget) while others pursued 3 "horizontal" programmes (INCO, Innovation/SME, IMPROVING, which were assigned 14,16% of the budget).

The main novelty in the structure of the fifth FP was a rationalization in the various thematic programmes and in particular greater consistency in the internal organization of each of them. The structure of the FP in fact was "problem-oriented" and "integrated": the projects proposed had to be directed at solving some general issues, which constituted important socioeconomic challenges for the Community ("key actions"); other projects concerned "research and technological development activities of a generic nature", in order to "help the Community maintain and improve its scientific and technological capability"; while, finally, other activities were directed at supporting research infrastructures.

The role of the horizontal programmes was, also in this case, to complement and direct the thematic programmes. Most of the activities of the previous INNOVATION programme were continued by the horizontal programme Innovation/SMEs, managed by Enterprise DG. The programme was intended to perform three main functions, namely:

¹⁵ Decision of the European Parliament and Council of 22 December 1998, relating to the Fifth Framework Programme of Community research, technological development and demonstration (1998-2002) 1999/182/CE.

1. "service provider" to SMEs, to other firms and relevant actors;
2. "clearing house", collecting data on innovation and analysing trends, initiatives and policies implemented at national and Community level;
3. "test bed", promoting pilot actions directed at increasing SME participation to innovation processes and at improving the Community's instruments in this direction.

This functional taxonomy is in fact quite useful in order to classify the interventions that were implemented. With respect to services provision, various types of actions were activated, among which information services¹⁶, support networks for SMEs and for actors interested in the fifth FP¹⁷, "helpdesks" for SMEs¹⁸. As a clearing house for innovation policies, the Innovation/SMEs programme funded various activities: the EIMS research activities were continued with slightly different modalities; a survey among European managers, Innobarometer, was launched, whose objective was to explore company needs with respect to innovation, investments and results achieved; further funding was approved for the "European Trend Chart on Innovation"; a new initiative, PAXIS, was set up, in order to promote the coordination and sharing of experiences among regions that had activated support programmes for innovative start ups. Some measures involved coordination among different DGs: the RINNO website, a joint initiative between Enterprise DG, Regional Policy DG and Research DG, provided regional policymakers with information on innovation support schemes implemented by other regions; while the Network of Innovating Regions in Europe (IRE), a joint initiative of Enterprise DG and Regional Policy DG, aimed at establishing communication and exchange networks among European regions that developed innovation support programmes. The intent was to connect the fourth Framework 's RITTS projects with the RIS and RIS+activities, funded with the Structural Funds budget. Many regions that developed regional innovation strategies in the context of IRE went on to implement them in the framework of the ERDF innovative actions programmes: IRE, therefore, represented an attempt at coordinating policies with different objectives pursued by different Community

¹⁶ The Cordis website and related newsletters; a portal dedicated to small firms in order to inform them about funding possibilities in the context of the FP; a website (the "Technology Marketplace") designed to help FP participants to market the results of their research by providing a meeting place with potential "clients".

¹⁷ "National Contact Points"; Innovation Relay Centres.

¹⁸ IPR Helpdesk; e-gateway (a project by Enterprise DG, aimed at supporting SMEs that intended to set up e-commerce tools); the "Financing Innovation" programme, which included the new LIFT (Linking Innovation Finance and Technology) initiative. At a later time, the various actions promoted by the "Financing Innovation" framework were organized into a more comprehensive initiative, Gate2Growth, an electronic portal designed to help entrepreneurs find investors for their projects and to help investors identify interesting investment opportunities.

actors. Finally, as a “test bed” for pilot actions fostering innovation and SME participation, the Innovation/SMEs programme funded: the “Innovation Projects” which continued the activities of the “TV&TT” programme; the ETI (Economic and Technological Intelligence) projects, whose objective was to identify SME needs and anticipate technological and market trends.

The sixth Framework Programme¹⁹ (2002-2006), whose budget is detailed in Appendix 4, was the first that directly incorporated the Lisbon strategic objectives. It was in fact organized around the objective to contribute to the creation of the European Research Area, by improving integration and co-ordination of research in Europe; at the same time, research was to be targeted at strengthening the competitiveness of the European economy, solving major societal questions and supporting the formulation and implementation of other EU policies. The sixth FP was also intended to facilitate the achievement of the objectives set in Barcelona in 2002²⁰.

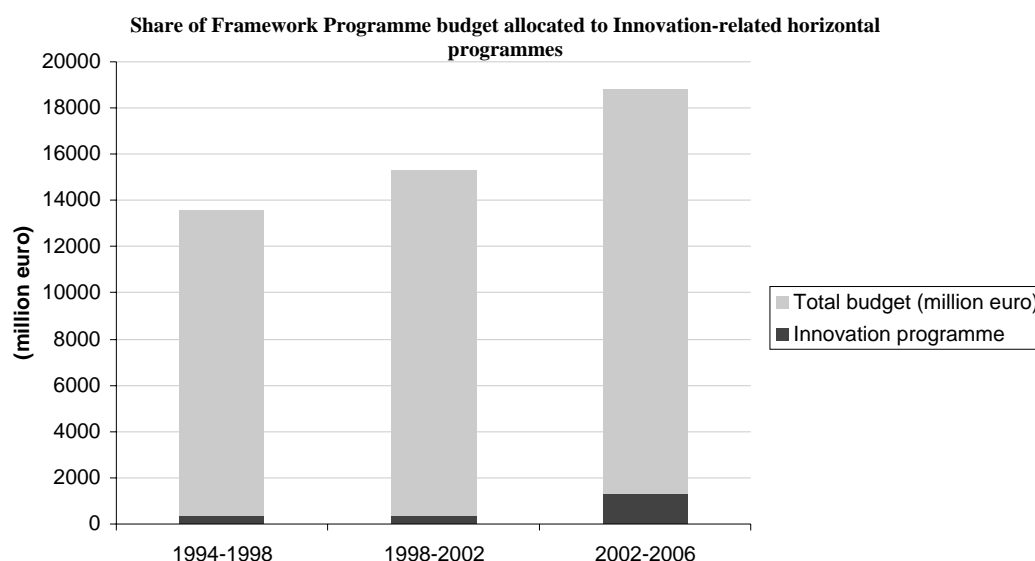
In the sixth FP, the activities carried out in the context of the previous programmes were substantially maintained; however, there was a high-level reorganization of the overall programme structure, intervention areas being grouped into three main “blocks”. The first “Focusing and integrating European research”, which was assigned 71,91% of the budget, comprised programmes aimed at promoting projects in specific “thematic areas”, in line with those presented in the previous programmes, and in four wider “research areas” that nonetheless pursued specific objectives. The second block, “Structuring the ERA”, which was assigned 14,89% of the budget, comprised activities directed at strengthening some perceived “structural weaknesses” of the European research system (in particular it intended to improve the innovative performance of European research, promote training and mobility of human resources, improve research infrastructures, facilitate dialogue between the scientific community and society at large). The third activity block, “Strengthening the foundations of the ERA”, received 1,83% of the budget and was directed at supporting coordination among research activities and at promoting the development of consistent policies for research and innovation.

