Chapter 3

Multi-level Governance of Catalonia's S&T&I policy

Introduction

Catalonia's S&T and innovation policies are embedded in a multi-level governance context. In this policy field, both EU and Spanish policy streams are significant. Catalonia must also co-ordinate across its different local governments. Local actors are increasingly making efforts to support innovation in terms of both soft and hard infrastructure. As discussed in Chapter 2, Catalonia has developed its own policies in part as a function of the objectives, policy content, resources and evaluations set by policy makers elsewhere. Given this mutual dependence, Catalonia needs opportunities to co-design, when possible, the policies originating at other levels of government. Secondly, it needs instruments to help effectively share and co-ordinate these S&T and innovation competencies. The governments of both Spain and Catalonia recognise that more co-ordination is needed to guarantee greater effectiveness in co-design and implementation in this policy field.

This chapter first highlights the importance of funding streams coming from outside of the region for Catalonia's innovation system. It then explores the influence of EU policy and instruments on Catalonia's policy approach and its innovation system actors. The Spanish policy context, and the mix of instruments that can be accessed by Catalonia's actors, is discussed. The formal roles of both Spanish and Catalan governments in terms of S&T and innovation policy is reviewed, a role sharing that has been challenged in the past but has stabilised. The different "gaps" resulting from this role sharing are highlighted, as well as the effectiveness of mechanisms for co-ordination to bridge these gaps. Finally, Catalonia's opportunities to co-ordinate in this policy field with its own local communities, as well as regions beyond Spain, are highlighted. Horizontal co-ordination among Catalan government actors is addressed in Chapter 2.

3.1. EU and Spanish S&T and innovation policy context

Catalonia's explicit strategy with respect to public financing of R&D has been to use its own resources to build research excellence so as to maximise funding receipt from EU and Spanish sources. For 1994, one calculation of publicly financed R&D accessed by Catalan actors showed a split of: 7.5% Catalan funding, 11.4% Spanish funding and 81.1% EU funding, the latter including EU Structural Funds.[1] There has been considerable growth in the levels of different sources of funding for R&D, with the exception of EU Structural Funds, and Catalonia has grown increasingly successful in attracting EU competitive research funds. The net

result is that in the mid-2000s the flow of S&T and innovation funds was approximately 4% from the EU Framework Programmes, 5% from relevant EU Structural Funds, 50% from Spanish government programmes and 41% from the Catalan government (see Table 3.1). The Catalan government figure includes funding of the share of university professor salaries associated with research duties. If those amounts were excluded, the Catalan share of spending would decline. In 2006, for example, 36% of Catalan government spending on R&D&I was for university professor salaries associated with research duties (see Table 2.7).

Table 3.1. **Public funding for S&T and innovation**

mid 2000s

Organisation or programme	Funding trend over time	Period of data	Public funding total (EUR million)	Public funding avg. annual (EUR million)	Share (%)
Catalan government[1]	Up	2004-2007	2 407	602	41%
Spain (National R&D Plan – includes CDTI)[2]	Up	2004-2007	2 917	729	50%
EU Framework Programme	Up	2002-2006	217.5	54.4	4%
EU-Regional Policy (ERDF)[3]	Down	2000-2006	445.2	63.6	4%
EU-Social Policy (ESF)[3]	Down	2000-2006	51.1	7.3	1%
Total			6 038	1 456	100%

Notes: 1. Includes all funds reported by the Catalan government across ministries for R&D&I in the annual CIRIT reports, which includes university funding. 2. Includes grants, loans and approved funds for human resources. 3. The figures, in current prices, refer to Community contributions and projects effectively executed until 31/12/2008 inside the 2000-2006 programming period. The ESF during the 2000-2006 period shares the same operational programme with the ERDF. The ESF figures introduced in the table refer to actions related to the strengthening of labour capacity in research, science and technology.

Source: OECD calculations based on various data sources (EU, Spanish government (*Memoria* of National R&D Plan), and the Catalan government (CIRIT).

An analysis of Catalan firm use of public programmes at EU, Spanish and Catalan levels of government reveals interesting findings to understand the respective roles in a multi-level governance context. Firms that receive public support from domestic sources (national and to a slightly lesser extent regional) increase the likelihood that firms co-operate with national or international partners. National and regional programmes also increase the probability that firms develop product innovations. Regional programmes

further support changes in process innovation. Firms that participate in national and international pre-competitive programmes are more likely to have patented, while firms that use other forms of intellectual property protection apart from patenting were more likely to participate in national (as opposed to international) programmes (Fernández-Ribas, 2009).[2]

EU influence on Catalonia's regional efforts

With Spain's integration in the EU in 1986, EU policy has influenced the Catalan innovation system in a number of ways. It should be noted that Catalonia had already begun to develop its own regional science and technology policies prior to 1986. The different EU regulations and sectoral policy streams have an impact on the framework conditions for firms in Catalonia. There are also over-arching agendas like the Lisbon Agenda and the Bologna Process that have an important influence on public policy and actors in the innovation system. Catalonia participates in a number of networking activities promoted by Europe. The two main EU funding sources for Catalonia's S&T and innovation actors are EU regional policy and, to an increasing extent, EU research policy.

EU agendas and networks

The EU Lisbon Agenda aims to modernise Europe to become "the most dynamic and competitive knowledge-based economy in the world". One of the two main quantitative targets is an R&D intensity of 3% by 2010.[3] Member states commit to this agenda and Spain has considerably increased public funding for R&D and innovation, which Catalonia benefits from as a leading recipient of many Spanish programmes. Regions also have an incentive to promote greater R&D investment to meet this target. The Lisbon Agenda is also serving to direct EU spending in different policy areas, such as research and regional policy.

