

RIP-WATCH

ANALYSIS OF THE REGIONAL DIMENSIONS OF INVESTMENT IN RESEARCH

CASE STUDY REGIONAL REPORT: EMILIA-ROMAGNA (ITALY)

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Case Study Regional Report on the Regional Dimensions of Investment in Research

OBJECTIVE

The main objective of this regional case study report is to provide a better understanding of the structural and techno-economic characteristics of the European region analysed, to present the key factors conducive to increased investment in R&D and to identify the key R&D policy challenges the region is facing.

BACKGROUND

In partnership with DG Research, the Institute of Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) has been conducting a watching brief on policy developments aimed at promoting both private and public investment in R&D (RIP-WATCH). A stated aim of this policy watch activity is to take stock of developments aimed at increasing investments in R&D in the European regions.

In the design phase of the activity, a typology of the European regions was produced. A balanced mix of regions was selected from each of the nine regional types identified, representing fifteen member states of the European Union.

REGIONS COVERED

Phase 1		Phase 2	
1. Andalusia (ES)	2. Catalonia (ES)	11. Bavaria (DE)	12. Corsica (FR)
3. Carinthia (AT)	4. Crete (EL)	13. Emilia-Romagna (IT)	14. Etelä-Suomi (FI)
5. Dél-Dunántúl (HU)	6. Jihozápad (CZ)	15. Lorraine (FR)	16. Midi-Pyrénées (FR)
7. Norte (PT)	8. Sicily (IT)	17. Saxony (DE)	18. Scotland (UK)
9. Styria (AT)	10. Wielkopolskie (PL)	19. Västsverige (SE)	

THE REPORTS

The regional reports are structured according to the following two interrelated dimensions of regional techno-economic systems:

- **Regional knowledge base**, including the research, technological development and innovation (RTDI) infrastructure, human resources, RTDI efforts and outcomes and knowledge-transmission mechanisms in the region.
- **Regional economic structure**, including the productive structure, regional clusters and networks, international position and financial capacities and instruments.

Each report examines these dimensions from two points of view: their current state, as reflected in a selected set of regional indicators, and their policy context (i.e. policy framework, actors, objectives and instruments).

In addition to the regional case study reports, a **synthesis report** will be produced that combines and interprets the information contained in the case study reports. This will present the strengths and weaknesses of the regions covered and the factors that determined the trajectories of development of their R&D and innovation capacities. It will also discuss the main R&D and innovation challenges identified.

The JRC-IPTS launched the second phase of the activity in December 2006 with the contribution of the ERAWATCH Network. The work was undertaken between December 2006 and May 2007 by a project team led by LOGOTECH S.A. (EL) with the participation of Advansis Ltd, (FI), Faugert & Co Utvärdering AB (SE), Fraunhofer Institute for Systems and Innovation Research (ISI) (DE), Institute for Policy and Practice of Centre on Knowledge, Innovation, Technology and Enterprise (KITE) of University of Newcastle (UK), PREST – Manchester Institute of Innovation Research (UK), and Technopolis France (FR).

The regional case study reports produced in the study are now available on the ERAWATCH web-site at <http://cordis.europa.eu/erawatch/index.cfm?fuseaction=intService.home>

The synthesis report will also be available on the ERAWATCH web-site.

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Abbreviations

MC	Management Committee
PM	Project Management
ToR	Terms of Reference
ANBERD	Analytical Business Enterprise Research and Development Database
BERD	Expenditure on R&D in the business enterprise sector
EPO	European Patent Office
GBAORD	Government budget appropriations or outlays for R&D
GDP	Gross domestic product
GERD	Gross Domestic Expenditure on R&D
GUF	General university funds
HERD	Expenditure on R&D in the higher education sector
ISIC	International standard industrial classification
IPTS	Institute of Prospective Studies, Seville, Spain
NACE	General Industrial Classification of Economic Activities within the European Communities
NEC	Not elsewhere classified

+

1 Introduction

Emilia-Romagna, a region in the North of Italy (see Figure 1), comprises 9 provinces (Bologna – the region’s capital, Ferrara, Forlì – Cesena, Modena, Parma, Piacenza, Ravenna, Reggio-Emilia and Rimini). With a population of about 4.2 million (01 – 01 – 06), Emilia-Romagna is the sixth most populated region in Italy.

Figure 1. Emilia-Romagna



In 2003, Emilia-Romagna produced 8.72% of the national GDP (€117 844 million current PPS compared to Italy’s GDP of €135.705.8 million current PPS). GDP per inhabitant was €29 059 PPS compared to the Italian average of €23 448 PPS and the Eurozone average of €23 545 (EUROSTAT, 2006). In 2003, 33.6% of the region’s GDP was produced by the manufacturing sector (Italy, 28.1%), 63% by the service sector (Italy, 69.1%) and 3.4% by agriculture (Italy, 3.8%). Regional unemployment was 3.7% in 2004, against a national average of 8%.

In 2005, Emilia-Romagna’s economy was organised in over 400 thousand enterprises (about 1 company for every 10 people), with an average company size of just over 3 employees; over 90% of companies have fewer than 50 employees (Confindustria). The SME structure and the high level of activity in the region are mirrored by the organisation of industrial districts throughout the region. Major districts are: Bologna (3 districts) machinery and packaging, motorcycles (Officine Ducati), and automotives and parts; Modena (5 districts) ceramics, textiles, automotives (Ferrari and Maserati), woodworking machinery, biomedical devices. Other important districts are those of food and food processing in Parma (Parmigiano Reggiano, Prosciutto di Parma), machinery for agriculture in Reggio Emilia and machinery for industrial automation in Piacenza.

Most of the production of the region is export-oriented. 56% of exports are directed towards the EU-25 and other markets, including the US (11%), Japan, China and the Russian Federation. The import-export balance is positive, at €15 billion in 2005 (Unioncamere).

Regional R&D expenditure in 2003 was €1.4 billion, accounting for 9% of national investments. The business sector performed about 58% of total R&D; this figure is higher than the European average of 54%. In 2003, the regional higher education sector performed about 33% of the region’s R&D. This figure is in line with the national average of 34% but higher than the European average for higher education R&D, which in 2003 accounted for only about 22% of total R&D (ISTAT, 2007 and ADIR, 2006).

Infrastructure in the region ranks very highly in a recent national NUTS 3 survey over the period 2001 – 2004, 5 of the 9 provinces of the region having social and economic infrastructure above the national average (excluding ports and other maritime infrastructure). NUTS 2 level comparative analysis shows that the average endowment of infrastructure in the region is well above the national average (Table 1.1).

2 Regional Knowledge Base

2.1 Description of the regional knowledge base

2.1.1 Knowledge creation capacity

R&D infrastructure in Emilia-Romagna comprises public and private institutions of uneven size, diverse competence bases and varying governance structures. In detail, four universities are based in the region: the public universities of Bologna (the oldest university in Europe, with premises also in Ravenna, Rimini, Forlì e Cesena), Ferrara, Modena-Reggio Emilia (with seven faculties in Modena and 3 in Reggio Emilia) and Parma. The region also hosts in Piacenza one branch of the 'Politecnico di Milano' and one of the private 'Università Cattolica del Sacro Cuore' with headquarters also in Milan. Overall, these institutions comprise 80 departments with S&T focus.

Their activities are complemented by those carried out in 7 institutes and 8 sections of the 'Consiglio Nazionale delle Ricerche' (CNR), Italy's top national research institution. 11 out of 15 of these are clustered in the Bologna area and 10 out of 11 are strongly S&T-oriented. They specialise: radio-astronomy, astrophysics, meteorology, agricultural machinery, material sciences (for electronics, ceramics and nanotechnologies), information sciences, electronics, micro-electronics and micro-systems, marine sciences, biomedical (transplants and immune-cytology) and biology (organic synthesis and photo-reactivity).

In addition, the region hosts the public research institutes of INAF (National Institute of Astrophysics), INFN (National Institute for Physical Sciences of Matter), ENEA (the Agency for New Technologies, Energy and the Environment) and INFN (National Institute of Nuclear Physics), as well as centres of excellence in applied research such as CINECA (the Universities' Consortium for Automatic Computation), CNIT (the Universities' Consortium for Telecommunications) and IOR (Rizzoli Orthopaedics Institute). Overall, the region is the Italian leader for the number of centres for technological research endorsed by the Ministry of University and Research (MIUR), which account for 249 out of 1 881. Of these, around 25% work for the private sector and concentrate on the testing and certification phases of product development. 56% of client-firms are from the region, 35% from the rest of the country and 9% from abroad.

Recent trends in R&D expenditure (latest years for which data are available: 2001-2004 — see Table 2.1) show an overall increase in total R&D spending from €1.230 billion in 2001 to €1.372 billion in 2004. Breaking the figure down by R&D performer shows a decrease of about 4.5% in R&D investment in Public Administrations, a moderate increase for universities ($\approx 3\%$), and about a 20% increase in firms' expenditure. Overall, R&D investment figures more than doubled between 1997 and 2002 (+109%) and the research effort grew by 72% in terms of employment. R&D expenditure accounts for 1.28% of GDP, against the national average of 1.16. Of the amounts invested, 56% comes from the private sector against a national average of 50% (the second biggest contributor to intra-mural R&D are universities with a share of around 32%). With respect to other regions, Emilia-Romagna follows only Lombardy, Lazio, and Piedmont, where MNEs, public administrations and larger universities are clustered in higher concentrations, at the technological forefront of the country. For the year 2004, the distribution of research efforts by type of performer (firms, HEIs, research organisations) is as follows: out of a total figure of €1 371 831, 8.5% is invested in public research institutes, 0.6% in not-for-profit institutions, 59.1% in firms and 31.9% in universities, against national shares of 17.8%, 1.5%, 47.8% and 32.8% respectively (2004 National total = €15 251 698).

In terms of R&D intensity as a percentage of regional GDP, Public Administration and HEIs R&D expenditure in Emilia-Romagna systematically outperforms Piedmont, Lombardy and Veneto, while Business Enterprises R&D (BERD) lags behind Piedmont and Lombardy (see Tables 2.2 and 2.3).

As far as employment in R&D is concerned, from 1995 to 2004 it increased by approximately 32%. With respect to the figures of comparable Italian regions (see Table 2.2), this was the highest increase over the period considered.

ISTAT provisional data for the year 2006 indicate that Emilia-Romagna's universities employ around 6 400 staff in professorial and research positions, as against 5 400 in 2004. 76% of R&D employment is involved in research in scientific and technical domains. When staff active in S&T research are aggregated across the public and private sectors, the employment figure rises to approximately 15 000 for a relative share of 9.3% of the national total. Some 33.9% of students in higher education institutions are enrolled in S&T-related disciplines, slightly above the national average of 32.7%. 3.7 in 1000 inhabitants in the region work in S&T sectors, a figure that is higher than the national average of 2.7, but considerably lower than both the average performance of the most advanced European regions, competitors in key businesses, and the European Commission targets.

With specific reference to graduates and post-graduates in S&T disciplines, the relative performance of the region is top among comparable Italian regions, with the number of graduates per 1000 inhabitants steadily growing from 8.7 in 2000 to 16.5 in 2005 (see Table 2.5).

In terms of outputs, the region's public R&D system is characterised by higher-than-average efficiency with respect to the national level. According to 2006 OECD data, it generates about 15% of the national research output by absorbing about 5.9% of the overall national research budget (this is associated with the funding of staff costs for 7.4% of the total number of Italian researchers). The index of "scientific production" based on the ISI Thomson® Citation Index¹ from ISI Thomson® database confirms the strong vocation of the region in science, technology and engineering, producing over 19% of the publications of Italy's STE. Also, natural science publications stand at well over 97% of all scientific publications of the region. The trend highlighted in Table 2.6 shows a drop of about 3.6% in social sciences and a slight increase of only 0.3% in the natural sciences citation index from 2005 to 2006.

Patenting activity (Table 2.7) within the region is exceptionally high compared to national levels. Against a national average of about 64 patent applications per million habitants, Emilia-Romagna has filed almost 150 patents. The variation between 1999 and 2004 is also well above the national average (31.4% against 27%). When broader trends of technological specialisation are considered, over the period between 1990 and 2002, for which data are available disaggregated by International Patent Class, the figures show a notable increase of outputs in Performing Operations & Transporting, Human Necessities and Electricity, no significant increments in the areas of Chemistry & Metallurgy, where a period of decline from 1991 to 1998 was balanced by one of relative progress in later years, and moderate increments in all other areas (Figure 2.1).

With respect to technology trading partners, Emilia-Romagna appears to have core strengths in the provision of technical and engineering services and weaknesses in patenting and exploitation of patented and copyrighted know-how. 50% of transactions are with European partners, not surprisingly with the largest economies in Europe; outside Europe technology trade is at its highest intensity with US companies (Tables 2.8 and 2.9). These data have been interpreted as an

¹ The ISI Thomson® Citation Index contains the references cited by the authors of the articles covered by the index. The cited reference search finds articles that cite a previously published work. The index used is based on the counting of publications authored or co-authored by at least 1 author with an affiliation in Emilia-Romagna in the three sections of the main database, namely: the *Science Citation Index Expanded* - a multidisciplinary index to the journal literature of sciences. It fully indexes 5 900 major journals across 150 scientific disciplines; the *Social Sciences Citation Index* - a multidisciplinary index to the journal literature of social sciences. It fully indexes more than 1 725 journals across 50 social sciences disciplines, and it indexes individually selected, relevant items from over 3 300 of the world's leading scientific and technical journals; and finally, the *Social Sciences Citation Index* - a multidisciplinary index to the journal literature of social sciences. It fully indexes more than 1 725 journals across 50 social sciences disciplines, and it indexes individually selected, relevant items from over 3 300 of the world's leading scientific and technical journals (<http://apps.isiknowledge.com>).

indication that innovation generated in the region is mostly of an incremental nature, with radical breakthroughs usually outsourced from foreign R&D producers, on which Emilia-Romagna's tend to rely to a larger extent than on competing regional/national producers.

2.1.2 Knowledge diffusion capacity of the region

The knowledge diffusion "infrastructure" of the region is mainly centred on ASTER, the institutional core of the regional innovation policy. ASTER is a consortium of the Regional Government, universities, institutes and centres of research and business associations. ASTER comprises a network of organisations across the region active in industrial research, technology transfer and innovation.

The main role of ASTER is to develop a range of services for innovation. The services provided include access to finance for research and development and innovation, promotion of collaborative research, industrial research services, support to start-ups, research networking and collaboration between regional centres and European partners, linking/bridging research centres and businesses, trans-national, national and regional technology transfer initiatives, coordination of the regional network of business angels and venture capital, ICT and multimedia incubators and a plethora of knowledge-based innovation activities ranging from e-government to health and medical innovation and the environment.

The priorities of ASTER (in no particular ranking order) are summarised by the following key areas:

- high-tech mechanics (HiMech). HiMech involves 11 networked industrial research laboratories and 5 innovation centres employing 140 researchers and more than 130 companies;
- life sciences and health involving 5 industrial research laboratories and 1 innovation centre. The network comprises several departments of life sciences, medicine, veterinary and IT departments of several regional universities;
- agri-food is engaged in all aspects of agriculture and food production (from biotechnology and seeds to highly mechanised food processing machinery). This theme brings together two industrial laboratories (one in Parma and one in Reggio Emilia) with three innovation centres;
- building and construction materials sees the participation of several engineering faculties (mainly in Bologna) collaborating with industry associations in Bologna, Faenza and Ravenna. This theme is strong, with two industrial research laboratories and 4 innovation centres;
- organisational innovation involves business, management and S&T departments of universities and business associations. Its activity is organised in 8 innovation centres specialised in business competitiveness, transferring knowledge from academic centres to enterprise, and developing and providing the appropriate expertise;
- Information and Communication Technologies is organised in two laboratories (on multimedia and e-infrastructure) working on 9 projects. The theme also has two innovation centres (Bologna and Forlì);
- environment, sustainable development and energy, with the aim of gathering knowledge on energy themes and relevant technology capabilities. The theme involves 5 industrial research laboratories and one innovation centre.

