

RIP-WATCH

ANALYSIS OF THE REGIONAL DIMENSIONS OF INVESTMENT IN RESEARCH

CASE STUDY REGIONAL REPORT: MIDI-PYRÉNÉES (FRANCE)

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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 higher education
ISIC	International Standard Industrial Classification
IPTS	Institute for Prospective Technological Studies, Seville, Spain
NACE	Statistical Classification of Economic Activities in the European Community
N.E.C	Not elsewhere classified
PPP	Purchasing power parity

1 Introduction

Midi-Pyrénées is the largest region in France, with an area of more than 45 thousand km², exceeding that of Denmark or the Netherlands. Midi-Pyrénées includes 8 *départements* (cf. Figure 1) with diverse landscapes and relief. The region borders the Aquitaine region to the west and Languedoc-Roussillon to the east. The demographic growth of the region has been particularly impressive: on 1 January 2006 its official population was 2.8 million inhabitants, which was 200 000 more than in 1999. Moreover, newcomers to the region are typically young and skilled. In particular, Haute-Garonne, the *département* in which some 40% of the region's population and most of its economic activity are concentrated, shows exceptional growth by French standards (the population of Toulouse has doubled over the last 40 years).

The demographic and economic growth of the region over the last few decades cannot be seen in isolation from the historical path followed by technological capacity in Midi-Pyrénées and from the changes affecting local research and innovation activities: since the beginning of the 2000s, Midi-Pyrénées has been the top French region in terms of investment in research and development relative to the region's GDP (3.56% of the region's GDP in 2002 and 3.72% in 2003).¹ Its share of France's national GDP increased from 3.70% in 1998 to 3.87% in 2003. However, GDP per capita remains below the national average (cf. Eurostat regio database). Compared with the national level, and particularly with Île-de-France, Midi-Pyrénées has a high share of agricultural employment (5.90% versus 0.35% in the Paris region and 3.50% in the whole of France). The structure of employment in the region shows a clear focus on the services sector (72.17% of employment in 2003), albeit below the national rate (73.79%).²

Figure 1: Midi-Pyrénées and its 8 *départements*



Source: www.cartesnumeriques.com/france & *Préfecture de Haute-Garonne* (www.haute-garonne.pref.gouv.fr)

¹ Cf. Eurostat, regio database. For comparison, in the whole country 2.23% of GDP in 2002 and 2.17% in 2003 were invested in research and development. The corresponding figures for Île-de-France were 3.32% in 2002 and 3.2% in 2003. Cf. also: <http://www.midipyrenees-expansion.fr/page944.htm>.

² In the Paris region the share of employment in the services sector is 83.78%.

2 Regional knowledge base

2.1 Description of the regional knowledge base

2.1.1 Knowledge creation capacity

Higher education and public sector

Four universities and a wide variety of engineering and business schools and research institutes are located in Midi-Pyrénées. The four universities bring together some 70% of all students in Midi-Pyrénées. They specialise in the following fields:

- Toulouse 1: social sciences;³
- Toulouse 2 – Le Mirail: human sciences;⁴
- Toulouse 3 – Paul Sabatier: life and social sciences;⁵
- *Institute National Polytechnique*:⁶ three engineering schools (the *École Nationale Supérieure d'Agronomie* de Toulouse ENSAT, the *École Nationale Supérieure des Ingénieurs en Arts Chimiques et Technologiques* ENSIACET and the *École Nationale Supérieure d'Électrotechnique, d'Électronique, d'Informatique et d'Hydraulique de Toulouse* ENSEEIHT). The region also has 12 more engineering schools.

With some 113 000 students in higher education (in 2003), Midi-Pyrénées ranks second in France after Paris. 90 000 are studying in Toulouse, which makes this city the leading university centre in France outside Paris. The region is seen as very attractive judging from intra-regional flows of students: INSEE's "student regional attractiveness indicator" ranks Midi-Pyrénées top region in France in terms of intra-regional migration.⁷ Due to these flows, Midi-Pyrénées is statistically the only region in France not "losing" some of its students to the Paris area. At the same time, in comparison with other French regions, higher education in Midi-Pyrénées shows a larger share of students involved in longer cycles (formerly known as "bac+3" and "bac+4" degrees).⁸ This may be seen as an indicator of the quality and attractiveness of the higher education offered.

In Midi-Pyrénées institutes attached to the *Centre National de la Recherche Scientifique* (CNRS),⁹ the largest public research body in France, are located mainly in and around Toulouse. Further main locations are the Midi-Pyrénées Observatory (Pic du Midi, Tarbes, Lannemezan), the "technical platform" (*plateau technique*) of the ecological federation in Moulis-Ariège and the joint research unit with the *École des Mines* in Albi-Carmaux. In 2002, 13.5% of the research staff in the region were employed by the CNRS. The region ranks fourth among the French regions for CNRS personnel: at the beginning of 2006, 752 researchers (+ 761 ITA (*ingénieurs, techniciens et administratifs*) staff) were employed in the region by CNRS

3 <http://www.univ-tlse1.fr/>.

4 <http://www.univ-tlse2.fr/>.

5 <http://www.ups-tlse.fr/>.

6 <http://www.inp-toulouse.fr/>.

7 The "student regional attractiveness indicator" calculated by INSEE for the French regions is based on the differences between students' (official) place of residence and the place where they are enrolled in higher education (cf. INSEE Midi-Pyrénées 2005).

8 This finding was made before the general introduction of the bachelor's/master's/PhD cycles in French universities. Nevertheless, it can be assumed that this trend will continue (cf. INSEE Midi-Pyrénées 2005).

9 The CNRS emanated from the *Caisse Nationale des Sciences* (National Office of Science) in 1939. CNRS institutes are involved in all fields of science along with interdisciplinary programmes. CNRS institutes are *Établissements Publics à caractère Scientifique et Technologique* (EPST) (public institutes for science and technology). The CNRS now employs around 25 000 persons (among them around 11 000 researchers) and is the largest public research institute not only in France but also in Europe (cf. European Commission 2005: 3, <http://www2.cnrs.fr/en/8.htm>). Nowadays CNRS departments and universities are interrelated; the majority of CNRS units are currently *unités mixtes* between the CNRS and universities. Research objectives are defined by the university concerned, the CNRS institute and the Ministry of Research in four-year contracts (cf. European Commission 2005: 3).

institutes. They were working in 63 *unités de recherche*, 11 *fédérations de recherche* and 8 *groupements de recherche*. Furthermore, CNRS maintains two *Unités Mixtes Internationales* (international joint units) with the USA and Japan, three *Laboratoires Européens Associés* (European associated laboratories) with Spain, Poland and Italy and one *Groupe de Recherche Européen* (European research group) with Russia.¹⁰ The main specialist fields of CNRS institutes in Midi-Pyrénées are physics and mathematics, information and communication technologies, engineering, chemistry, geosciences, life sciences and social sciences. CNRS has 23 laboratories for mathematics, physics and geosciences, 8 for chemistry, 18 for life sciences, 12 for social sciences, 2 for the environment and sustainability and 10 for engineering (cf. CNRS, Délégation Midi-Pyrénées 2005 and also the CNRS regional website: <http://www.cnrs.fr/midi-pyrenees/>).

The *Institut National de la Recherche Agronomique* (INRA) has 21 regional centres, one of which is located in Toulouse and is working on the genome and biotechnology and food safety and production. The INRA centre cooperates with regional institutions and organisations in the fields of science, economics and social sciences and also with the regional authorities (*Conseil régional*). INRA Toulouse comprises 21 research units (of which 11 are *unités mixtes*), 5 experimental units and 3 research support units (*unités d'appui à la recherche*). INRA Toulouse employs about 500 civil servants plus about 500 more staff (cf. the INRA website at <http://www.toulouse.inra.fr/>). The *Centre National d'Études Spatiales* (CNES) has its headquarters in Paris. Establishment of the Toulouse Space Centre (CST) in 1968 was one of the measures for decentralisation of high-tech industries from Paris to the regions. CST replaced the former space centre at Brétigny-sur-Orge. In this centre, space systems are developed in collaboration with industrial and scientific partners. CST employs more than 2 400 persons (some 1 800 engineers and executives) (cf. <http://www.cnes.fr/>). The French National Aerospace Research Establishment – ONERA (*Office National d'Études et de Recherches Aérospatiales*) – in Toulouse performs applied research on physics, information processing, fluid mechanics and energetics. ONERA Toulouse serves as a multidisciplinary research centre for the National Aeronautics and Space Engineering School SUPAERO (*École Nationale Supérieure de l'Aéronautique et de l'Espace*) and other teaching centres. ONERA was set up in 1968 and employs 420 staff, including 280 permanent research engineers and technicians, plus 90 PhD students. Besides aerospace, the centre is active in the fields of energy, telecommunications and road traffic (cf. <http://www.cert.fr/>).

The region, and particularly the Toulouse area, hosts further laboratories and research centres. In the aeronautics and aerospace sectors, for instance, there are the *Centre d'Essais Aéronautiques de Toulouse* (CEAT), the *Centre d'Études de la Navigation Aérienne* (CENA), the *Centre Européen de Recherche en Management de l'Aéronautique et du Spatial* (CERMAS), the *Service Technique de la Navigation Aérienne* or TESA (*Télécommunications Spatiales et Aéronautiques*). Other specialist fields are mathematics and ICT, with the *Centre Européen de Recherche et de Formation Avancée en Calculs Scientifiques* (CERFACS), the *Fédération de Recherche en Informatique et Automatique* (FÉRIA), the *Institut de Recherche en Informatique de Toulouse* (IRIT) or the Laboratory on Analysis and Architecture of Systems (LAAS). The *Centre d'Études Spatiales de la BIOSphère* (CESBIO), the *Centre d'Études Spatiales des Rayonnements* (CESR), the *Centre National de Recherches Météorologiques*

¹⁰ The *Direction des systèmes d'information*, a decentralised national directorate, is located in Labège. In 2005 the CNRS granted €13.21 million to support research units. The CNRS has institutional partnerships with the Universities of Toulouse I, II and III, with the *Institut National Polytechnique*, the *Institut National des Sciences Appliquées*, the EHESS, the *École des Mines Albi-Carmaux* (EMAC), the *Institut National de Recherche Agronomique* (INRA), the *Institut National de la Santé et de la Recherche Médicale* (INSERM), the *Institut de Recherche pour le Développement* (IRD), the *Centre National d'Études Spatiales* (CNES), Météo-France, the *Office National d'Études et de Recherches Aérospatiales* (ONERA) and the *Institut de Recherche Pierre Fabre* (IRPF) (cf. CNRS, Délégation Midi-Pyrénées 2005).

(CNRM) and the Midi-Pyrénées Observatory are working on geosciences. Other organisations are working on medical fields, energy and engineering sciences.¹¹

Regional capacity in terms of qualifications, research investment and personnel

Toulouse universities provide a wide range of opportunities for high-level education in many different fields, such as exact sciences, life sciences, human and social sciences or engineering. Universities in Midi-Pyrénées award 4 000 master's degrees and 700 PhD degrees a year. One fifth of these post-graduates come from abroad.¹² In proportion to its population Midi-Pyrénées is the leading French region for engineering degrees (77 per 100 000 inhabitants) and the third in terms of number of doctoral dissertations defended. Midi-Pyrénées is the top French region for investment in research (in relation to regional GDP) and also one of the leading regions (after Île-de-France) for the proportion of researchers in the population. At the same time, in financial terms, with R&D spending of €2.28 billion in 2003, Midi-Pyrénées took third place among the French regions (after Île-de-France with €14.4 billion and Rhône-Alpes with €3.9 billion). This is equivalent to spending 3.7% of the region's GDP on research and development in the region, out of which 2.4% (€1 476.2 million) was spent by the business sector, 0.7% (€446.0 million) by the Government and 0.6% (€360.4 million) by the higher education sector. The region's figures on R&D spending by private business and higher education are above the national average. Midi-Pyrénées also shows a stronger focus on private and Government R&D spending than Île-de-France.¹³ This indicates the high importance of research and development activities in the region as a whole, in both the public and private sectors.

University education and public research budgets together added up to around €1.35 billion in 2004 (cf. Brugarolas, 2007). Universities and engineering schools employ approximately 12 000 staff. R&D employs nearly 25 000 people in the region (2001), of whom about 11 600 work in private-sector businesses, about 4 250 in public-sector research bodies and nearly 9 100 in higher education.¹⁴ Public research in Midi-Pyrénées is concentrated primarily on the sciences of the universe (i.e. natural environment, astronomy and astrophysics), engineering (fluid mechanics and process engineering) and information technology and communication sciences (IT, automation, signal processing, etc.) whereas private-sector research clearly concentrates on aeronautics and space engineering, ICT and pharmaceutical industries (cf. section 3).

Trends in R&D expenditure in the region

Figure 2 illustrates the trends in R&D expenditure between 1995 and 2003 in every region of (metropolitan) France, including the French average. It clearly shows that Midi-Pyrénées and Île-de-France are the most important regions in terms of total R&D expenditure, measured as share of the region's GDP. The other French regions – as well as the national average – have R&D investment between 0.24% (Corsica) and 2.61% (Rhône-Alpes) of their GDP. At the end of the 1990s, R&D expenditure in Midi-Pyrénées was even exceeding the Paris region before falling below the Île-de-France curve in 2000 and 2001 and then strongly increasing once again.¹⁵ This trend becomes even clearer when the R&D expenditure in the different sectors of

11 For an overview of major research organisations in Midi-Pyrénées see http://www.toulouse.cci.fr/Ccit/donnees_economiques.htm.

12 In 2001 Midi-Pyrénées awarded 7.6% of the engineering degrees in France (Île-de-France: 26.8%), and 5.2% of the PhDs in France (Île-de-France: 36.6%), cf. OST 2004: 361.

13 For comparison, in France as a whole 1.37% of GDP was invested in R&D by the business sector in 2003, 0.36% by the Government, 0.42% by higher education organisations and 0.03% by the private non-profit sector. The corresponding figures for Île-de-France were: 2.19% for the business sector, 0.45% for the Government, 0.53% for higher education and 0.04% for the private non-profit sector. Data source: Eurostat, regio database.

14 Data source: Eurostat, regio database.

15 Research activities in France are generally highly concentrated: in 1998 more than two thirds of all public- and private-sector research was conducted in five regions: Île-de-France, Rhône-Alpes, Provence-Alpes-Côte-d'Azur, Midi-Pyrénées and Brittany (cf. Gollain, no year indicated).

performance are considered (cf. Figure 4 (total values) and Figure 5 (shares of regional GDP for France, Île-de-France and Midi-Pyrénées) in Annex 3). While the shares of R&D expenditure in the different sectors of performance remained comparatively stable between 1995 and 2003 at national level (cf. Figure 5a), both Île-de-France and Midi-Pyrénées recorded marked upswings in R&D expenditure in higher education between 1996 and 1997 (cf. Figure 5b, c), since when around 0.5% of their GDP has been invested in research and development in higher education (2003: 0.53% in Île-de-France and 0.59% in Midi-Pyrénées). While Government R&D investment in Île-de-France remained relatively stable, with a slight decrease (1995: 0.53%, 2003: 0.45%), this sector showed greater fluctuation over the same period in Midi-Pyrénées: after a comparatively moderate increase between 1995 and 1997, expenditure increased strongly in 1998 and 1999 (by 1.51% and 1.47%), before declining sharply to below 1% in 2000 and then settling into a relatively stable, but slightly downward, trend. In general, Government expenditure on R&D moved from 1.11% of the region's GDP in 1995 to 0.73% in 2003. On the other hand, after a lag of about two years, private-sector R&D expenditure in the region has increased strongly since 2001 and reached the highest level among all French regions in 2003 (2.4% of GDP). The high public R&D investment at the end of the 1990s is attributed to the CNES, the CNRS, INRA, INSERM, ONERA and the four universities (cf. INSEE Midi-Pyrénées 2002: 2). In Midi-Pyrénées non-university research organisations – particularly the CNRS and the CNES – are of above-average importance. The diversified structure of the public-sector research in universities and further research organisations differentiates Midi-Pyrénées from many other regions of France, with the university sector preponderant (cf. INSEE Midi-Pyrénées 2002: 5).