¹⁹ The documents through which the sixth framework programmes has been launched are: Decision of the European Parliament and of the Council on the Sixth framework programme (June 2002); Decision of the Council on the specific programmes of the Sixth framework programme (September 2002), downloadable from <http://www.cordis.lu/era/background.htm>

²⁰ In this respect, see the Working Paper annexed to Communication COM(2003)226 which listed, at pp. 28-30, the initiatives activated in the context of the Sixth FP which were expected to positively contribute to the achievement of the Barcelona objectives.

It is interesting to note that there is substantial continuity in time among the FPs' contents; this is shown in Appendix 5, where we try to reconstruct the evolution of thematic and horizontal areas in the course of the three most recent FPs. At the same time, as can be seen from figure 1 below, the Commission has dedicated an increasing share of the FP's budget to the horizontal programmes specifically aimed at supporting innovation promotion (from 2.66% in 1994-1998 to 2.43% in 1998-2002 and up to 7.57% in 2002-2006).

Figure 1. The horizontal programmes aimed at innovation promotion



Source: data from www.cordis.lu

Besides the FPs, the Commission funds some specific-purpose multiannual research programmes, the most important of which are EUREKA, a transnational research fund which sponsors projects carried out by companies and research institutes in 27 countries, and COST, a cooperation programme launched in 1971, which allows for European coordination between technical and scientific research projects funded at national level, and may also involve extra-EU countries.

2.2 The Structural Funds

Through the Structural Funds, the EU pursues its “economic and social cohesion” policy, a goal introduced in the Rome Treaty by the Single European Act (1986). Cohesion policy stems from the convergence between two policy areas: on the one hand, the Community’s regional policy, implemented since 1975 with the setting up of the European Regional Development Fund; on the other hand, the EEC’s social policy, launched in 1957 and

implemented through the European Social Fund (Triulzi, 1999). Cohesion policy's main goal²¹ is to reduce the disparity among the development levels of the various regions and the delay of less advanced regions, including rural ones.

The Structural Funds are: the European Regional Development Fund (ERDF), set up in 1974 and managed by the Regional Policy DG, the European Social Fund (ESF), set up in 1957 and managed by the Employment and Social Affairs DG, the European Agriculture Guidance and Guarantee Fund (EAGGF)²², set up in 1960 and managed by Agriculture DG, and the Financial Instrument for Fisheries Guidance (FIFG), set up in 1993 and managed by the Fisheries DG. The overall Structural Funds budget is allocated among the above four funds and the Cohesion Fund. The latter, managed by the Regional Policy DG, was set up in 1993, and it funds environmental and infrastructural projects in the countries whose GDP is below 90% of the European average. The formal institution of cohesion policy in 1986 has involved some changes in the structure and functioning of the Structural Funds, implemented through the 1988 reform. The basic principles underpinning the reform are, in line with the political objectives relating to cohesion:

- “concentration” of the funds on a set of areas, classified, on the basis of several economic indicators, according to some “priority objectives”²³, which identify the types of fund that can be issued and the types of actions that can be performed;
- complementarity and partnership: Community action must be regarded as “complementary” to the corresponding national actions. The reform assigns regional governments a preferential role in the definition of the priorities for action and in the issuing of funds;
- additionality: the Structural Funds must not replace, but integrate, national expenditure;
- multiannual programming of interventions: the design of interventions, which used to fall within the exclusive competence of member states, is now arranged *ex ante* through the definition of multiannual programmes negotiated between EU, member states and regions.

The Structural Funds can sponsor innovation-supporting interventions in three main ways: 1) through measures of the National and Regional Operational Programmes (OPs) and of the

²¹ According to art.130A of the Rome Treaty, as modified by the Maastricht Treaty.

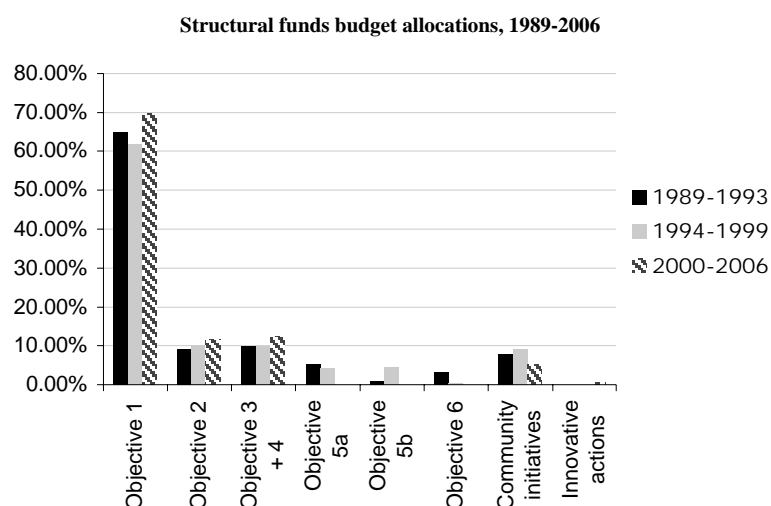
²² The EAGGF, with the Guarantee section, funds the Common Agricultural Policy (CAP). Only the Guidance section of EAGGF is comprised in the structural funds' budget.

²³ On the criteria used in order to define the objective areas, see, for instance, Mantino (2002, p.54-59).

Single Programming Documents (SPDs)²⁴; 2) through Community Initiatives; 3) through Innovative Actions.