The Bologna Process seeks to harmonise higher education systems across member states for one European higher education system.[4] In Catalonia, some universities had created foundations to offer professional training in the form of non-degree programmes and lifelong learning to overcome the rigidities in the Spanish higher education system that did not include professional Masters degrees. Implementation of the Bologna Process will therefore facilitate the development of degree programmes in Spain and Catalonia that are easier for students to have recognised in the labour market. It will also support Catalonia's efforts in attracting foreign students.

A number of different EU-related networks provide a forum for information sharing and potentially joint action with Catalonia. The Four Motors Agreement promotes joint projects on a range of themes among four leading industrial regions in their respective countries, including Catalonia.[5] A current focus is on "further strengthening of their economic, scientific and technological competitiveness in an interconnected global context" and to better access EU funds in regional and research policy streams. Catalonia participates in other trans-national networks as well (see later section). Catalonia is a member of numerous groups for sharing best practices, such as ERRIN, the European Regions Research and Innovation Network, which includes approximately 70 EU regions.

EU regional policy

For Spain, EU regional policy funds have played a key role in supporting regional innovation systems, particularly in lesser developed regions. While the overall EU regional policy budgets are going up, the share and absolute amounts to Spain are going down. Only 15.9% of the total EU funds in the 2007-2013 programming period are going to regions that are *not* in the convergence or phasing out categories. This decline in EU regional policy funding to Spain has been identified as a threat to the national innovation system given its role in S&T and innovation-related infrastructure funding in many regions (EC, 2008). The core regional policy funds to Spain (ERDF, ESF, and the new Technology Fund) declined by 31.4% between the 2000-2006 and 2007-2013 programming periods (from EUR 40.4 billion down to EUR 27.7 billion in 2004 prices).

For Catalonia, as a leading region in Spain and above average in the EU25, the decline in Structural Funds is even greater. In the latest period (2007-2013), Catalonia will receive a total of EUR 1.2 billion in 2004 prices, down 40.4% from the prior period. The 2007-2013 Plan for using ERDF funds totals EUR 679 million, on average EUR 97 million annually. One of the five axes of the plan is "knowledge economy, innovation and firm development" which will receive 53% of the funds or approximately EUR 51.4 million annually from the EU with matching Spanish funds. While not all of these funds may be considered pure R&D and innovation-related investments, this amount gives a rough benchmark of the scale of funds from this EU policy stream. The European Social Fund, approximately EUR 284 million in the latest period (EUR 40.6 million annually on average), includes some portions for entrepreneurial development. There are EU Cohesion Funds that may be used in Catalonia, but they have only an indirect impact on the regional innovation system.

Several specific initiatives targeted at regional innovation system development have been used by Catalonia. One is the RIS (Regional Innovation Strategies). The RITTS (Regional Innovation and Technology Transfer Strategies) approach was the basis for Catalonia's first Innovation Plan 2001-2004 (see Chapter 2). The process was valuable in helping shift Catalonia's approach from the "academic" research orientation to one that increasingly recognises firm demand for innovation support. The process included firm interviews to identify different innovation processes. Programmes were developed based on an innovation-project logic for firm support. International benchmarking was also part of the plan development.

EU research policy

The EU Research Framework Programmes are the guiding plans for EU research policy funding. The Seventh Framework Programme (FP), *Building the Europe of Knowledge*, runs from 2007-2013.[6] It reflects a 65% budget increase from the Sixth FP, from an annual average spending of EUR 4.375 billion to EUR 7.217 billion. Catalonia has been able to capture a growing share of Spain's total FP receipt over time, from 14.7% in the Third FP to 23% in the Sixth FP (see Table 3.2). Furthermore, Catalonia is capturing an increasing share of European spending, as the region's growth rates in receipt between the Third and Sixth FP are significantly higher than the EU as a whole.

Within the Seventh FP is the new European Research Council (ERC), and Catalonia's researchers have successfully accessed its funding streams (see Table 3.3). The programmes include ERC Starting Independent Researcher Grants and ERC Advanced Investigator Grants.[7] While the funding amounts are not at the same scale as the other EU research funding sources, they are strategic for Catalonia's goal of attracting and building its science research base. The overall EU budget in 2007 for the ERC Starting Grant was EUR 335 million and in 2008 for the ERC Advanced Investigator Grant EUR 553 million. The benefits of Catalonia's researcher attraction policies, as supported by the ICREA Foundation, are evidenced here.

Table 3.2. **EU Research Framework Programme: Catalonia**

Programme period	Years	Total budget EU (EUR billions)	Increase from prior period annual average (%)	Share of Spanish total (%)	Catalonia		
					Total received (EUR millions)	Avg annual (EUR millions)	Increase from prior period (%)
Third	1990-1994	6.60	23%	14.7%	34.4	8.6	--
Fourth	1994-1998	13.12	99%	17.7%	75.5	18.9	119%
Fifth	1998-2002	14.96	14%	20.4%	127.9	32.0	69%
Sixth	2002-2006	17.50	17%	23.2%	217.5	54.4	70%
Seventh[1]	2007-2013	50.52	65%	25.3%	86.2	86.2	59%

Note: 1. Figure for the year 2007 only.

Source: OECD calculations and data from EU, Spanish and Catalan government sources.

Table 3.3. **European Research Council grants: Catalonia**

	Starting independent research grants	Advanced investigator grants
Spain grants	33	12
% EU total	4.2%	2.7%
Catalonia grants	18	7
% Spain total	55%	58%
Recipients	-10 Catalan Research Centres -8 ICREA researchers	-3 Catalan Research Centres -6 ICREA researchers

Source: Catalan government, Ministry of Innovation, Universities and Enterprise.