At the end of the 1990s most business R&D expenditure in the region was concentrated on (see Table 1 in the annex): (i) aerospace and electronics (55.9%); (ii) pharmaceuticals and chemicals (19.7%); and (iii) transport and capital goods (14.0%). (cf. INSEE Midi-Pyrénées 2002: 5). About 90% of the researchers were working in and around Toulouse (cf. INSEE Midi-Pyrénées 2002: 6).

Knowledge output

Turning to the knowledge output, in terms of patent applications to the European Patent Office in 2002, the technical specialisation of Midi-Pyrénées is similar to that of the country as a whole, with the main fields being electricity, physics, operations and human necessities (absolute figures). Comparison of patent applications/population with the national level highlights the region's focus on electricity and physics, with less importance attached to operations and human necessities (cf. Eurostat regio database). In 2002 Midi-Pyrénées accounted for 3.42% of all French patent applications to the European Patent Office. In 2001, 5.0% of French scientific publications were produced in Midi-Pyrénées (versus 37.4% in Île-de-France). The region's highest shares of the country's publications were reported in geosciences (8.7% of all publications in France) and engineering (7.8%); other important fields are mathematics (5.7%), applied biology (5.1%) and chemistry (5.1%). 5.2% of all doctorates and 7.6% of all engineering degrees awarded in France were obtained in Midi-Pyrénées in 2001. In relation to the number of inhabitants, the region's share of engineering graduations is higher than in the Paris region (76.7% v. 63.2% in Île-de-France) (cf. OST 2004: 361-363.)

2.1.2 Knowledge dissemination capacity of the region

Knowledge dissemination and support for innovation

In France, knowledge dissemination at regional level is generally organised via two main channels (cf. section 2.2.1 for more details): (i) national organisations with their regional agencies; and (ii) the specific institutional support structure for the region. The regional delegations for research and technology (DRRT, *Délégations Régionales à la Recherche et à la Technologie*) of the French Ministry of Research coordinate and stimulate action in the fields of research, technology, innovation, dissemination and interaction with the public. Their role is to lead and coordinate public research in the regions, support technological development in

firms and support scientific and technical culture. In addition, the DRRT is the Ministry's platform for granting support to firms in the region, e.g. support for innovation or qualifications or for initiation of collaboration between a firm and a young graduate (CIFRE, see below). The DRRT is involved in the innovation support infrastructure and regional networks such as the *Réseaux Régionaux de Recherche Technologiques* (RRRT), *Centres de Ressources pour l'Innovation et le Transfert de Technologies* (CRITT, see below). The DRRT also manages the European Structural Funds in the region.¹⁶ It works closely together with the *Délégations Régionales de l'Industrie, de la Recherche et de l'Environnement* (DRIRE) – the regional delegations for industry, research and the environment – which are in charge of several State departments for technical and regulatory control over industrial activities.¹⁷

Regional aid from the Structural Funds is coordinated in the prefectures, by the *Secrétariat Général pour les Affaires Régionales des Préfectures de Région* (SGAR) in cooperation with the *Conseils Régionaux*. Research and innovation are supported by various organisations and institutions at national level: The *Agence Nationale de la Recherche* (ANR) – the national research agency – finances research projects from the public and private sectors. Besides generation of new knowledge, the ANR aims at fostering interaction between public and private partners. The *Agence de l'Innovation Industrielle* (AII)¹⁸ co-finances, together with enterprises, large-scale industrial R&D programmes. *Pôles de compétitivité* (cf. section 2.2.3) and *Réseaux Thématiques de Recherche Avancée* (RTRA) are bodies to foster competitiveness by means of cooperation. The “*pôles*” bring together stakeholders from science and business and from the public and private sectors, while the RTRA are networks within the scientific community, selected on the strength of their excellence and the quality of the scientific project (see also section 2.2.2).

Technology transfer and application of research

Closer cooperation between public and private research, based on the scientific and technological needs of industry, is the aim of the national centre for technological research in aeronautics and space (*Centre National de Recherche Technologique “Aéronautique et Espace”* CNRT-AE), located in Toulouse. The technology transfer landscape in French regions consists, for instance, of *Centres Régionaux d'Innovation et de Transfert de Technologie* (CRITT) with a specific regional orientation. CRITT form part of the interface between public research and firms in the regions and aim at supporting innovation and technological development in SMEs. There are two kinds of CRITT: (i) *CRITT prestataire* with a clear technological focus, directed towards the technological needs of SMEs, and (ii) *CRITT interface* which aim at raising awareness in firms with the aid of “*Conseillers en développement technologique*” (CDT). Some *CRITT prestataires* are labelled “*Centre de ressources technologiques*” (CRT) to emphasise their service nature (cf. European Commission, 2005: 31 and 34). Midi-Pyrénées hosts the following CRITT: (i) CATAR Agroressources, (ii) Bio-Industries, (iii) Mécanique & Composites, (iv) CTCPA in the agro-food field, (v) Bois (wood), (vi) TECHNACOL: *Collage des matériaux et productique*, (vii) *Génie des Procédés & Technologies environnementales*, (viii) DIAC (Diagnostic Ingénierie) and (ix) Automatisation/CAAPI. The regional CRITT are affiliated to INTER-CRITT with the aim of strengthening their coherence and developing synergies and complementarities.¹⁹ Regional technological research networks (*Réseaux Régionaux de Recherche Technologique*, RRRT) have been incorporated in the *Contrat de Plan État-Région* (CPER, see below) for 2000-2006 in the following domains: agro-resources and biotechnology, water and environment and

¹⁶ Cf. <http://www.recherche.gouv.fr/drrt/drrt.htm>, <http://www.drrtmip.cict.fr/>, <http://www.drrtmip.cict.fr/>.

¹⁷ The DRIRE is active in the fields of environmental protection, automobiles, metrology, pressure instruments, nuclear safety, energy, mines and, since 1975, development of SMEs. Consequently, the DRIRE is responsible for implementing the policies of the Ministry of Economic and Financial Affairs and Industry. Cf. <http://www.drيره.gouv.fr>.

¹⁸ Establishment of this institution was one of the recommendations made in the “Beffa report” on new directions for French industrial policy (cf. Beffa, 2005: 17-31, 47-60; see also European Commission 2005: 27/28).

¹⁹ Cf. http://www.drrtmip.cict.fr/rubrique.php3?id_rubrique=13, <http://www.critt.net/index.htm>.

information and communication technologies. They focus on support for innovation by means of collaboration between research centres and private firms. These networks have been integrated into the activities of the regional agency *Midi-Pyrénées Innovation* (see below).

Parallel to the recent trends in the “regional technology transfer and innovation support landscape” in Midi-Pyrénées (cf. section 2.2), in 2006 universities and institutes of higher education and research in the region set up the *Agence de valorisation de la recherche en Midi-Pyrénées* (AVAMIP) – the agency for the application of research in Midi-Pyrénées. The goal of the agency is to promote and develop activities conducted in public research laboratories in terms of economic and patent applications. It is one of the first bodies of this kind developed in France, and its ambitious target is to double the number of patents generated and applied for by the academic world in Midi-Pyrénées. Interestingly, AVAMIP was set up in response to a national call for proposals launched by the *Agence Nationale de la Recherche* (ANR).²⁰ The quick and effective response from the academic and policy communities in the region allowed AVAMIP to become the first body of this kind to be started up in France. AVAMIP’s main tasks are to support patent applications by means of targeted information to research groups, to support new business start-ups by researchers from public laboratories, to provide information about regional research activities to the private sector and to support the contribution by laboratories to the research programmes of the European Communities. Adopting the networking principle, AVAMIP is expected to integrate the efforts of some twenty different local higher education and research institutions²¹ and at the same time to work in close collaboration with the clusters formed (i.e. *pôles de compétitivité*, cf. section 2.2.3) in order to allow industrial partners to express their research- and innovation-related needs.

Support for business start-ups – the regional incubator

The Midi-Pyrénées incubator,²² located in Toulouse, was initially founded as an association in 2000. The Midi-Pyrénées incubator is one of the 31 incubators launched in France as an initiative driven by the Ministries of Education and of Research and Technology and supported by the European Social Fund. The members constituting the association come from four main areas: (i) national authorities (i.e. local representatives of the national State such as the regional prefect and the regional branches of the ministries concerned, i.e. the DRIRE and DRRT); (ii) local authorities (i.e. the regional council, general councils and municipalities); (iii) research and higher education institutions; and (iv) intermediaries (chambers of commerce) and venture and seed capital operators. Over the period 2001-2006 the cumulative budget of the incubator was €5.8 million. Half of the budget was provided by the State directly (initially by the Ministry of Research and later under the “CPER agreement” (cf. section 2.2.3) concluded between the State and the region), one fourth by the regional council and the remainder by other local authorities (general councils and municipalities). On average the incubator supports some 12 start-ups a year. From 2007 on, the incubator expects additional sources of financing in the form of reimbursements from successful incubation of newly created firms. The average incubation time is around 18 months.

²⁰ Establishment of the *Agence Nationale de la Recherche* (ANR) (in 2005 and as an *établissement public à caractère administratif* at the beginning of 2007) is one of the major changes affecting the French institutional system for innovation. The ANR is in charge of supporting fundamental and applied research. It was founded to provide financial support for research projects. Financial support is awarded after a competition and evaluation procedure (cf. <http://www.agence-nationale-recherche.fr/Agence>, European Commission 2006a: II, 6). As such, the philosophy is close to the practice of the National Science Foundation (NSF) in the USA, which marks a shift in the way research will be funded in France in the future. Since both public and private laboratories can apply for funding, the action by the ANR is expected to reinforce public-private partnerships in the French research landscape.

²¹ Some 20 higher education and research institutes are associated with the project: the four universities, several “*grandes écoles*” (INSA, SUPAERO, ENAC, ENSICA, ICAM, ENFA, ENVT, ENSTIMAC, ESAP and ENIT) and research institutes (CNRS, INSERM, INRA, CNES and ONERA).

²² Cf. <http://www.incubateurmipy.com/>.

As an example, during 2003, 42 incubation projects were selected (from some 160 applications). Table 2 (cf. Annex) gives an overview of the origin of these incubation projects. Between 1999 and 2005, 18 companies were set up as spin-offs from Université Paul Sabatier, INP Toulouse and INSA Toulouse (cf. IGAENR 2007: 54).

In Midi-Pyrénées, the region's knowledge dissemination capacity can be seen as an anchoring factor – and to a certain extent as a magnet – for the development and blossoming of private-sector R&D activities. Over time it has clearly created a context and environment fostering, nurturing and positively influencing innovation behaviour on the part of local firms. Nevertheless, three points must be made in this respect. First of all, the region as a whole is benefiting unequally from the region's dissemination capacity. As can easily be seen, due to the strong concentration of resources in and around Toulouse, the favourable effects are not spread evenly over the whole region. Even more significant are the sectoral differences. As explained in section 3, a contrast can be identified between high-tech manufacturing and services on the one hand and the remaining traditional activities which are clearly facing severe difficulties due to international competition. So far there is little evidence that the latter could in fact benefit from the region's knowledge dissemination capacity. Finally, the relative shares of centralised decisions (taken at national level and implemented at regional level) and of local initiatives and decisions have evolved over the last few decades. The growing importance of the local level most probably reflects not only the greater autonomy progressively gained by French regions over the last 25 years but also, in the case of Midi-Pyrénées, a shift from a mainly reactive governance system to stronger pro-activity, notably in terms of knowledge dissemination capacity.

2.1.3 Knowledge absorption capacity of the region

Midi-Pyrénées has a highly educated workforce. In 2005, 48.45% of the economically active population had secondary education (levels 3-4 ISCED 1997) and 28.09% had graduated from tertiary education (levels 5-6 ISCED 1997, cf. Eurostat, regio database). These shares are above the national averages (43.24% of the economically active population in France with secondary education and 26.58% with tertiary education). However, the human resources in science and technology (HRST) in the region (as a percentage of the population) are slightly below the national share, although the HRST as a percentage of the labour force were very near to the national value in 2005. A considerable share of the adults in the 25-64 age group participated in education and training in 2005: 7.52% versus 7.48% in the Paris region and 3.06% in France as a whole. 5% of French students are enrolled in higher education institutions in Midi-Pyrénées (ISCED levels 5-6, cf. Eurostat regio database). This is slightly higher than the share of the French population living in the region (4.35%). The Paris region has a share of 26.7% of all students in France with 18.17% of the French population living in Île-de-France. In 2001 around 5% of all DEA (*Diplôme d'Études Approfondies*), DESS (*Diplôme d'Études Supérieures Spécialisées*) and PhDs awarded in France were obtained in Midi-Pyrénées. Relating the diplomas awarded to the regional population, Midi-Pyrénées outperforms Île-de-France in the case of graduations in engineering sciences which shows the strong technical and engineering orientation of the region (data source: OST 2004: 363).

2.2 Policy context

2.2.1 Governance structure and stakeholders

Decentralisation and deconcentration

In recent years the French governance system has been marked by *décentralisation* transferring new powers to regional level (following the 1982 Decentralisation Act) and *déconcentration* exercising central powers at regional level, for instance by establishing

regional agencies that represent the nation State in the regions.²³ Since 1982, the regional administration has been under the responsibility of the *Conseil Régional* (regional council) whose members are elected by the regional population for a period of six years. In the area of innovation policy, this council can establish centres for innovation and technology transfer or technology centres and can grant support to enterprises. Deconcentration takes the form of delegating more powers to the *préfet* who represents the French State in the region. The *préfet* is delegated from the central Government and directly represents the Prime Minister and the Ministers. To sum up, innovation policy is shaped by (i) measures at national level without any regional differentiation, such as the *Crédit Impôt Recherche*, (ii) central state measures delegated to regional level such as the DRIRE or DRRT and (iii) measures rooted in the specific regional context, such as the CRITT or AVAMIP in Midi-Pyrénées.

National level

Starting with the national context and attempting a broad characterisation, the French innovation system is facing profound transformations, coupled with new stakeholders, new regulations, new frameworks and new ways of implementing priorities. During the 1980s and 1990s the French innovation system was still clearly marked by strong State involvement, reflecting what could be described as an interventionist philosophy (“technological Colbertism”, cf. Larédo/Mustar 2001). Great emphasis was placed on “*grands programmes*” encompassing the civil and defence sectors and aiming at technological development and national independence in specific fields (such as the nuclear, space, aeronautics, telecommunications or defence sectors). Public support was strongly focused on large companies active in high-tech fields, with the aim of winning a leading position for France in research and innovation. SMEs, on the other hand, were modestly involved in research activities. Historically, over the last thirty years, Midi-Pyrénées, and in particular the Toulouse area, has benefited greatly from this trend (cf. section 3), development of the aeronautics industry being emblematic in this respect.

Government responsibilities for French research and innovation policy are borne by the Ministry of Research (*Ministère délégué à l'Enseignement supérieur et à la Recherche*), particularly the *Direction de la Recherche*, and the Ministry of Economic and Financial Affairs and Industry (*Ministère de l'Economie, des Finances et de l'Industrie*), especially the *Direction de la Technologie*. The *Direction Générale des Entreprises* (DGE)²⁴ within the Ministry of Industry – the result of a merger of the former *Direction Générale de l'industrie, des technologies de l'information et des postes* and the *Direction de l'action régionale et des PMI* in 2004 – is geared to more efficient support for firms and for innovation and competitiveness. The DGE is responsible for regulation and coordinates the regional delegations for industry, research and the environment (DRIRE, see above). Another important institutional development is the merger of the innovation agency ANVAR²⁵ with the SME development bank *Banque du développement des PME* (BDPME) to form the OSEO group in 2005. OSEO, a public holding

²³ The precise functions of decentralisation and deconcentration are explained as follows: “*La décentralisation vise à donner aux collectivités locales des compétences propres, distinctes de celles de l'État, à faire élire leurs autorités par la population et à assurer ainsi un meilleur équilibre des pouvoirs sur l'ensemble du territoire. La décentralisation rapproche le processus de décision des citoyens, favorisant l'émergence d'une démocratie de proximité. La déconcentration est une notion bien distincte ; elle vise à améliorer l'efficacité de l'action de l'État en transférant certaines attributions de l'échelon administratif central aux fonctionnaires locaux, c'est à dire aux préfets, aux directeurs départementaux des services de l'État ou à leurs subordonnés.*” (Assemblée Nationale, 2005).