Figure 2 below details the Structural Funds' budget allocations (as percentages of the total Structural Funds' budget) in the three most recent programming periods.

Figure 2. Structural funds' budget allocations



Source: elaborated from data in Mantino (2002).

1) The measures envisaged in the Single Programming Documents and in the Operating Programmes are *ad hoc* interventions designed by individual regional and national policy makers with the approval of the Commission. While respecting the autonomy of these actors, the Commission defined a set of guidelines for the programmes of the period 2000-2006 (COM(1999)344) through which it invited the regions and member states that set up such programmes to take into account several strategic priorities. These were: the creation of the necessary conditions for regional competitiveness; the implementation of the European employment strategy²⁵; the management of urban and rural development in order to sustain a balanced environment. Among the measures directed at promoting regional competitiveness, the same Communication explicitly recommended several interventions that affected innovation processes, in particular: innovation promotion; networking and industrial cooperation; human resources development; strengthening of research and technological development actions through effective policy management; support to SMEs through

²⁴ Since 1993, member States and regions can issue Structural funding in two ways: through the regular procedure, which involves the negotiation of a Community Support Framework with the European Commission, followed by the National or Regional Operational Programme; or through an abridged procedure which relies on the Single Operational Programme (SPD), as long as the funding requested to the EU does not exceed 1 billion Euro.

²⁵ The European Employment Strategy was defined by the Luxembourg Jobs Summit in 1997.

improvements in financing policies and through the provision of support services (support for technology transfer, marketing, internationalization, management and organizational innovation, financial guidance).

In order to quantify the economic impact of the innovation-supporting measures implemented through the Structural Funds in the period 1994-96, Bachtler, Taylor and Kearney (1996) individually examined all the objective 2 areas SPDs, in order to quantify those measures specifically aimed at supporting R&D and innovation. They found that funds allocated to these measures amounted to at least 346 million ECU, or 14% of the total budget (while in the previous programming period, 1989-1993, these measures amounted to 9% of the budget). Moreover, the 14% figure is, according to Taylor (1996), underestimated, because it has not always been possible to isolate the funds that were committed to R&D and innovation in the context of measures whose main purpose was different. Bachtler, Taylor and Kearney also developed a taxonomy of policy interventions common to most SPD proposals, and tried to provide quantitative estimates for the funding allocated to each of them. Their proposed taxonomy was the following:

Type of policy intervention	Funding assigned (million ECU per year)
RTD/innovation infrastructure	84
Advice and support to business	65
Training	65
Environmental technologies	22
Network building, among firms and firms and research institutes	n.a.
Promotion of technology and technological development (initiatives directed at raising awareness on the importance of research and technological development and at encouraging SMEs to participate to national and international research projects)	n.a.

For the purposes of innovation policy analysis, it would be useful to be able to rely on this kind of synthetic data, calculated by separating out innovation-supporting measures and their respective allocations; the aforementioned analysis by Batcher, Taylor and Kearney (1996), a useful exercise in this direction, has unfortunately not been repeated the later programming periods.

2) Community initiatives are specific interventions concerning special interest issues, directly proposed by the Commission. In the period 1994-1999, 13 Community initiatives were launched, which generated over 500 programmes; these initiatives were allocated about 9% of the overall Structural funds budget. In the period, 2000-2006, the regulations provided for only 4 Community initiatives (INTERREG, LEADER+, URBAN e EQUAL) receiving up to

5,35% of the overall structural funds budget. According to Taylor (1996), in the period 1994-1996 several Community initiatives were involved in the funding of R&D and innovation projects. Analyses of the innovation-supporting measures funded through Community initiatives in later programming periods do not appear to be available.

3) Innovative actions are pilot or demonstration projects which can be allocated up to 1% of the overall Structural Funds budget (in the period 2000-2006, the budget share of each fund assigned to innovative actions and technical measures should be around 0.65%). Their purpose is to experiment with new modes of Community structural intervention; the 1999 regulations specified that innovative actions should contribute to the design of new methods and practices intended to improve the quality of interventions in the objective areas, while technical support measures should include studies, exchanges of experiences and information and the implementation of information systems for management, supervision and evaluation (European Commission, 1999). Although innovative actions promote innovation in policy design, some of the projects proposed may have the objective to support technological innovation processes. The projects can be submitted by member states, local and regional authorities or private organizations, usually upon encouragement from the Commission, which invites proposals on specific topics.

During the period 1994-1999, the ERDF funded about 350 interventions divided into 8 different topics²⁶, one of which was called “Innovation promotion”. In this context, a set of pre-pilot programmes called Regional Technology Plans Pilot Actions (RTP) were funded in the period 1994-1996; these were followed in the period 1996-1999 by the RIS, RIS+ and RTT programmes (66 programmes were funded in total). During the period 2000-2006, the ERDF funded innovative actions within three strategic intervention areas: “knowledge-based regional economies and technological innovation”²⁷; “eEuropeRegio: the information society and regional development”²⁸; “regional identity and sustainable development”²⁹.

²⁶ “New sources for jobs”, 42 programmes; “Culture”, 32 programmes; “TERRA”, 15 programmes; “Urban Pilot Projects”, 26 programmes; internal and external interregional cooperation (ECOS-Ouverture), 63 programmes; territorial employment pacts, 89 programmes; “Regional Information Society initiatives” (RISI), jointly funded by ERDF and ESF; “Innovation promotion”, 66 programmes.