Spanish strategy, programmes and funding

Evolution and current status of Spanish science, technology and innovation policy

While Spain's economic growth was strong until the onset of the current financial and economic crisis, labour productivity growth has been modest. GDP per hour worked expanded by just 0.8% per year between 2001 and 2007 – one of the lowest growth rates among OECD member countries, significantly below the OECD average of 1.7%, and far below the productivity growth realised by the best performing countries within and outside the OECD. There are several factors behind this low productivity growth (OECD, 2008a). The lower than average investments in R&D is one factor. Spain spent 1.27% of GDP on research and development in 2007, significantly below the EU27 (1.77%) and OECD (2.29%) averages.

Furthermore, the composition of R&D and innovation funding in Spain reveals some structural features that are typical of less mature national innovation systems, notably a lower than average share of R&D investment by firms', due in part to industrial structure (see Box 3.1).

Box 3.1. **Spain: R&D investment trends**

Spain spent 1.27% of GDP on research and development in 2007, significantly below the EU27 (1.77%) and OECD (2.29%) averages. While the current level of R&D and innovation represents a substantial increase from the levels of the mid-1990s (around 0.8% of GDP), and innovative capacity has increased by the strong growth in R&D personnel (which expanded by 7.8% per year on average between 2000 and 2006), Spain's overall investment in R&D and innovation is still comparatively low. In a longer-term perspective, this dampens productivity growth and reduces the potential for sustainable gains in income per capita. In addition, R&D efforts are concentrated in two regions: Madrid and Catalonia account for half of total R&D.

The composition of R&D and innovation funding in Spain reveals some structural features that are typical of less mature national innovation systems. The share of total expenditures on R&D (GERD) financed by the business sector is 47% while that financed by government at 42.5% is nearly as high; 5.9% is financed from abroad – reflecting a need for increasing participation of industry in European R&D programmes – and 4.5% from other national sources (2006). The business sector performs just 55.9% of total Spanish R&D (2007), as compared to 63.4% in the EU27 and 69.5% in the OECD – a share of industry which is much more representative of the best performing countries. While Spain has succeeded to increase the share of industry in total R&D performed, further boosting R&D and innovation in the business sector is a challenge given Spain's industrial structure. Most industries are relatively low-tech and most firms are small or medium-sized. The share of government in financing business enterprise expenditure for R&D (BERD) was 14.4% in 2006, twice the EU27 (7.2%) and OECD (6.8%) averages (not including tax incentives for R&D).

Boosting productivity growth is therefore one of the main challenges for achieving strong, sustainable growth performance in the Spanish economy. Science, technology and innovation is a key pillar in any strategy to meet this goal. Recent initiatives, including the National Reform Programme 2005, aim to boost productivity and sustainable growth through reforms in product and labour markets, higher education and human capital, investment in infrastructure and by fostering research and innovation.

The system of science, technology and innovation policy has evolved, notably after 1986[8] – the year of Spain's accession to the European Union. Over time, the portfolio of instruments of Spanish science, technology and

innovation policy has developed into a differentiated set of measures providing generic support, addressing specific shortcomings, or fostering emerging strengths in the Spanish innovation system. The European TrendChart lists about 50 such instruments. This evolution at the national level has taken place against the background of regional governments' emergence as increasingly important players in innovation, developing their own R&D and innovation policies. This co-evolution can potentially complement and magnify the impact of policies delivered at the national level but may also lead to some degree of inefficiency in the case of an inadequate interplay of, and between, different levels of government.

Spanish R&D and innovation policy continues to evolve. Successive governments have been active in approving new science and technology plans, and proposing new policy schemes, sometimes accompanied by reorganisation and redistribution of competences among ministries. Currently, the main foundations of Spain's research policy are laid out in the sixth National Plan for Scientific Research, Development and Technological Innovation (2008-2011) – complemented by the INGENIO 2010 initiative which is part of the wider National Reform Plan.

The National Reform Plan

The National Reform Plan (*Ministerio de la Presidencia*, 2005 and 2008) is a broad-based initiative launched by the Spanish government in 2005 to boost Spain's competitiveness. The National Reform Plan contains the INGENIO 2010 initiative which is designed to contribute to closing the gap in science and technology with Europe's most advanced countries. INGENIO 2010 can be seen as the main policy instrument to shift the overall policy mix towards higher quality research and innovation in the business sector. It complements the measures taken under the National Plan for Scientific Research, Development and Technological Innovation (see below). Under INGENIO, the Spanish government has strongly increased public support to R&D and innovation (allocating more than EUR 8 billion in the 2007 budget), with a view to achieving a research intensity (ratio of GERD to GDP) of 2% by 2010.

The INGENIO 2010 initiative encompasses a number of instruments. They are designed to: increase the focus and the level of funding of public research; stimulate technology transfer by encouraging public-private partnerships; and enhance the incentives for business-sector research and the diffusion of new technologies. The policy package of INGENIO 2010 includes the promotion of public-private partnerships (CENIT) for innovation, venture funds and programmes to increase research capacity (CONSOLIDER and CIBER).

The overarching goal of the differentiated set of policy instruments proposed by INGENIO 2010 is to build critical mass in research, foster networking and increase the contribution of public research to innovation throughout the Spanish economy. The funding is targeted at long-term, large-sized and broad-ranging projects, to stimulate higher-risk and more ambitious research. Regional investment is encouraged, therefore regional governments are encouraged to collaborate in the start-up of the programmes as well as to co-finance the subsequent activity in their areas (OECD/FECYT, 2007).

The National Plan for Scientific Research, Development and Technological Innovation

The National Plan for Scientific Research, Development and Technological Innovation ("National Plan") is the basic programming instrument of the Spanish system of R&D and innovation, as defined in the Science Law of 1986. It is the mechanism to establish medium-term research and innovation policy objectives and priorities, and to design the tools to achieve them.