²⁴ Cf. http://www.industrie.gouv.fr/portail/une/index_esse.html.

²⁵ The *Agence Nationale de Valorisation de la Recherche* ANVAR (or *Agence Française de l'Innovation*) is a central institution for supporting innovation with regional delegations (since 1996). The Agency was set up in 1974, originally with the objective of promoting application of public research results but later increasingly focused on support for SMEs. ANVAR's remit has widened during this time to include loans for innovation projects, SME contracts with research companies and recruitment of PhD students and researchers by SMEs (cf. Mustar/Larédo 2002: 65, European Commission 2005: 41/42).

reporting to the Ministry for Economic and Financial Affairs and Industry and to the Ministry for Higher Education and Research, has a mandate to provide assistance and financial support to SMEs in crucial stages of their development, i.e. in the start-up, innovation, development and buy-out phases. Within the OSEO group, OSEO ANVAR is in charge of support for innovation and funding in the fields of technology transfer and innovative technology-based projects, thus improving public support for SMEs and at the same time supporting development of innovative firms.²⁶ The OSEO regional network is present in every region of France and aims to support entrepreneurs, to network SMEs and to foster their activities, especially in risky phases of development (cf. European Commission, 2005: 5 and 29).²⁷

Regional level

Recently there have been several major changes in the regional landscape in Midi-Pyrénées. Historically, the French context can be summed up as strong centralisation followed by several decentralisation efforts over the last two decades. This created a situation where, in most French regions, the multiplicity of (regional and national) stakeholders in technology transfer and innovation support at regional level led to poor “readability” of the system as a whole, notably for SMEs. As a consequence, “Midi-Pyrénées Innovation” (MPI)²⁸ was created in 2006 with the aim of providing a single entry-point for regional firms looking for support for innovation in Midi-Pyrénées. This ARI (*Agence Régionale pour l’Innovation* or regional agency for innovation) replaces three former structures – *Adermip*, *Miditech* and *3RT* – in order significantly to clarify the priorities and procedures for regional support for technology transfer and innovation. MPI takes the form of an association, 60% of whose funding is provided at regional level (*Région Midi-Pyrénées*) and 40% at national level (French State and OSEO).

The CRRDT (*Comité Consultatif Régional pour la Recherche et le Développement Technologique*) is a unit working on regional RTD governance in Midi-Pyrénées.²⁹ The mandate of this consultative committee is to provide analyses, foresight studies and advice in order to support the policy process aiming at fostering economic and technological development in the region. It was set up in 1983 in Midi-Pyrénées (following the 1982 French Innovation Act). Some 80 members are associated with this committee, covering a broad spectrum of entities: research institutes, universities, small firms, large groups, trade unions, technology transfer organisations and other intermediaries. The main areas of action of the CRRDT are linked to the following priorities: (i) reorganising the regional innovation and technology support landscape (aiming at better “readability” and building up critical mass); (ii) developing interfaces allowing interdisciplinary research at regional level; (iii) supporting the emergence and organisation of collaboration between academia and private firms; (iv) reinforcing the position of Midi-Pyrénées within the ERA; and (v) making the region more attractive in order to act as a magnet for talented individuals and teams. In particular, the CRRDT contributed to the “*Assises régionales de la recherche, de l’innovation et du transfert de technologies*” in 2005 (cf. next section) which developed the new framework for support for regional innovation in Midi-Pyrénées.

²⁶ OSEO bdpme is responsible for funding investment with banks, whereas OSEO sofaris, a subsidiary of OSEO bdpme, guarantees funding of banks and equity capital investors. Finally, OSEO services, an economic interest group between the OSEO and the *Caisse des Dépôts*, performs studies and provides on-line services to SMEs (cf. http://www.oseo.fr/oseo/groupe/english_version).

²⁷ See also http://www.oseo.fr/tous_nos_services/l_offre_oseo/contrat_de_developpement_innovation, http://www.oseo.fr/oseo/groupe/english_version, <http://www.oseo.fr/oseo/groupe/mission>, http://www.oseo.fr/oseo/filiales_metiers/oseo_anvar, <http://www.oseo.fr/oseo/groupe/offre>, <http://www.oseo.fr/oseo/groupe/organisation>.

²⁸ Cf. <http://www.midipyrenees-innovation.fr/>.

²⁹ Cf. http://www.recherche.midipyrenees.fr/article.php3?id_article=48.

CPER agreement between the State and the regions

Besides social, economic and other issues, innovation-related regional projects are addressed in the *Contrat de Projet État-Région* (CPER, former *Contrat de Plan État-Région*), agreements between the Government and the regions which govern financial transfers from the State to the regions and establish joint projects to be put into action at regional level. Both levels – the regional representatives of the nation State and the elected regional administration – are responsible for formulation of the CPER.³⁰ Under these agreements, along with other chapters on, for example, physical infrastructure, education and training or social programmes, regions are also involved in science and technology policies and can negotiate their budget for R&D and innovation issues. Over the period 2000-2006, the CPER for Midi-Pyrénées had an overall budget of €2 196 million, of which the Government financed €958 million. The largest share of investment was earmarked for “infrastructure and transport” (50.65%), whereas “research and innovation, higher education” ranked second (14.75%). However, in terms of expenditure per inhabitant, the level of support which the region offers for research, innovation and higher education is above the national average (€127 per inhabitant versus €90 on average for the whole of France) (cf. DATAR, no year indicated: 3).³¹

2.2.2 Policy objectives

National level

At national level, since the beginning of the 2000s, French innovation policy has been focusing on starting up and developing innovative enterprises, including establishment of firms by researchers. Further measures have been dealing with public-private partnerships, industrial research and integration of young researchers into firms (cf. European Commission, 2005). Currently, the main goals of French innovation policy are directed towards competitiveness, – in line with the European strategy since the beginning of the 2000s – growth and employment and also towards bridging public and private research, industrial innovation activities and development of high-tech SMEs.³² General objectives are related to the “3% aim”, i.e. to invest

³⁰ *Contrats de projet* focus, for instance, on economic development, employment, regional competitiveness, social and territorial cohesion, sustainability, etc. Regions are “*interlocutrices privilégiées de l'Etat*” that can conclude additional arrangements with intra-regional authorities such as *départements* (cf. <http://www.senat.fr/rap/r05-337/r05-33719.html>). Since CPER were introduced in 1984, their financial resources and the areas which they cover have been broadened. In general CPER are considered to allow coordination of policies, at both inter- and infra-regional levels. With the launch of the new contracts in 2007, the Government changed the specific instruments for this contract-oriented policy coordination; this new approach is also mirrored in the change of name from *Contrat de Plan État-Région* to *Contrat de Projet État-Région*. A new focus is on the Lisbon and Göteborg objectives of favouring innovation, competitiveness and sustainability and also on priority projects and themes. The 2007-2013 CPER provides for projects along the general lines of (i) regional competitiveness and attractiveness, (ii) environmental issues and sustainability and (iii) social and spatial cohesion (cf. DIACT 2006: 8/9).

³¹ Cf. http://www.drrtmip.cict.fr/article.php3?id_article=17, <http://www.agence-nationale-recherche.fr/>, <http://www.aii.fr/srt/aii/home>, <http://www.recherche.gouv.fr/discours/2006/listepmrtra.pdf>, <http://www.cnrs.fr/midi-pyrenees/Actualites/7998/Suite.aspx>, <http://www.recherche.gouv.fr/discours/2006/rtra.htm>, <http://www.cnrtae.com/>, <http://www.cnrtae.com/>, <http://www.recherche.gouv.fr/technologie/mesur/aides/cortec.htm>, <http://www.technologie.gouv.fr/technologie/mesur/aides/cifre.htm>, http://www.drrtmip.cict.fr/article.php3?id_article=6, http://www.diatct.gouv.fr/Datar_Site/DATAR_Actu.nsf/Frame/Actus?opendocument&ID=SJEZ-6RTMSB&.

³² The Minister for Research and New Technologies along with the Minister for Industry have set the goal of further developing innovation in France, more precisely increasing use of R&D in French firms because “... **il y a urgence: bien que l'innovation soit la clé de notre avenir économique, notre pays est en retard** ; il souffre d'une trop faible coopération entre les entreprises et le monde de la recherche ; nos industries et nos laboratoires sont insuffisamment soutenues par la collectivité dans leurs efforts de recherche et d'innovation.” (Ministère délégué à la Recherche et Ministère de l'Économie, des finances et de l'industrie; bold taken from the original text).

3% of GDP in research and development. The Ministry of Industry envisages supporting innovation by (i) considering economic needs, (ii) supporting innovative operators in the form of project support (OSEO financing for SMEs to support start-ups, dissemination of technology in *Réseaux de Développement Technologiques*, strategic projects, for instance in *pôles de compétitivité* with the aid of *Réseaux de Recherche et d'Innovation Technologiques* (RRITs)³³ and support for the *Agence Nationale de Recherche* (ANR) and for enterprises (such as *Crédit Impôt Recherche* (CIR), CORTECHS and CIFRE, see below) and (iii) creating a favourable environment for firms. This latter aspect includes, for instance, easier access to financial resources (funds and credit, such as OSEO financing and foundations), expert support for entrepreneurs (incubators, *technopoles*, innovation networks such as *Réseaux de Développement Technologique* (RDT) and *Réseaux de Recherche et d'Innovation Technologiques* (RRIT)), plus support for patenting, design, market access, etc. Technology transfer is organised via the DRIRE, CRITT and *Centres Techniques Industriels* (CTI). Finally, regional competitiveness is covered by the competitiveness clusters (*pôles de compétitivité*, see below) and further knowledge is provided on the future development of regions and technologies.³⁴ Concerning research questions, the *Direction Générale de la Recherche et de l'Innovation* (DGRI) has been established in order (i) to formulate and implement French policy in the fields of research and scientific employment and (ii) to coordinate the tasks on research and higher education.³⁵

Legal aspects and new directions: the “Research Pact” and the 2006 Research Programming Law

From the legislative perspective, the 1999 Innovation Act³⁶ focused on interaction between academia and business with the aim of supporting innovation activities and improving the general attitude towards innovation. The 2006 *Loi de Programme pour la Recherche* has been adopted as the new framework law for research in France.³⁷ It has three principal thrusts: balanced development of the whole research system (basic and applied research), development of interfaces and cooperation between stakeholders and development based on a global long-term strategy. The law set six objectives: (i) to strengthen State capacity in the fields of strategic planning and priority setting, by establishing a *Haut Conseil de la Science et la Technologie* (HCST) and research debates in the *Conseil Supérieur de la Recherche et la Technologie*, by adjusting regional, national and European policies, by establishing *pôles de compétitivité* (see above) and *pôles de recherche et d'enseignement supérieur* (PRES) and by supporting research projects via the *Agence Nationale de la Recherche* (ANR) and the *Agence d'Innovation Industrielle* (All); (ii) to implement a system for evaluation of research by the *Agence d'Évaluation de la Recherche* (AER); (iii) to bundle efforts and facilitate cooperation between different stakeholders in research: among others establishment of “campus recherche”, regional coordination, alleviation of administrative procedures and creation of *Réseaux Thématiques de recherche Avancée* (RTRA, see above) fall into this category; (iv) to

³³ RRITs bring together public research teams, SMEs and industrial groups in joint projects. The Ministry of Research and sectoral Ministries provide funding (cf. European Commission, 2005: 30).

³⁴ Cf. <http://www.recherche.gouv.fr/>, http://www.industrie.gouv.fr/index_portail.php, <http://www.industrie.gouv.fr/enjeux/innovation/actions.html>.

³⁵ Cf. <http://www.recherche.gouv.fr/dgri/index.htm>.

³⁶ Historically the beginning of the 1980s was the turning point due to changes in government and presidential policy, emerging discussions on research policy, organisation of research conferences at national and regional levels and the creation of the Ministry of Research and Technology. The 1982 *Loi d'orientation et de programmation de la recherche et du développement technologique* transformed the research infrastructure and introduced changes to the legislation, accompanied by organisational changes in research bodies aiming at supporting industrial competitiveness, SMEs and research activities in firms and at integrating public resources for civil research in the civil budget for technological research and development to prioritise research activities (cf. Mustar/Larédo 2002: 56).

³⁷ Cf. <http://www.france-science.org/home/page.asp?target=news&ID=565> and <http://www.recherche.gouv.fr/discours/2006/loioprogercherche.htm>.

make scientific careers more attractive; (v) to intensify innovation, by bringing together public and private research: this is envisaged by providing support for *Jeunes Entreprises Innovantes*³⁸ and for private research activities; and (vi) to increase integration of the French system into the European Research Area (cf. Brunet, no year indicated: 6/7).³⁹ This law considers research a national priority. It provides the legal basis for the *Pacte pour la recherche* that aims at reforming the French research and innovation system, emphasising research cooperation and giving universities a prominent position in public research.⁴⁰ To sum up, there has been a shift in funding, e.g. to financing research on a project basis, and in fiscal measures. Current priorities are creation of an innovation-friendly environment, support for clusters, establishment of innovative enterprises and introduction of new governance models. At national level, evaluation, foresight and benchmarking tools are being discussed and introduced (cf. European Commission 2006b: i).

The French cluster and network concepts

The most important recent development in innovation policy was the *pôles de compétitivité* (“competitiveness cluster”) concept, launched in September 2004. The initiative aims at strengthening the competitiveness of the French economy by developing synergies between research institutes, firms and educational establishments in a given geographical area. The idea is that active partnerships between cluster members will contribute to fostering synergies in the sector or technology underlying the cluster. Cluster members are eligible for direct aid, tax incentives and preferential access to funding sources. Out of more than 100 proposals, 67 competitiveness clusters were selected in 2005, six of which are high-level *pôles de compétitivité mondiaux* and ten *pôles de compétitivité à vocation mondiale*. The six *pôles mondiaux* are in Provence-Alpes-Côte d’Azur, Grand Lyon, Paris (2), Grenoble-Isère, Midi-Pyrénées and Aquitaine, and the *pôles à vocation mondiale* are in the Paris region, Brittany (2), Champagne-Ardenne and Picardie, Alsace, Provence-Alpes-Côte d’Azur, Haute and Basse Normandie, Nord-Pas de Calais, Lyon Rhône-Alpes and Anjou Loire (cf. European Commission, 2005: i-ii, 10 and 34/35, Ministère de l’Economie, des Finances et de l’Industrie, 2006a, Ministère de l’Economie, des Finances et de l’Industrie, 2006b: 5, Brunet, no year indicated: 7).⁴¹

In this context, the Prime Minister recently launched the *Réseaux Thématiques de Recherche Avancée* (RTRA) to foster competitiveness by means of cooperation. These networks within the scientific community, selected on the strength of their excellence and the quality of the scientific project, receive financial aid from the State. The overall objective of the French Government is to support the emergence of high-level scientific networks that have an international reputation. Consequently, each *réseau* brings together high-level researchers working towards a common scientific goal. At the centre of this network are research institutes in close geographical proximity. Thirteen networks have been selected by the Government, with Île-de-France in first place, but others in Rhône-Alpes, the south of France (Midi-Pyrénées and Languedoc-Roussillon) and one in Strasbourg. A further social and human sciences network joins up

38 *Jeune Entreprise Innovante* (JEI) status makes young firms eligible for tax credits to compensate for their R&D investment and thus facilitates their first years of development (cf. European Commission, 2005: 42).

39 Cf. also <http://www.pactepoullarecherche.fr/>.

40 The “Pact for research” aims at intensifying innovation with the aid of close relationships between public and private research activities. The five dimensions to this are: (i) to support young, research-intensive enterprises, (ii) to support research activities in SMEs, (iii) to foster research and innovation programmes in firms, (iv) to further develop the interface between public and private research and (v) to develop the territorial dimension of support for research. Cf. <http://www.pactepoullarecherche.fr/fr/>, <http://www.recherche.gouv.fr/brochure/fichesinnov.pdf>.