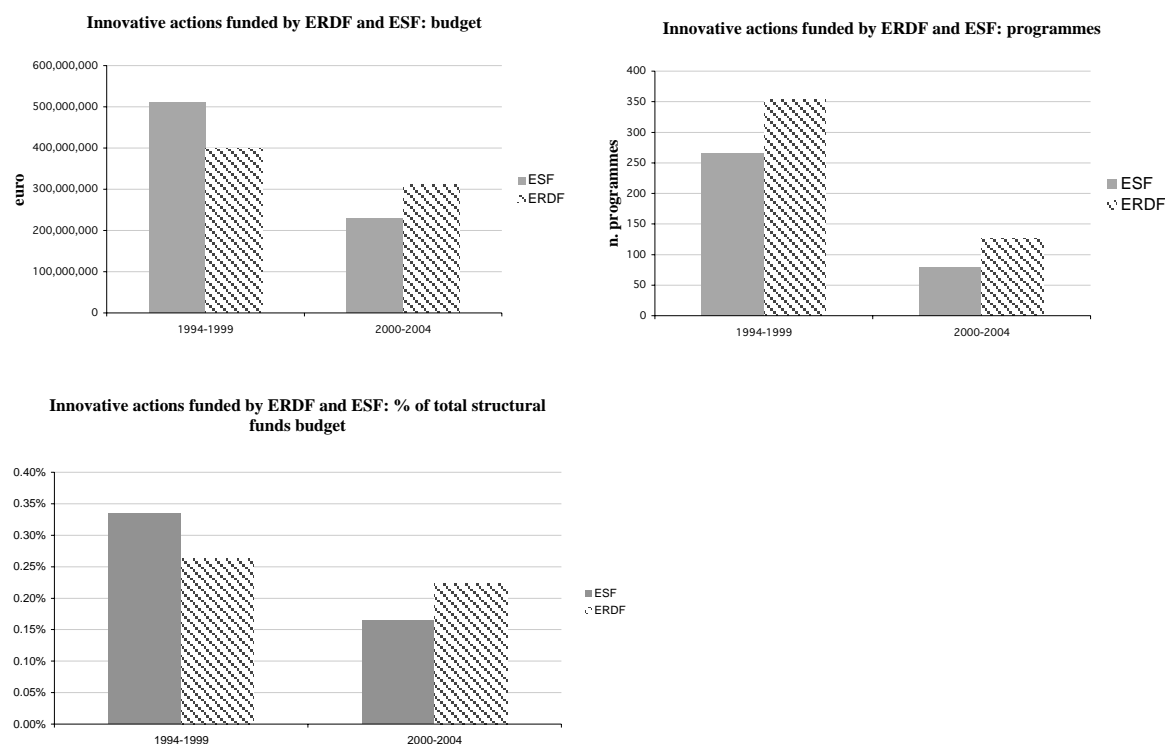
²⁷ The objectives were: promoting cooperation networks; fostering personnel exchanges among research centres, universities and firms; supporting diffusion of scientific research results and implementation of new technologies in SMEs; supporting business incubators; increasing the availability of new financial instruments for newly founded firms.

²⁸ The programmes explored innovative strategies in order to improve the access of people and small firms to digital technology.

Accompanying measures were also funded whose purpose was to foster the exchange of experiences and the creation of networks of regions interested in specific topics promoted by the innovative actions.

The ESF funded 266 innovative actions programmes in the period 1994-1999 and 79 in the period 2000-2004. Figure 3 below summarizes the innovative actions' budget and funded programmes in the two periods 1994-1999 and 2000-2004.

Figure 3. The innovative actions 1994-2004.



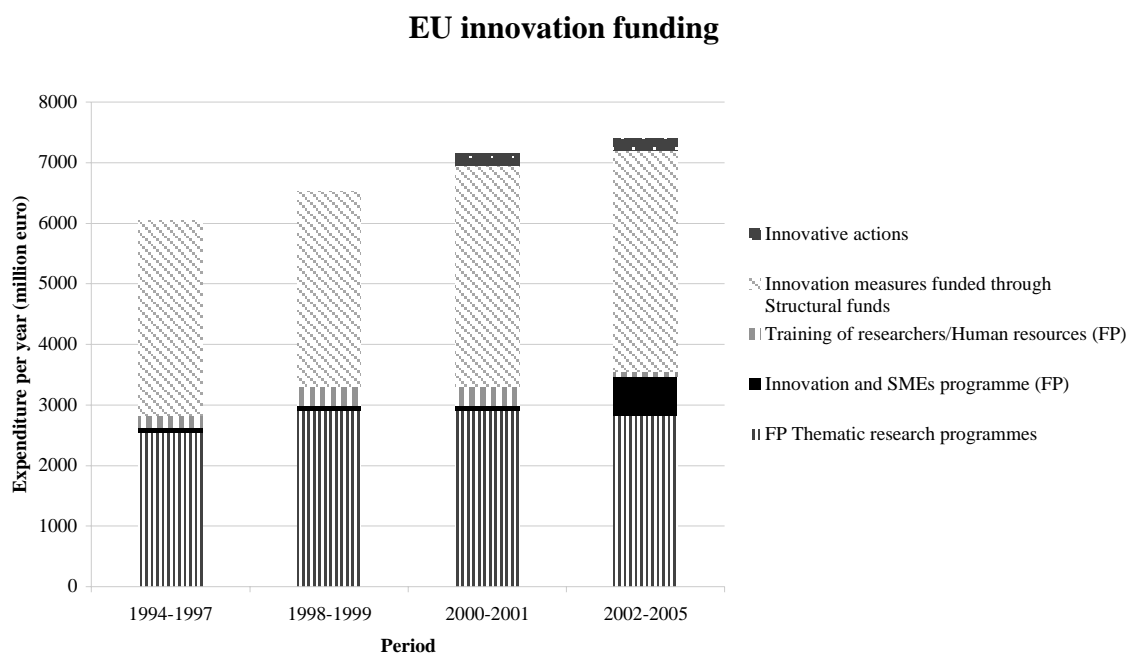
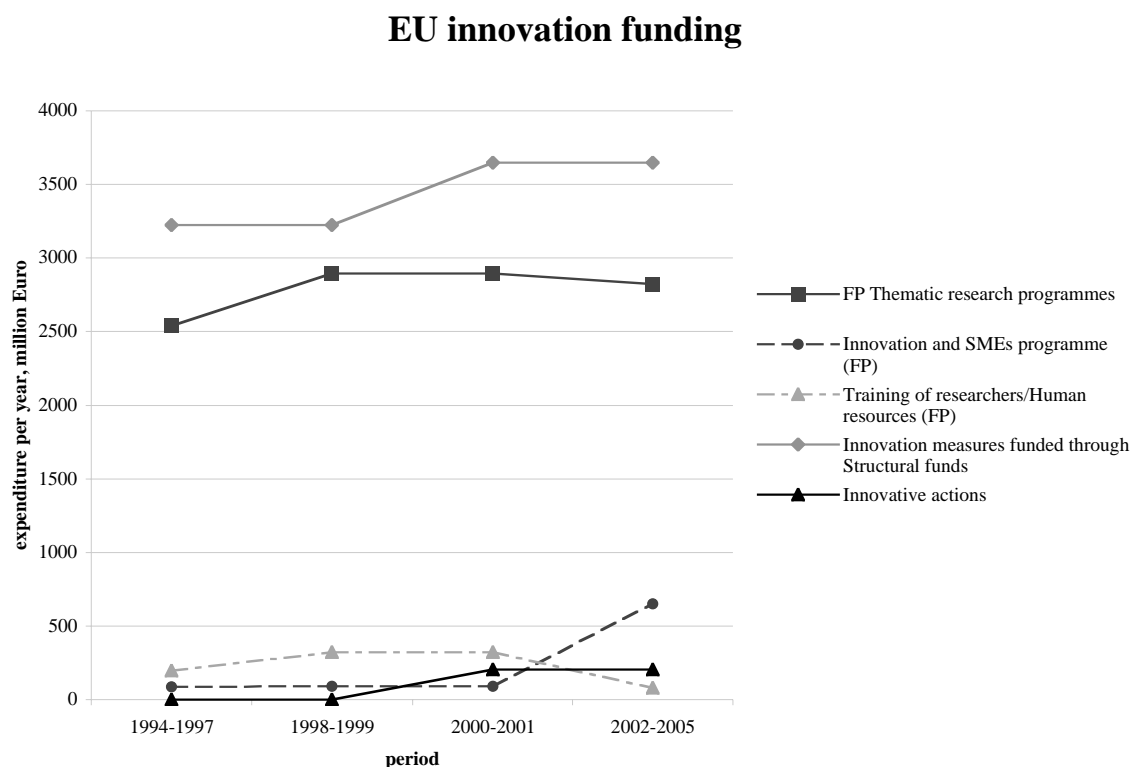
Source: European Commission³⁰