The sixth National Plan for 2008-2011, approved in 2007, relates to the National Strategy for Science and Technology (*Estrategia Nacional de Ciencia y Tecnología*, ENCYT). This National Strategy was adopted in early 2007 as the guide for S&T policies until 2015, at the third Conference of Presidents (with regional governments) chaired by the Prime Minister. It aims to provide a general framework of principles and broadly shared objectives upon which the future national and regional plans for R&D and innovation will be elaborated.

The sixth National Plan presents the following four areas related to its general objectives and linked to instrumental programmes aiming at specific objectives: *i)* knowledge and capacity generation; *ii)* promotion of co-operation in R&D; *iii)* sectoral development and technological innovation; and *iv)* strategic actions (see Box 3.2 for a summary of National Plan objectives).

Box 3.2. National Plan for Scientific Research, Development and Technological Innovation

The National Plan (2008-2011) encompasses six objectives:

- ***Put Spain in the vanguard of knowledge:*** Raising the profile of knowledge generation; funding based on criteria of excellence and demand; increasing the number of researchers and their qualification.
- ***Promote a highly competitive firm structure:*** (1) Increasing the capacity of the science and technology (S&T) infrastructure organisations and (2) its interdisciplinary use by all agents, especially small- and medium-sized enterprises (SMEs), fostering (3) co-operation and (4) technology transfer; (5) matching R&D with demand in the markets.
- ***Integrate the regional level into the national S&T system:*** (1) Encouraging co-ordination between national and regional policies (2) including joint tenders and (3) the evaluation of policies.
- ***Strengthen the international dimension of the S&T system:*** Promoting the international (1) co-operation of Spanish R&D agents; (2) participation in and use of large European research facilities and (3) participating in the seventh Framework Programme, (4) providing access for foreign R&D actors to national public tenders; (5) co-ordination of R&D performing actors of different countries through ERA-NET.
- ***Provide a favourable climate for R&D investment:*** Improving (1) co-operation, (2) transparency, (3) the policy management and (4) organisation (evaluation criteria, access, etc.) to assure the achievement of goals related to investment in R&D and innovation.
- ***Provide favourable conditions to promote scientific culture and the diffusion of S&T advances in society:*** (1) Using new communication forms to show the scientific and technological innovations to the society; (2) design stable structures to promote scientific culture; (3) create networks for the social communication on science and technology.

The National Plan contains quantitative objectives relating to 16 S&T indicators. The specific goals of the INGENIO 2010 initiative – which is part of the National Reform Plan aimed at achieving the objectives of the Lisbon Strategy – include an increase in the ratio of R&D investment to GDP to 2% by 2010, with a private participation of 55%, and convergence to the EU15 average in the percentage of GDP devoted to ICT.

Source: European Commission (2009), *ERAWATCH Country Report 2008: An Assessment of Research System and Policies (Spain)*, European Communities, Luxembourg.

The sixth National Plan was prepared in a participatory process to which the key stakeholders of the Spanish innovation system have contributed. The National Plan attempts to involve the regional governments, not only in designing the National Plan, but also in taking part in and financing the actions it defines. In contrast to previous National Plans, the sixth National Plan relies on a new model that is based on the definition of instruments designed as policy responses to the strategic and operational objectives set out in the National Strategy for Science and Technology. The sixth National Plan includes a set of "strategic actions" or initiatives in areas of special interest, among them climate change and energy. It also led to some changes in the Spanish innovation policy mix, some of which respond to OECD recommendations (OECD-FECYT, 2007). Among these new initiatives (EC, 2008) are:

- The establishment of *technology platforms and networks* to enhance co-operation between firms and actors in research. The EuroIngenio Programme was presented in 2007. It was designed to enhance the participation of Spanish researchers in European projects and enhance the internationalisation of the Spanish research community. It had a budget of EUR 15.6 million in 2007 for its four sub-programmes (Euroscience, InnoEurope, Eurohealth and TecnoEurope).

- The *PROFIT Programme*, which had the overall aim to encourage R&D and innovation activities in organisations, was discontinued. However, its specific objectives have been integrated in other programmes.

As other countries, Spanish S&T and innovation policy is undergoing some longer-term change. Among these trends one can observe (EC, 2009):

- a shift from institutional (block-grant) funding to competitive project funding;

- a shift from grants to soft loans and fiscal incentives in the period 1998-2004 and a re-emergence of subsidies in recent years;

- an increasing role of the universities in scientific research as well as a diversification of their tasks;

- an increasing emphasis on excellence and critical mass in research;

- a degree of re-orientation of the research system towards the needs of the economy and society as a whole;

- notably, growing attention to the varied and changing needs and requirements of business sector R&D and innovation, inducing a diversification of policy instruments; and

- a growing emphasis on policies to foster human resources, including at the post-doctoral level.

These trends are complemented by corresponding developments in the governance system. They include the growing role of regional governments on the one hand and the European Union on the other, leading to the emergence of a multi-level governance structure. Another is the concentration of R&D and innovation-related competencies among actors in the Spanish government within the Ministry of Science and Innovation. And finally, Spain has implemented the Integrated Monitoring and Evaluation System (SISE) for *ex post* assessments of the impact of R&D and innovation programmes.

Some characteristics of the Spanish policy mix

According to ERAWATCH, for the National Plan and INGENIO 2010, the greater part of funding (57%) takes the form of subsidies, versus 43% through loans (EC, 2009). Over 41% of the grants and 81% of the loans are devoted to generic public competitive tenders for projects, a further 11% to infrastructural support and 16% to human resources. The Working Programme for 2007 (covering the National Plan and INGENIO 2010) foresaw that 34% of the funds are allocated to the public R&D sector, 27% to the private sector and 39% to public-private initiatives.[9] The main instrument of Spanish R&D policy directed towards public R&D is subsidies (84% of the funds received), while for private R&D and public-private initiatives, funding takes mainly the form of loans (63% and 53%, respectively).