The network is 1 300 companies strong and employs 1 500 researchers in 57 laboratories, innovation centres and innovation parks. The public regional investment channelled through ASTER totalled €156.6 million for two years and rose to €158 million between December 2004 and July 2005 (ASTER Annual Report, 2005). The network also co-finances projects for a total of €367.5 million. The network comprises 27 Industrial Research Laboratories, 24 Innovation Centres and 6 Innovation Parks.

2.1.3 Knowledge absorption capacity of the region

The ability of the labour force to absorb new knowledge can be considered satisfactory when compared to the national average although the relative absorption capacity of the region, compared to other top European regions, has to be considered unsatisfactory.

In more detail, education in Emilia-Romagna and the relative absorption capacity is 4% higher than the national average, with over 77% of the population aged between 20–24 with upper secondary and post-secondary non-tertiary education (isced3_4). Equally, the share of population age between 20 and 29 with S&T tertiary education (isced5_6) is 16.5%, compared to the national share of 11%. Although this higher rate is justified by the higher than average concentration of universities in the region, the percentage of human resources (HR) in science and technology sectors is considerably high (7.9%), as is the percentage of HR in education (7.5%). Another aspect where Emilia-Romagna scores higher than the national average is in the lifelong learning indicator. In Emilia-Romagna, 7% of employees aged 25 to 64 participated in adult training programme in 2004. Although impressive, compared to a national average of just about 6%, this indicator is still below the target of 10% set for 2010 (Tables 2.10 to 2.13).

The composite indicators presented in Table 2.14 show the scores in terms of HR and in knowledge creation and absorption of Emilia-Romagna compared to the national and European averages and against the leading regions at national and European level. Compared to national indicators, Emilia-Romagna scores first in terms of lifelong learning, tertiary education and number of patent applications. In terms of leading European regions, the relative absorption capacity of Emilia-Romagna is rather poor: tertiary education and lifelong learning are only a fraction of the London regional assembly (41.66 for London against 11.77 for Emilia-Romagna and 25.20 for London against 6.4 for Emilia-Romagna respectively). The share of medium to high-tech employment in manufacturing in Emilia-Romagna is 10.41, against 21.24 in the region of Stuttgart, while the same ratio for the services sector is 2.85 in Emilia-Romagna, against 8.8 in the region of Stockholm.

2.2 Policy context

2.2.1 Governance structure and stakeholders

Significant changes have taken place in the definition and implementation of policy governance in recent decades. An important event in the history of the region's S&T policy was the establishment of ERVET in 1974. ERVET was set up as a limited company by the regional government, its major shareholder, to design and implement innovation strategies at a time when regional administrations were very young institutions and their role with respect to national policies co-evolved with the emergence of powerful local business associations and with the growing importance of SMEs in the context of the regional economy.

In the 1970s, the main objectives pursued at regional level focused on the improvement of physical infrastructure, especially in relatively disadvantaged areas. In the 1980s, with the remarkable growth of micro and small businesses around Emilia-Romagna's industrial districts, attention shifted to facilitating communication among stakeholders, monitoring the activities of production systems and promoting sector-specific innovation strategies through the creation of a network of Business Service Centres. Although industrial policy at the time was firmly under the remit of the national government, Business Service Centres provided training, information, marketing and technical assistance.

From the early 1990s, stronger market orientation led to significant reforms in the organisation of ERVET. Its activities refocused on innovation, finance and internationalisation. A number of business centres were shut down and a few selected ones (among which ASTER, later to become the pivot of regional innovation policies) specialised further, on the one hand, on the knowledge

content of their services and, on the other, accentuated their role in facilitating networking at regional, national and European levels.

The shift of administrative power from the national to the regional government (Law No 59 of 1997) has primed the Emilia-Romagna government to develop its regional RTD – first three-year plan (2000-2002), which was designed to bring all matters of RTD and innovation policy group under the umbrella of the regional administration. From 2002 onwards, the transition was completed and all RTD and Innovation policy matters have been transferred from the national government and the EU to the regional government. RTD and Innovation policy are defined by Law No 7 of 2002.

The original idea of shared governance of RTD and innovation policy dates back to 1974, with the establishment of ERVET by the regional government. Indeed, ASTER's remit provides for research and development, technology transfer and innovation services in order to connect research and business. The regional government, universities, research centres, business associations and trade unions hold shares in the consortium and all participate in the definition of policy priorities and implementation. In addition, the regional government plays the political role of steering the activities of ASTER in accordance with the economic and social interests of voters.

2.2.2 Policy Objectives

In the 1980s and 1990s RTD policy was the sole remit of the national government. In the late 1990s administrative power increasingly shifted from the national to the regional government (Law No 59/1997) and regional RTD policy began to be formulated, managed and organised by the regional government.

The main policy schemes in place were as shown in the following table:

Law	Art.	Governance Level	Content
46/82	4	National	Expenditure on applied research
46/82	5	National	Professional training
46/82	11	National	Spin-off
297/97	12	Transfer of administrative power to the regional and local government	Research and training projects
297/97	14	Transfer of administrative power to the regional and local government	Hiring of research staff
Eureka	6	European/National	Projects of international cooperation
488/92	4	National	Research projects
488/92	5	National	Training
488/92	6	National	Modernisation schemes

Since the shift of administrative power from the national government to the regional and local governments, the regional government has considered industrial RTD policy as an embedded part of the larger policy framework of regional socio-economic development based on innovation and high-quality standards.

The implementation strategy chosen by Emilia-Romagna consisted of a three-year plan (2000-2002) budgeted through the "Fund for Production activities" (Fondo Unico per le Attività Produttive), which amounted to about €280 million with a contribution of about 30% from the Region (Annex 3 — Table 2.17).

Since 2002, Emilia-Romagna has been formally and practically in charge of regional RTD and innovation policy. The principles to which it adheres are determined by the stakeholders in ASTER and are in line with the national and European principles and priorities defined through the Lisbon process.

2.2.3 Policy Instruments

From 1998, R&D governance became the remit of the regional government, which addressed the issue of transition “from national to regional/local” governance by applying a unifying strategy to the plethora of rules and regulations affecting RTD (See Table 2.16).

During the transition, regional RTD policy was organised by objectives, and objectives in turn by measures. Measures with direct impact on RTD included:

- *Policy Objective 1: Support for investment*
 - *Policy Measure 1.3: Support for R&D initiatives and tax bonus for innovative activities.*
 - Instrument: Funding for this measure was provided by national and regional sources
- *Policy Objective 2, support for start-up and first employment*
 - *Policy Measure 2.2: Support to start-ups*

The instruments included in this policy measure are organised in “actions”:

- **Action A** – provision of a guarantee fund for the creation of new companies and technical support services for new companies
- **Action B** – support for new enterprises in high-tech sectors with a guarantee fund and grants
 - support for spin-off with a guarantee fund and grants
- **Action C** – support for new cooperative enterprises

In 1999, the “Plan” was in place to reconcile previous legislation (including policy measures, programmes and institutions) in a coherent body of policies organised towards a common objective. In 2002, the process was finalised by law No 7 (l. 7/2002) in matters of research and innovation.

With regard to science, technology, engineering and research and development activities, between 2000 and 2002, the regional government increased the role of universities in regional RTD policy because by making them more active in industrial research, technology transfer operations, entrepreneurship, and advanced education and training. It also considered the share of the service sector providing professional advice to the industry. This branch of the services has in fact grown both in depth and in breadth to cover knowledge management and diffusion and technological assessment, reaching a level of excellence in linking knowledge and technology to new business opportunities.

The impact of RTD policy can be summarised by the number of projects approved and the total investment on R&D activated by the co-financing system. In the three years considered 4 588 projects were approved. The trend was positive as in 2000 about 1 100 projects were approved while in 2002 the number of projects co-funded by the Region was over 1 800. The amount of total investment activated through this mechanism was about €1 500 million over the three years, with a regional contribution in the form of tax relief and bonuses of only €91 million (Table 2.18). About 60% of the total investment went to researchers and research support staff, 20% to personnel, while about 15% of investment was spent on consultancy services and a smaller share (around 5%) was invested in laboratory appliances.

In terms of participants in the scheme, the share of large company projects funded was only 13% of the total although the measures targeted both large and small to medium-sized companies (Table 2.19).

Investments on R&D and innovation by consortia of SMEs were primarily directed towards the acquisition of machinery and laboratory durables (about 52%) and software (15%). Some 15% of investment went towards the acquisition of services (consultancy services and project / technology management). Only a relatively small share of investment was channelled into prototyping (development phase) and patenting (Table 2.20).

Measure 2.2 primarily targeted the development of high-tech manufacturing and service sectors from university spin-offs and start-ups. Between 2000 and 2002, 26 projects were approved and €1 billion of Regional government expenditure contributed to the activation of about €2 billion in investments from the private sector for a total of over €3 billion (Table 2.21).

The First Three-Year-Plan has steered regional policy towards innovation and economic development of the regional economic system, based on the principles of the knowledge economy. This approach has been consolidated through the commitment of the regional government to regional innovation and research policy and through the “Patto per la qualità dello sviluppo e la coesione sociale” (pact for quality of economic and social development) and the Lisbon Strategy.

In 2002 and 2003, Emilia-Romagna's RTD policy derived renewed strength from Law No 7 of 2002 designed to promote the regional system of industrial research, innovation and technology transfer. This law integrated all the specific programmes linked to RTD activities in the region and helped to organise all actions more efficiently. With the implementation in 2003 of Regional Law No7 of 2002 and the associated launch of the so-called Regional Programme for Industrial Research, Innovation and Technology Transfer (PRRIITT), Emilia-Romagna significantly strengthened its support for the regional S&T system. It did so not only by augmenting the level of financial commitments but also, and above all, by devising a highly coordinated programme of local governance through the institution of ASTER, a consortium of regional authorities, universities, R&D centres and firms. The stated specific objective of the policy strategy has been a major shift: from small flexible firms to medium-sized specialised firms; from simple clusters to complex clusters; from local policies to integrated regional policies; from local external economies to knowledge networks; and from incremental innovation to radical innovation.

The actions involved in the new programme have included, on the one hand, the development of industrial research and technology transfer networks and, on the other, the facilitation of firms' R&D activities and science-industry relationships.

For the first set of goals, the scheme has been designed to foster the promotion of:

- Networked labs
- Centres of innovation
- Technology parks
- Network coordination
- “Research to business”
- European networking and strategic projects

For the second set of goals, the programme comprised:

- R&D projects involving new researchers and collaboration with universities and/or research centres
- Joint SME laboratories
- Spin-offs
- Venture capital funds

In the first phase, the scheme led to the employment of 930 new R&D researchers in enterprises, and 313 new specialised staff involved in applied research across 27 laboratories, plus the generation of 750 research contracts between enterprises and research centres and the production of 361 new industrial patents from the 529 enterprises' projects (for a more comprehensive overview of the impact of the programme, see Table 2.22, and for a sectoral breakdown of activities, see Table 2.23).

Overall, RTD policy has been part of a wider policy approach that has increasingly shifted the focus towards strengthening regional competitiveness through structural reforms aiming to put into place, re-launch and reinforce already advanced physical and intangible infrastructure. The approach centres on the principles of capitalising on the region's physical assets by improving their

accessibility and generally upgrading technology-oriented infrastructure, for example expanding the network of optical cables and satellite technologies for broadband internet connections. Measures designed to increase energy production have been put into place in an effort to increase efficiency in both production and distribution and to develop alternative/clean sources of energy. Capitalising on intangible assets has been one of the priorities of the regional government as universities, research organisations and a vibrant and socially rooted industrial base have formed the spearheads of economic development of the region since the post-Second World War rebirth. By enhancing the synergies between physical and intangible assets, the regional government has been working towards a long-term vision where technological development, innovation and social and economic development are the keys to prosperity.

Exhibit 1: RTD policy mix affecting the region

Policy Areas ²	Policy objectives and instruments at National* level affecting the region	Policy objectives and instruments at Regional* level
Improve R&D governance	The shift of administrative power from the national to the regional government (Law No 59/1997) has primed the Emilia-Romagna government to develop its regional RTD – first three-year plan (2000-2002). From 2002 onward the Regional government is completely empowered in matters of RTD and innovation policy.	Unify overall governance of regional economic policy and delegate responsibilities to ad-hoc institutions and networks by devising a highly coordinated programme of local governance through the re-classification of ASTER, a consortium of regional authorities, universities, R&D centres and firms.
Creation of an innovation friendly environment	After Law No 59 of 1997 – passage of administrative power from the central government to regional and other local governments	Emilia-Romagna's economic policy has increased its focus on the competitiveness of the economic system by promoting a structural approach and launching (or reinforcing) a series of infrastructural plans aimed at creating an innovation-friendly environment.
Development of human capital	n/a – as the framework programmes of the Ministry of University and Research and the Ministry for Education leave ample power for the regional government.	The policy objective is to increase the skills base of the workforce, facilitate the transition from the education system to the workplace and maintain the skill set of the workforce updated through life-long training and education. Also, the regional government aims to provide a stable stream of highly qualified individuals employable in research both in research centres and in industry, including scientific capabilities at post-graduate level with an international profile.
Networking, co-location and clustering measures	n/a – the Emilia-Romagna regional Government does not adhere to the principles of the policy framework set out by the national government in	The approach of the regional government to networking has been on two fronts 1) creating nodes and / or hubs in order to achieve better

² Compilation from typologies described in the bibliography such as Boekholt, P. et al (2001), *An international review of methods to measure the relative effectiveness of technology policy instruments*, Technopolis B.V., Amsterdam; Soete, L. et al (2002), *Benchmarking National Research Policies: The impact of RTD on Competitiveness and Employment (IRCE)*, A STRATA-ETAN Expert Group Report, DG Research, European Commission, Brussels; Guy, K. and Nauwelaers, C (2003), "Benchmarking STI Policies in Europe: In Search of Good Practice", *The IPTS Report*, Vol. 71, February, IPTS, Seville; European Commission (2003), *Raising EU R&D Intensity: Improving the Effectiveness of the Mix of Public Support Mechanisms for Private Sector Research and Development*, Report to the European Commission by an Independent Expert Group, Brussels. Also, TrendChart has developed its own policy mix taxonomy.