Figure 4 below reports our estimates of yearly expenditure in innovation-supporting interventions through the Framework Programmes and the Structural Funds. Estimates of innovation measures funded through the Structural Funds have been obtained by applying the figures computed by Bachtler, Taylor and Kearney (1996) to the entire Structural funds budget (excluding innovative actions) and by extending them to later periods.

²⁹ The objectives were related to the development of specific factors in order to sustain regional competitiveness: firms in the craft or traditional production sectors, cultural tourism, new types of local services, innovative environmental management systems.

³⁰ See http://europa.eu.int/comm/regional_policy/innovation/innovating/index_en.htm for information on ERDF innovative actions; see http://europa.eu.int/comm/employment_social/esf2000 for information on ESF innovative actions.

Figure 4. Yearly EU expenditure on innovation-supporting interventions.



Source: our elaborations on data reported in Appendixes

2.3 EIB-sponsored initiatives

In order to complete this general overview of Community innovation policies, we introduce some brief remarks on the “Innovation 2000” initiative, recently launched by the European Investment Bank (EIB) in the context of the Lisbon Strategy. With this initiative, EIB commits to pursuing some objectives related to innovation support. These objectives are:

- the development of small firms and entrepreneurship. The European Investment Fund, which is the operational arm of EIB, commits to supporting venture capital funds which intend to: purchase shares in small innovative firms; branch out into seed capital and start-up capital financing; specialize in funding for new technologies; concentrate on specific, especially less developed, regions; set up pan-European funds. EIF also commits to providing direct funding to initiatives such as science parks, incubators, pilot projects directed at sustaining local development in cooperation with partner banks (creation of agencies that specialize in issuing micro-loans to SMEs);
- the diffusion of innovation and the application of information technology. EIB commits to support investment in ICT, whether by public or private actors;
- research and development³¹. EIB commits to promoting firm based research, through loans directed at funding: research activities, the upgrading of research laboratories, information services for SMEs, patenting activities carried out by SMEs, centres of excellence for R&D (it is in fact argued that “innovative industries tend to cluster in science parks and major basic research centres and universities”³²);
- the creation of information and communication technologies networks. EIB intends to increase the amount of loans directed at creating ICT networks, modernizing and broadening existing networks, investing in the physical and virtual infrastructure that may facilitate access to them;
- support to human capital, by funding the modernization of schools, universities and training centres.

The financial instruments that EIB may rely on in order to carry out these activities are: individual loans issued to the project’s promoter or to partner banks that organize the project’s

³¹ On June 7th 2001, a joint memorandum was signed for the development of synergies between the research framework programme and EIB’s Innovation 2000 initiative. Some information is available from the website http://www.cordis.lu/era/private_investment.htm

³² EIB “The Innovation 2000 Initiative. Actively promoting a European economy based on knowledge and innovation”. Downloadable from: http://www.eib.org/Attachments/thematic/i2i_en.pdf

funding; “grouped loans” issued to organizations that are promoting several projects; “global loans” issued to EIB-approved brokers. The EIF’s resources can also be tapped into, mostly in order to support venture capital funds.

The first review of the initiative, at the end of 2002, showed that EIB had approved a volume of loans totalling almost 17 billion Euro (of which 14,4 billion issued by EIB and 2,5 billion issued by EIF) for a total of over 300 projects. The initiative “Innovation 2010” which continues the activities of “Innovation 2000” in the period 2003-2006, is expected to issue loans for about 20 billion euro³³.

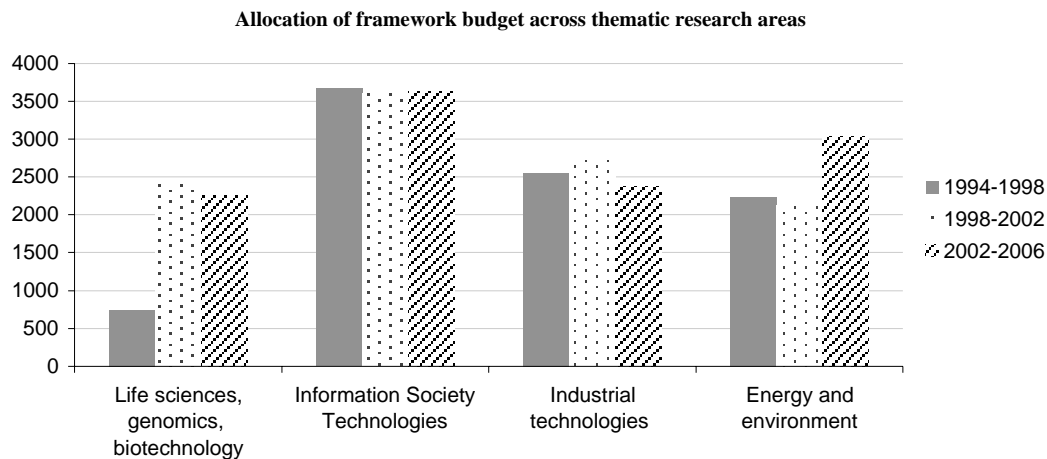
3. Innovation policies between theory and practice

We present some final remarks on the relationship between the approach to innovation policy that emerges from the Commission’s documents and the interventions that are carried out in practice.