41 Cf. also http://trendchart.cordis.lu/tc_country_list.cfm?ID=5. The programme is described at <http://www.competitivite.gouv.fr/> or http://www.industrie.gouv.fr/portail/politiques/index_polecompet.html. An overview of the *pôles* is given at http://www.competitivite.gouv.fr/rubrique.php3?id_rubrique=36.

institutes in Lyon, Aix-Marseille, Nantes and Paris.⁴² The two RTRA networks in Midi-Pyrénées

are “Aerospace Science and Engineering” and “Toulouse Sciences Économiques”.

Regional level

Consequently, Midi-Pyrénées has been successful in both the *Pôles de Compétitivité* and the *Réseaux Thématiques de Recherche Avancée* schemes run by the French state. As a result of the regional discussions and consultations which ended in 2005 (*Assises régionales de la recherche, de l'innovation et du transfert de technologies*), a new regional framework for supporting innovation and research is progressively emerging in Midi-Pyrénées. In terms of definition of policy objectives it is anchored in the guidelines given to MPI (*Midi-Pyrénées Innovation*). Three broad objectives corresponding to six functions can be singled out in this respect:

- to support the economic development of the region;
- to improve the coherence and efficiency of the regional innovation system;
- to reinforce the strategic roles of the regional authorities and of the State.

Considering the policy priority given to local SMEs (both innovators and traditional), the links between objectives and functions are depicted in Figure 3 (cf. Annex).

This reorientation can be interpreted as an effort to improve the efficiency of the whole regional system rather than the result of a shift in strategic objectives. The Lisbon objectives were referred to in the final stage of the discussions in the *Assises régionales de la recherche, de l'innovation et du transfert de technologies* which evoked the relative weakness of investment in R&D in France compared with the USA or Japan.⁴³ In this respect, support for setting up and participating in EU projects is explicitly included in the newly defined functions of MPI. The regional strategy concerning Structural Fund aid for research, technology and innovation in Midi-Pyrénées is oriented less towards strengthening the regional (public) knowledge base (due to the already high R&D expenditure relative to GDP), but more towards inter-regional deconcentration, i.e. “... due to the political choice of compensating the overwhelming position of its capital city in the region by re-distributing to “*départements*” outside Toulouse ...” (European Commission 2006b: 26).

2.2.3 Policy instruments

National level

Measures taken at national level to support innovation are focusing on the following dimensions:

- Incentives for creation of innovative firms: national competition for support for starting up innovative firms,⁴⁴ incubators, the seed fund (*fonds d'amorçage*) and the *jeune entreprise innovante* (JEI) status making young firms eligible for tax credits to compensate for their investment in R&D plus public organisations focusing on support for R&D and innovation: *Agence de l'Innovation Industrielle* (All) and the *Observatoire de la création d'entreprises à potential de R&D*.⁴⁵
- Financial measures: *Crédit d'Impôt Recherche* (CIR)⁴⁶ for financial support for firms' R&D activities, the *Fonds Commun de Placement dans l'Innovation* (FCPI),⁴⁷ tax incentives for private individuals investing in innovative companies that are not quoted on the stock exchange or the *Bons de Souscription de parts de Créateurs d'Entreprises* (BSPCE)⁴⁸ to support employees participating in starting up an SME with strong development potential.
- National support for young researchers and innovative partnerships between firms: CORTECHS, CIFRE⁴⁹ and *Aides au recrutement pour l'innovation dans les PME*⁵⁰ (support for recruiting R&D personnel).
- Channels for technology and knowledge transfer: *Centres nationaux de recherche technologique* (CNRT) favouring collaboration between public research laboratories and research centres of large industrial groups, *Centres régionaux d'innovation et de transfert technologique* (CRITT, cf. section 2.1.2), the *Centre de ressources technologique* (CRT, cf. section 2.1.2), *Équipes de recherche technologique*, medium-term research teams established for specific technological issues and *Plate-formes technologiques* that put

educational establishments and their specialists into contact with small and medium-sized businesses and industries. *Réseaux de recherche et d'innovation technologiques* (RRIT, cf. section 2.2.1) focus on collaboration between public and business research activities, whereas *Réseaux de développement technologique* coordinate the different stakeholders in innovation at regional level.⁵¹

- Mobilising the potential for innovation at regional level by supporting networks between firms, public research organisations and higher education institutes, for instance *pôles de compétitivité* (cf. section 2.2.2).

Specific instruments at regional level

The “research and technology transfer call for proposals” (*appel à projets recherche et transfert de technologies*) constitutes the first important policy instrument at regional level to support innovation and research in Midi-Pyrénées. In 2006, 101 eligible proposals were submitted to the regional authorities and presented to the CRRDT (*Comité Consultatif Régional pour la Recherche et le Développement Technologique*). This finally led to selection of 57 projects qualifying for total funding of approximately €3.4 million. The main selection criteria considered were: (i) the expected socio-economic spill-overs at regional level; (ii) the foreseeable economic and scientific relevance of the expenditure; and (iii) partnerships with private enterprises. In addition, specific support is earmarked for projects in the social sciences (*dispositif régional de soutien à la recherche en Sciences Humaines et Sociales*), covering project-related expenses of higher education and research institutions in Midi-Pyrénées for a maximum of 12 months. For 2006 different areas were defined for research on social sciences reflecting the diversity of the regional priorities in this respect: urban violence, cultural heritage, socio-economic analysis of competitiveness clusters, ecological building, financing of innovative firms and analysis of the rural world.

Another form of support currently available is under the PRAI (*Programme Régional d'Actions Innovatrices*) or innovative actions of the European Regional Development Fund (ERDF). This programme, based on a call for proposals published in 2005 and launched officially in March 2006, is managed locally by the regional authorities.⁵² The whole budget totals €5.7 million for two years (2006-2007), with the EU co-financing 48.6% of the programme. For its research component, an original approach has been developed in order to integrate local firms in a technology transfer scheme focusing on new digital image processing technologies; molecular sifting and model development and calculus.

With the aim of attracting talented and renowned researchers from abroad, the *Chaires d'Excellence Pierre de Fermat*⁵³ programme initiated by the *Conseil Régional Midi-Pyrénées* allows local research institutions to host guest scientists for six months or a year to collaborate on a joint project. In 2005, some €300 000 was allocated to these international research chairs. Besides traditional instruments to support research and development, the policy initiative which is most likely to exert a long-lasting influence on the French R&D landscape since the publication of the 1999 Innovation and Research Act (*Loi sur l'innovation et la recherche pour favoriser la création d'entreprises de technologies innovantes*) is probably the competitiveness clusters (*pôles de compétitivité*) programme (see above). At the request of Midi-Pyrénées, the French central government has awarded competitiveness cluster status to three *pôles de compétitivité*. On the strength of this cluster label, firms and universities can be granted greater dedicated funding for research, innovation and development.

These three *pôles* are:

- The world-class cluster on “Aeronautics, aerospace and onboard systems” (AESE) also known as “Aerospace Valley”.
- The “Cancer and bio-health” (CBS) cluster which will number among the top European cancer research centres. On a single site called “Cancéropôle”, multinational, public research laboratories of great repute, a teaching hospital and “the Institute of Advanced Technologies of the Living” (hosting cross-cutting research projects) will work in collaboration.
- The agriculture and agronomy cluster “Agri-Mip Innovation” (whose activities have yet to be launched).

Exhibit 1 summarises the main policy objectives and instruments at national and regional levels. It has to be borne in mind that the general French tradition of political governance explains the strong impact that the national governance level has on the regions. As a result of decentralisation moves and the CPER, the State and its Ministries are now represented in the regions. This general structure is supplemented by other measures, stakeholders and activities at the level of individual regions.

Exhibit 1: RTD policy mix affecting the region

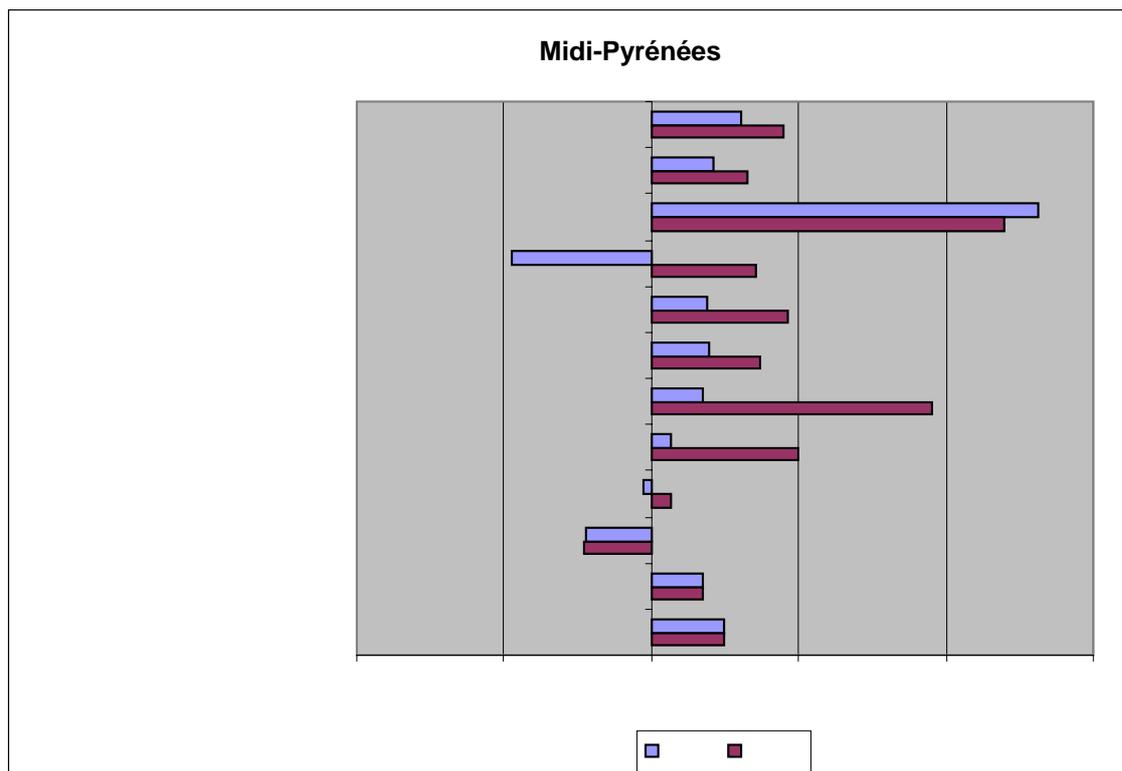
Policy areas	Policy objectives and instruments at national level affecting the region	Policy objectives and instruments at regional level
Improving R&D governance	To provide regional agencies of (national) institutions supporting innovation, such as technology transfer and innovation financing. These include, for instance, the OSEO anvar network, DRRT, DRIRE, etc.	To set up Midi-Pyrénées Innovation as the single entry-point for firms in the region looking for support for innovation.
Creating an innovation-friendly environment	To provide incentives to start up innovative firms, e.g. financial measures, such as the <i>Crédit Impôt Recherche</i> , funds and credits, expert support, support for young researchers and partnerships between firms under CORTECHS or CIFRE schemes and <i>Aides au recrutement pour l'innovation dans les PME</i> ; a strong technology and knowledge transfer and dissemination structure; and new measures to support research, collaboration and networking: <i>Pôles de compétitivité</i> and <i>Réseaux Thématiques de Recherche Avancée</i> .	Various measures, stakeholders and their activities, such as Midi-Pyrénées Innovation, CRITT, PRAI, etc.
Developing human capital	Besides general support for education, qualifications and research: CORTECHS, CIFRE: support for a young technician or a doctorate to contribute to an innovation project by an SME. Furthermore, the DRT technological research diploma (<i>Diplôme de Recherche Technologique</i>).	Chaires d'excellence Pierre de Fermat: to attract foreign researchers of international reputation to pursue a scientific project in the region and cooperate with regional laboratories.
Networking, co-location and clustering measures	<i>Pôles de compétitivité, réseaux thématiques de recherche avancée, équipes de recherche technologique</i> (research teams for specific technological issues), <i>plate-formes technologiques, réseaux de recherche et d'innovation technologiques</i> , etc.	CRITT/CRT, <i>Réseaux de développement technologique</i> that coordinate the different regional actors engaged in innovation issues.
Knowledge and technology transfer to enterprises	Various measures, stakeholders and their activities, such as <i>Réseaux régionaux de recherche technologiques</i> (RRRT), CORTECHS, CIFRE, activities of OSEO, etc.	CRITT, AVAMIP (agency for the application of research in Midi-Pyrénées), <i>Programme régional d'actions innovatrices</i> (PRAI), etc.
Research collaboration between public research organisations and the private sector	Regional delegation of the Ministry of Research (DRRT), <i>Réseaux régionaux de recherche technologiques</i> (RRRT) and programmes of the <i>Agence Nationale de Recherche</i> (ANR).	Midi-Pyrénées Innovation, excellence clusters, <i>projets recherche et transfert de technologies</i> , etc.
Supporting public research	ANR and other measures, such as RRTA, plus funding for public research organisations: INRA, INSERM, CNRS, etc.	Research strategy of the <i>Conseil Régional</i> , activities of AVAMIP, etc.
Financial incentives for R&D in the private sector	<i>Crédit Impôt Recherche</i> (CIR) (tax incentive), programmes of the <i>Agence Nationale de Recherche</i> (ANR), support by the OSEO network, etc.	Midi-Pyrénées Innovation, <i>appel à projets recherche et transfert de technologie</i> .

2.3 Conclusions

The strong knowledge base in the Midi-Pyrénées region is mirrored in Summary Graph 1. With the exception of patent applications, in 2001 all the indicators considered were above France's national indices in Midi-Pyrénées. The figures for Government R&D spending (0.79% of GDP in Midi-Pyrénées against 0.36% in France in 2001) and also for Government R&D personnel (0.41% of total employment in Midi-Pyrénées in 2001 versus 0.21% in France) are particularly high, pointing to public research in the region being well above the national average. In general, the (already favourable) situation in 1995, compared with the national average, improved up to

the beginning of the 2000s, particularly the R&D expenditure and personnel indicators (except GOVERD which was at a very high level in the mid-1990s). Summary Graph 1 also points to the changes in R&D expenditure in higher education which was below the national average in 1995, but then increased until 2001 and is now above the national level (cf. also Figure 5a, c in Annex 3). Higher education therefore benefited from heavy investment in the second half of the 1990s, adding to the importance of the universities and other higher education institutions in the region and producing a marked upswing in R&D personnel in higher education.

Summary Graph 1: Comparison of the Midi-Pyrénées regional knowledge base with France



Note: R&D personnel total, business, Gov., HEIs, students in tertiary education and life-long learning: 2000, 2001.

As the previous sections showed and Summary Graph 1 further illustrates, Midi-Pyrénées has a strong concentration of knowledge creation potential. Besides its four universities, the broad spectrum of research organisations in the region lends Midi-Pyrénées particular weight in the research and innovation system in France. Toulouse, for instance, is the top academic centre in France outside Paris. The region, and in particular the Toulouse area, is undeniably attractive for students and researchers alike (as well as for the skilled workforce more generally). The socio-demographic trends in the local population over the last few decades clearly highlight this. The number and variety of research and higher education institutions in the region, principally in and around Toulouse, explains, at least partly, why Midi-Pyrénées is the leading French region for investment in research (in relation to the region's GDP) and (after Île-de-France) for the proportion of researchers in the population. Nevertheless, it should not be forgotten that the region's figures for R&D spending by private businesses (during the time span considered here, i.e. since 1995) are also above the national average.

However, the technology transfer and knowledge dissemination infrastructure appears less developed in relation to the knowledge creation potential. The recent establishment of AVAMIP (agency for the application of research in Midi-Pyrénées), whose goal is to support patent applications and new business start-ups by researchers from public research laboratories, may

improve the situation. Its ambitious target is to double the number of patents generated and applied for by the academic world in Midi-Pyrénées.