Policy Areas ²	Policy objectives and instruments at National* level affecting the region	Policy objectives and instruments at Regional* level
	matters of industrial districts and clusters.	coordination and far-reach of policy measures to smooth the transition from “industrial districts” to networked productive systems; on another level 2) the regional government favours ad-hoc measures – taken in agreement with cluster and network representatives – in order to fine-tune its efforts to increase R&D activities (in terms of activities performed and funding).
Knowledge and technology transfer to enterprises	ASTER has many institutional partners outside the region.	The knowledge diffusion “infrastructure” of the region is mainly centred around ASTER, the consortium of the Regional Government, universities, institutes and centres of research and business associations. The main role of ASTER is to develop a range of services for innovation. The services include promotion of collaborative research, industrial research services, technology transfer.
Research collaboration of public research organisations with private sector	See above	See above
Support of public research	15 institutes and sections of the Consiglio Nazionale delle Ricerche (CNR), National Research Council. INAF (National Institute of Astrophysics), INFN (National Institute for Physical Sciences of Matter), ENEA (Agency for New Technologies, Energy and the Environment) and INFN (National Institute of Nuclear Physics)	The 15 institutes and sections of CNR and other institutes of research, although centrally governed, are functional to the innovation potential of the region
Financial R&D measures for the private sector	Remit of the Regional Government by Law No 7 of 2002	Industrial research and pre-competitive development Initial investments and organisation of R&D laboratories for SMEs Initial investments for High Tech Start-ups Initial investments for R&D laboratories and Technology Transfer Initial investments and re-organisation of Innovation relay Centres Research Projects — ICT (Piano Telematico) Innovation and science parks INGENIUM Fund Regional Programme for innovation

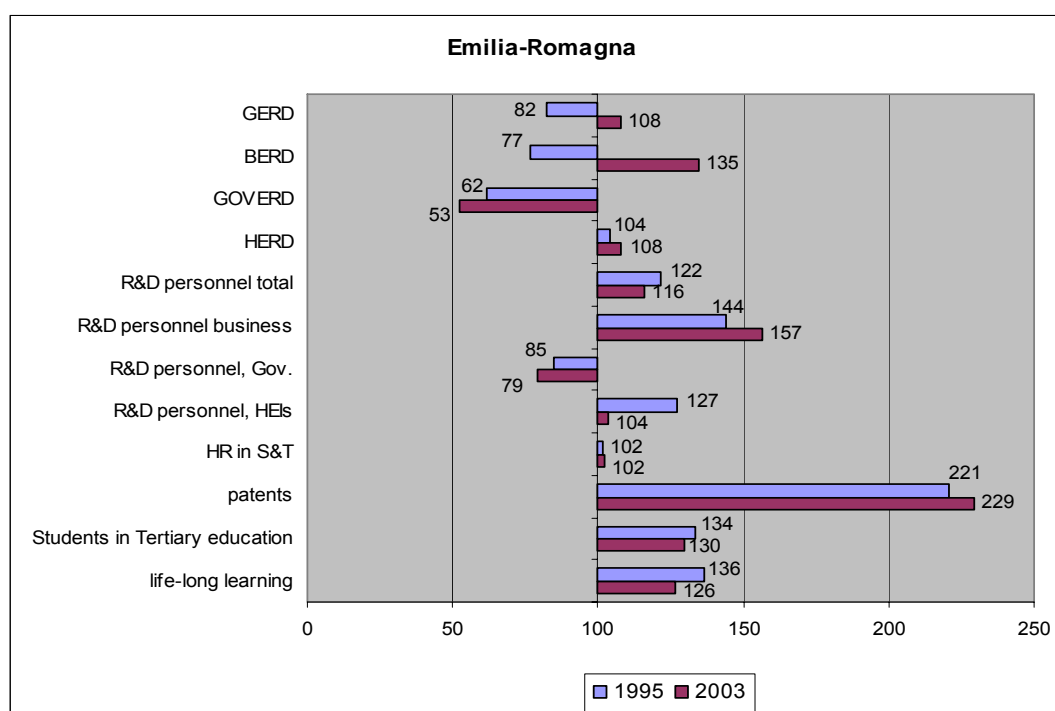
[* Policies at national level are formulated and implemented by national stakeholders even if they have a regional dimension, while policies at regional level are under the complete and exclusive control of the regional authorities. Shared policies planned and/or implemented jointly by national and regional authorities, e.g. co-funding, are regarded as regional.]

2.3 Conclusions

The performance of Emilia-Romagna's innovation system between the second half of the 1990s and 2003 can be summarised by the following indicators, which show a general improvement of the regional knowledge base compared to that of Italy. For example, while business R&D expenditure was 23 percentage points lower than the national average in 1999, Emilia-Romagna's business R&D expenditure shot up to 135 in 2003, against a national average of 100. R&D performed by the region's higher education sector, which in 1999 was 4% above that of the national average, also registered a net improvement of 4%, with an index of 108, against a national average of 100. However, R&D performed by the regional government was below the national average in 1999 and further decreased in 2003. Nevertheless, in terms of regional R&D effort (regional GERD), Emilia-Romagna, which scored only 82% against a national index of 100, outperformed Italy in terms of GERD by 8 percentage points in 2003.

In the same period, the proportion of regional R&D personnel was above the national average, although, between 1995 and 2003, Emilia-Romagna lost some ground, with the proportion falling from 122 in 1995 to 116 in 2003, compared to the national average of 100. The decrease is mainly due to the declining performance of employment in Government-performed R&D in the region, which saw personnel fall from 85/100 in 1995 to 79/100 in 2003. The regional higher education sector also grew at a slower pace than the national average, as in 1995 Emilia-Romagna exhibited an index of 127 against a national index of 100 while in 2003 the region scored only 4% above the national average (104 compared to Italy = 100).

Summary Graph 1: Comparison of Emilia-Romagna's knowledge base with Italy



Note: R&D personnel total, Bus., Gov., HEIs, students in Tertiary education, Life long learning 1999, 2003

Within the region, the best performing sector in terms of the employment of R&D personnel has been the business sector. With an initial index of 144 in 1995 (Italy = 100), R&D personnel in businesses scored 157 (Italy =100). In terms of overall HR in science and technology, Emilia-Romagna scored 2% above the national average, a figure which was stable between 1995 and 2003. Other indicators of the regional knowledge base presented in Figure 2.3 relate to numbers of students in tertiary education and lifelong learning. Here, Emilia-Romagna performed above the national average throughout the period considered, although there has been a 4% decline in terms

of students in tertiary education (from 134 in 1995 to 130 in 2003) and a 10 percent fall in terms of lifelong learning (136 in 1995 and 126 in 2003).

In terms of R&D output (Patents), the region has constantly outperformed Italy as a whole, with an index for patenting of 221 (Italy = 100) in 1995 and 229 in 2003.

After the formal approval of law No 59 of 1997 ruling on the passage of administrative powers from the central government to regional and other local governments, the balance of responsibilities for the innovation policy mix gradually shifted towards the regional government. After the period of transition (1998–2002), the management of funds for innovation policy became the complete competence of the regional government.

Starting in 1998, the regional government first harmonised the plethora of policy measures (sometimes with miss-aligned objectives) and then developed its own economic policy framework with the main objective of moving the regional economy into the knowledge-based economy. RTD and innovation policies have been embedded in this framework, making it one of the five most important components of the policy mix. This new policy mix has been constantly developed since and the process now seems to be starting to run smoothly.

The intermeshing of policy objectives regarding 1) structural economic development, 2) innovation and RTD measures, 3) education STE and training, 4) financial matters and 5) reform of the public administration has constantly increased the efficiency in deploying policy instruments through specific actions. Two factors have been decisive in determining the sharp increase in efficiency:

- 1) developing regional policy with the participation, agreement and commitment of all interested parties (regional government, universities, business association, trade unions, etc.);
- 2) organising the modus of delivery of policy measures through a well structured network (based on the same principles sub 1).

The co-participation of all parties involved ensures that the policy mix reflects the interests of the social and economic fabric of the region and that its objectives are feasible without major renegotiations. Organisation of the “modus of delivery” of the policy mix ensures that the governance is unified within the central regional government, although executive responsibilities are delegated to ad hoc networks and institutions, thereby increasing far-reach capacity and increasing the coordination of objectives.

It is still too early to be able to assess the results of the policy mix as its objectives are devised for the long-term structural transformation of the region. However, strategies adopted to deliver the policy are in line with the actual configuration of the region’s economy. For example, the network approach to delivering policy measures is in line with the organisation of the industry (districts and clusters of SMEs) and with the policy objective of facilitating the evolution of industrial districts and clusters into networked systems of production.

3 Regional economic structure

3.1 Description of the economic structure

In the 1970s, Emilia-Romagna underwent a rapid process of industrialisation, driven mainly by small and medium-sized enterprises. In that decade, Emilia-Romagna experienced the fastest GDP growth rates among the most industrialised regions of Italy (4.1% against Italy's average of 3.8% in the decade 1971–1980). In the 1980s and 1990s, the performance of the regional economy realigned on that of Italy with average annual growth rates lower than 2%. However, the restructuring of the regional economic structure in the 1990s re-balanced towards a larger minimum efficient scale of production, with a sharp reduction of industrial micro-companies (fewer than 10 employees) and an increase in firms with between 10–49 and 100–499 employees. In the same period, the number of companies listed on the Stock Exchange also doubled in respect to the 1970s. In the period 1981–1996, the number of business services grew tenfold (from 3 200 in 1981 to 34 500 in 1996) and business consultancies grew from 12 000 in 1981 to 75 800 in 1996. Nonetheless, the economic structure of the region is still heavily reliant on small and medium-sized enterprise as a form of organisation, as over 90% of the enterprises have fewer than 50 employees. In 2005 the average size was of about 4 staff per company,³ and the distribution of the average size of company by sector of activities was 5.4 staff in industry (7.4 in manufacturing), 2.6 staff in services and 1.2 staff in agriculture (Table 3.1).

The process of re-structuring Emilia-Romagna's manufacturing base benefited from increasing penetration in end markets, especially within the EU, North America and Asia; it also benefited from extensive outsourcing of low-value added manufacturing to low-cost labour markets (Rinaldi, 2005). Restructuring of the manufacturing sector went hand in hand with a gradual upgrading of workforce capabilities. Although the introduction of ICT and other forms of advanced mechanisation and programming was as pervasive throughout the two decades (1980s and 1990s) as it had been in Italy and in Europe, in Emilia-Romagna the transition did not cause any substantial reduction of employment; in fact, unemployment in the region has been constantly lower than national unemployment rates (4.5% against a national average of 11.4%) – Source: Unioncamere Emilia-Romagna). During the 1980s and 1990s, Emilia-Romagna grew and developed at double the pace. Along the “Emilian way” – an infrastructural complex that goes from Rimini in the south-east to Piacenza in the northern tip of the region passing through Bologna, Modena, Reggio Emilia and Parma – the economy grew at impressive rates. The organisation of production based on flexible specialisation within industrial districts characterised by small but highly flexible and specialised companies consolidated into a model of governance oriented towards concentration into groups of SMEs (Brioschi et al, 2002, Lazerson et al. 1999). Away from the “Emilian way”, in the north-eastern province of Ferrara, the economy, based on heavy industry and large companies experienced a decline throughout the decades (Objective 2). The Apennines (west, south-west) followed the well-known pattern of decline characteristic of mountainous areas (Objective 1).

Industrial specialisation in the region is diverse and spans from traditional industries (ceramics, furniture, clothing and footwear), to medium to high-technology sectors (automotive and parts, mechanics and machinery) and to high-tech industry (biomedical devices and mechatronics). Within industrial districts and the local system of production, distributed innovation has been traditionally driven by learning by doing and networking. R&D activities have also played an important role in the definition of regional specialisation patterns in traditional sectors, medium to high-tech sectors, and high-tech industry.

In traditional sectors such as ceramics, although R&D intensity has traditionally been very low, innovation was relatively high compared to similar sectors through the 1980s and 1990s. This

³ PREST estimate based on the following data: 1) employment 68% of the active population, 2) active population 70% of total population, 3) number of active companies.

process was fostered by the co-location of a large number of businesses and a continuous and efficient flow of distributed innovation, which blurred the boundaries between firms' and made it impossible to distinguish "innovator" from "imitator". Notwithstanding the instability of demand for ceramic products, the industry in the region has led the competition thanks to the capability of the district, rather than the capabilities of any single enterprise, to capitalise on process and product innovations and to gain a foothold external markets (Gagliardi, 2005; Assopiastrelle, 2004).

In medium to high-technology sectors, R&D activities have been the driving force behind the development of the value chain linked to mechanics and automotives: Officine Ducati in motorcycles and Ferrari, Maserati and Lamborghini in the car industry are prime examples of innovation-driven industries with high R&D intensity.

In high-tech sectors, research and development activities have played a significant role in the development of sectors such as biomedical devices in the Mirandola cluster in the province of Modena (Gagliardi, 2005) and mechatronics in Bologna.

3.1.1 Characteristics of the productive structure of the region's economy

In 2003, the region's GDP was €117 844 million current PPS. Compared to Italy's (€1 357 058 mil current PPS), Emilia-Romagna's GDP accounts for about 8% of the national GDP (EUROSTAT, 2007).

In 2004, GDP growth in the region was lower than the national average (0.2% against 1.2%). However, Emilia-Romagna's GDP grew 0.9% in 2005 whereas the national GDP stagnated. According to Unioncamere's estimates for 2006 and 2007, the region's growth in GDP will be higher than the national average (1.9% in 2006 and 1.7% in 2007 for the region against 1.7% in 2006 and 1.4% in 2007 estimated for Italy).

In 2003, 33.6% of Emilia-Romagna's GDP came from manufacturing and construction, against an average of 28.1% for Italy. The service sector in Emilia-Romagna produced 63% of regional GDP while in Italy as a whole it has a higher share of 69.1% of national GDP (Table 3.2).

In terms of GDP per inhabitant, in 2003 Emilia-Romagna was amongst the 10 richest regions in Europe, with over €29 000 PPP per capita compared to an average of about €23 500 PPP for Italy, €23 700 PPP for EU-15 and about €21 750 PPP per inhabitant in the EU-25. During the period 1998 – 2003, the regional GDP per person was always between 30 to 40% higher than the European average although its relative importance decreased from about 45% in 1998 to 33.7% in 2003 (Table 3.3).

The total added value of the economy of the region in 2005 was €109 216.1 million in cash terms or 8.6% of Italy's as a whole. The composition of the region's added value by agriculture, manufacturing and service sector is shown in Table 3.4 (a, b, c, d).

The regional added value for manufacturing was around 28% of the total from 2000 to 2005, the corresponding Italian share being lower and decreasing from 23.4% in 2000 to 20.8% in 2005. The share of agriculture decreased throughout the period 2000-2005 (in line with the national trend) although Emilia-Romagna's agriculture added value was, on average, 0.5% higher than Italy's. The share of the service sector in the region was fairly constant over the period 2000-2005, at about 63.5% and about 5% lower than the national average. In terms of regional specialisation, the service sector plays an important role in the regional economy, which, nevertheless, has a relatively dominant manufacturing and agricultural base. Table 3.5 shows the sectoral breakdown for the years 2000 to 2004. It is worth noting that the industry with the biggest increase in terms of value added has been the construction industry (from €3.9 billion in 2000 to €6.1 billion in 2004), while, in services, financial and estates gained over €4 billion in terms of added value over the same period.

Regional employment is higher than the national and the European average, with a rate of active population of 71% in 2004 (Italy 62.5%) and employment of 68.3%; unemployment in the region was only 3.7%, much lower than the national average of 8%. However, in 2005, the average unemployment rate in the region increased by 0.1% while the national level decreased by 0.3%, to 7.7% (Table 3.6).

Productivity indicators based on the ratio of value added/employment in 2004 show that total productivity in the region was more than 5% above the national average in all three macro sectors of activity. In agriculture, regional productivity was over 20% higher than the national average; Emilia-Romagna's industry is at least 10% more productive than Italy's as a whole and the regional service sector displays a productivity level of over 104 compared to a national index of 100 (Table 3.7).

An important feature of the regional economy is the relevance of the cooperative sector. A recent census identified about 5 000 cooperatives, with some 170 000 employees. The stakeholder base was 2.6 million (Table 3.8). The cooperative sector's turnover in 2004 was €47 billion.

3.1.2 Systemic characteristics of the region

The industrial sector along the Emilian way is organised into industrial districts with different local specialisations. Under Italian law No 317 of 1991 on policy measures for innovation and development by small sized enterprises, industrial districts are local economies characterised by a high concentration of small enterprises relative to the number of enterprises in the area, the population and the specialisation of the local economy. According to this definition some industrial districts/clusters, characterised by a higher concentration of larger firms — for example Sassuolo — are not recognised as districts and therefore excluded from access of policy measures for research and innovation. The regional government of Emilia-Romagna has implemented a different strategy regarding the definition of "industrial district". Representatives of local systems of production within the region are entitled to promote their cases directly with the regional government in matters of development and innovation policy.

Emilia-Romagna, Tuscany and Veneto are the three Italian regions with the highest concentration of industrial districts or clusters. Industrial specialisation among Emilian clusters spans from low-tech (textiles, food processing, footwear, ceramics and furniture) to medium-tech and medium- to high-tech (farm and wood processing machinery, packaging machinery, motorcycles and automotives and parts) to high-tech manufacturing (biomedical products and mechatronics) (see Figure 2 and Table 3.9 for details).