The largest share of FP funds (76,88% in the fourth FP, 72,48% in the fifth, 64,49% in the sixth) is deployed in order to fund research projects in thematic areas whose selection belongs, first of all, to the Commission. The margin of funding for research that does not fall within the realm of the chosen thematic areas appears to be quite narrow. The selection of the thematic areas is therefore a key element in the design of Europe’s research policy. As can be seen from Figure 5 below, the Commission has consistently assigned the greatest share of funding to research in ICT, followed by industrial technology, energy and environment, and life sciences.

Figure 5. Thematic research areas funded by the framework programmes

³³ EIB “Innovation 2010 Initiative”. Downloadable from: <http://www.eib.org/i2i/en/index.htm>



Source: www.cordis.lu

The FPs also include “horizontal” programmes, some of which try to interface the world of research with that of enterprises. An overview of these programmes highlights that great importance is assigned to allowing interactions between firms that “demand” innovations, on the one hand, and universities, research centres and other institutions that “offer” scientific results ready to be marketed, on the other. This approach is consistent with a linear view of the innovation process, whereby each stage (basic research, applied research, development, commercialization) is characterized by different actors and artifacts; the role of the public actor is to facilitate the unfolding of this process, by promoting the creation of competitive and functioning markets corresponding to each of the stages that compose it. In the context of the FPs, we can identify several initiatives that move in this direction, particularly the attempts to create: a market for European research, as suggested by the sixth FP; a market for the research results offered by research centres and universities and demanded by firms (for instance, the “technology marketplace” initiative); a market for innovation financing capital (for instance, the Gate2Growth initiative).

All these markets can function only where sufficient information is available in order to enable the match of demand and supply, even in situations where the product is complex and its characteristics cannot easily be evaluated: many interventions promoted within the “horizontal” programmes are in fact information services, mostly directed at small firms (for instance, Business Incubators on Cordis, SME Portal, Innovation Relay Centres), and at FP participants (for instance, the National Contact Points network).

The special attention paid to small firms in the context of the latter three FPs, but emphasised also in the context of the Structural Funds interventions (for example through specific

Community initiatives like the SME initiative in 1989-1993), highlights an awareness of the specificity of many European economies where small firms are responsible for important shares of national GDP and export, and are often particularly innovative. Community documents seem to filter through the conviction that newly created firms, especially university spinoffs, are the actors most able to develop and market the results of scientific research: hence the numerous measures directed at facilitating the creation of such firms, like the provision of information services and the promotion of initiatives directed at increasing the availability of risk capital³⁴.

Various measures intend to incentivate private expenditure in research, on the basis of the assumption that a direct and positive relation exists between R&D expenditure and innovation (as explicitly noted by COM(2002)499). The possibility to protect the outcomes of R&D is considered an important incentive for firms' private R&D expenditure: some measures are directed at informing firms about existing patent laws (IPR Helpdesk) and at promoting the patentability of the outcomes of public research, going hand in hand with the parallel efforts of the European Patent Office to create an European patent.

From the theoretical viewpoint, the traditional linear view of innovation has increasingly been challenged by 'systemic' theories that see innovation as a complex process, involving many actors, their relationships and the social and economic context in which they are embedded. This perspective has been adopted in the literature on national systems of innovation: emerging at the beginning of the 1990s with the contributions by Lundvall (1985; 1988; 1992), Freeman (1988) and Nelson (1988; 1993), this approach has highlighted the roles of national institutions in influencing how innovation processes unfold. Other contributions have applied the concept of 'innovation system' to the regional (Saxenian, 1994; Ehrenberg and Jacobsson, 1997; Cooke, 2001) and even sector levels (Breschi and Malerba, 1997). Interest for social interactions as a locus for innovation has led policymakers to assign particular importance to supporting networks of cooperation among heterogeneous actors, especially in economic contexts composed of small and medium enterprises (Audretsch, 2002).

The Commission seems to be influenced by these approaches when it acknowledges that innovation policies must be implemented through interventions that involve not only basic and applied research, but also companies and their social and institutional contexts:

³⁴ A survey of venture capital support schemes in Europe was provided by Dimov and Murray, who have singled out, besides the aforementioned "Innovation 2000" EIB initiative and other specific EIF-funded projects, also a series of initiatives implemented by individual member States at the national level.

innovation policies should therefore integrate and coordinate interventions in different policy areas. Numerous resources are assigned to policy coordination, where various Directorates, managing different funds, are implementing measures that affect similar actors or processes: information services, exchange and coordination networks for national or regional policymakers, joint initiatives (European Trend Chart on Innovation, PAXIS, RINNO, Innovating Regions in Europe).

The systemic approach seems to emerge also when attention is paid to different elements that may influence the innovation process, such as entrepreneurship, competencies creation, the presence of an “innovation culture”. Numerous measures are suggested that aim at “smoothing” the environment in which firms operate, in particular by simplifying information exchanges among organization, access to capital, administrative procedures (for instance, the BEST initiative ³⁵), communications (for instance, the eEurope initiative ³⁶).

In order to implement measures that are better able to affect national and regional innovation systems, greater coordination would probably be required among FP funds and funds issued by other actors, as well as greater involvement of various stakeholders in the ex ante planning of FP interventions, including the selection of thematic areas, which today seem to be very influenced by historical factors and, as shown in Appendix 5, by a strong tendency to the continuation of existing programmes.