Analysis of the regional policy objectives with regard to R&D and innovation reveals the importance attached to reinforcing public-private partnerships on research activities. Research is generally regarded as crucial to the socio-economic organisation of France. Currently a change in policy instruments is taking place, both at national level with the focus shifting to networking and clusters, and at regional level, notably with the reorganisation of the leading local innovation support structure: Midi-Pyrénées Innovation (MPI). Finally, the development of a number of *pôles de compétitivité* (or competitiveness clusters) corresponding to the core fields of specialisation in the region (i.e. aeronautics and space industries, cancer and bio-health research and agro-food activities) will most probably be crucial to the future economic development of the region (cf. section 3). Thanks to these clusters, firms and universities can be granted higher and dedicated funding for research, innovation and development.

In the general context of France, the Paris region is clearly the centre of scientific and economic activity. However, outside Île-de-France, Toulouse and the Midi-Pyrénées region have a high profile with respect to high-tech industrial activities, research and development, education and qualifications. This can be partly attributed to the deconcentration measures taken by the French Government in the 1960s, for instance establishment of the Toulouse Space Centre in Midi-Pyrénées. According to interviewees in the region, the turning-point was reached in 1998-1999. At the time the public authorities were convinced of the need to promote the emergence of larger public research units, bringing together several institutions in order to share common resources and to build up critical mass. In parallel, greater importance was attached to interdisciplinary research in which local expertise from different fields of science can interconnect and converge. In this respect, the growing institutionalised combination of expertise in biotechnologies and computer science provides a perfect example of this trend in Midi-Pyrénées.

A second development which can be tracked is the shift away from the predominance of aeronautics and space-related fields in the region's science base and towards the emergence and subsequent strengthening of research in other areas, notably life sciences and, more particularly, cancer research. Altogether, interviewees in the region agree that these trends can be considered to have had a real impact, not only on the scientific profile of the region, but also on recent economic developments affecting Midi-Pyrénées. Two main vectors can be identified in this respect: the attractiveness of the region for direct investment by large multinational groups (both in research laboratories and in production plant) and the numerous start-ups over the years, stemming directly or indirectly from the academic world.

To sum up, public investment seems to have boosted the region's research and innovation capacity and also its economic development, but mainly in and around Toulouse. This points to the conclusion that public investment has had a very positive impact in the Midi-Pyrénées region and, more precisely, in the area in and around the region's capital.

3 Regional economic structure

3.1 Description of the economic structure

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

The GDP of the Midi-Pyrénées region is estimated at approximately €68 billion for 2005, which is broadly equivalent to 4% of France's national GDP and places Midi-Pyrénées 8th among the French regions.⁵⁴ Historically, Midi-Pyrénées is a rural region, far from the traditional core industrialised areas in the North and East of France. Nevertheless, the development of traditional manufacturing activities, followed over the last few decades by high-tech industries, has transformed Midi-Pyrénées into one of the most dynamic regions in France. However, the economic situation is full of contrasts, depending on the sector examined.

The breakdown of jobs by major economic sectors – agriculture, manufacturing and services – shows the predominance of the tertiary sector which accounts for 72% of employment in the region (similar to the national average of 74%). Nevertheless, agriculture still holds a relatively important place (6% of employment in the region, which is higher than the national average), with significant variations by *département*: Gers, Aveyron, Lot and Tarn-et-Garonne remain markedly agricultural (more than 10% of the active population), whereas Haute-Garonne, Ariège, Tarn and Hautes-Pyrénées are much more industrialised (cf. also Table 3 in the Annex).

Manufacturing employs nearly 15% of the workforce in Midi-Pyrénées. Nevertheless, even if overall employment in this sector seems relatively stable over the years, in practice the situation is more complex.⁵⁵ On the one side, aeronautics and the space industry feature prominently in the industrial landscape, both in terms of level of manpower (57 000 employees) and by virtue of the strong subcontracting activity induced in sectors like mechanics, metallurgy and ICT. On the other side, traditional industries like textiles (including clothing and leather) or mechanical equipment are facing severe difficulties due to international competition. For instance, nowadays only some 4 000 people are working in the textiles industry, which used to employ up to 20 000.

The regional distribution of businesses by size (Table 4 in the Annex) reveals the predominance of small and very small production units, even when comparing Midi-Pyrénées with France as a whole. In manufacturing, 85% of the firms (i.e. approximately 12 600) employ fewer than 20 people. This distribution is even more marked than in France in general (80% of manufacturing firms). In addition, with approximately 68 000, the Toulouse area concentrates some 45% of the total workforce employed in manufacturing in Midi-Pyrénées.

Over the last 30 years, the region's economy has shifted from traditional activities (agriculture, textiles, leather and mining) to development of more "intangible" resources, thus paving the way for major technological breakthroughs in aeronautics, space, electronics, computer sciences and biotechnologies. The academic world has been contributing to this evolution, starting in the late 1960s. A national scheme (*Le Plan Calcul*) introduced by former French President De Gaulle in the early 1960s was the launching pad for setting up firms specialising in electronics, such as Motorola or Siemens VDO. Similarly, establishment of the National Centre for Space Research (CNES) was a key factor in development of space activities in the region in the shape of Matra (now EADS Atrium), Thales, Alcatel, Alenia Space, etc.

Nowadays, Midi-Pyrénées is indisputably attractive. This can be measured by two figures: migratory flows (29 300 new inhabitants every year since 1999) and foreign direct investment (Midi-Pyrénées: 4th region in France, cf. section 3.1.3). Other indicators bear witness to the region's dynamism and put Midi-Pyrénées at the head of the French regions, for example the number of companies created (14 398 in 2005), the balance of foreign trade (+ €9.1 billion in 2005) or the quality of life.

The size distribution of the region's firms is very similar to the French average and dominated by small firms with fewer than 10 employees (cf. Table 5 in the Annex). The list of the biggest employers in Midi-Pyrénées (cf. Table 6) reflects the predominance of a few high-tech sectors.

According to ADERMIP (2006), 83% of the workforce employed in the aeronautics and space sector work for establishments with more than 500 employees.⁵⁶

Midi-Pyrénées is seen as a business-friendly region which ranked 4th among French regions for new business start-ups in both 2002 and 2003. Since 1995 the number of start-ups, reactivations and takeovers of firms in Midi-Pyrénées has been consistently higher than the national average and appears to be increasing over time (see Table 7 in the Annex).

3.1.2 Systemic characteristics of the region: clusters, networks and interaction

At least two types of economic activity display a distinctly systemic structure in Midi-Pyrénées:

- the aeronautics and space industry; and
- the health and biotechnology cluster.

Further fields, in particular related to the agro-food sector, to use of micro-wave technologies and photonics or to production of ceramics, could develop into clusters in future but, at the moment, must be considered as emerging.⁵⁷

The Aeronautics, Space and Embedded Systems Cluster label was officially awarded to Midi-Pyrénées – together with the neighbouring region Aquitaine – by the DIACT (*Délégation interministérielle à l'aménagement et à la compétitivité des territoires*)⁵⁸ on 12 July 2005 as one of six international clusters in France.⁵⁹ After joining forces in 2000 to set up “Aerospace Valley” (the association in charge of management of the cluster activities), the two regions expect to generate some 40 000 new jobs in the next twenty years.⁶⁰

Indeed, Midi-Pyrénées is the leading centre of excellence in Europe for aeronautics and space technology and one of the leading centres for embedded systems. Together with Aquitaine, the region brings together 94 000 employees in more than 1 200 establishments, including 8 500 employed in research in the aeronautics and space industry. In addition, more than 550 subcontractors (employing 32 000 people) are active locally in this field. Toulouse, the world headquarters for Airbus, is also the world's leading test centre for aeronautics structures and materials. Twenty aeronautics constructors, with around 27 000 employees, are clustered in and around Toulouse. The main companies are Airbus, ATR, Latécoère, EADS Socata, Ratier-Figeac, Liebherr Aerospace and Thales Avionics. In addition, in the space industry, Toulouse is a key production and development site for the Galileo programme and its applications. Midi-Pyrénées is the leading region in Europe for space technology, telecommunications, meteorology and climatology. Ten establishments are directly active in spacecraft construction (which generates approximately 8 600 jobs) and over 150 (approximately 12 000 employees) are supporting spacecraft construction. The main companies are Alcatel Space, EADS Astrium, Intespace, Spot Image, CLS, Météo France, SCOT and GEOSYS. Finally, a number of connected fields of research are specific to Midi-Pyrénées, covering topics such as the sciences of the universe, Earth observation, astronomy or the environment. Meteopole (the meteorology site) and the Midi-Pyrénées Observatory of the University Paul Sabatier are in fact located in Toulouse.

Over the years, development in the aeronautics and space industries has been the driving force behind growth in IT, electronics and telecommunications in Midi-Pyrénées. Today the region is a major player in ICT development in France. Altogether, this evolution of the aeronautics and space cluster has created 15 000 new jobs in the region over the last 15 years. Today Midi-Pyrénées is the biggest employment pool in Europe in the fields of aeronautics, space and embedded systems.

Midi-Pyrénées has also been awarded the Cancer-Bio-Health Cluster quality label by the DIACT. By taking a comprehensive approach to cancer research, this cluster has two goals. The first is economic, aimed at creating new wealth and new jobs. The second is humanitarian, with the objective of beating back the illness and reducing inequalities in access to preventive and curative treatment.⁶¹ Activities around this cluster can be broadly summed up as follows:⁶²

- health-care industries: 130 companies providing approximately 9 000 jobs;
- biotechnologies: 63 companies (including 36 start-ups) with some 300 employees;
- the food and health sector: 30 companies providing approximately 1 100 jobs; and, finally,

- the pharmaceutical industry which employs 4 600 persons in the region.

In addition, on the academic side the three universities, four engineering schools and two doctoral schools involved provide human potential broadly adding up to 15 000 students and 500 PhD students in life sciences, medicine, chemistry and pharmacy.

Several international groups involved in life sciences are active in the region, in particular Pierre Fabre, which is the leading dermocosmetics laboratory in Europe and the second largest independent pharmaceutical group on the French market. Pierre Fabre employs 3 100 persons in Midi-Pyrénées. Sanofi Aventis (the third largest pharmaceutical group in the world) has sited its largest research centre in Europe in Midi-Pyrénées, employing 800 people. Further firms play a crucial role in the region in this industry: Nutrition & santé (450 employees in Midi-Pyrénées); SYNGENTA (470) and MERIAL (350). Finally, Midi-Pyrénées is the leading region in France for seed breeding and production.

3.1.3 The regional economy in the international context

Midi-Pyrénées is the leading region in France in terms of trade surplus. In 2005 the region's exports totalled more than €21 billion and far exceeded its imports (approximately €13 billion), as in previous years.⁶³ The export growth rate in Midi-Pyrénées is more than twice the French national average. In absolute terms, Midi-Pyrénées is the fifth exporting region in France, but only the 11th importing region.

The structure of the goods and services exported perfectly reflects the high-tech orientation of the region's economy: more than 70% of the exports are related to aeronautics and space. Agro-food products accounted for less than 6% of exports from Midi-Pyrénées in 2005. The principal destinations of exports are: Germany (first in 2004), the USA (first in 2005), Spain, China and the UK. The strongest relative increases recorded in 2005 were in exports to India and Japan.

The pattern of imports reveals a kind of symmetry with exports: 60% are related to aeronautics and space and 6% to the agro-food sector. The main countries exporting to Midi-Pyrénées remained the same in both 2004 and 2005: Germany, the USA, the UK, Spain and Italy. Both the region's imports and its exports grew over the period 2004-2005.

Regarding FDI, Midi-Pyrénées is ranked fourth region in France for receiving international investment.⁶⁴ On average, over the period 2000-2005 some 50 international investment projects were performed each year in Midi-Pyrénées. In 2005, 62 projects were completed (corresponding to investment of €350 million). FDI is assumed to account for approximately one third of all investment made in Midi-Pyrénées. 80% of the international investment is in aeronautics, space and ICT activities. The top investors are multinationals, such as EADS and AIRBUS (i.e. combining capital from several European countries, including France), followed by companies from the USA, Germany, the UK and Belgium. In 2005, 370 foreign-owned establishments could be identified in Midi-Pyrénées, employing almost 60 000 persons.

Recently, new establishments have been generating fewer jobs in proportion to the volume invested. This trend is assumed to reflect the opening of representations, company headquarters and R&D centres, employing workers with above-average skills.

3.1.4 The local financial system

Regarding venture capital activities, the IRDI (*Institut Régional de Développement Industriel de Midi-Pyrénées*) is the main financial player in the region. The IRDI was founded in 1981 on the initiative of Alain Savary, who was President of the *Conseil Régional de Midi-Pyrénées* at that time, in order to support development of capital stock in small and medium-sized enterprises in the region and to integrate private initiatives. The IRDI has the legal status of an IRP (*Institut Régional de Participations* i.e. a regional venture and development fund). With its own capital stock of €95 million it is the biggest IRP in France.⁶⁵ The IRDI intervenes mainly – but not exclusively – in Midi-Pyrénées (it also holds shares in firms located, in particular, in the neighbouring regions of Aquitaine and Languedoc-Roussillon). Since 1981 the IRDI has invested more than €200 million. The cumulative portfolio of investments made by the IRDI over the years is displayed in Table 8.

The level of funding invested by the IRDI generally varies between €200 000 and €4 million. The capital stock provided by the IRDI takes the form of shares or of bonds convertible into shares. The distribution of investments made by the IRDI, by sector of activity of the firms concerned, is shown in Table 9.

In addition, in cooperation with other private and public partners, the IRDI contributes to two development funds with a specifically regional orientation (i.e. for South-West France, not just Midi-Pyrénées, but also Aquitaine and Languedoc-Roussillon).⁶⁶

Furthermore, a specific seed fund, called FAM (*Fonds d'Amorçage*) Midi-Pyrénées, is intended principally for start-ups emerging from the regional incubator (cf. section 2.1.2). The fund started in 1999 with an initial capital endowment of €4.33 million and its investments are generally limited to €400 000. The firms concerned are typically young (in existence for less than two years) and high-tech-oriented. Between 1999 and 2005 FAM invested in 13 different start-ups.

Midi-Pyrénées Création (MPC) is a further investment fund, created in 1996 on the initiative of the *Conseil Régional de Midi-Pyrénées*, in collaboration with the eight *départements* making up the region (Ariège, Aveyron, Haute-Garonne, Gers, Lot, Hautes-Pyrénées, Tarn and Tarn et Garonne).⁶⁷ MPC was conceived mainly as a tool to support young enterprises (under seven years of age) applying the philosophy of “proximity venture capital” (“*capital risque de proximité*”). The investments made by MPC range from €15 000 to €150 000 and aim at strengthening the capital endowment of the firms supported by taking a minority holding. One specific feature of MPC is that investments are targeted exclusively outside the Toulouse area, which demonstrates the willingness to compensate for the imbalance by favouring local investment. Between its foundation in 1996 and June 2005, MPC invested €6.2 million in 132 different firms.

More recently, the decision taken in 2006 by ACE Management to open a branch in Toulouse can be interpreted as proof of the attractiveness of Midi-Pyrénées for national venture capital operators.⁶⁸ At national level, ACE Management is running seven different specialised venture funds, with a combined capital endowment exceeding €200 million. Investments are strongly oriented towards high-tech activities, particularly fields such as the aeronautics and space industries, weapon systems, etc. but also biotechnologies and ICT. Finally, some smaller players can be identified who voluntarily limit their activities to a very local scale within Midi-Pyrénées (mostly a single *département*) and whose investments most often complement the activities of bigger investors (cf. Table 10).

Concerning the level of activity of business angels in Midi-Pyrénées and the attractiveness of the region for this category of funder, local interviewees clearly indicate that numerous investments have been made over recent years by this type of private investor. Nevertheless, no official information or publicly accessible documents can be found on this subject, as is usually the case with business angels. Although the different stakeholders recognise that investments by business angels are quite common in Midi-Pyrénées, no clear picture could be formed of their origins and profiles; business angels seem either to be local entrepreneurs willing to diversify their investment portfolios or else to be attracted from the national and even international levels.

All in all, considering the weaknesses commonly affecting the French economy as a whole with respect to innovation funding, i.e. the underdevelopment of venture capital for historical and cultural reasons (cf. Lachmann, 1992, 1993 and European Commission, 2005), and even though progress has been observed since the 1990s, the supply of both early-stage and high-tech-oriented venture capital is still generally low in France compared with the USA. Nevertheless, Midi-Pyrénées has one of the most dynamic local financial systems in France.