It appears that priority setting has not been among the strengths of Spanish S&T and innovation policy. The main beneficiaries are firms in the following sectors: transport (construction of components, vehicles and others [18%]), IST services (11%), aeronautics and space (12%), machinery and equipment (4%), chemical products (5%) and pharmaceuticals (3%). The intensity of support (support as a percentage of own R&D expenditures) varies across industries, the average being 14%.[10]

Spain has a number of direct measures in its policy mix that are complemented by initiatives to reduce red tape and provide more innovation-friendly framework conditions through legal reforms. The European Commission (2008) identifies the following main areas of actions within the Spanish policy mix:

- creation of innovative enterprises, with a special focus on technology-based enterprises, by providing direct support and indirect incentives (*e.g.* fiscal measures);

- consolidation of enterprises (Neotec Programme, InnoEmpresa and the Statute of the Young Innovation Enterprise of the sixth National Plan);
- support to R&D and innovation projects in enterprises (CENIT, InnoEmpresa and the sixth National Plan);
- improvement of researcher employment conditions and human capital (I3 Programme), Torres Quevedo Programme, Organic Universities Act and the ratification of the Bologna Process;
- fostering innovation capacity and knowledge transfer (Strategic Fund, CREA Programme, CIBER Projects and PROFARMA);
- policy assessment through the establishment of a monitoring and assessment instrument (SISE) to evaluate the performance of the measures implemented so far; and
- expansion of the information society (Avanza Plan).

In addition to direct support through grants and soft loans, Spain also applies indirect support via fiscal incentives to stimulate R&D and innovation. Although these measures do not involve a flow of money, they do increase the total amount of government support to R&D and innovation (see Figure 3.1). The Spanish system of tax incentives for R&D and innovation is one of the most generous among OECD member countries. It allows a deduction from corporate taxes to firms investing in R&D and innovation activities, offering a mixed system of "volume-based" and "incremental" tax credits. Deductions can reach as much as 30% of the level and 50% of the increment in R&D expenditure on a broad range of operations, including staff costs, acquisition of technology and purchase of material.

In 2003, the government enabled the Ministry of Industry, Tourism and Commerce (MITYC) to issue certificates for R&D and innovation activities for firms willing to benefit from the corresponding tax incentives. This policy was developed with the aim to increase legal security for firms confronting the internal revenue service and encourage them to use R&D and innovation benefits more broadly. Between 40% and 50% of Spanish innovative firms were estimated to benefit from these incentives (around 4 000 in 2004)[11] which represented EUR 262 million in the annual budget for the year 2006 (21% more than in 2005). Of the overall estimated allowances in the 2006 MITYC report for R&D and IT, roughly EUR 36 million were registered for Catalonia, 35% of the Spanish total of EUR 130.5 million (Sanchez Granada, 2008).

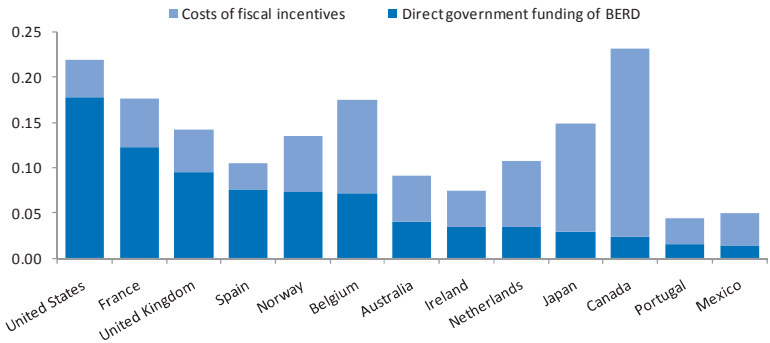
The tax reform approved in November 2006 has brought about important changes.[12] First of all, a new instrument has been introduced in the form of a reduction of 40% in the social charges to be paid by the firm corresponding to R&D staff (not compatible with the use of R&D and innovation corporate tax benefits). Second, corporate tax rates have been reduced 15% for all companies, in one year for SMEs (from 30% to 25% by 2007) and in two years for the rest of firms (from 35% to 32.5% by 2007 and to 30% by 2008). Third, to compensate for the general decrease in corporate taxes, R&D and innovation corporate tax credits have also been reduced (8% by 2007 and 15% by 2008). Fourth, the tax reform also states that the current system of tax incentives for R&D and innovation will not be available as of 1 January 2012.[13] Finally, the government envisages to evaluate the relative effectiveness of the two alternative R&D and innovation support measures (reduction in social charges for R&D staff versus R&D and innovation corporate tax credits) before the end of 2011 and decide which one is better adapted to the needs of the Spanish economy.

Taken together, all these provisions make Spain's fiscal incentives for R&D and innovation the second-most generous in the OECD, as measured in terms of the subsidy rate per USD spent on R&D (see Figure 3.2). Only France has a more generous scheme of incentives in place.

Catalonia is one of the top two recipients of Spanish programme funds, albeit in some categories its share declined between 2004 and 2007 (see Table 3.4). The region is the top recipient in terms of "competitiveness support" at 24.1% of the Spanish total, mainly funds from CDTI. It follows Madrid in terms of "RDI projects" (22.8% in 2007), "complementary actions" (18.4%) and "human resource development" (18.9%) categories. The region has gained in its share of "S&T equipment and infrastructure" receipt. In 2008, Catalonia continued to lead Spanish regions in terms of CDTI funds, 22% of the Spanish total.