From a longer-term perspective, the evolution of Emilia-Romagna IDs has been characterised by increasing economies of scope, meaning the number and type of activities carried out within the districts have been growing at impressive rates in order to adapt to changing market conditions. In the same timeframe, the flow of information within the district has been constant, allowing participants to work to a model of distributed innovation (Gagliardi, 2005; Santarelli, 2006).

The district or cluster model of organising production has been taken a step forward as the emerging networks of small-but-fast-growing enterprises operating in the ICT and Multimedia and other knowledge-intensive activities has caught the attention of analysts and policy-makers.

3.1.3 The regional economy in the international context

The import-export balance of the region is positive, at about €15 billion, while Italy has a negative balance of over €9 billion (Table 3.10).

In 2005 regional export increased by 7.7%, in value, compared to the previous year. Mechanical engineering and machinery covered over 33% of the total value of regional exports. An important share of the value from export comes from the automotive and motorcycle industry (12%), and textiles and clothing (8%) (Table 3.11).

Breaking down the value of regional export by technological content (Table 3.12) shows that over 50% is from the high-tech industry (Italy 42%), 48% from traditional / standard industry (Italy 56.4%) and only 1.8% from agriculture and raw materials, in line with the Italian average.

With respect to trading partners, the technological performance of the region can be summarised by its technology trade figures. For Emilia-Romagna these reveal core strengths in technical and engineering services and weaknesses in patenting and exploitation of patented and copyrighted know-how. Partners are mostly from Europe, but outside the European Union technology trade is at its highest intensity with US companies.

Internationalisation of the regional economy is also highlighted by the flow of foreign direct investment. Together with Piedmont, Emilia-Romagna is the scores second for investment in foreign companies and third for the number of regional companies attracting foreign investment (ERVET, 2004).

3.1.4 The local financial market

The traditional financial market of the region is well developed. Traditional instruments for financing RTD and innovation activities include credit and loans. The credit/debit index for the region shows a healthy picture, with bank exposure as a percentage of GDP at 64%, against an average of 60% for neighbouring regions. This index is “supported” by rates of sustained rates of growth of GDP and a dynamic economy.

Cooperative ventures are a further form of finance that is very much developed within the region. This source of funds is mainly in use within industrial districts and within clusters of co-located small to medium-sized enterprises and cooperatives. Traditionally, this has been the main source of finance nevertheless, but the increasing risks attached to research and development activities in high-tech sectors have probably been the cause of the constant decline in this form of financing of SMEs.

Financial instruments appropriate for research and innovation activities, such as venture capital, are still underutilised in Emilia-Romagna (compared to the most innovative regions in the UK, France and Germany). Nonetheless, the shock on the global venture capital market of 2001 has had only mild effects on Emilia-Romagna. AIFI data and reports (Associazione Italiana Finanziarie Industriali) on venture capital show that Emilia-Romagna has ranked second (after Lombardy) in the number of VC deals for some years now. Long-terms trends show that Emilia-Romagna's performance was consistent up to 2003, with an average of 40 VC deals per year. In 2004 the number decreased to only 15 deals (in line with national trends) and in 2005 -2006 the trend seems to have stabilised at an average of 35 deals. Emilia-Romagna attracted a share of 10% of the deals on the national VC market, as recorded by the AIFI in the period 1998 — first half of 2006 (Table 3.13).

3.2 Policy context

The existing policy context is the result of the region's recent economic development, and involves planning and steering mainly by the national government, but also by regional and local policy-makers.

Brusco in 1982 identified two main factors driving Emilia-Romagna's economic structure down this path of development, namely, growth in the traditional artisan sector and the concentration and rise of subcontracting. The policy framework within which this model has developed and prospered has centred on the social and economic role of the artisan sector. Identification of the artisan and the artisan firm model is defined by law⁴ as a company composed of the owner-manager and

⁴ A national law was passed in 1986, but before that date the regional government had rules and regulations in place for the identification of measures in support of artisan companies.

employing at least one member of the family. Identification of the economic stakeholders was only the first step to policy-making; indeed, despite the lack of an organic policy, local governments and other public bodies have always encouraged and supported this business model, as it was recognised of being a viable way of fostering economic and social development and is consistent with the social and economic structure of the region. Public support for this business model has spurred several initiatives, geared towards the organisation of collaborative agreements amongst artisans designed to achieve economies of scale otherwise unreachable by the single small firms.

In the 1980s and 1990s, industrial policy was managed by local government on behalf of national policy-makers. Local policy was deemed to be more effective than national as the linkages between local policy-makers and local businesses were direct and the high degree of accountability of both business and policy-makers would have helped to keep antisocial practices under control. While this system worked in almost every aspect, the economy of the region grew at high rates and the inequalities of post-WWII were closing at a similar pace.

A further factor that contributed to the evolution of this model is the establishment of artisan parks. Artisans and artisan companies could then access a wide range of services provided by co-located consultancies and services enterprises. This kind of networking heavily involved local authorities working with artisan associations, the banking sector and landowners (Brusco 1989).

A major role in driving the policy agenda can be attributed to the local Artisan Associations affiliated to the CNA (National Confederation of Artisans). The CNA- Emilia-Romagna lobbied regional and local governments to get them involved in the policy-making process and work towards promoting policies and institutional frameworks that would help small business to overcome the obstacle of "size" and exploit internal and external economies of scale. The development of a high degree of cooperation between businesses, public/private organisations and financial sectors proved to be essential for the success of the proactive industrial policy pursued.

Among the most significant policies the following are worth noting: Loan Guarantee Schemes and Financial Consortia were introduced throughout the region. The schemes were based on cooperation between small firms and local and regional government. They were managed by a board representing member firms and the CNA and the guarantee fund consisted of the firms' membership fees plus funds from local, regional and national government.

According to Best (1990), the schemes were successful because of the low level of default: fewer than 0.2% of borrowers default on their loans. As Brusco stated, "the person who receives a loan from the cooperative will stay up at night thinking of ways of repaying his loan; whereas the person who receives a bank loan will stay up at night thinking of ways of not repaying his loan" (Brusco 1985).

An initiative of great impact on the region's economic development and innovation was launched in 1974 and developed throughout the 1980s and 1990s. ERVET (Regional Board for Economic Development) was set up in 1974 by the regional government of Emilia-Romagna (ERVET's major stakeholder) in order to act as the executive arm for the implementation of regional policy. ERVET provides real services, either supplied directly by the company or through ERVET's system network (Maccani, 2003). In order to fulfil its mission, ERVET operates with both public and private partners, including financial institutions and banks, business associations and chambers of commerce. This modus operandi proved to be very effective in increasing the networking capacities of the organisation and in extending the reach of the services provided. Although, following the re-structuring of the regional policy framework, the role of ERVET has been reduced, the experience gained from over 30 years of good management has been translated into a more ambitious plan. ASTER, since its restructuring in early 2000s, manages most of the RTD and innovation functions that previously came under ERVET's umbrella and became the executive branch of regional RTD and innovation policy.

3.2.1 Policy objectives and instruments

Since the introduction of law No 59 of 1997 – passage of administrative power from the central government to regional and other local governments – Emilia-Romagna is the sole governmental institution in charge of its regional policy. The regional government has included RTD and Innovation policy in its broader economic policy and has increased its focus on the competitiveness of the economic system by promoting a structural approach rather than intervention through ad-hoc economic policies.

Within the broader economic policy, other policy measures and programmes that have an impact on RTD are as follows:

- Regional IT and multimedia Infrastructure (Piano Telematico Regionale), of strategic importance to the regional objectives of developing its knowledge economy. Not only does this programme set out to upgrade regional infrastructure in the ICT and Multimedia sector but, in so doing, to build a highway where innovation can be more effectively distributed across the region. The programme targets complete broadband coverage of the territory by cabling the plains areas and reaching the mountain areas with satellite technology.
- DocUP Objective 2 aims to develop the peripheral areas, particularly the north-east and the Apennines. The strategy adopted is based on the use of local resources to initiate local development processes based on the region's cultural heritage, the environment and small locally embedded enterprises.
- Local initiatives (patti territoriali) are part of the negotiation between the regional and the local governments. These measures entail specific and ad hoc development programmes in some areas, with particular characteristics.
- The aim of the Regional Energy Plan (Piano Energetico regionale) is to increase the production of energy within the region by increasing efficiency in distribution and energy-related technologies and energy saving. The regional energy programme aims to increase the autonomy of the region from external sources and increase production from clean sources.
- In POR Objective 3, the regional government places great importance on education and professional training as complementary to the innovation process.
- Other infrastructure measures regard planning and transportation policy, the environment, and other economic sectors (agriculture, trade, tourism and fisheries).

Other measures in support of the strategy of the regional government aim to create an innovation-friendly environment by concentrating the biggest share of its investments on projects and infrastructure with the potential for long-term and region-wide impact on the economy.

The regional financial policy has the objective of smoothing access to credit for SMEs. The instruments used aim to increase the guarantee systems already in place by further promoting cooperative actions in credit and finance matters. Subsidies to cut interests are also considered for investment in new machinery, IT, operations for internationalisation and other “upgrades” in matters of certification (ISO). Moreover, the regional government has negotiated deals with banks and financial operators on behalf of SME consortia (Table 3.14).

An important aspect of the regional strategy of basing its economic and social development on knowledge and innovation concerns education and training, the policy objective being to increase the skills base of the workforce by providing better education and training options, better access to education, easier transition from the education system to the workplace and updating of the skill set of the workforce through life-long training and education. By supporting higher education, the regional government also aims to provide a stable stream of highly qualified individuals who can be employed in research both in research centres and in industry. The skill set that the region aims to promote includes scientific capabilities at post-graduate level with an international profile. The results/resources for this action are reported in Tables 3.15 and 3.16

An additional area of intervention concerns the Regional Public Administration and its well known role in the economic process. The regional government aims to increase its efficiency in order to provide better services to businesses and play a role in setting high standards in procurement.

The Regional Innovation and Research Policy now in place is based on the “Patto per la qualità dello sviluppo e la coesione sociale” (Pact for the quality of economic and social development) and the Lisbon Strategy. The “Pact” agreed by the regional government, local governments, business associations, chambers of commerce, trade unions and other local institutions has the objective of increasing cooperation between subscribers and promoting common strategies in matters of development and Innovation in the economy, the labour market, welfare and other social policies, the environment and solidarity. The reason behind this wider policy platform stems from the awareness of subscribers that the regional social and economic system is in need of “improvement” if it is to meet the goals of the Lisbon strategy (becoming a knowledge-intensive region) and that to reach this goal it is paramount to promote a total quality strategy (social capital, production, environment and workplace). A second reason behind the “pact” is the recognition of a “New Way” of understanding the role of regional government, based on the inclusive participation of all parties to the policy-making process regarding both shared common policy objectives and inclusive strategies.

The body of policy in place is, however, in line with the national strategy of bringing the Italian economy to reach the target set by the Lisbon/Barcelona strategy. In fact, both national and regional policy are geared towards the Lisbon objectives and the regional government pursues these objectives with full autonomy.

Exhibit 2: Effects of policies complementary to RTD instruments on the R&D capacity of the region

Policy Areas	Policies complementary to RTD instruments affecting policy area	Effects on R&D capacity of the region
Improve R&D governance	The structural approach of the region in terms of economic policy has “embedded” RTD policy in a wider context, on the one hand, and has centralised RTD governance, on the other, delegating function throughout a network of organisation coordinated within ASTER.	The effects on RTD capacity are: 1) a self-sustained structure of R&D collaboration between university and the business sector mediated by ASTER; 2) improved reach of policy measures through network linkages; 3) more efficient use of public monies in support of R&D projects; 4) improved access to credit ; 5) promotion of more efficient ways of funding industrial research (venture capital).
Creation of an innovation-friendly environment	By promoting infrastructure plans (ICT, Energy Plan, education and professional training, transport infrastructure, etc.), the regional government has invested heavily in creating an innovation-friendly environment.	The effect of this type of investment has both indirect and longer-term effects on the R&D capacity of the region.
Development of human capital	See above	Educational and professional training policy impacts on R&D capabilities by supplying research staff and qualified workforce to be employed directly on industrial R&D projects or in the R&D service sector and indirectly by increasing absorption capacity..
Networking, co-location and clustering measures	The approach of the regional government to the identification and use of ad-hoc measures taken in agreement with the interested parties (industrial districts’ representatives) is designed to increase the concentration in local areas and	This approach has direct effects on R&D capabilities as an increase in average firm size also means increasing of firms’ capabilities (in organisational and financial terms) for undertaking R&D.

Policy Areas	Policies complementary to RTD instruments affecting policy area	Effects on R&D capacity of the region
	increase the minimum efficient size of companies.	
Knowledge and technology transfer to enterprises	SEE notes on ASTER	
Research collaboration of public research organisations with private sector	SEE notes on ASTER	The use of public laboratories for private testing and development has increased in recent years and collaboration programmes are in place.
Support for public research		
Financial R&D measures for the private sector		

3.3 Conclusions

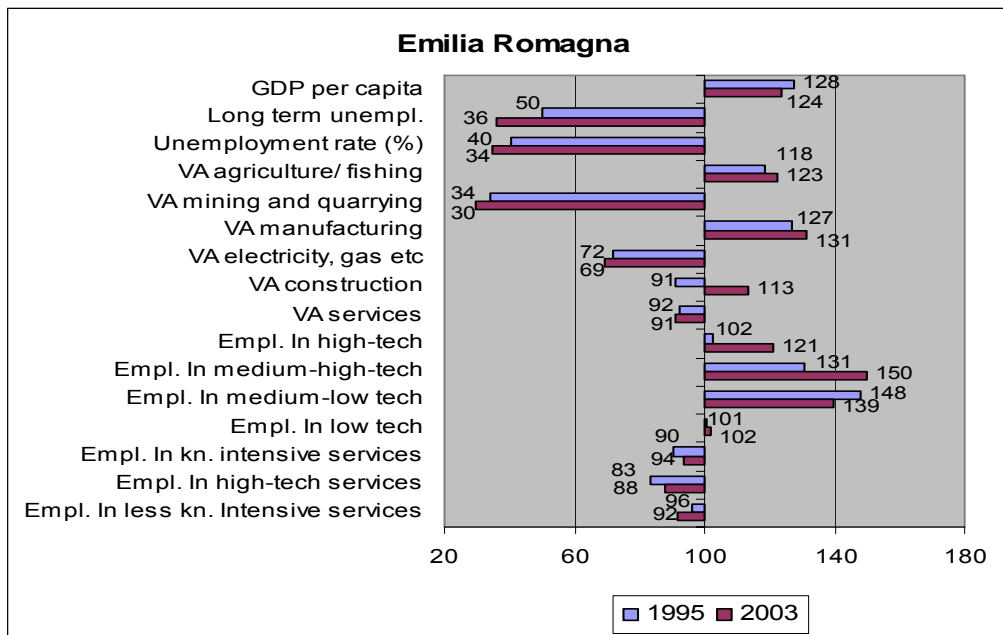
Emilia-Romagna is one of the 10 wealthiest regions in Europe in terms of GDP per capita and its rates of employment are in line with the Lisbon–Barcelona objectives. In 1995, regional GDP per capita was 28% higher than that the national figure while in 2003 it was 124 against the national average of 100. Unemployment figures show a strong position of the regional labour market. The already low unemployment indices recorded in 1999 improved further in 2003 when long-term unemployment dropped to 36 and the unemployment indicator dropped to 34, against the Italian average of 100.