3.2 Policy context

3.2.1 Policy objectives

The strategic orientation of regional development is directed towards economic development and job creation. The *Schéma régional de développement économique* has four general strategic lines of action: (i) sustainable growth of the region; (ii) growth of the region's production system; (iii) the international dimension; and (iv) monitoring and evaluation at regional level. Among others, these lines of action refer to the general economic model of the region, including suppliers and sub-contractors, and to the different development phases (start-up, establishment, development, growth and corporate descent) and different fields of activity: industry, handicrafts, commerce and services (cf. Région Midi-Pyrénées 2006). The recent update of the objectives set for the *Conseil Régional de Midi-Pyrénées* highlights four main dimensions, according to the latest declaration by the region's President, Mr Malvy:⁶⁹

- Innovation support (together with OSEO-Innovation): a regional fund with an initial capital endowment of €6 million will be set up. The region and the State will each finance 50% of the capital endowment.
- Business start-up and support for corporate descent. The regional authorities expect to allocate €1.2 million to this task in 2007.
- Specific accompanying measures for selected sectors. In particular, €8 million should be allocated to action related to the region's competitiveness clusters.
- Strengthening of international activities (specific financial support not yet communicated).

More generally, in 2007 the *Conseil Régional* expects to mobilise €42 million for economic development in the region, of which €17 million should be channelled directly to SMEs.

3.2.2 Policy instruments

Currently, the economic support measures deployed in Midi-Pyrénées can be broadly divided into the following categories:⁷⁰

- preparing and accompanying business start-ups and succession (corporate descent);
- accompanying the development of SMEs with tangible and intangible investments;
- specific support for creation of new jobs.

The measures mostly take the form of reimbursable loans or subsidies covering 50% to 80% of the expenses involved (with set financial limits, depending on the type and size of companies). The activities covered by the subsidies and loans include feasibility studies, capital endowment, financial guarantees, international prospecting and export support, tangible and real estate assets, advice and audits by consultancy firms, etc.

At operational level, the structure of the main economic support measures focusing specifically on "technology transfer, innovation and research" (using the label employed by the Midi-Pyrénées regional authorities, i.e. *transfert de technologies, innovation et recherche*) is described as follows by the *Conseil Régional*:

- dissemination and technology transfer, encompassing notably tools such as ATOUT (Aide à la Diffusion Technologique) and FRATT (Fonds Régional d'Aide au Transfert de Technologies);
- innovation in SMEs (feasibility studies, support related to international patenting, etc.);
- innovation-related collective support for firms (RRRT: Réseaux Régionaux de Recherche Technologique).

Since support for research, development, technological success and innovation can touch several policy areas, Exhibit 2 gives an overview of policy areas, except research and innovation policies with a possible impact on the R&D capacity of regional stakeholders. It

shows that policies directed towards the general framework conditions in the region, education, qualifications, etc. can have considerable effects on the region's innovation capacity.

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

Policy areas	Policies complementary to RTD instruments affecting the policy area*	Effects on R&D capacity in the region
Improving R&D governance	<p>Decentralisation: Transfer of powers to the regional level; definition of R&D activities in the CPER. Also decentralisation of organisations, e.g. OSEO anvar (former ANVAR), now one of the leading players at regional level whose powers have been widened from industrial business start-ups and innovation to application of research results, innovation support and industrial growth.</p> <p>New governance models following the 2006 <i>Loi de programmation pour la recherche</i>: focus on research and on cooperation with education and with industry.</p>	<p>Regions decide autonomously about their innovation and R&D budget (however, most R&D is financed by the French government, cf. European Commission 2006a: 9).</p> <p>Regions have powers over education, training and research, as well as regional planning, including economic development.</p>
Creating an innovation-friendly environment	Facilitation of access to finance for firms (funds, credit, etc.), expert support (incubators, <i>technopoles</i> , networks, etc.), support for patenting, design, market access, etc. and provision of information.	Direct and indirect support for firms in the region and their R&D activities, business start-ups and application of their research results.
Developing human capital	Education policy was initially under the responsibility of the central State, but has been decentralised. In Midi-Pyrénées the <i>Plan Régional de Développement des Formations Professionnelles 2007-2011</i> was launched in 2006. The main objectives are to improve access to professional qualifications, to develop professional qualifications and to support conversion. Furthermore, Midi-Pyrénées is the first French region to have established <i>Maisons communes emploi-formation</i> in order to link employment, education and the local economy.	Transfer of powers to regional level allows better matching of qualifications to the needs of firms in the region.
Networking, co-location and clustering measures	<p>The general aim of the <i>Pôles de compétitivité</i> concept is to strengthen the competitiveness of French industry. This should be achieved by developing interactions between industry, research and education.</p> <p>The <i>Conseil Régional</i> supports interregional cooperation (with Aquitaine and Provence-Alpes-Côte d'Azur) on joint research projects.</p>	<p>Preparation of a proposal and awarding of <i>pôle</i> (cluster) status leads to closer collaboration and networking between regional stakeholders and to pooling of expertise.</p> <p>Networking with stakeholders from neighbouring regions may pool expertise and contribute to building up "critical mass".</p>
Knowledge and technology transfer to enterprises	Knowledge and technology transfer are covered by several policy measures, for instance by the regional delegations (DRRT and DRIRE). The DRRT are under the Ministries of Education and of Research and Technology whereas the DRIRE are responsible for implementing the policies of the Ministry of Economic and Financial Affairs and Industry.	The knowledge and technology transfer infrastructure contributes support and services covering the whole range of activities related to an innovation project. This includes provision of information, searches for partners, access to financial resources, support for preparation of proposals, etc.

Policy areas	Policies complementary to RTD instruments affecting the policy area*	Effects on R&D capacity in the region
Research collaboration between public research organisations and the private sector	See above, for instance the <i>pôle de compétitivité</i> (competitiveness cluster) measure. In order to support technological development and provide incentives for public laboratories to develop new fields of technological research, the <i>Conseil Régional</i> selects projects with reference to the economic and social goals. Networks including at least one firm or socio-economic partner are selected.	Research collaboration enhances networking activities between public and private partners, leading to knowledge flows and therefore to (i) incentives and ideas for new research projects and (ii) provision of (fundamental and applied) knowledge that can be incorporated in innovation projects. The efforts by the <i>Conseil Régional</i> put the emphasis on those goals, focusing on the applied aspect of research and on market demand.
Supporting public research	The regional research strategy is built around three lines of action: (i) to strengthen the national and international position of the region's research capacity; (ii) to foster interdisciplinarity of scientific expertise; and (iii) to apply research, both socially and economically. These lines aim at integrating development of the whole region (consisting of clusters of excellent research and industries on the one hand and the part of the region shaped by agriculture on the other). Enhancement of public financial support for research (increase of 25% in CPER 2000-2006 compared with previous CPER). Support for research networks and preparation of proposals for European Framework Programmes. Concentration of support for research under the CPER on six thematic fields in order to favour interdisciplinarity.	The regional policy is focusing on the regional, national and international levels. This fosters the national and international competitiveness of the RTD in the region and also enables regional stakeholders to gain access to and appropriate knowledge from outside the region. Furthermore, the policy measures aim at greater intra-regional integration in order for the whole region outside the Toulouse area to benefit from the region's success.
Financial incentives for R&D in the private sector	<i>Bons de Souscription de parts de Créateurs d'Entreprises</i> (BSPCE): capital bonds offered (at a set price) to researchers, engineers and managers with the advantage of high potential for capital gains. Further economic measures taken at regional level to link firms to the scientific potential of the region: incubators, seed capital funds (<i>fonds d'amorçage</i>) and risk capital.	Researchers, engineers and managers can benefit from these bonds and identify closely with their firms. Further financial measures help to overcome financial barriers related to (risky) innovation projects. They aim at facilitating decisions by firms to engage in innovation.

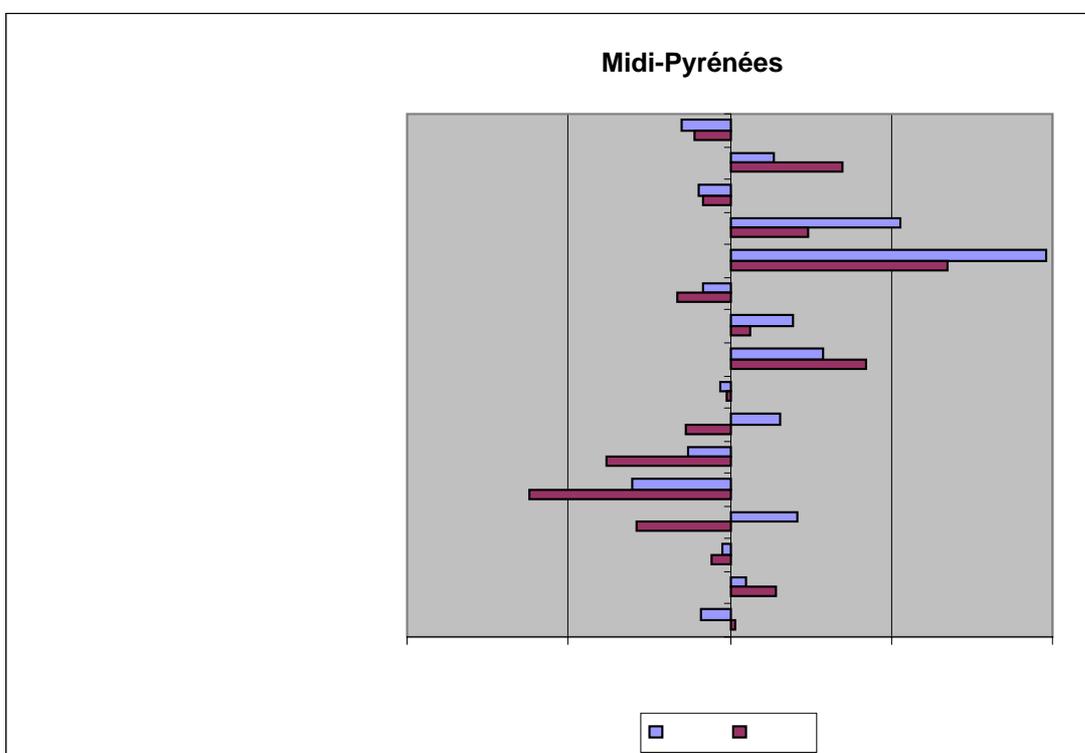
3.3 Conclusions

Compared with the national level, Summary Graph 2 shows the downward trend in the value added by agriculture and fishing and by mining and quarrying. On the other hand, the value added in construction increased over the time-span considered. While the unemployment rate is below the national level, the long-term unemployment figures are less favourable. Furthermore, the region's GDP per capita is below the national average. With regard to R&D activities, the most striking development is the growth of employment in high-tech services. Over the same period, employment in manufacturing has decreased.

Midi-Pyrénées can be described as consisting of a metropolitan area (Toulouse), surrounded by a highly rural region. The industrial structure mainly relies on agriculture and food

processing, on the one hand, and on the aeronautics and space industries on the other. The strengths of the economic activities in Midi-Pyrénées are inextricably linked to its high-tech orientation, which is in line with the region's knowledge creation potential. This is particularly true of the aeronautics and space industries and also of the health-care and biotechnology industries. Today Midi-Pyrénées is the biggest employment pool in Europe for aeronautics and space activities and has one of the most impressive concentrations of resources on health-care and biotechnologies in France. In addition, Midi-Pyrénées offers a business-friendly environment which benefits from business start-up rates higher than the national average. Finally, Midi-Pyrénées is a strongly export-oriented region (the top region in France in terms of trade surplus), whose exports can be classified as R&D-intensive, since 70% of them are products related to the aeronautics and space industries.

Summary Graph 2: Comparison of the economic structure of Midi-Pyrénées with the economic structure of France



Note: Long-term unemployment, unemployment rates in 1999 and 2003; VA shares 2001, 2003

In terms of regional weaknesses, the remaining traditional manufacturing and agricultural activities clearly face severe difficulties due to international competition. The concentration of a high share of the region's resources and development potential in Toulouse leads to a contrasting situation, where a large part of the region must be considered highly rural peripheral areas. The whole level of regional activity is strongly influenced by and dependent on aeronautics and space activities, notably due to the importance of local suppliers' networks. In this respect, the business cycle for AIRBUS is emblematic for the region. Furthermore, in comparison with the USA for instance, the region seems to suffer, like most French regions, from a relative underdevelopment of venture capital capacity, even if recent trends indicate some improvement in the situation in France in this respect. Finally, the public support infrastructure appears to be handicapped by a lack of transparency due to the large numbers of stakeholders and levels of action. The moves currently in progress are intended to make the economic development instruments more efficient at regional level.

4 Conclusions

4.1 Assessment of the RIS

The analysis of the strengths and weaknesses must be set in the context of the national science and technology framework.⁷¹ First of all, it must be remembered that in France there is generally a stronger focus on science than on technology and that the Île-de-France region predominates distinctly.⁷² However, Midi-Pyrénées is one of the regions of France that has benefited from the decentralisation measures of the Government: “Globally it can be said that France is yet encountering difficulties for departing from its State-centred and State-piloted model relying on public research dominated by large research programmes, big research organisations and defence and private research concentrated on a small number of scientific and technological areas and firms (*“champions nationaux”*) located mainly in Île-de-France. (...) If there has been a progressive geographical redistribution of R&D activities, in particular public R&D linked to universities, outside Île-de-France, RTDI activities remain concentrated in a few attractive regions (Rhône-Alpes, Midi-Pyrénées, Provence-Alpes-Côte-d’Azur and Languedoc-Roussillon) which encounter difficulties to turn their R&D potential into high-tech manufacturing industries” (European Commission 2006b: i).

Trying to answer the question of how far Midi-Pyrénées has established an RIS, first of all Cooke and Memedovic (2003, p.14) underlined that “It is important to bear in mind the fact that regional innovation systems are unusual in the sense of not being present in many countries, and that where they exist or have at least some key characteristics of systemic interaction focused on innovation, they are diverse in nature.” Secondly, in the case of France, public research is mainly financed by Government expenditure. At regional level, the *Conseils Régionaux* develop the research strategy for their region (cf. Brugarolas, no year indicated). Research has been developed as a regional economic development factor since the 1960s in Midi-Pyrénées where three universities and other higher education organisations have been established. Up until the last decade the regional authorities had played a rather limited role. As a result, a certain lack of regional innovation governance systems and strategies could be observed in the past, “... which is now a main challenge considering the current piling-up of innovation actors at the regional level” (European Commission 2006b: i).

The most distinctive characteristic of Midi-Pyrénées as an RIS is the domination of science and innovation by just one major industry: aeronautics and space, with strong links with suppliers in the region and with public or private research laboratories and higher education. The region attracts migrants from Île-de-France and northern France and has a relatively young population. Its performance on public knowledge-related indicators (large universities and major further research organisations) is above-average. Furthermore, research activities are highly concentrated in Toulouse. Trying to analyse Midi-Pyrénées as a regional system, five main observations can be made:

- The story of Midi-Pyrénées as an RIS starts with the willingness of the central State to deconcentrate powers over the aeronautics and space sector and to move expertise away from Île-de-France (mainly during the 1970s and 1980s). “The characteristically dirigiste actions of the central government played a key role in the early development of the Toulouse local innovation system (...) These actions boosted industry and employment in Toulouse” (Simmie et al., 2004, p. 541). The region’s economy took on a systemic character mainly thanks to the expansion, over time, of networks of local suppliers and the intensification of links with the academic world.
- Historically for the past decade the regional trend towards science-related activities can be summed up as a shift from a high-tech monoculture (aeronautics and space) to diversification (notably in the form of emergence of biotechnologies and health-care as fields of excellence).
- The resilience of the system was demonstrated by the AZF crisis in 2001, as it will most probably be once again by the current difficulties of AIRBUS in the light of the degree of mobilisation of the stakeholders concerned.

- A policy consensus exists on research and innovation issues between left-wing elected representatives and executives (who control the regional authorities) and the right wing (who control the Toulouse area).
- The numerous local start-ups, stemming notably from public research institutions, can be interpreted as proof of the efficiency of the system in terms of economic take-up of the knowledge generated locally.