Resources issued through the Structural Funds allow for the coordination of different funds in the same area and could be a tool through which more integrated innovation-supporting programmes could be implemented, however programmes’ definition is very fragmented. Community initiatives and innovative actions are more immediate tools available to the Commission, but they concern narrower initiatives that can only have limited impact.

Further, attention to problems concerning the transfer of research outcomes is not accompanied by particular attention to what happens to new products and services once they are brought to market and start competing with other products and services. Recommendations concerning the opportunity to implement policies supporting innovation diffusion are underpinned both by the linear view of the innovation process (also in its more complex variants) where diffusion is seen as a distinct stage of the process which follows the innovation’s commercialization, as well as by epidemiologic diffusion models according to

³⁵ The Business Environment Simplification Task Force (BEST) (1998) Final Report, vol. I e II. Downloadable from: http://Europe.eu.int/comm/enterprise/enterprise_policy/best/

³⁶ See COM(2002)263 “eEurope – An Information Society for all”.

which innovations spread through a “contagion” process – this kind of view is probably underpinning the definition of proposals like those directed at supporting new technologies through public procurement, in the hope that many users can be “contaminated” or even that a “critical mass” of users can be created precipitating the adoption process toward a new technology that is considered preferable to rival ones. But the reflection on the economic, technical and social changes connected with innovation diffusion, and in general on the development of the innovation process following the implementation of research outcomes, is not fully articulated.

Besides statements about the importance of understanding innovation as a system, even in the stage of the definition of general policy directions it appears that innovation continues to be conceived as a phenomenon that unfolds according to well defined stages and whose beginning and end can be easily identified; especially, the effects that new products and services, once marketed, have on the socioeconomic system, often remain out of sight, just when they start producing (or not) those effects on growth in order to obtain which innovation policies are designed.

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Appendix 1

The European innovation scoreboard

Innovation scoreboard 2003		Source
1. Human resources		
1.1	S&E graduates (% of 10-19 years age class)	EUROSTAT: Education statistics
1.2	Population with a tertiary education (% of 25-64 years age class)	EUROSTAT (Labour Force Survey)
1.3	Percent of total employment in medium-high and hi-tech manufacturing	EUROSTAT, R&D statistics, based on Labour Force Survey data
1.4	Percent of total employment in high-tech services	EUROSTAT, R&D statistics, based on Labour Force Survey data
2. Knowledge creation		
2.1	Government R&D funding as % of GDP (GOVERD + HERD)	EUROSTAT, R&D statistics, OECD
2.2	Business expenditures on R&D as a percentage of GDP (BERD)	EUROSTAT, R&D statistics, OECD
2.3.1	European Patent Office high-tech patent applications (per million population)	EUROSTAT, R&D statistics, based on EPO data
2.3.2	USPTO high-tech patent applications (per million population)	USPTO
2.3.3	EPO patent applications (per million population)	EUROSTAT
2.3.4	USPTO patent applications (per million population)	USPTO
3. Transmission and application of knowledge		
3.1	SMEs innovating in-house (% of manufacturing SMEs and % of services SMEs)	EUROSTAT, Community Innovation Survey
3.2	SMEs involved in innovation co-operation (% of manufacturing SMEs and % of services SMEs)	EUROSTAT, Community Innovation Survey
3.3	Innovation expenditures (% of all turnover in manufacturing and % of all turnover in services)	EUROSTAT, Community Innovation Survey
4. Innovation finance, output and markets		
4.1	Share of high-tech venture capital investment	EVCA
4.2	Share of early stage venture capital in GDP	EUROSTAT
4.3.1	SMEs sales of "new to market" products (% of all turnover in manufacturing SMEs and % of all turnover in services SMEs)	EUROSTAT, Community Innovation Survey
4.3.2	SMEs sales of "new to the firm but not new to the market" products (% of all turnover in manufacturing SMEs and % of all turnover in services SMEs)	EUROSTAT, Community Innovation Survey
4.5	Internet access/use (% of GDP)	EUROSTAT
4.6	Share of manufacturing value-added in high-tech sectors	EUROSTAT: SBS
4.7	Volatility rates of SMEs (% of manufacturing SMEs and % of services SMEs)	EUROSTAT: BDS

Source: European innovation scoreboard, Technical Paper n. 1 annexed to Commission Staff Working paper SEC (2003) 1255

Appendix 2

The Fourth Framework Programme (1994-1998)

Activity	"Specific Programme"	"Work programme"	Budget (mln ECU)	% Budget
First activity: Research, technological development and demonstration programmes	Information and Communication Technologies	ACTS = Advanced Communications Technologies and Services	671.00	5.08%
		ESPRIT = Information Technologies	2084.00	15.77%
		TAP = Telematics Applications total	913.00	6.91%
	Industrial Technologies	IMT = Industrial and Material Technologies - BRITE/EURAM III	3668.00	27.76%
		SMT = Standards, Measurements and Testing total	1833.00	13.87%
			307.00	2.32%
			2140.00	16.19%
	Environment	Environment and Climate	914.00	6.92%
		MAST III = Marine Sciences and Technologies	243.00	1.84%
		total	1752.50	13.26%
	Life Sciences and Technologies	BIOTECH 2 = Biotechnology	595.50	4.51%
		BIOMED 2 = Biomedicine and Health	374.00	2.83%
		FAIR = Agriculture and Fisheries	739.50	5.60%
		total	1709.00	12.93%
	NNE = Non-nuclear Energy		1076.00	8.14%
	Transport	Transport Research Programme	263.00	1.99%
		TSER = Targeted Socio-Economic Research	147.00	1.11%
		INCO = International Cooperation	575.00	4.35%
Second activity: Cooperation with Third Countries and International Organizations				
Third activity: Dissemination and Exploitation of Results		Innovation Programme	352.00	2.66%
Fourth activity: Human Capital and Mobility		TMR = Training and Mobility of Researchers	792.00	5.99%
Total 4th Framework RTD Programme			11879.00	89.89%
4th Framework EURATOM Programme	Research and Training in the Nuclear Sector	NFS2 = Nuclear Fission Safety	441.00	3.34%
		FUSION = Controlled Thermonuclear Fusion	895.00	6.77%
Total 4th Framework Programme			13215.00	