In relative terms, the economic performance of the economy, especially where Emilia-Romagna has higher specialisation, namely, agriculture, manufacturing and construction, has shown a relative net improvement in value added. Agriculture and fishing had a relative value added index of 118 (compared to Italy = 100) in 1995 and further improved in 2003 (123 against a national average of 100). Relative improvements are also shown in manufacturing where Emilia-Romagna scored 127 in 1995 and 131 in 2003. The best performing sector in terms of value added was construction where, against a score of 91 in 1995, improvements were in the order of 20%, reaching a score of 113 in 2003 against a national average of 100.

Emilia-Romagna has also performed better than Italy in terms of employment in sectors with medium, medium to high and high-tech content. Compared with an Italian average of 100 in both 1995 and 2003, Emilia-Romagna's employment in high-tech sectors was 102 in 1995 and 121 in 2003. In medium to high-tech sectors, a strong employment index of 1995 (131) further improved in 2003, reaching 150, against a national average of 100. In medium to low-tech sectors, Emilia-Romagna performed stronger than the national average with relative employment figures 48 points higher than the national average in 1995. However, between 1995 and 2003 this figure decreased to 139.

The regional service sector underperformed compared to the national average both in terms of value added and employment. However, regional indicators show a slight relative improvement of employment figures in knowledge-intensive services (90/100 in 1999 and 94/100 in 2003 for knowledge-intensive services and from 83/100 in 1999 to 88/100 in 2003 for high-tech services).

Summary Graph 2: Comparison of Emilia-Romagna's economic structure with the economic structure of Italy



Note: Long-term unemployment, unemployment rate 1999, 2003

Since the shift of administrative power from national to regional/local government in 1997, the regional policy mix, including RTD and innovation policies, has worked consistently with the idea of **moving the regional social and economic structure along a high and steady growth path with a long-term perspective**. The main factors for success can be found in the strong network of relationships between **public and private partnerships** in the economic and social spheres. The aim of policy-makers of providing a **suitable environment for entrepreneurship** (and social entrepreneurship) with forward-looking views is the pivotal aim of the policy mix. That said, the regional government's ambition for Emilia-Romagna to become a knowledge-based economy is still a "work in progress", as indicators of education, STE, and lifelong learning — while higher than the national average — still lag behind the most advanced European Regions (Greater London, for example). On the RTD front, the performance of Emilia-Romagna, although improving at a fast pace, lacks the critical mass necessary and its effectiveness is still very low compared to the European average and far from meeting the Lisbon objectives.

4 Conclusions

4.1 Assessment of the RIS

In conclusion, Emilia-Romagna has a strong R&D and innovation infrastructure, public and private institutions, universities hosting about 80 STE departments and independent, semi-independent and public research centres. The region also has a number of centres of excellence in applied research. Overall, the region is the Italian leader in the number of centres of technological research endorsed by the Ministry of University and Research (MIUR) with linkages to regional, national and international businesses.

Structural and economic indicators show that Emilia-Romagna is one of the 10 richest regions in Europe. Its manufacturing base shows levels of productivity well above the national average. However, the technological specialisation of manufacturing is on export-oriented products with medium-to-high technological content, the high-tech industry, although growing at a sustained pace, still being in its infancy. The involvement of regional companies in R&D activities is often inadequate; this is primarily due to the average firm size, which is very low (fewer than 4 employees), with over 90% of companies employing under 50 staff.

The general trends identified can be summarised as follows:

1) The role of medium-sized firms is increasing throughout the regional economy, together with that of small but highly dynamic firms. Intra-sectoral dynamics show 1) the decline of traditional industrial districts in the textile and clothing, footwear and furniture sectors, 2) consolidation of the industrial structure in export-oriented sectors (ceramics, food and constructions), and 3) emerging networks of small enterprises operating in the ICT and Multimedia and other knowledge-intensive activities.

2) Knowledge specialisation in the education and STE sectors is both a) keeping pace with the needs of the economic sectors and b) driving and consolidating the trends of economic specialisation in knowledge-intensive activities. However, life-long learning possibilities are still underutilised, both by the education system and by the economy (while there is a match between demand and supply, this appears to be at a fairly low level).

3) The financial capacity of the region has much improved, the indices of access to credit in the last 5 years showing that companies can benefit from better credit conditions compared to Italy. In 2005, the venture capital market was also able to offset the bad performance of 2004, showing signs of recovery.

The overall systemic approach of the regional government includes policy matters of RTD and innovation in the broad regional economic policy framework and it is keen to promote interconnections between industry and the research community by helping to match scientific competencies and their application to the production process. This objective is pursued by fostering applied research and improving technology transfer.

The process involves institutional players (regional and local governments, universities, business associations and trade unions) and is mediated by ASTER; it promotes the development of a regional network of industrial research laboratories, innovation centres and technology parks which ultimately have to activate a number of R&D projects and underscored science-industry relationships.

This strategy, as of 2006, has produced excellent results, leading to the employment of 930 new R&D researchers in enterprises, and 313 new specialised staff involved in applied research across

27 laboratories,⁵ plus the generation of 750 research contracts between enterprises and research centres and the production of 361 new industrial patents from 529 enterprises' projects.

Exhibit 3: Strengths and weaknesses of the regional innovation system

	Strengths	Weaknesses
Knowledge creation capacity	This is excellent and investments in knowledge creation capacity mirror the economic development of the regional economy	S&T potential does not fully realised as the excellent knowledge infrastructure and knowledge creation capacity have not produced a knowledge base that can compete with that of the top ranking regions in Europe.
Knowledge diffusion capacity	The knowledge diffusion system is based on networks and is very effective	
Knowledge absorption capacity	Although the region's absorption capacity is higher than the national average,	It is still below that of the top ranking European regions.
Interaction of main stakeholders	Level of interaction is very high as the PPP network has the critical mass necessary to pass on to the private sector the benefits of public support to innovation.	The use of public research infrastructures by private companies is mainly based on service transaction rather than on cooperative R&D
RTD governance capacity	The Governance capacity of RTD is highly effective as the main decision power is centred around the regional government but transmission of the policy objectives onto the economic and social sphere is managed by the regional government together with universities, trade unions, business organisations and the financial and banking systems.	
Knowledge vs. economic specialisation	There is no apparent mismatch between knowledge specialisation and regional economic structure.	An upgrade of both demand and supply is necessary if the region wants to compete at the level of the top ranking European regions
Economic Structure	The regional economic structure is flexible enough to respond promptly to shocks and the support network is very effective.	The average firm size is still too small to envisage a volume of economic activities similar to better-performing European regions. There are areas in the region where the economic structure is still weak (Apennines and Ferrara Province)

4.2 Assessment of policies

The policy framework in place in Emilia-Romagna is reaching the final phase of a work in process that began in 1997 when the administrative power was devolved to local governments. The policy landscape has been totally re-designed and the previous dominance of national government in regional matters is no longer the case. In fact, the exclusion of the national government from the regional dimension of society and the economy and the progressive and independent involvement of the regional government in defining and delivering on matters of regional economy is now almost complete.

⁵ According to official sources, the "contractual agreement for new researchers and specialised staff" involved in research will be for a term specified by the timeframe of the project and in any case not shorter than 1 year.

Development of Emilia-Romagna's current RTD policy began in 1998. In its inception phase, the main focus was to facilitate a smooth transition from the previous policy framework, which included a plethora of measures, to a coordinated approach where the Regional Government would act as coordinator. RTD Governance has in fact played a major role in the transition period but it is also intended to play an important role in the delivery of effective policy measures in line with the objectives drawn up in the DPEF.

It is not possible to identify major weaknesses at this stage as the RIS development process is long-term and the implementation plan is still ongoing. However, the policy objectives set out for the transition phase (1998 – 2002) have been fully achieved and the results can be seen in the increase in R&D spending by the business sector of about 20% between 2001 and 2004 and the increase in research expenditure by the university sector (of about 3%) in the same period.

The focus on structural measures has gradually led to the upgrading of critical innovation infrastructure and the creation of a self-sustainable economic and social environment. Major achievements in this regard include the provision of broadband facilities (via satellite technologies) in the Apennines and the substantial increase in value added in the production and distribution of energy from €1.26 billion in 2000 to €1.8 billion in 2004, in education from €3 billion in 2000 to €3.4 billion in 2004 and in health from €4.2 billion in 2000 to €5.5 billion in 2004.

Exhibit 4: Public Policy vs. Strengths and Weaknesses of RIS

<i>[S&Ws from Exhibit 3]</i>	Effective approaches	Failures
Strengths		
<i>R&D Governance</i>	The transition to more centralised RTD governance will distribute responsibilities after the shift of administrative powers and the introduction of Law 7/2002	Too soon to assess results as policy measures are based on long-term objectives and the implementation phase is still ongoing
<i>Structural approach to innovation (including RTD policy as an important part of the policy framework)</i>	The renewed emphasis on a structural approach to economic policy by making innovation a priority in pursuing a high development trajectory	-
<i>Lean policy approach to RTD policy</i>	Harmonisation of a number of RTD and innovation policies both in terms of number of policy measures /instruments and in terms of their governance	
Weaknesses		
<i>Correspondence between lean RTD policy and decision-making process</i>	The principles on which the policy framework is based make the whole decision-making process longer due to the frequent consultations between policy-makers and the other parties that have agreed to the principles of the framework and committed themselves to the policy-making process. However, the same principles provide a strong incentive for the parties to participate in the policy-making process.	-

4.3 Policy challenges

Given the relatively strong performance of the regional system, the main policy challenge is continuity. The question is whether the policy framework is strong enough to last when external challenges are brought upon the regional economy?

Given that the aim is to consolidate the economic and social structure of the region within a long-term horizon, and concentrates the main instruments on the creation of an innovation-friendly environment and the improvement of an already high standard of living, the challenge should address the weaknesses of the RIS.

The main policy challenge is to upgrade the composition and size of industry. The average firm size of Emilia-Romagna's industry is still too small to fully benefit from economies of scale and make large investment in R&D. The support network provided to small and highly dynamic companies in knowledge-intensive sectors should be integrated with policy measures that go beyond supporting R&D collaboration, cooperative R&D and R&D consortia. This challenge ties in with the **structural characteristics** of the region's industry.

Recognising that the knowledge creation capacity of the region is exceptionally high is also to recognise that its full potential is a long way from being fully exploited. Public research infrastructure used by private companies is based primarily on service transactions, namely, university and other public research laboratories rent out both facilities and competencies to business enterprises that otherwise would not have the opportunity to carry out testing and other development activities. On this front there are two possible ways that are explored: 1) joint development efforts to speed up time to market or 2) extended development activities by including research (both basic and applied research) to increase the scope of R&D. As these strategies are extremely successful, for example, in Cambridge and Oxford (UK), Boston and Palo Alto (US), assessment/feasibility studies might be advisable (**forward looking**).

A further weakness is the handicap in absorptive capacity due the poor performance in life-long learning and tertiary education of the workforce – when compared to the leading European region of London. However, measures to tackle this shortcoming are already in place; hence it will be worth continuing to monitor life-long learning indicators (participation and attainments) and to devise a structure of incentives (for organisations, the workforce and training services providers) in order to increase participation in LLL and improve absorptive capacity.

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Annex 1: Definition of policy mix typology

- **Improve R&D governance capacity:** Technical assistance type funding used by public authorities, regional agencies and public-private partnerships in developing and improving policies and strategies in support of R&D investments. This could include changes in the organisation of decision making, national and regional foresight, measures for improvement of evaluation etc.
- **Creation of an innovation friendly environment:** This category covers a wide range of actions which seek to improve the overall environment in which enterprises, universities and research organisations innovate. In this category the following measures are included:
 - Regulation and initiatives addressing the intellectual property rights either by improving legislation in cases of commercialisation of public or collaborative research or by covering protection costs
 - Direct or indirect support of spin-offs and New Technology Based Firms (NTBFs). Direct support includes public financial schemes such as pre-seed and first stage capital, while indirect measures include funding of incubators, training related to entrepreneurship, etc.
- **Development of human capital:** This category includes measures aiming at the upgrading of human resources in R&D and innovation related activities, such as supporting science and technology graduates to follow research and innovation-oriented careers; training of researchers in enterprises or research centres; intra- and international mobility of scientists; curriculum development in higher education aimed at developing science and technology; orientated under- and post-graduate courses etc.
- **Networking, co-location and clustering measures:** Policies under this category focus on promoting R&D cooperation, networking and interaction. Measures promoting co-location of industrial and scientific organisations (e.g. innovation poles), funding for clusters infrastructure and activities with technological and R&D orientation are some of possible interventions under this category.
- **Knowledge and technology transfer to industry:** This category includes policies supporting directly or indirectly knowledge and technology transfer from universities and public research organisations and commercialisation of public research results. Direct support includes aid schemes for utilising technology-related services or for implementing technology transfer projects from public or private sector to the private sector. Indirect policies include development of infrastructures facilitating technology transfer such as technology parks, innovation centres, university liaison and transfer offices, etc.
- **Research collaboration of public research organisations with private sector:** Measures supporting collaborative research projects and development of common (for use by private and public sector) research infrastructures are included.
- **Support of public research:** Measures under this category include:
 - Public investments in research infrastructure and direct funding of public R&D e.g. setting up new infrastructures, or supporting centres of excellence

- Grants for R&D projects implemented in Universities and other Public Research Organisations
- Regulatory changes and incentives for universities and other public research organisations which encourage the commercialisation of research results and collaboration with industry
- **Financial R&D measures for the private sector:** Two main categories of measures are included:
 - **Direct and indirect financial R&D measures for the private sector:** Direct measures include direct public funding of R&D in the private sector e.g. grants, conditional loans etc. Indirect measures include tax incentives for firms to undertake R&D activities.
 - **Catalytic Financial R&D Measures for the private sector:** Includes instruments facilitating the access of R&D performers to external private sector sources of finance. Typical measures of this type are measures encouraging the use of *risk capital* (e.g. venture capital funds) for both R&D and innovation related activities and the *loan and equity guarantee measures*.