Exhibit 3: Strengths and weaknesses of the regional innovation system

	Strengths	Weaknesses
Knowledge creation capacity	Large higher education organisations and research laboratories (such as the CNRS, INSERM, INRA, CNES, ONERA, etc.) and more than 100 000 students plus high-tech companies.	Strong concentration of research in Toulouse. "Urban area system" rather than regional system.
Knowledge dissemination capacity	Numerous start-ups.	
Knowledge absorption capacity	Highly qualified workforce.	
Interactions between main stakeholders	Regional successes in national clusters and network competition: <i>pôles de compétitivité</i> and <i>Réseaux Thématiques de Recherche Avancée</i> .	
RTD governance capacity	Support for regional innovation governance by (i) improving regional governance with the foundation of <i>Midi-Pyrénées Innovation</i> and (ii) supporting inter-regional networks and action to structure and coordinate the regional economic system in the South-West (Midi-Pyrénées, Aquitaine and border regions).	
Knowledge vs. economic specialisation	World-wide excellence achieved in the aeronautics and space industries. National/European excellence in biotechnologies and health-care. Variety of excellent scientific research centres.	Excellence and diversity of scientific clusters not fully harnessed in the regional economy, since despite the development of the large industries, like aeronautics, agro-food and space technologies, the region is highly agricultural. (Challenge: research as the driving force for new industrial development.)
Economic structure	System proven to be resilient (AZF crisis and current AIRBUS crisis).	Regional economy sensitive to cyclical variations. Traditional industries (textiles, clothing, etc.) are losing ground.

4.2 Assessment of policies

Over the years in Midi-Pyrénées policies focused on RTD – together with policy concerns relating to unemployment – have been clear regional priorities. Nevertheless, more success has been achieved on the former than on the latter. One success story illustrating the political will can be found in the changes in the “regional powers portfolio” on science and technology. In parallel, “as a result of changes from the 1950s onwards, local innovation governance in Toulouse has evolved towards a far more complex and decentralised system. It now associates public and private collaborations in planning decisions, and high-tech industry support. It can no longer be considered as a dirigiste system organised and driven by the central state level.” (Simmie et al., 2004, p. 547). In Midi-Pyrénées, a shift from a mono-culture (i.e. the strong focus on aeronautics and space science activities) to a broader spectrum of powers (notably over selected fields of biotechnology and health-care, with a particular focus on cancer) has been observed over the last 10 to 15 years. The strategic analysis underlying this evolution was based on identification of the danger of strong dependence on one main sector of activity and was clearly associated with the fear of a regional lock-in. In this respect, the region has demonstrated its ability to attract huge investments commensurate with this diversification strategy (e.g. Pierre Fabre, Sanofi, etc.).

Exhibit 4: Public policy v. strengths and weaknesses of RIS

	Strengths	Weaknesses
<i>Knowledge creation capacity</i>	High density of research institutes, higher education organisations and other research bodies. Leading region in France in terms of R&D investment (% of GDP), i.e. GERD and business R&D expenditure. This means that the strong knowledge creation capacity in the form of the high density of research organisations is supplemented by strong efforts (by the private sector) on research and development. High scientific potential.	Lack of business culture. Potential for (i) creating qualified jobs and (ii) developing an entrepreneurship culture needs to be confirmed (cf. European Commission 2006b: 41). Unemployment rate since the beginning of the 2000s: between 8.8% (2001) and 7.5% (2005).
<i>Knowledge dissemination capacity</i>	Willingness to build up a critical mass by means of more coherent support structures.	Large number of stakeholders.
<i>Knowledge absorption capacity</i>	Big efforts on R&D, including in the business sector (see above).	
<i>Interactions between main stakeholders</i>	Geographical concentration of high technologies in and around Toulouse and the (national) competitive cluster combined with the RTRA approaches foster interaction and cooperation. Generally, the French innovation systems are evolving from a rather “dirigiste” approach to a networked innovation governance model.	
<i>RTDI governance capacity</i>	Policy coherence and political consensus on RTD issues between right- and left-wing elected representatives and executives.	Large number of (mainly public) stakeholders; however, recent efforts to make the support structures more coherent.
<i>Economic structure</i>	Willingness to foster economic development outside the Toulouse area.	Large number of stakeholders.

Finally, the ability to seize “windows of opportunity” reveals not only the willingness of stakeholders in the region to support development of Midi-Pyrénées but also the coherence of their action. The most crucial “windows of opportunity” in this respect are most probably the launching of the *pôles de compétitivité* (competitiveness clusters) exercise at national level, where Midi-Pyrénées has been one (if not the) winner of the competition for State financial resources. The consequences are multiple, but the clusters developing in Midi-Pyrénées – and the resources allocated to support them – have and will have a positive impact in terms of: critical mass, visibility of strategic choices and multi-level governance aptitude in Midi-Pyrénées. One stakeholder suggested the hypothesis that the success of Midi-Pyrénées regarding this evolution in comparison with most other regions of France could be tracked back, at conceptual level, to the eagerness of different stakeholders to adopt an attitude corresponding to the “triple helix” approach⁷³ bringing together three different worlds and ways of thinking: academia, business and policy-making.

4.3 Policy challenges

Beyond broad regional policy issues, which have remained more or less constant over time, such as the attractiveness for FDI or the fight against unemployment, Midi-Pyrénées currently faces three specific challenges regarding RTD. First of all, in order to sustain a high level of excellence in core scientific expertise, it is crucial for this region to maintain its efforts to stay at the leading edge in science-based activities and to pursue the development of high-tech manufacturing, entrepreneurship and research-driven clusters. In this respect, reinforcement of multidisciplinary expertise along with stronger integration of local stakeholders appear to be the key issues according to interviewees in Midi-Pyrénées. Secondly, as pointed out by previous analyses (cf. European Commission 2006b), the local innovation culture has been able to benefit from intensified efforts targeted on establishing and developing high-tech and innovative businesses, on easier access to financial resources (beyond seed capital), on developing high-tech services and on general availability of entrepreneurship training. Finally, even if for the time being it is difficult to determine exactly how far Midi-Pyrénées can be considered to have an RIS in the strict sense (as defined, for example, by Braczyk/Cooke/Heidenreich 1998), it seems clear that the initiatives taken on science and innovation do not follow any single logic but, instead, correspond to a multi-level strategy or at least to a multi-level presence. In some cases the local (Toulouse area) or regional scale is the relevant dimension for action. In others cooperation with neighbouring regions (usually Aquitaine) lies at the core of the initiatives, whereas in certain situations, national or European networks set the framework for joint efforts on science and innovation. In this respect, as underlined by some interviewees, Midi-Pyrénées currently faces a need for new strategies for internationalisation, notably in the form of reinforcing partnerships with regions in the UK, Germany and Spain. Under these circumstances, there can be little doubt that Midi-Pyrénées could make a major contribution to establishment and development of the European Research Area (ERA).

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List of interviewees

- | | |
|---|-----------|
| - Mr Xavier Toussaint (<i>Conseil Régional de Midi-Pyrénées</i>) | 8.3.2007 |
| - Mr Pierre Benaïm (<i>Conseil Régional de Midi-Pyrénées</i>) | 9.3.2007 |
| - Mr Elisée Brugarolas (<i>Réseau universitaire européen de Toulouse</i>) | 12.3.2007 |
| - Mr Jean-François Marfaing (<i>DRIRE Midi-Pyrénées</i>) | 12.3.2007 |
| - Mr Gérard Goma (<i>DRRT Midi-Pyrénées</i>) | 12.3.2007 |
| - Mr Frédéric Deleuil (<i>OSEO ANVAR Midi-Pyrénées</i>) | 12.3.2007 |
| - Prof. Jean-Alain Héraud (Université Louis Pasteur, Strasbourg I) | 15.3.2007 |

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 covered: Two years, i.e. 1995 and 2004 or the closest possible years.

Index: Country = 100.

Source: Eurostat, 2006.

Summary Graph 1: Key indicators of development of the region's knowledge base in comparison with the whole country

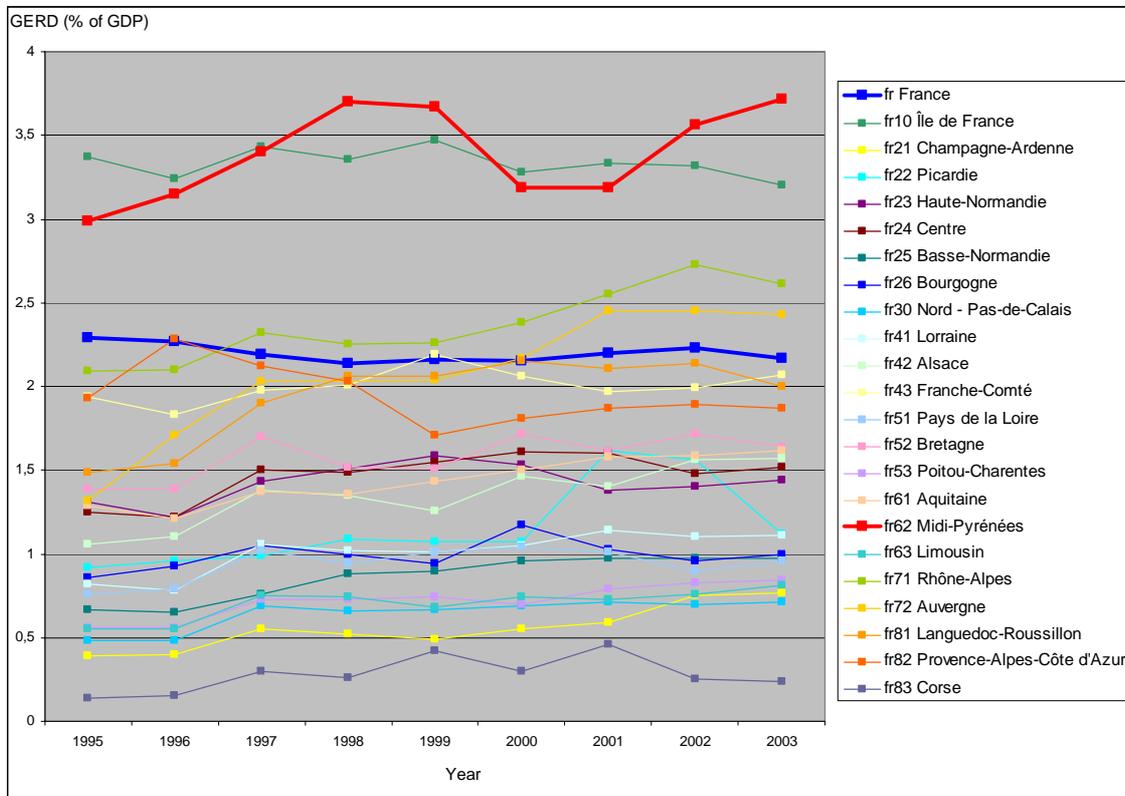
1. Total intramural R&D expenditure as a percentage of GDP
 - GERD
 - BERD
 - GOVERD
 - HERD
 - PNPERD
2. R&D personnel as a percentage of total employment
 - All sectors
 - Business
 - Government
 - Higher education
 - Private non-profit
3. Human resources in S&T as a percentage of labour force
4. Patent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

Summary Graph 2: Key indicators of the region's economic structure and development

1. GDP per capita at current market prices
2. Long-term unemployment rate (based on total unemployment)
3. Unemployment rate (%)
4. Value-added at basic prices (EUR million): Share (%) of sectors in total
 - Agriculture/fishing
 - Mining and quarrying
 - Manufacturing
 - Electricity, gas and water supply
 - Construction
 - Services (excluding 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 and 73
 - Total less-knowledge-intensive services: NACE Rev. 1.1, codes 50, 51, 52, 55, 60, 63, 75, 90, 91, 93, 95 and 99

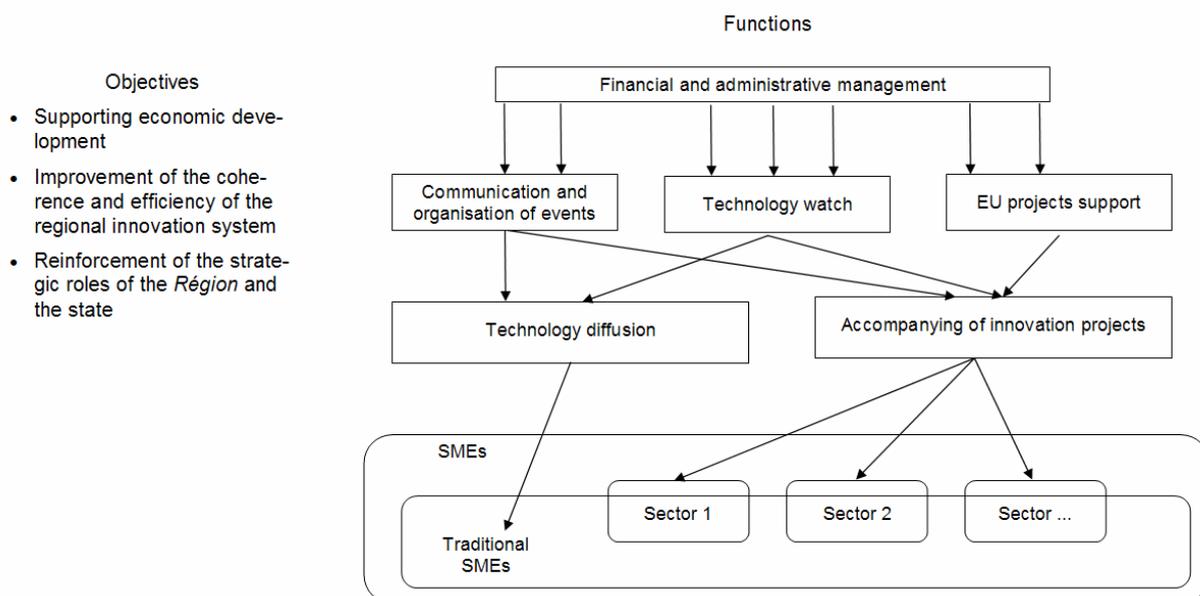
Annex 3: Tables and Figures

Figure 2: Total intramural R&D expenditure (GERD) in French regions, 1995-2003 (all sectors)



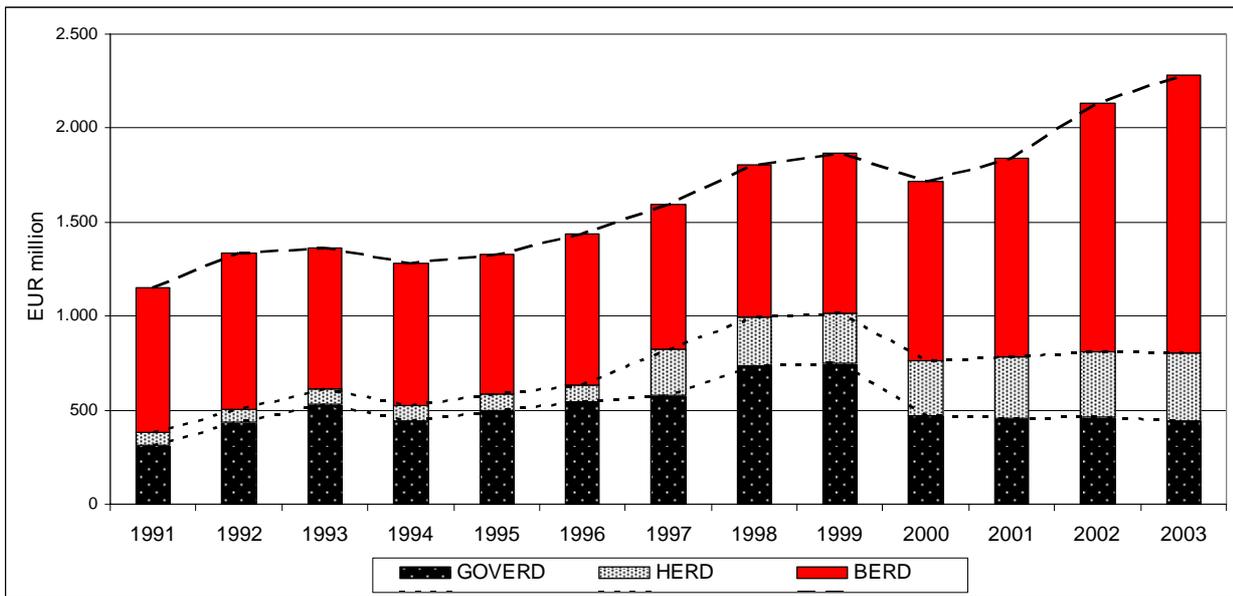
Data source: Eurostat regio database

Figure 3: Objectives and functions of MPI



Source: Adapted from "Nouveau dispositif de soutien régional": www.recherche.midipyrenees.fr, 2005