Fourth FP: budget allocation



- ▨ Research, technological development and demonstration programmes
- INCO = International Cooperation
- ▤ Innovation Programme
- ▩ TMR = Training and Mobility of researchers
- Euratom

Source: data available from the website www.cordis.lu. In particular, for budget data: www.cordis.lu/en/src/f_006_en.htm

Appendix 3

The Fifth Framework Programme (1998-2002)

Activity	Programme	Sections	Budget (mln ECU)	% Budget
First Activity (Thematic Programmes)	LIFE = Quality of Life and Management of Living Resources	key actions	1860	12.43%
		generic research	483	3.23%
		support for research infrastructures	70	0.47%
		Total:	2413	16.13%
	IST = User-friendly Information Society	key actions	3120	20.86%
		generic research	319	2.13%
		support for research infrastructures	161	1.08%
		Total:	3600	24.06%
	GROWTH = Promoting Competitive and Sustainable Growth	key actions	2122	14.18%
		generic research	546	3.65%
		support for research infrastructures	37	0.25%
		Total:	2705	18.08%
	EESD = Energy, Environment and Sustainable Development	key actions	895	5.98%
		generic research	119	0.80%
		support for research infrastructures	69	0.46%
		Energy programme key actions	1026	6.86%
		generic research	16	0.11%
		support for research infrastructures	0	0.00%
		Total:	2125	14.20%
Second activity (Horizontal programme)	INCO = Confirming the International Role of Community Research		475	3.18%
Third activity (Horizontal programme)	Innovation/SMEs = Promotion of Innovation and Encouragement of SME Participation		363	2.43%
Fourth activity (Horizontal programme)	IMPROVING = Improving Human Research Potential and the Socio-economic Knowledge Base		1280	8.56%
Direct actions	JRC = Joint Research Centre		739	4.94%
Total 5th Framework RTD (Research, Technological Development and Demonstration) Programme	Total 5th Framework RTD Programme		13700	91.58%
	5th Framework EURATOM Programme		1260	8.42%
	Total 5th Framework Programme		14960	100.00%

Fifth FP: budget allocation



RTD Thematic programmes

INCO = Confirming the International Role of Community Research

Innovation/SMEs = Promotion of Innovation and Encouragement of SME Participation

IMPROVING = Improving Human Research Potential and the Socio-economic Knowledge Base

JRC = Joint Research Centre

5th Framework EURATOM Programme

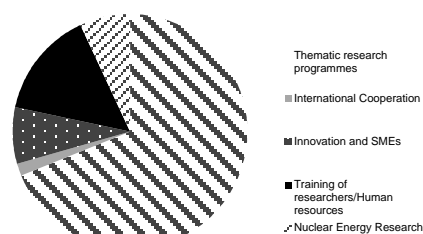
Source: COM(97)142 and data available from the website <http://www.cordis.lu>

Appendix 4

The Sixth Framework Programme (2002-2006)

Activity	Programme	Budget (min. Euro)	% Budget
Block 1: Focusing and integrating European research - Thematic priority areas	LifeSciHealth = Life sciences, genomics and biotechnology for health	2255	12.89%
	IST = Information Society Technologies	3625	20.71%
	NMP = Nanotechnologies and nano-sciences, knowledge-based multifunctional materials and new production processes and devices	1300	7.43%
	Aeronautics and space	1075	6.14%
	Food quality and safety	685	3.91%
	SUSTDEV = Sustainable development, global change and ecosystems	2120	12.11%
	Citizens and governance in a knowledge-based society	225	1.29%
	Research for policy support; NEST	555	3.17%
	Specific SME activities	430	2.46%
	INCO Infopoint on international co-operation activities	315	1.80%
Block 2: Structuring the ERA Research and Innovation	JRC	760	4.34%
	Marie Curie Actions - Human resources and mobility	1580	9.03%
	Research infrastructures	655	3.74%
Block 3: Strengthening the Foundations of ERA	Science and Society	80	0.46%
	Coordination of research activities	270	1.54%
	Development of research/innovation policies	50	0.29%
Total EC Framework Programme		10390	59.37%
Nuclear energy	Fusion Energy Research	750	4.29%
	Management of radioactive waste	90	0.51%
	Radiation protection	50	0.29%
	Other activities in the field of nuclear technologies and safety	50	0.29%
	JRC	290	1.66%
Total 6th RTD framework programme		17500	100.00%









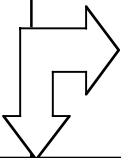




Sixth FP: budget allocation



Source: data available from the website www.cordis.lu

Appendix 5

Thematic comparison among the fourth, fifth and sixth Framework Programmes

1994-1998	1998-2002	2002-2006
Information and Communication Technologies	IST = User-friendly Information Society	IST = Information Society Technologies
		
BIOTECH 2 = Biotechnology	LIFE = Quality of Life and Management of Living Resources	LifeSciHealth = Life sciences, genomics and biotechnology for health
BIOMED 2 = Biomedicine and Health		FOOD = Food quality and safety
FAIR = Agriculture and Fisheries		
		
IMT = Industrial and Material Technologies - BRITE/EURAM III	GROWTH = Promoting Competitive and Sustainable Growth	NMP = Nanotechnologies and nano-sciences, knowledge-based multifunctional materials and new production processes and devices
SMT = Standards, Measurements and Testing		Aeronautics and space
Environment	EESD = Energy, Environment and Sustainable Development	SUSTDEV = Sustainable development, global change and ecosystems
NNE (Non Nuclear Energy)		
		
INCO = International Cooperation	INCO = Confirming the International Role of Community Research	Cross-cutting research activities
		
INNOVATION Programme	Innovation/SMEs = Promotion of Innovation and Encouragement of SME Participation	Strengthening the Foundations of ERA
		
TSER = Targeted Socio-Economic Research TMR = Training and Mobility of Researchers	IMPROVING = Improving Human Research Potential and the Socio-economic Knowledge Base	Structuring the ERA
		
Marie Curie Fellowship Association		Nuclear energy
ETAN = European Technology Assessment Network (part of TSER)	Direct actions Now part of the STRATA framework	
NFS2 = Nuclear Fission Safety	EURATOM	
FUSION = Controlled Thermonuclear Fusion		

Source: constructed using data available from the website www.cordis.lu