Annex 2: Description of key indicators used in Summary Graphs 1 and 2

Period of coverage: Two years are used, i.e. 1995 and 2004 or the closest possible years

Index: Country=100

Source: Eurostat, 2006

Summary Graph 1: Key indicators of the Emilia-Romagna's knowledge base development in comparison to Italy

1. Total intramural R&D expenditure as a percentage of GDP
 - GERD
 - BERD
 - GOVERD
 - HERD
 - PNPERD
2. R&D personnel as a percentage of total employment
 - All sectors
 - Business
 - Government
 - Higher education
 - Private non-profit
3. Human Resources in S&T as a percentage of labour force
4. Patent applications at EPO per million inhabitants
5. Students in tertiary education (ISCED 5+6) per thousand inhabitants
6. Life-Long Learning: Participation of adults aged 25-64 in education and training as a percentage of population

Summary Graph 2: Key indicators on Emilia-Romagna's economic structure and development

1. GDP per capita at current market prices.
2. Long-term unemployment rate (on total unemployment).
3. Unemployment rate (%).
4. Value-added at basic prices (EUR million): Share (%) of sectors to total.
 - Agriculture/fisheries
 - Mining and quarrying
 - Manufacturing
 - Electricity, gas and water supply
 - Construction
 - Services (excl. extra-territorial organisations and bodies)
5. Annual data on employment in technology and knowledge-intensive sectors at regional level: Percentage of total employment
 - High technology manufacturing: NACE Rev. 1.1 codes 30, 32 and 33
 - Medium-high technology manufacturing: NACE Rev. 1.1 codes 24, 29, 31, 34 and 35
 - Medium-low technology: NACE Rev. 1.1 codes 23 and 25 to 28
 - Low technology: NACE Rev. 1.1 codes 15 to 22 and 36 to 37
 - Total knowledge-intensive services: NACE Rev. 1.1 codes 61, 62, 64 to 67, 70 to 74, 80, 85 and 92
 - Knowledge-intensive high-technology services: NACE Rev. 1.1 codes 64, 72, 73
 - Total less-knowledge-intensive services: NACE Rev. 1.1 codes 50, 51, 52, 55, 60, 63, 75, 90, 91, 93, 95 and 99

Annex 3: Tables and Figures

Table 1.1

<i>indicator</i>	<i>year</i>	<i>Emilia-Romagna</i>	<i>Italy</i>
Economic infrastructure	2004	115.64	100
Economic infrastructure	1991	114.76	100
Economic and Social infrastructure	2004	109.82	100
Economic and Social infrastructure	1991	112.74	100

Source: Istituto Tagliacarne

TABLE 2:1 Intra-muros S&T expenditure by institutional source 2001-2004 (in million €)

<i>Selected REGIONS</i>	<i>Public Administration</i>	<i>Universities</i>	<i>Not-for-profit</i>	<i>Firms</i>	<i>Total</i>
2001					
Piemonte	80 656	266 554	-	1 461 791	1 809 001
Lombardia	285 214	553 885	-	2 172 117	3 011 216
Emilia-Romagna	121 522	427 633	-	680 355	1 229 510
Toscana	118 804	466 292	-	301 572	886 668
Lazio	1 336 988	561 575	-	650 960	2 549 523
Italia	2 493 294	4 418 275	-	6 660 900	13 572 469
2002					
Piemonte	77 818	300 360	12 472	1 404 095	1 794 745
Lombardia	224 219	667 533	110 624	2 237 989	3 240 365
Emilia-Romagna	104 484	449 714	6 919	855 498	1 416 615
Toscana	164 795	497 034	3 610	299 633	965 072
Lazio	1 269 703	583 433	26 819	713 078	2 593 033
Italia	2 565 321	4 791 712	186 398	7 056 502	14 599 933
2003					
Piemonte	78 279	310 860	15 876	1 346 118	1 751 133
Lombardia	226 051	754 101	124 675	2 158 908	3 263 735
Emilia-Romagna	112 806	461 074	6 775	818 050	1 398 705
Toscana	139 295	531 075	3 872	319 572	993 814
Lazio	1 328 319	598 831	21 258	668 070	2 616 478
Italia	2 582 142	4 999 720	207 817	6 979 177	14 768 856
2004					
Piemonte	88 994	313 429	16 623	1 476 232	1 895 278
Lombardia	222 433	608 061	130 561	2 273 319	3 234 374
Emilia-Romagna	116 104	437 134	8 107	810 486	1 371 831
Toscana	169 585	542 407	3 829	322 835	1 038 656
Lazio	1 361 812	638 895	26 322	646 623	2 673 652
Italia	2 721 631	5 004 511	232 706	7 292 850	15 251 698

Source: ISTAT

TABLE 2.2 S&T expenditure in Public administration and HEIs (% of GDP)

Selected REGIONS	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Emilia Romagna	0.40	0.40	0.48	0.49	0.45	0.46	0.52	0.50	0.50	0.47
Piemonte	0.24	0.26	0.29	0.30	0.30	0.30	0.33	0.36	0.36	0.36
Lombardia	0.28	0.29	0.33	0.32	0.31	0.31	0.34	0.35	0.38	0.31
Veneto	0.28	0.26	0.30	0.30	0.29	0.28	0.31	0.40	0.39	0.39
Toscana	0.61	0.62	0.67	0.73	0.66	0.72	0.71	0.78	0.77	0.79
– Nord-ovest	0.30	0.33	0.35	0.35	0.34	0.33	0.35	0.38	0.38	0.34
– Nord-est	0.35	0.33	0.39	0.40	0.38	0.38	0.43	0.46	0.47	0.45
Italia	0.47	0.47	0.53	0.55	0.53	0.53	0.57	0.58	0.58	0.57

Source: ISTAT

NOTES: (1) The figures, expressed in full-time equivalent units, include researchers, technicians and other personnel dedicated to R&D. From 2002 onwards, not-for-profit organisations, which were previously not surveyed, are also taken into account. (2) The figure for Piedmont includes that of Valle d'Aosta. (3) From the year 2000 onwards data exist that reflect an updated classification of S&T expenditure that has not been applied backwards to previous years of the time series. We reproduce the 'old series' in order to give a better understanding of the trend over the years.

TABLE 2.3: S&T expenditure in Public and Private Firms (% of GDP)

Selected REGIONS	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Emilia Romagna	0.41	0.43	0.45	0.48	0.48	0.49	0.64	0.77	0.72	0.69
Piemonte	1.44	1.46	1.39	1.38	1.32	1.36	1.41	1.32	1.24	1.30
Lombardia	0.90	0.89	0.86	0.85	0.87	0.87	0.88	0.88	0.83	0.84
Veneto	0.25	0.24	0.21	0.22	0.22	0.26	0.32	0.33	0.32	0.30
Toscana	0.32	0.31	0.24	0.23	0.29	0.30	0.36	0.35	0.37	0.36
– Nord-ovest	1.00	0.99	0.97	0.95	0.95	0.96	0.97	0.97	0.91	0.93
– Nord-est	0.35	0.35	0.35	0.36	0.35	0.38	0.46	0.51	0.48	0.47
Italia	0.53	0.54	0.52	0.52	0.51	0.53	0.55	0.56	0.54	0.54

Source: ISTAT

NOTES: (1), (2) and (3) as in previous table

TABLE 2.4: S&T Personnel per 1000 inhabitants (a)

Selected REGIONS	1995	1996	1997 (b)	1998 (c)	1999	2000 (d)	2001 (d)	2002 (e)	2003	2004
Piemonte	4.2	4.3	4.2	3.9	4.0	4.1	4.2	4.4	4.3	4.3
Lombardia	3.4	3.4	3.4	3.5	3.4	3.7	3.2	3.4	3.2	3.2
Veneto	1.5	1.5	1.6	1.7	1.5	1.7	2.0	2.1	2.0	2.0
Emilia Romagna	2.8	2.8	2.9	3.1	3.1	3.4	3.7	4.0	3.7	3.7
Toscana	2.6	2.6	2.4	2.5	2.5	2.5	2.8	3.0	2.9	3.0
– Nord-ovest	3.6	3.6	3.6	3.5	3.5	3.7	3.4	3.7	3.5	3.4
– Nord-est	2.1	2.2	2.2	2.4	2.3	2.5	2.8	3.0	2.8	2.9
Italia	2.5	2.5	2.5	2.6	2.5	2.6	2.7	2.9	2.8	2.8

Source: ISTAT

NOTES: (1) and (2) as in previous tables.

TABLE 2.5: Graduates and Post-graduates in S&T areas per 1000 inhabitants (Aged 20-29)

Selected REGIONS	1998 (c)	1999	2000	2001	2002	2003	2004	2005
Emilia Romagna	6.6	8.4	8.7	9.3	11.3	13.5	16.2	16.5
Piemonte	5.1	6.5	6.9	7.3	8.6	10.7	12.7	12.7
Lombardia	6.1	7.1	7.0	7.0	8.2	12.4	13.3	13.0
Veneto	5.1	6.1	6.0	6.4	7.7	8.3	10.9	11.0
Toscana	6.7	8.3	8.8	9.2	12.1	14.3	14.0	14.2
Lazio	5.2	6.4	6.3	7.5	9.2	11.4	12.6	14.6
- Nord-ovest	5.8	7.0	7.0	7.2	8.4	11.8	13.0	16.4
- Nord-est	5.2	6.5	6.7	7.1	9.1	10.3	12.6	12.2
Italia	4.4	5.4	5.7	6.2	7.4	9.0	10.2	11.5

Source: ISTAT

NOTES: Figures include graduates and post-graduates (MSc and PhD levels) in the following disciplines: Engineering, Information Sciences, Mathematics, Physics and Life Sciences, Statistics, Industrial Chemistry, Nautical Sciences, Environmental Sciences, Biotechnologies and Architecture.

Table 2.6 Distribution of scientific output by disciplines

Year	Italy			Emilia-Romagna			E — R / Italy x 100		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
Natural sciences	36409	37607	37952	6947	7196	7379	19.1%	19.1%	19.4%
Social sciences	1226	1305	1686	302	320	353	24.6%	24.5%	20.9%
Arts and Humanities	404	382	322	82	80	68	20.3%	20.9%	21.1%
Total	37301	38553	38913	7133	7370	7544	19.1%	19.1%	19.4%

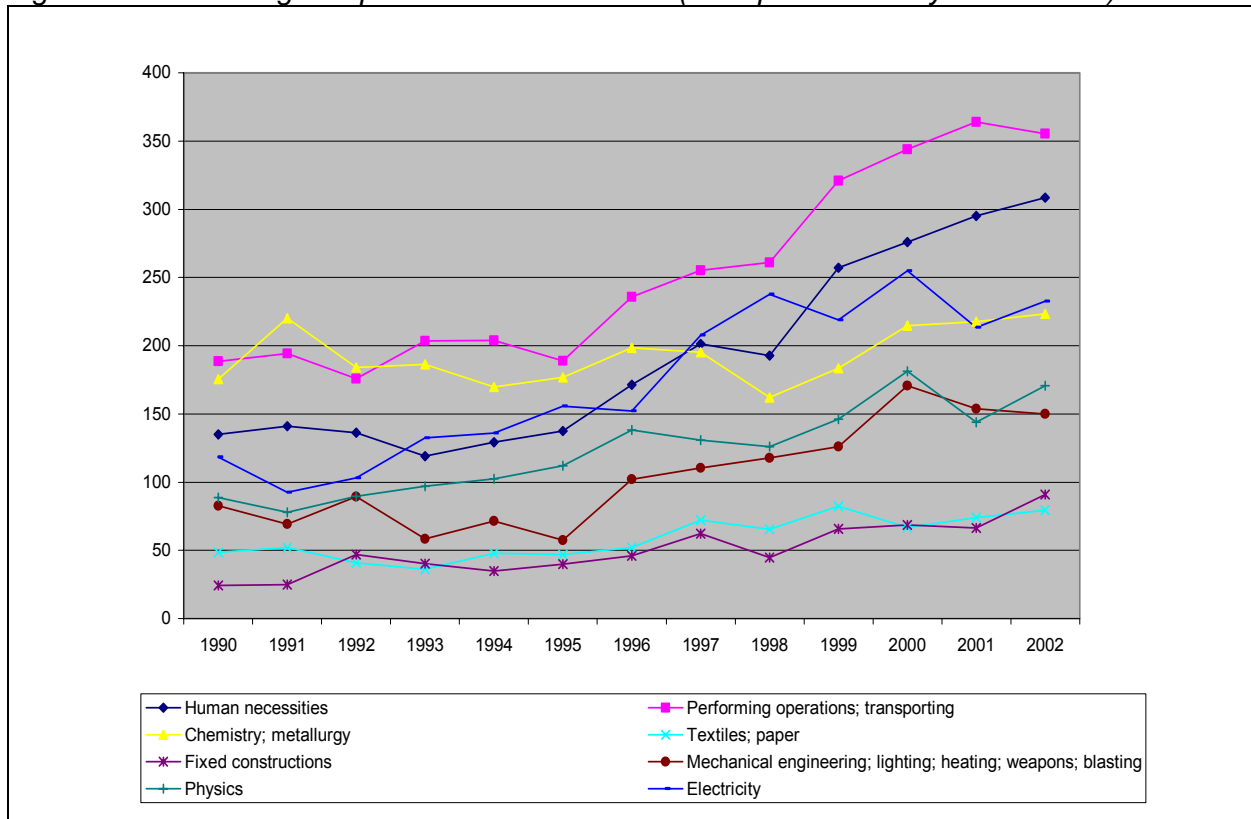
Totals are as given by ISI Thomson ® and do not correspond to the sum of output by disciplines

Table 2.7- Patents filed to EPO, variation and Patents for 1 million habitants — 2004

	Number Of Patents	Var. % 1999-2004	Patents for 1 million. habitants
Emilia-Romagna	625	31,4	149,1
Nord-est	1.213	22,8	108,5
Italia	3.911	27,0	64,5

Source: Osservatorio Brevetti Unioncamere su dati EPO (European Patent Office)

Figure 2.1: Technological specialisation 1990-2003 (EPO patent data by IPC classes)



Source EPO

Table 2.8: Technological Balance of Paymentst (TBP). Year 2002 (Thousand €)

	Revenue		Expenditure		Balance
	val. ass.	%	val. ass.	%	val. ass.
Trade in technology	22 850	18.3	27 479	16.8	-4 629
Cess./acq. Patents	3 584	2.9	6 806	4.2	-3 222
<i>Royalties and licences</i>	15 512	12.5	17 072	10.5	-1 560
<i>Know-how</i>	3 679	3.0	3 574	2.2	105
<i>Cess./acq. inventions</i>	75	0.1	27	0.02	48
Brands and designs	13 581	10.9	41 106	25.2	-27 525
<i>Copyrights - the share of large companies' project funded was</i>	8 424	6.8	37 456	23.0	-29 032
<i>Cess./acq. - the share of large companies' project funded was</i>	5 157	4.1	3 650	2.2	1 507
Services – high-technological content	61 345	49.3	54 993	33.7	6 352
<i>Technical and commercial services related to the patents, trademarks and designs</i>	19 100	15.3	21 302	13.1	-2 202
<i>Technical services and expert advices</i>	14 797	11.9	17 167	10.5	-2 370
<i>Training services</i>	378	0.3	704	0.4	-326
<i>Technical studies and engineering</i>	27 070	21.7	15 820	9.7	11 250
R&D funded from abroad	20 790	16.7	32 407	19.9	-11 617
Other trade in technology	5 981	4.8	7 062	4.3	-1 081
Total	124 547	100.0	163 047	100	-38 500

Source: Ufficio Italiano Cambi

Table 2.9: BTP dell'Emilia-Romagna per Paesi partner. Anno 2002 (dati in migliaia di euro)

Country	Revenues	Expenditure	Balance
Austria	551	4 037	-3 486
Belgium	3 127	2 826	301
Luxembourg	3 088	10 767	-7 679
Denmark	728	7 042	-6 314
Finland	69	392	-323
France	22 401	17 220	5 181
UK	14 597	30 625	-16 028
Greece	604	70	534
Ireland	247	757	-510
Netherlands	11 102	12 340	-1 238
Portugal	343	2 106	-1 763
Spain	3 656	2 374	1 282
Sweden	458	2 825	-2 367
Germany	14 123	12 556	1 567
TOTAL UE	75 094	105 937	-30 843
Brazil	611	276	335
Canada	79	861	-782
China	2 712	413	2 299
Switzerland	4 253	8 257	-4 004
U.S.A.	22 860	33 052	-10 192
Japan	3 064	2 160	904
Eastern European Countries	2 598	2 747	-149
OPEC Countries	1 412	1 309	103
Asian NIC	2 627	3 121	-494
Other Non -EU countries	9 237	4 914	4 323
TOTAL EXTRA-UE	49 453	57 110	-7 657
TOTAL world	124 547	163 047	-38 500

Source: Ufficio italiano cambi

Table 2.10: 2005 Synopsis of Education Data

	2005	
Drop-out (% pop. 18-24)	Emilia-Romagna	19.0
	Nord est	18.4
	Italia	22.1
Secondary education (% pop. 20-24)	Emilia-Romagna	77.3
	Nord est	77.1
	Italia	73.1
S&T tertiary education (‰o habitants 20-29)	Emilia-Romagna	16.5
	Nord est	12.2
	Italia	10.9

Source: Istat

Table 2.11: Secondary Education (as % of 20-24 years-old population)

Selected Regions	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Piemonte	59.1	60.1	62.5	64.1	64.0	66.3	64.4	68.1	70.8	72.5	74.6
Lombardia	61.0	62.2	65.6	68.9	70.2	70.1	71.6	72.1	72.0	73.1	74.1
Emilia Romagna	65.0	68.2	68.7	69.7	70.1	72.6	73.0	74.2	73.5	76.0	77.3
Toscana	60.2	64.6	65.3	66.3	66.2	66.8	69.6	72.4	74.6	74.0	78.3
Lazio	68.8	68.7	68.9	71.7	73.5	73.3	73.3	74.3	75.6	79.3	80.3
– Nord-ovest	61.0	62.0	64.7	67.2	68.3	68.9	69.5	70.9	71.6	73.5	74.5
– Nord-est	63.0	65.2	65.3	68.6	71.2	71.9	73.3	74.9	75.5	76.5	77.1
Italia	58.5	60.1	61.9	64.3	66.4	67.3	68.2	69.7	71.1	72.3	73.0

Source: Istat

NOTE: direct comparisons between data for the years 2004 and 2005 and previous years should be made with caution because of the different classification of educational qualifications underlying the figures.