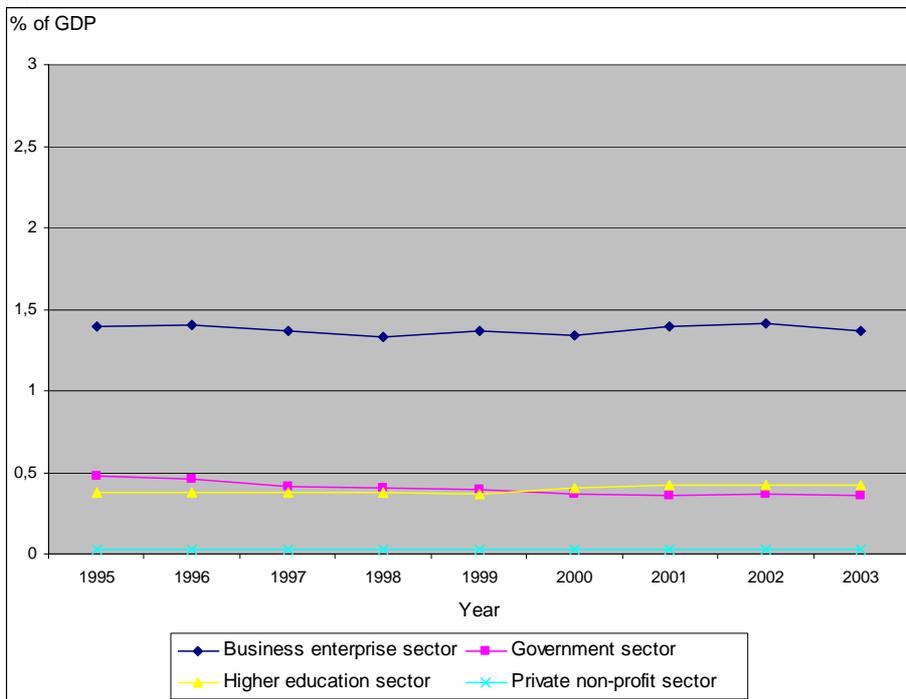
Figure 4: Development of GOVERD/HERD and BERD in Midi-Pyrénées, 1991-2003



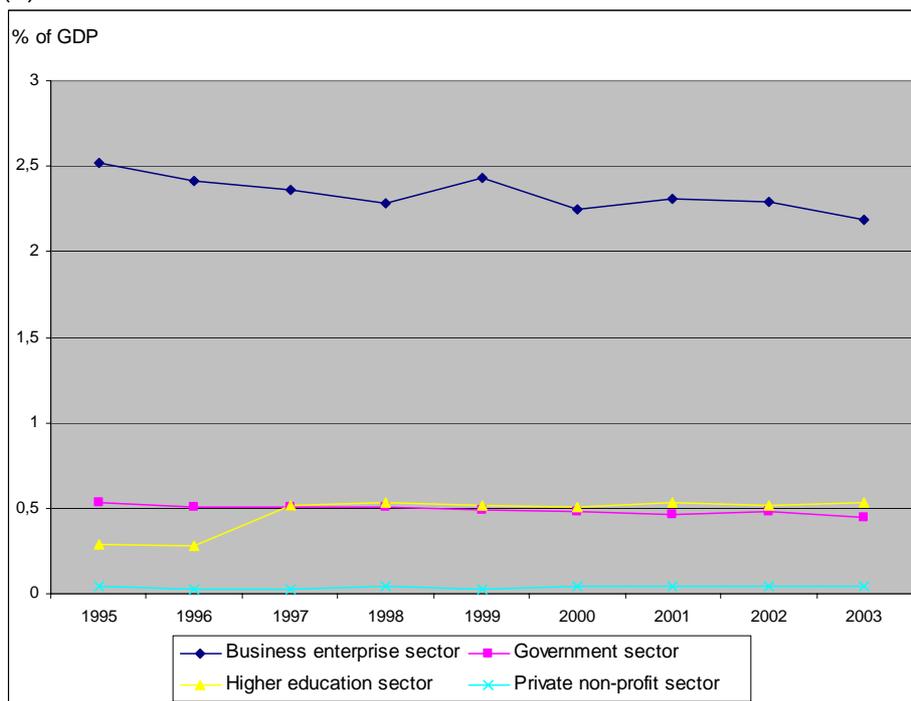
Source: Eurostat, own diagram

Figure 5: Total intramural R&D expenditure (GERD) as % of GDP by sector in (a) France, (b) Île-de-France and (c) Midi-Pyrénées, 1995-2003

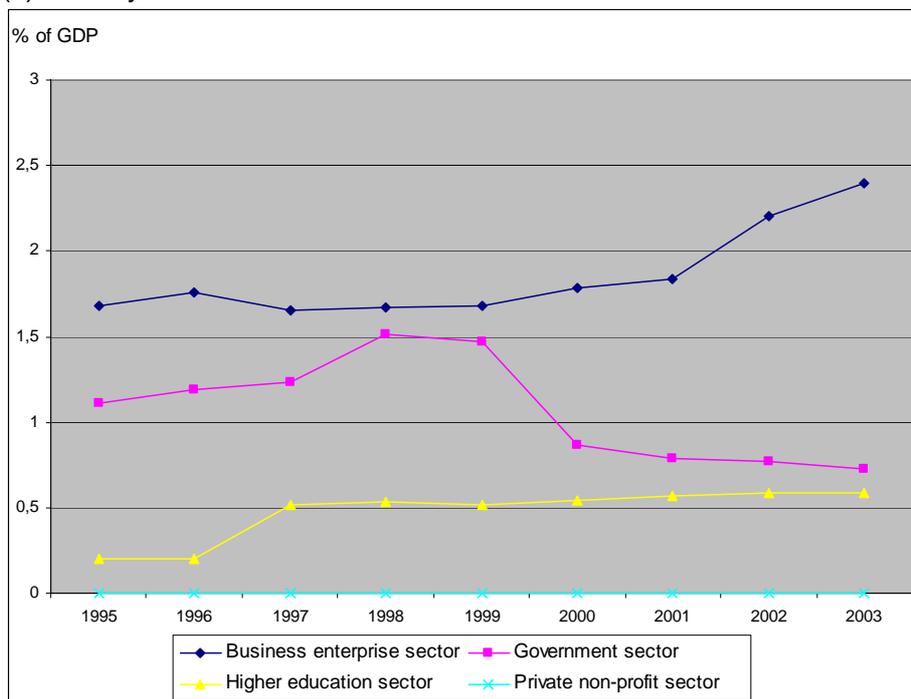
(a) France



(b) Île-de-France



(c) Midi-Pyrénées



Data source: Eurostat regio database

Table 1: Business R&D expenditure

Region	Private business expenditure on research and development Shares in sectors of activity (%)					
	Aerospace, electronics	Pharmaceuticals , chemicals	Transport, capital goods	Other industries	Services	Total
Midi-Pyrénées	55.9	19.7	14.0	6.3	4.1	100.0
Île-de-France	35.0	22.1	21.6	11.8	9.5	100.0
Rhône-Alpes	29.6	22.5	23.3	12.1	12.5	100.0
Provence-Alpes-Côte d'Azur	68.0	16.2	2.3	4.9	8.6	100.0
France	33.9	23.3	20.7	13.2	8.9	100.0

Source: Adapted from INSEE Midi-Pyrénées (2002: 5): http://www.insee.fr/fr/insee_regions/midi-pyrenees/rfc/docs/6P-n57.pdf

Table 2: Origins of incubation projects in Midi-Pyrénées in 2003

ORIGIN	Amount	Proportion
Research institutes (CRITT, IRIT, etc.)	4	10%
Research organisations (CNRS/INSERM)	9	21%
Engineering schools	6	14%
Universities	6	14%
Others	17	40%
TOTAL	42	100%

Source: www.incubateurmipy.com

Table 3: Active population by economic sector (31/12/2003)

Sector	Midi-Pyrénées	The region's share in France (%)
Agriculture	65 200	7.5
Industry	161 000	3.9
Construction	71 600	4.8
Tertiary	771 200	4.8
Total	1 069 000	4.3

Source: INSEE/Midi-Pyrénées Expansion, 2006

Table 4: Distribution of firms by size (all sectors)

Employees	Midi-Pyrénées (%)	France (%)
0	50.8	49.75
1–9	41.9	41.9
10–499	7.3	8.3
500 and more	0.004	0.006

Source: INSEE/Midi-Pyrénées Expansion, 2006

Table 5: Size distribution of firms in Midi-Pyrénées (all sectors)

Employees	Midi-Pyrénées (%)	France (%)
0	50.8	49.75
1-9	41.9	41.9
10 – 499	7.3	8.3
500 and more	0.004	0.006

Source: INSEE/Midi-Pyrénées Expansion, 2006

Table 6: The 10 largest industrial enterprises (French and foreign groups)

Companies	Activity	Location (département)	Personnel in 2005
Airbus France Toulouse	Aeronautics	Toulouse (31)	11 500
Airbus (world headquarters)	Aeronautics	Blagnac (31)	4 400
Laboratoires Pierre Fabre	Health	Midi-Pyrénées	8 450
Onet Group	Industrial cleaning	Labège (31)	3 800
Siemens VDO Automotive	Automobile electronics	Midi-Pyrénées	2 850
Latécoère Group	Aeronautics	Midi-Pyrénées	2 730
Alcatel Alenia Space	Space	Toulouse (31)	2 200
3A Group	Agri-business	Midi-Pyrénées	2 000
Robert Bosch SAS	Automobile equipment	Onet-le-Château (12)	2 000
EADS Astrium	Space	Toulouse (31)	1 970

Source: Midi-Pyrénées Expansion 2006

Table 7: Number of businesses created in Midi-Pyrénées in 2005

	Number	Index (basis 100: 1993)
New start-ups	9 801	153
Reactivation	2 669	104
Transferred	1 928	66
Regional total	14 398	121
Total in France (outside Paris region)	230 002	117

Source: INSEE/Midi-Pyrénées Expansion 2006

Table 8: Portfolio of cumulative investment by the IRDI by type of operation

	Number of firms	Volume (in million €)
Creation	155	60
Development	162	94
Succession	66	38
Participation in VC funds	8	15
Total	391	197

Source: adapted from: <http://www.irdi.fr>

Table 9: Distribution of investment by the IRDI by sector of activity

Share in %	of financial volume concerned	of the number of firms concerned
ICT	21	31
Health-care and biotechnology	13	10
Chemicals and new materials	6	2
Manufacturing of consumer goods	22	24
Industrial goods and services	15	12
Other manufactured goods	6	7
Construction and transport	5	3
Others	12	11

Source: adapted from www.irdi.fr

Table 10: Further stakeholders present locally in the field of investment capital

Name	Location and area of activity (name of the <i>département</i>)
SOFIREM	Tarn
SORID	Aveyron
FILTARN/AGATE	Tarn
GERSINVEST	Gers
SDD 55	Hautes-Pyrénées

Source: own web research

Annex 4: RTD policies

National-level policies:

Title of the measure or initiative: The competitiveness clusters (<i>pôles de compétitivité</i>) initiative of the French Government.
Objectives: To mobilise the key factors for competitiveness, starting with innovation capacity.
Policy area: Industrial policy.
Main instruments and structure: (i) to support associations of different types of stakeholders on a given territory, (ii) to develop a common development strategy and (iii) to harness synergies between innovation projects. This policy measure aims at fostering initiatives taken by economic operators and academics on a given territory.
Main beneficiaries/target group: Firms, research centres and educational establishments.
Achievements or failures: This initiative provides incentives for different stakeholders in the region to collaborate and network and to develop a common vision and projects. This policy is a novelty in the general governance system in France which hitherto has been highly vertical and strongly dominated by the central State. The objectives of collaboration between regional stakeholders are to focus on technologies oriented towards markets with high growth potential and to join forces in order to create a “critical mass” with high international visibility. This measure can be described as a new type of policy which combines regional planning, innovation and industry.

(cf. <http://www.competitivite.gouv.fr/>)

Title of the measure or initiative: Cortechs
Objectives: To provide incentives for small and medium-sized enterprises to entrust a development project to a young technician, who works on the project for at least one year in collaboration with a centre of expertise.
Policy area: Research and higher education policy.
Main instruments and structure: This measure brings together three partners: a technical school graduate, a centre of expertise (university or other educational institution, technology transfer organisation or research institute) and an SME in an innovation project. During the period concerned, the graduate participating receives a qualification in management of innovation projects. The firm receives financial support (contribution to the salary of the technician) and the research centre can be reimbursed for its efforts by the Ministry of Research and New Technologies, the local authorities or the European Structural Funds.
Main beneficiaries/target group: Firms (small and medium-sized enterprises), graduate (technician) and centre of expertise.
Achievements or failures: This initiative provides incentives for different stakeholders to collaborate and network in an innovation project. It associates a young graduate, who is awarded a specific qualification, an SME and a centre of expertise which are given incentives to cooperate on the specific project.

(Cf. <http://www.recherche.gouv.fr/technologie/mesur/aides/cortec.htm>)

Title of the measure or initiative: <i>Crédit Impôt Recherche</i> : Direct R&D support for the business sector
Objectives: To enhance firms' competitiveness by supporting their R&D efforts.
Policy area: Research policy.
Main instruments and structure: Tax reduction equivalent to half of the R&D expenditure in one year. Eligible R&D expenditure includes spending on (i) human capital, (ii) materials and (iii) sub-contracting.
Main beneficiaries/target group: Businesses.
Achievements or failures: This initiative directly supports firms' R&D efforts. About 7 000 firms per year apply for this credit (about 3 200 are accepted). This initiative gives incentives for laboratories to launch research projects and gives further incentives for public and private laboratories to collaborate in joint research projects.

(Cf. <http://www.recherche.gouv.fr/technologie/mesur/cir/defaultb.htm>)

Title of the measure or initiative: Project funding by the national research agency (<i>Agence Nationale de Recherche</i>)
Objectives: To enhance the number of (private, public or joint) research projects in order to (i) create new knowledge and (ii) support interactions between public and private research laboratories.
Policy area: Research policy
Main instruments and structure: The <i>Agence</i> launches calls for proposals in different fields of research, to which laboratories and partnerships can answer. Proposals are peer reviewed and the successful proposals receive financial support.
Main beneficiaries/target group: Public and private research laboratories.
Achievements or failures: This initiative gives incentives for laboratories to launch research projects and gives further incentives for public and private laboratories to collaborate in joint research projects.

(Cf. <http://www.agence-nationale-recherche.fr/Agence>)

Regional-level policies:

Title of the measure or initiative: Foundation of <i>Midi-Pyrénées Innovation</i> .
Objectives: (i) to encourage traditional SMEs to acquire new technologies and to engage in innovation, (ii) to develop innovating firms and to identify potential innovation projects by means of collaboration between the private sector and research organisations and (iii) to organise events focusing on innovation.
Policy area: Innovation policy.
Main instruments and structure: To create a single entry point for support for innovation (by merging Adermip, 3RT and MidiTech) and for networking between research laboratories and small and medium-sized enterprises in the region.
Main beneficiaries/target group: Research laboratories and SMEs.

Title of the measure or initiative: <i>Chaires d'excellence Pierre Fermat</i>
Objectives: To provide incentives for researchers of international repute to work in the region and to support networking with stakeholders in the region.
Policy area: Regional policy.
Main instruments and structure: Financing of chairs of excellence to invite foreign researchers of high repute to the region.
Main beneficiaries/target group: Researchers (foreign and regional).