Figure 3.1. **Direct and indirect government funding of business R&D and tax incentives**

2005 or latest year available

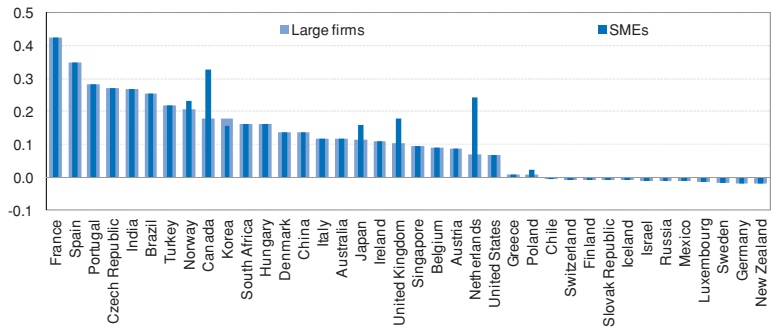


Notes: The estimates cover the federal research tax credit for the United States; the SR&ED tax credit for Canada; the mixed volume and incremental incentive for France; the refundable research premium for Austria; the tax credit consisting of a reduction of taxes on R&D wages as well as the allowance on profits of R&D self-employed for the Netherlands; the volume measure for Mexico, Norway and the United Kingdom; the mixed volume and incremental measure for Spain (now being phased out); both the tax offset and incentive depreciation for Australia; the incremental tax credit for Ireland; the tax incentives for experimental research plus the special tax depreciation of equipment for developmental research for Japan.

Source: OECD, based on national estimates (NESTI R&D tax incentives questionnaire), some of which may be preliminary.

Figure 3.2. **Tax subsidy rate for USD 1 of R&D**

Large firms and SMEs, 2008



Source: *OECD Science, Technology and Industry Scoreboard 2009.*

Table 3.4. **Use of Spanish National Plan funds by category**

In percent

Share of Spanish total	RDI projects		Complementary actions		Human resources development		Competitiveness support		S&T equipment & infrastructure	
	2004	2007	2004	2007	2004	2007	2004	2007	2004	2007
Catalonia	28.1	22.8	14.2	18.4	19.5	18.9	29.2	24.1	14.7	21.1
Madrid	26.2	33.6	45.9	35.1	24.9	30.8	7.5	15.8	10.4	11.2
Basque Country	9.2	10.7	8.4	8.5	2.7	2.3	14.3	13.3	5.5	15.1
Total of three regions	63.5	67.1	68.5	62	47.1	52	51	53.2	30.6	47.4

Source: OECD calculations based on the *Memoria de Actividades*, 2007 and 2004, Spanish Ministry of Science and Innovation.

3.2. Central-regional competency sharing on S&T&I

Formal attribution of roles

The increasing regional role in S&T and innovation policy is part of a number of trends that change the terms of mutual dependence across levels of government (OECD, 2009b). Economic, scientific and socio-cultural factors in relation to the role of science in society are interacting with dynamic changes in political governance to give rise to this increasing regional role among OECD member countries (Perry and May, 2007).

The Spanish Constitution of 1978 lays out the framework for competency sharing between the central government and the regions, known in Spanish as *Comunidades Autónomas* (see Table 3.A1.2). There are currently 17 of these regions with similar devolved powers, albeit the process for creation of the regions (1978-1983) and the decentralisation of responsibilities took place at different speeds. Spain is one of the OECD member countries with a relatively higher share of sub-national fiscal activity, with sub-national governments responsible for over a third of public revenues and almost half of expenditures in 2006.

Control over science and technology policy has been a source of inter-governmental disagreement, particularly with respect to Catalonia. Per Article 149.1.15 of the 1978 Spanish Constitution, among the functions considered to be of exclusive competence of the central government is the "promotion and co-ordination of scientific and technical research."

However, Article 9.7 of Catalonia's 1979 Autonomy Charter stated that it too had exclusive jurisdiction in the field of research. Subsequently, the 1986 Science Law of Spain noted that the central government should have exclusive competencies for the promotion and formulation of science and technology policy, albeit the central government's R&D plans could take into account regional activities. In 1987, the Catalan government filed a case in the Constitutional Court regarding this law, requesting that the central government transfer funds for such policies and give the region control over the central government's research labs (CSIC network) located in its boundaries. The Court ruled in 1992 not to decentralise this R&D funding. Nevertheless there has been explicit devolution of some areas of research funding, including university funding, the public health system and its associated research, and agricultural research.[14]

The 2006 Charter for Catalonia, currently being reviewed by Spain's Constitutional Court, clarifies its S&T and innovation focus and linkages with the Spanish State. Per Article 158 on research, development and technological innovation, the *Generalitat* has "exclusive power in matters concerning its own research centres and structures, and the projects it finances" and "shared power over the co-ordination of the research centres and structures in Catalonia." It further acknowledges that "collaboration criteria between the State and the *Generalitat* in research policy, development and innovation shall be established within the framework of the provisions of Title V. Likewise, systems shall be established for the participation of the *Generalitat* in determining policies affecting these matters at European Union level, and in other international bodies and institutions." These Title V framework conditions give the rationale for co-operation to "provide mutual assistance to each other and collaborate when necessary so as to effectively exercise their respective powers and defend their respective interests." The instruments for collaboration may include conventions (agreements) as well as multilateral bodies and procedures, in addition to other collaboration instruments as appropriate.

In practice, science and technology policy is therefore a shared responsibility between central and regional levels in Spain. Regions may seek to take on greater S&T policy responsibilities based on their own budgets, capacities and strategies as well as agreements with central government. The Basque Country is unique in Spain in that it has recently negotiated additional competencies in research.[15] While a few regions began their S&T policies in the early 1980s, prior to Spain's integration into the EU, today all regions have their own S&T policies that are funded with regional budgets. Of public R&D&I spending by Spain and its regions in 2007, approximately 20% of the EUR 10 billion comes from the regional governments (CICYT, 2007).