Table 2.12: Adult training (as % of 25-64 year-old employed adults participating in training programme per 100 adults employed in the same age group)

Selected Regions	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Piemonte	3.1	4.8	5.0	5.0	6.3	5.8	4.5	4.3	3.2	5.5	4.6
Lombardia	3.6	4.1	5.3	4.7	6.6	5.2	4.2	4.3	3.8	6.6	5.8
Emilia Romagna	4.3	5.5	6.1	5.7	7.9	6.8	6.0	6.4	6.5	7.0	5.7
Toscana	3.7	3.8	4.3	4.4	5.2	5.0	5.4	3.1	4.3	6.5	6.9
Lazio	2.7	2.5	2.5	3.2	3.6	3.0	3.0	2.2	2.4	8.0	7.3
– Nord-ovest	3.3	4.2	4.9	4.6	6.3	5.2	4.1	4.1	3.6	6.3	5.4
– Nord-est	4.2	4.9	5.4	6.2	7.7	7.1	6.2	6.0	5.9	7.1	6.3
Italia	2.9	3.4	3.9	4.1	5.3	4.7	4.0	3.6	3.5	6.4	5.6

Source: Istat

NOTE: as for previous table

Table 2.13: Life-long learning (as % of 25-64 year-old population)

Selected Regions	2000	2001	2002	2003	2004	2005
Piemonte	5.6	4.1	3.9	3.8	5.2	4.8
Lombardia	5.3	4.2	4.1	4.1	6.0	5.5
Emilia Romagna	6.9	5.2	5.5	5.7	6.7	5.7
Toscana	6.1	5.0	4.9	5.4	6.2	6.8
Lazio	5.3	4.8	4.8	4.9	8.0	7.7
– Nord-ovest	5.3	4.1	3.9	4.0	5.8	5.3
– Nord-est	7.1	5.4	5.3	5.4	6.7	6.1
Italia	5.5	4.5	4.4	4.5	6.2	5.8

Source: Istat

NOTE: as for previous table

Table 2.14 RTD Indicators⁶. Emilia-Romagna – Europe

	HR Knowledge creation and application of new knowledge								
	Tertiary Education	Lifelong learning	Med/Hi-tech empl in manufact.	High-tech empl. in services	Public R&D	Business R&D	High-tech patent appl.s	Patent appl.s	GDP per capita
EU 15	21,78 (a)	8,52 (a)	7,41 (a)	3,57 (a)	0,68 (b)	1,30 (b)	31,6 (b)	161,1 (b)	22.603 (c)
Italia	10,36 (a)	4,61 (a)	7,37 (a)	3,02 (a)	0,54 (c)	0,53 (c)	6,5 (b)	74,7 (b)	20.165 (c)
Emilia-R.	11,77 (a)	6,37 (a)	10,41 (a)	2,85 (a)	0,46 (c)	0,50 (c)	5,6 (b)	176,7 (b)	25.523 (c)
Leading Italian region	11,77 Emilia-R.	6,37 Emilia-R.	13,17 Piemonte	5,67 Lazio	1,34 Lazio	1,35 Piemonte	19,2 Lombardia	176,7 Emilia-R.	26.941 Trentino-AA
Leading European region	41,66 London (UK)	25,20 London (UK)	21,24 Stuttgart (DE)	8,78 Stockholm (SE)	2,38 Flevoland (NL)	5,27 Västsverige (SE)	341,9 Noord-Brabant (NL)	824,2 Oberbayern (DE)	48.920 Bruxelles (BE)

Source: Confindustria Emilia-Romagna on EUROSTAT data.

Base year: a: 2002; b: 2001; c: 2000

Table 2.16

Law	Art.	Content
46/82	4	National Expenditure on applied research
46/82	5	National Professional training
46/82	11	National Spin off
297/97	12	Transfer of administrative power to regional and local government Research and training projects
297/97	14	Transfer of administrative power to regional and local government Hiring of research staff
Eureka	6	European/National Projects of international cooperation
488/92	4	National Research projects
488/92	5	National Training
488/92	6	National Modernisation schemes

⁶ Definition of indicators:

- Tertiary Education: as percentage of active population (25-64) with post-secondary education
- Lifelong learning: percentage of population (25-64)
- Med/Hi-tech employment in manufacturing is calculated in the following Med/Hi-tech sectors: chemistry, machinery, office machinery, electronics, communication, instruments, automobile and parts, aerospace, and transport; total workforce includes all manufacturing sectors and services
- High-tech employment in services: as a percentage of the total workforce. This indicator considers three sectors: post and communication, IT (including the software industry) and R&D services; total workforce includes all manufacturing sectors and services
- Public R&D: expenditure on R&D as percentage of GDP
- Business R&D: expenditure on R&D as percentage of GDP
- High-tech patent applications: patent application by high-tech sectors to the EPO per million inhabitants. High-tech sectors include: pharmaceutical, biotechnology, Information technologies and aerospace
- Patent application: patent application to the EPO
- GDP per capita.

Table 2.17 Resources 2000-2002 (million €)

	<i>Regional resources (*)</i>	<i>National resources managed by the region</i>	TOTAL
2000	18.6	65.1	83.7
2001	21.2	62.5	83.7
2002	21.2	72.3	93.5
Total	79.0	199.9	278.9

() excluded funds L 20/94 — craft sector*

Source: Regione Emilia-Romagna

Table 2.18 No of Projects supported, investments and Region's contributions

	Approved applications	Investments (million €)	Contributions (million €)
2000	1 086	345.9	30.8
2001	1 627	553.8	31.0
2002	1 875	603.7	29.4
Total	4 588	1 503.5	91.2

Source: Mediocredito Centrale, Regione Emilia-Romagna

Table 2.19 Distribution of projects by size of company (1998-2002)

Firm size	No of Projects approved	%
Large Companies	745	13
Medium Companies	1 664	30
Small Companies	3 164	57
Total	5 582	100

Source: Mediocredito Centrale, Regione Emilia-Romagna

Table 2.20 SMEs consortia expenditure (million €) 2000 – 2002

Type of Investment	Investment (million €)	Share
Machinery and durables	9.2	51.8
Projects, planning and consultancy services	2.8	15.7
Software	2.7	15.1
Employees and training	1.6	8.9
Marketing	0.9	4.9
Prototyping	0.4	2.2
Patenting and licensing	0.1	0.8
Other	0.1	0.6
Total	17.7	100.0

Source: Regione Emilia-Romagna

Table 2.21 impact of the Measure 2.2

	No of Projects approved	Total Invest. (Million €)	Region's contributions (Million €)
Start-ups	6	623.97	220.8
University spin — offs and hi — tech start-ups	12	1 594.5	584.35
Services to the above	4	352.3	141.7
Capitalisation and financial innovation	4	505.7	232.4
TOTAL	26	3 076.5	1 165.3

Source: Regione Emilia-Romagna

Table 2.22 RTD Projects by area of intervention 2003-2005(*)

Actions	No of Projects	Investments Million €	Contributions Million €
Industrial research and pre-competitive development	529	235,5	92,2
Initial investments and organisation of R&D laboratories for SMEs	12	6,6	3,0
Initial investments for High-Tech Start-ups	26	1,8	1,0
Initial investments for R&D laboratories and Technology Transfer	27	42,2	20,5
Initial investments and re-organisation of Innovation relay Centres	24	17,4	8,7
Research Projects — ICT (Piano Telematico)	10	21,5	8,5
Innovation and science parks	6	19,2	8,3
INGENIUM Fund	1	14	10,5
Regional Programme for innovation	35	10,5	5,2
TOTAL	670	368,7	157,9

(*) includes investments DocUP — Objective 2 2000-2006 and Programma Regionale di Azioni Innovative del FESR

Table 2.23: Results of the projects (2003 – 2005)

No of Contracts (University and Research Institutes)	746
No of researchers employed	900
No of researchers employed in Industrial research laboratories	313
Research Institutions and companies involved in research programmes	250
Number of “young Entrepreneurs” in start-ups	100
Patents	350

Source: Regione Emilia-Romagna

Table 3.1 Number of active companies by selected economic activity** (Year average)

		2001	2002	2003	2004	2005
Agriculture		86 119	83 116	80 447	78 185	76 599
INDUSTRY		114 088	117 286	120 246	123 907	127 031
C	- Mining and quarrying	242	228	225	229	224
D	- Manufacturing	58 875	58 948	58 780	58 424	58 117
E	- Energy and Utilities	155	156	180	199	198
F	- Construction	54 817	57 954	61 061	65 055	68 494
CDE	- Industry	59 271	59 332	59 185	58 852	58 538
SERVICES		208 045	210 420	212 825	216 258	219 861
G	- Trade	98 152	97 565	97 569	97 708	97 963
H	- Hotels and restaurants	20 069	20 252	20 540	20 921	21 362
I	- Transports, warehousing and communications	19 766	19 821	19 793	20 021	20 176
J	- Financial intermediaries	8 731	8 784	8 629	8 305	8 338
K	- Estates, renting / leasing	40 282	42 831	44 990	47 440	50 054
M	- Education	1 017	1 060	1 088	1 150	1 146
N	- Healthcare and social services	1 317	1 371	1 421	1 485	1 549
O	- Other social services	18 701	18 730	18 788	19 230	19 276
P	- Households services	12	9	8	0	0
Total active companies		409 419	411 817	414 516	419 296	424 410

Source: Infocamere ("Movimprese").

Table 3.2 GDP composition by sector of activity (%) in 2003:

	Agriculture	Manufacturing Constructions	Services
Emilia-Romagna	3.4	33.6	63
Italy	3.8	28.1	69.1

Source: ISTAT 2007

Table 3.3 GDP per inhabitant, Emilia-Romagna compared to Italy and the EU.

<>	1998a00	1999a00	2000a00	2001a00	2002a00	2003a00
Purchasing Power Parities per inhabitant						
Eu25 European Union (25 countries)	17926.5	18806.0	20114.3	20847.0	21536.1	21740.6
Eu15 European Union (15 countries)	19741.2	20690.7	22089.1	22857.9	23555.5	23720.1
it Italy	20639.1	21388.1	22750.8	23344.8	23705.1	23447.8
Ita5 Emilia-Romagna	26086.5	26938.6	28834.8	29224.7	29648.4	29058.9
Purchasing Power Parities per inhabitant in percentage of the EU average (EU — 25 =100)						
eu25 European Union (25 countries)	100.0	100.0	100.0	100.0	100.0	100.0
eu15 European Union (15 countries)	110.1	110.0	109.8	109.6	109.4	109.1
it Italy	115.1	113.7	113.1	112.0	110.1	107.9
Ita5 Emilia-Romagna	145.5	143.2	143.4	140.2	137.7	133.7

EUROSTAT, 2007

Table 3.4 a

Added Value — million € current prices <i>EMILIA-ROMAGNA</i>.					
Year	Agriculture	Manufacturing	Construction	Services	Total Value Added
2000	3 342.8	27 404.3	3 923.1	60 224.4	94 894.7
2001	3 410.4	28 310.8	4 695.3	62 927.7	99 344.2
2002	3 075.7	29 281.9	4 773.7	65 118.3	102 249.7
2003	3 055.6	29 397.0	5 326.3	67 021.8	104 800.7
2004	3 202.0	29 669.9	6 113.1	68 180.9	107 165.9
2005	2 908.5	30 821.9	6 081.6	69 404.0	109 216.1

Source: Istat.

Table 3.4 b

Added Value — million € current prices <i>ITALY</i>.					
Year	Agriculture	Manufacturing	Construction	Services	Total Value Added
2000	29 756.9	249 241.7	53 224.2	731 813.5	1 064 036.3
2001	30 015.3	256 576.9	59 070.7	777 314.2	1 122 977.1
2002	29 891.9	260 710.5	63 056.4	811 759.9	1 165 418.7
2003	30 468.8	258 196.1	67 795.5	847 279.4	1 203 739.7
2004	31 632.1	267 722.2	73 116.9	876 687.2	1 249 158.3
2005	28 761.0	265 069.2	76 736.2	902 195.9	1 272 762.4

Source: Istat.

Table 3.4 c,

% composition of added value by Sector <i>EMILIA-ROMAGNA</i>.				
Year	Agriculture	Manufacturing	Construction	Services
2000	3.52%	28.88%	4.13%	63.46%
2001	3.43%	28.50%	4.73%	63.34%
2002	3.01%	28.64%	4.67%	63.69%
2003	2.92%	28.05%	5.08%	63.95%
2004	2.99%	27.69%	5.70%	63.62%
2005	2.66%	28.22%	5.57%	63.55%

Source: Istat.

Table 3.4 d

% composition of added value by Sector <i>ITALY</i>.				
Year	Agriculture	Manufacturing	Construction	Services
2000	2.80%	23.42%	5.00%	68.78%
2001	2.67%	22.85%	5.26%	69.22%
2002	2.56%	22.37%	5.41%	69.65%
2003	2.53%	21.45%	5.63%	70.39%
2004	2.53%	21.43%	5.85%	70.18%
2005	2.26%	20.83%	6.03%	70.88%

Source: Istat.