The overlapping roles between central and regional governments in the field of S&T and innovation are common, particularly in regionalised or federal OECD member countries. In such countries, there are often concurrent responsibilities, meaning that both levels are active in the policy fields (see Table 3.5). For example, recent legal changes in Italy allow each region to set its own research and innovation policies beyond what is set at national level, with a wide variation in regional responses to this new opportunity. In Germany, the *Länder* have substantial S&T&I powers, however in some cases there is required consultation across levels of government. In France, the regions have no formally devolved powers for S&T, but rather regions are increasing their activities in S&T&I given competencies for economic development. Consequently, regional actions in France are more focused on innovation, technology transfer and knowledge exchange.

Managing S&T and innovation between central and regional levels

The challenge in Spain

There are inevitable inefficiencies and transaction costs associated with duplication across levels of government. There is of course a trade-off between such potential losses and the gains from regional experimentation. In general, the lesser developed regions in Spain tend to follow the actions of central government, while the advanced regions are more likely to experiment. Nevertheless, the duplication of programmes and agencies which results in actors "forum shopping" or accumulating benefits unknown by the other level warrants attention.

As a result of this overlap, different "gaps" may emerge which require action at specific government levels given the particular role-sharing arrangement (see Table 3.6). These gaps may be related to information asymmetries, as one level of government has the information needed for the other to develop or implement its policies. There may be capacity barriers to effective implementation of the policy. There is a fiscal gap if one level of government has the policy competence but lacks the funds to implement the policies. An administrative gap occurs when the spillovers from the policy action go beyond its administrative boundaries. Finally, a policy gap may occur when a particular policy is not sufficiently integrated with relevant related policies managed by other ministries or agencies (OECD, 2009b).

Table 3.5. **Division of S&T&I responsibilities: select OECD member countries**

Country	National role	Regional role
France	Formally the State has the primary and largely exclusive responsibility for STI policy across domains, including higher education, with the exception of areas relating to regional economic development which are joint.	While there are no formally devolved powers for STI policy, the regions have exploited competences for economic development to develop increasing activities in these areas. The General Code of Territorial Authorities states that regions can design and develop regional technological poles, can design regional interest pluri-annual programmes and are associated to the design and implementation of national research policy. Each region must have a regional consultative committee of technological research and development, though many are not active. Many regions now have regional research or higher education schemes, but these remain small by national standards. Regional involvement is generally limited to issues associated with innovation, technology transfer and knowledge exchange, though some national programmes, such as U3M or Plan Campus, have increased the involvement of regions in infrastructure and university-related expenditures.
Germany	The German Constitution clearly states that some STI policy tasks are for the *Bund* (federal government), while others for the *Länder.* Federal competences include grants in aid-based thematic R&D funding; institutional funding for large research organisations; foresight; horizontal R&D; international dimension of R&D policy; and innovation-oriented programmes and policies. There are also a range of joint tasks, such as the funding of non-university research institutes. The *Bund* can be involved in the construction of R&D facilities and there is a support scheme to allow involvement in university funding to take account of increasing costs.	The *Länder* are responsible for financing research and teaching at public universities – each state independently enacts its own legislative framework. The *Länder* also contribute to the funding of non-university research institutes and have substantial powers in STI leading to a range of regional research programmes and interventions.
Italy	The State retains primary responsibilities but the 2004-2006 National Research Plan clarifies that the regional legislative authorities can regulate aspects that have not been regulated by the State in relation to	Regions have acquired more responsibility through a change in the Italian Republic's Basic Law which enables them, along with the State, to adopt autonomous STI policies. All regions are allowed to have local regulation and establish specific regional STI policy. Each

Table 3.5. **Division of S&T&I responsibilities: select OECD member countries** (*continued*)

Country	National role	Regional role
	STI policy. State responsibilities include support of academic research and public research institutions; mission R&D programmes realised through the FIRB fund; the creation of large public-private labs; the co-ordination of a national scientific system; and support of the research infrastructure. There is a strong regional approach to STI policy based on the concept of the "technological district".	region has its own research policy and innovation policy that runs concurrently with the State. Regional research councils do not exist yet and there are few governance structures. Important areas of regional research policies have been covered by the National Operating Programmes (PON) conceived as a means to implement EU Structural Funds.
Spain	The central State has power to co-ordinate and promote scientific and technical research, as well as set the basis for and co-ordinate the general planning of economic activity. The Constitution states that the State has exclusive competence on the encouragement and co-ordination of scientific and technological research.	The Constitution allows for Autonomous Communities to assume competences on the promotion of research. The Constitution includes ambiguities subject to interpretative flexibility. Most bilateral contracts between the State and the ACs include a role for the regional government in R&D policy. Most regions have R&D plans and there are a large number of overlapping instruments, programmes and agencies. The decentralisation of hospitals has also led to more regional funding for research on drugs and healthcare, for example.
United Kingdom – Scotland	The United Kingdom operates a dual support system in which institutional funding for universities is administered through the Funding Councils and direct research funds through the UK Research Councils. The UK government has overall responsibility for STI policy.	In Scotland, science and research are concurrent powers. Institutional funding for higher education and quality elements (through the Research Excellence Grant, Horizon Grants and the General Fund) are administered through the Scottish Funding Council (SFC). All universities and eligible research performers can apply for UK research council funding. Scotland has its own science and innovation policy to ensure collaboration between public, private sectors and key stakeholders. Scottish ministers are responsible for policy on the SFC, for powers relating to knowledge transfer from higher and further education into business and society.