Table 3.5 Gross value added at basic prices at NUTS level 2, Million €

	2000	2001	2002	2003	2004
total All NACE branches — Total					
<i>eu15</i> European Union (15 countries)	7788544	8114637	8414838	8563846	8961136
<i>it</i> Italy	1064036	1122977	1165419	1203740	1249158
<i>itd5</i> Emilia-Romagna	94894.7	99344.2	102249.7	104800.7	107165.9
a_b Agriculture, hunting, forestry and fisheries					
<i>it</i> Italy	29756.7	30015.3	29891.9	30468.8	31632.1
<i>itd5</i> Emilia-Romagna	3342.8	3410.4	3075.7	3055.6	3202
Nace c_d_e Total industry (excluding construction)					
<i>it</i> Italy	249241.7	256576.9	260710.5	258196.1	267722.2
<i>itd5</i> Emilia-Romagna	27404.3	28310.8	29281.9	29397	29669.9
Nace c_to_f Industry					
<i>it</i> Italy	302465.9	315647.7	323766.9	325991.6	340839.1
<i>itd5</i> Emilia-Romagna	31327.5	33006.1	34055.6	34723.2	35783
Nace c Mining and quarrying					
<i>it</i> Italy	5224.1	5007.1	5372	4750.2	4918.1
<i>itd5</i> Emilia-Romagna	198.8	193.7	160.9	141.7	200
Nace d Manufacturing					
<i>it</i> Italy	223061.7	228686.5	231487.2	229249.1	237489.9
<i>itd5</i> Emilia-Romagna	25946.2	26589.5	27604.5	27578.4	27670.8
Nace e Electricity, gas and water supply					
<i>it</i> Italy	20955.9	22883.3	23851.4	24196.7	25314.2
<i>itd5</i> Emilia-Romagna	1259.3	1527.6	1516.5	1676.8	1799.1
Nace f Construction					
<i>it</i> Italy	53224.2	59070.7	63056.4	67795.5	73116.9
<i>itd5</i> Emilia-Romagna	3923.1	4695.3	4773.7	5326.3	6113.1
Nace g_to_p Services (excluding extra-territorial organisations and bodies)					
<i>it</i> Italy	731813.5	777314.2	811759.9	847279.4	876687.2
<i>itd5</i> Emilia-Romagna	60224.4	62927.7	65118.3	67021.8	68180.9
Nace g_h_i Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods; hotels and restaurants; transport, storage and communication					
<i>it</i> Italy	254669.6	271741.4	278372.4	281435	288679
<i>itd5</i> Emilia-Romagna	22097.2	23281.1	22773.7	22649.6	22906
Nace g Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods					
<i>it</i> Italy	135419.2	143472.8	143992.6	145327.5	146300.1
<i>itd5</i> Emilia-Romagna	11938.4	12575.9	12415.5	12092.4	12034.8
Nace h Hotels and restaurants					
<i>it</i> Italy	41585.9	43848.1	43468.7	44169.4	46725
<i>itd5</i> Emilia-Romagna	4181.6	4400.4	4051.5	4000.6	4199.6
Nace i Transport, storage and communication					
<i>it</i> Italy	77664.5	84420.5	90911.1	91938.1	95653.9
<i>itd5</i> Emilia-Romagna	5977.1	6304.8	6306.7	6556.7	6671.7
Nace j_k Financial intermediation; real estate, renting and business activities					
<i>it</i> Italy	263209.1	279205.7	298235.9	319445	332214.2
<i>itd5</i> Emilia-Romagna	23813.6	24661.9	26426.4	27963.5	28198.4
Nace j Financial intermediation					
<i>it</i> Italy	49802.1	53828.5	53055.9	57654.1	58210.7
<i>itd5</i> Emilia-Romagna	4344.8	4546.4	4589.6	5008.7	5102.5
Nace k Real estate, renting and business activities					
<i>it</i> Italy	213407	225377.2	245180	261790.8	274003.5
<i>itd5</i> Emilia-Romagna	19468.8	20115.5	21836.8	22954.8	23095.9
Nace l_to_p Public administration and defence, compulsory social security; education; health and social work; other community, social and personal service activities; private					

households with employed persons						
	<i>it</i> Italy	213934.8	226367	235151.6	246399.4	255794
	<i>itd5</i> Emilia-Romagna	14313.6	14984.7	15918.2	16408.7	17076.4
Nace / Public administration and defence; compulsory social security						
	<i>it</i> Italy	63067.8	67095.5	70294.4	75697.5	80237.6
	<i>itd5</i> Emilia-Romagna	3465.4	3567.6	3770.5	4122.8	4450.2
Nace m Education						
	<i>it</i> Italy	52274.2	54972.5	57833.3	60776.6	59940.6
	<i>itd5</i> Emilia-Romagna	3024.9	3172.4	3342.9	3551.1	3434.1
Nace n Health and social work						
	<i>it</i> Italy	57168.6	60696.5	62679	64619	69048.8
	<i>itd5</i> Emilia-Romagna	4221.8	4603.6	4883.4	5135.6	5471
Nace o Other community, social, personal service activities						
	<i>it</i> Italy	32204.9	33892.1	33966.3	34598.6	35160.7
	<i>itd5</i> Emilia-Romagna	2916.8	2897.6	3068.7	2738.6	2841.5
Nace p Activities of households						
	<i>it</i> Italy	9219.3	9710.4	10378.6	10707.7	11406.3
	<i>itd5</i> Emilia-Romagna	684.6	743.5	852.8	860.7	879.6

Source: EUROSTAT, 2007

Table 3.6 UNEMPLOYMENT RATES AMONG POPULATION 15 OR OVER

	1999	2000	2001	2002	2003	2004	2005
eu25	:	9.2	8.6	8.9	9.2	9.2	9.0
eu15		9.3	8.3	7.5	7.8	8.2	8.2
it Italy		11.4	10.6	9.5	9.0	8.7	8.0
Emilia-Romagna		4.6	4.0	3.8	3.3	3.0	3.7

Source: Data Base economico-statistico di Unioncamere Emilia-Romagna AND EUROSTAT 2006

Table 3.7 Index of productivity sector A V / Sector Employment (2004)

	<i>E-R (Italy = 100)</i>
Total productivity	105.5
Agriculture	121.7
Industry	110.5
Services	104.4

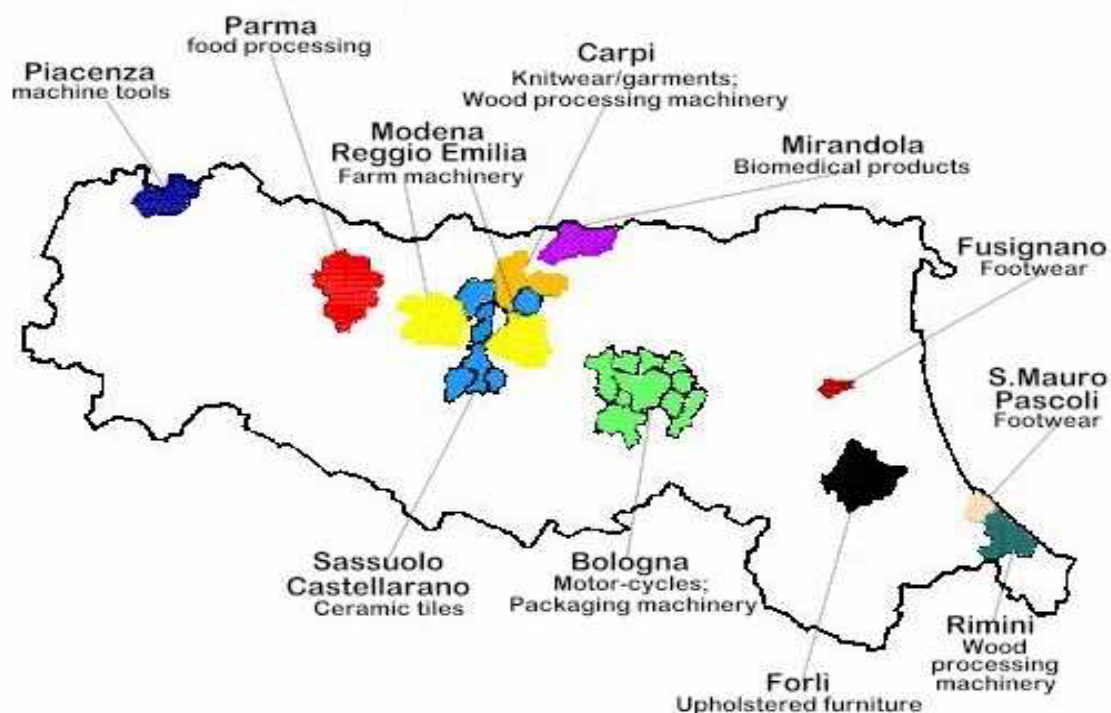
Own calculation of Istituto Tagliacarne and ISTAT (2006)

Table 3.8 Cooperation 2004

Cooperatives	5 034
Employees	170 000
Members	2 600 000

Source: Unioncamere/Tagliacarne

Figure 2



source: ERVET

Table 3.9 Selected Industrial districts / Clusters – Emilia-Romagna

Cluster/district and specialisation	No of companies	Employment	Turnover Million €	% export
Carpi — Textiles	1 800	8 100	1 000	40
San Mauro Pascoli — Footwear	n.a.	3 900	194	54
Fusignano — footwear	n.a.	650	50	50
Cento — Mechanics and farm machinery	350	n.a.	1 000	40
Faenza — Ceramics	70	n.a.	1 000	40
Forlì — Furniture	1 000	6000	1 000	40
Rimini — Tourism	n.a.	n.a.	8 300	n.a.
Parma — Food processing	2 070	10 500	8 500	n.a.
Mirandola — Biomedical devices	74	4 256	632.9	60
Bologna — Mechanics, motorcycles	5 000	40 000	13 000	50

Source: Club Distretti

Table 3.10 Table Import export 2005- table

	Import million €	Export million €	Balance million €
EMILIA-ROMAGNA	22 483	37 333	14 850
ITALIA	309 292	299 923	- 9 369

ER Unioncamere (2007)

Table 3.11: Regional Export by industry 2005 (million €)

Sector	2005	Var. % 2004-05	% of Total export E-R
Agriculture	619	6.7	1.7
Mining and quarrying	33	22.2	0.1
Food and Foodstuffs	2 519	3.7	6.8
Textile and clothing	2 991	9.0	8.1
Leather and Footwear	632	4.1	1.7
Wood	153	3.4	0.4
Paper, Print work, and publishing	279	-1.8	0.8
Oil , nuclear and other energy related products	23	15	0.1
Chemicals and fibres	2 348	10.3	6.3
Rubber and Plastic	956	6.0	2.6
Manufacturing of minerals — non metals	3 608	-2.2	9.7
Manufacturing of metals	2 500	8.2	6.7
Machinery and mechanicals	12 339	8.2	33.2
Optical and electrical instruments	2 659	12.1	7.2
Automotives and motorcycles	4 595	14.2	12.4
Other manufacturing	846	6.5	2.3
Other	29	31.8	0.1
Total	37 129	7.7	100.0

Source: Regione Emilia-Romagna

Table 3.12- Export technological content — 2005

	Agriculture Raw materials		Traditional and standard goods		High tech		Total	
	Thousand €	%	Thousand €	%	Thousand €	%	Thousand €	%
Emilia-Romagna	651 649	1.8	17 819 461	48.0	18 658 090	50.3	37 129 200	100.0
Nord-est	1 709 718	1.9	51 022 329	55.7	38 856 189	42.4	91 588 236	100.0
Italia	5 114 389	1.7	166 776 862	56.4	123 847 683	41.9	295 738 934	100.0

Source: Regione Emilia-Romagna — ISTAT

Table 3.13 Number of operations — venture capital deals in selected Italian regions

	1998	1999	2000	2001	2002	2003	2004	2005	2006 1st sem.	Total
Lombardia	54	66	157	79	74	76	55	83	35	679
Emilia- Romagna	34	31	47	36	41	48	15	37	16	305
Piemonte	13	23	24	16	14	22	27	11	9	159
Veneto	16	10	36	16	12	22	13	26	6	157
Toscana	12	18	16	20	11	9	11	18	9	124
Italia	269	390	646	489	301	286	206	234	112	2933

Source: AIFI

Table 3.14 Table: Projects funded 2003-2005

Measure	Contributions	Number of funded projects	Total investments (euro)
Access to credit	20 420 024	1 575	460 544 351
Projects of integrated system management	1 365 518	30	4 562 087
Projects for networks of firms	1 823 633	24	4 650 750
Research and experimental systems of social responsibility	350 000	5	654 200
Services to cooperation	600 000	19	845 900
integration Programmes of and development of cooperative businesses	540 525	25	4 659 823
Support for self-employment	2 280 703	629	6 298 693
Support for associations for self-employment	606 649	32	1 290 778
Support for entrepreneurship and professionals (consultancy businesses)	4 663 444	875	13 408 874
Support for networking services	117 655	10	1 207 661
Total	32 768 151	3 224	498 123 117

Source: *Regiona Emilia-Romagna*

Table 3.15 Resources and results of education for innovation policy

action	Results 2005	Grants 2005 €	Grants 2006 €
Voucher for accessing Master's Programmes with Professional training	Vouchers 904	2 840 114	846 000 00*
Professional training for ICT	59	1 425 507	619 248
Services for innovation instruments	Points of supply 83	3 113 804	1 037 049
Support for innovation (Spinner-Services)	N. of projects 1 448	2 500 000	1 000 000

Source: *Regiona Emilia-Romagna*

Table 3.16: Main results of education and training oriented to internationalisation

Action	Indicator	Value 2005	Resources 2005	Resources 2006
International Exchange programmes for training and study	Institutions involved	61	632 000	1 000 000
Students involved	1.000 (estimated)			
Services of "cultural intermediaries"	Number of points of services	5	198 700	
Number of participants	86			

Source: *Regiona Emilia-Romagna*

Annex 4: RTD policies

Title of the measure or initiative: Regional Law No 7 of 2002 in Support of the Regional System of Research and Development. Innovation and Technology Transfer. This Law has been integrated with Regional Law No 20 of 2005.
Objectives: To promote industrial research, innovation and technology transfer
Policy Area: Primary objectives: a) R&D governance b) Development of human capital c) Networking, co-location and clustering measures d) Knowledge and technology transfer to enterprises e) Research collaboration of public research organisations with private sector f) Support for public research g) Financial R&D measures for the private sector Secondary objectives: a) Creation of an innovation-friendly environment (coordinated with the DPEF) The typologies identified above are grouped into 3 objectives and set out in the “objectives” of the regional law: 1) Development of the regional system of production towards industrial research, technology transfer and innovation, with particular regard to environmental sustainability, re-qualification of production and energy consumption. In particular, this broad objective aims to support enterprises (small to medium-sized enterprises and consortia) to access regional, national and international research infrastructures, and provide support for the exploitation of intellectual property. 2) Transfer of knowledge and technologies, improvement of human capital in the higher education sectors (university research), other research institutions, industrial research centres and consortia. 3) Development of a network of research and innovation activities of particular industrial importance coordinated at regional and local level.
Main instruments and structure: Objective 1) targets: <ul style="list-style-type: none">- industrial research aiming at technological innovation and product innovation;- pre-competitive development activities, introduction of innovation and technology transfer;- development of research laboratories of particular economic and social interest carried out by enterprises, consortia, university-enterprise collaborations and public-private partnerships;- feasibility studies and research to broaden the sources of funding research, development and technology transfer. Such activities entail the following instruments: <ul style="list-style-type: none">- direct contributions to research programmes to provide support for entrepreneurship, industrial, sector and market analysis carried out by universities, professional consultancy and research units;- contributions and guarantees for start-ups and seed capital investments;- co-financing of industrial research projects and venture capital funds. Objective 2) targets: <ul style="list-style-type: none">- knowledge transfer between higher education institutions / research organisations and enterprises and consortia;

- technology transfer between higher education institutions / research organisations and enterprises and consortia.

Such activities entail the following instruments:

- co-financing of knowledge and research transfer contracts between universities / research institutes and enterprises / consortia;
- direct contributions, grants and funding of research projects carried out by universities, research institutions, businesses and consortia;
- programmes in support of exchange of people and competences between universities / research institutions and the business sector.

Objective 3) targets:

- development of a region-wide network of research and technology transfer laboratories and technological parks;
- development of a region-wide network of innovation centres.

These objectives are pursued with the following instruments:

- collection and collation of data and information organised in databases of science, technology and engineering capabilities and competences created and developed within the higher education sector, research institutions and regional and local government institutions;
- support for businesses to help them access universities' and research institutions' scientific and technical support infrastructure;
- promotion of collaborative activities between universities' / research institutions' technical support personnel and enterprises (university/research institutions and business partnerships);
- support for enterprise-based activities of universities' / research institutions' personnel (transfer of technical and scientific personnel from university/research institutions to enterprises);
- other activities facilitating business access to technology and knowledge created and developed by universities and research institutions, which might bring direct benefits to industrial research, development and innovation.

Implementation of policy measures is managed by ASTER (the consortium of regional authorities, universities, R&D centres and firms) through the Regional Programme for Industrial Research, Innovation and Technology Transfer (PRRIITT).

Main beneficiaries /target groups:

Enterprises and consortia, professional research and technology consultancy, universities and public research centres, and innovation centres.

Achievements or failures:

Up to 2005, the Regional Programme for Industrial Research, Innovation and Technology Transfer (PRRIITT) had activated €235.2 million of investments, about 39% of it or €92.2 million regional contributions. Of the 1 220 proposals submitted, 529 projects have been co-funded. Over 90% of the projects (489) employ 900 young researchers, 492 projects include long-term collaborative agreements with universities and research organisations for a total of about 750 contracts, and 336 projects integrate contracts with research laboratories accredited by the Ministry of Education, University and Research.

It is still too soon to assess the results of the programme as the policy measures are based on long-term objectives and the implementation phase is still ongoing. However, on the basis of first two calls, the programme has been successful overall.