Source: ERAWATCH (2009), *http://cordis.europa.eu/erawatch/*; OECD (2007), *Linking Regions and Central Governments: Contracts for Regional Development,* OECD, Paris; and Charles, D. (2007), *Case Study Regional Report Scotland (UK). RIP-Watch. Analysis of the Regional Dimensions of Investment in Research,* available at *http://cordis.europa.eu/erawatch/*.

Table 3.6. **Minding and bridging multi-level governance gaps**

Mind the co-ordination gaps	Bridge the co-ordination gaps
Information gap	Performance measurement
Capacity gap	Grants, co-funding agreements and multi-annual budget
Funding gap	Quasi-integration mechanisms (*e.g.* mergers and inter-municipal co-operation)
Administrative gap	Inter-sectorial collaboration (*i.e. ad hoc* and informal meetings)
Policy gap	Co-ordinating bodies, agencies
	Contracts
	Legal mechanisms and standard setting

Source: OECD (2009), "Mind the Gaps: Managing Mutual Dependence in Relationships among Levels of Government", *OECD Working Paper on Public Governance No. 14*, OECD, Paris.

In the case of Catalonia, there are some gaps that both Spain and Catalonia could address:

- *Information gap:* In this case, there is an information gap for both levels of government. There is a higher degree of uncertainty associated with the returns to S&T investment as opposed to many other investments, with actions at both levels of government to support it. Another information gap concerns the greater proximity of Catalonia to regional innovation actors than the Spanish government, information which is important for the effectiveness of Spanish policy given the considerable flow of Spanish programme funds to the region.
- *Capacity gap:* Catalonia's ability to implement its policy initiatives requires, most of all, greater capacity (knowledge, services and providers) to reach SMEs. Both levels of government share a capacity gap in terms of working effectively across levels of government on this topic. With respect to Catalonia, there is less of a general S&T capacity gap than may be found in other Spanish or OECD regions.
- *Fiscal gap:* There are no specific mandates by central government with respect to S&T or innovation programmes managed by the regional level that are explicitly unfunded.[16] However, there are some situations where the Catalan government becomes *de facto* responsible through loans between a locality in the region with the Spanish government or in future salaries and operating costs of facilities after an upfront Spanish subsidy.

- *Administrative gap:* Given the economic geography of Catalonia, there is less of an administrative gap than in other regions where functional economic areas are less contained within administrative borders. For specific projects with clear spillovers, like large infrastructure projects, Spain and Catalonia have been more effective at working together to bridge the administrative gap through contracts and joint funding and management. The general importance of Catalonia's spillovers in the overall Spanish innovation system is perhaps not sufficiently recognised in policy development, although the region is nevertheless able to capture significant shares of Spanish funds.
- *Policy gap:* Catalonia and Spain have respectively combined research and innovation policy through quasi-integration mechanisms and both have inter-ministerial committees seeking to reduce this cross-sectoral policy gap. While there is always progress to be made in terms of collaboration with different sectoral ministries, the gap is not as high as in many other OECD examples.

In a comparative context, Spain stands out among several peer countries for having a somewhat higher unmet need for co-ordination to address gaps. The problem is not the overlap per se, which as stated above is common in many regionalised or federal countries. Rather, the particular challenge is a high degree of overlap of S&T responsibilities in a field where there is a considerable need for increased spending at both levels. Furthermore, the co-ordination with respect to S&T and innovation occurs within a context of politicised, and at times, confrontational inter-governmental relations more generally. Both general central-regional conflicts as well as political party conflicts are an impediment to central-regional co-ordination. In many other regionalised countries, the degree of co-ordination may be low, but this is less of a challenge given the more complementary or clearly assigned roles of the different levels of government in theory or practice.

Co-ordination tools in place

Begun in 2004, the highest level political co-ordination vehicle between the governments of Spain and the regions is the Conference of Presidents. The Presidents meet to discuss important themes and arrive at a common agreement among members on actions to be taken, similar to initiatives in some federal countries. Thus far, the Conference has met three times. The First Conference (2004) discussed the institutionalisation of the Conference, improving Spanish regions' participation in European Community programmes, and an analysis of the financing of public health. The Second Conference (2005) focused on an agreement regarding health financing. The Third Conference (2007) involved the adoption of the National Plan for

Research, Technological Development and Innovation, an agreement to create Sectoral Conferences for Water and Immigration, and the creation of a Working Group to establish guidelines for the Body (MPT, 2009).

The general and permanent framework for inter-governmental relations with Catalonia is the *Generalitat*-State Bilateral Commission.[17] Its purpose is to work with the State on matters affecting Catalonia's autonomy and to exchange information and collaborate in areas of common interest. The Commission's functions are to "deliberate, make proposals and, if appropriate, reach agreements…" The *Generalitat* is also supposed to co-operate with the State in the consultation and implementation of EU policy. The Commission has an equal number of State and *Generalitat* representatives with rotating annual chairmanships. Meetings are plenary sessions twice per year plus additional meetings as needed.[18]

With respect to science and technology, there is a specific body to promote central-regional co-ordination. A 1986 Law (13/1986) created the General Council for Science and Technology (*Consejo General de la Ciencia y Tecnología*) as the consultation body within the Inter-ministerial Commission for Science and Technology (CICYT). This body is charged with promoting co-ordination for science and technology among the regions and between the regions and the State (see Table 3.A1.3 for a listing of formal functions). The Council members include representatives of several central level ministries as well as each region. In 2006, the Council created a Working Group associated with the General Council to further develop some themes. The Working Group also has an associated Group for Information Exchange State-Autonomous Communities. The main role of the Councils has been to facilitate information sharing.

The development of comparable S&T and innovation indicators across Spain is vital to both central and regional policy makers for improving multi-level governance dialogue. The Group for Information Exchange State-Autonomous Communities, part of the formal co-ordination body, has begun this work. But there are still differences in definition, for example, on what areas of public spending constitute R&D and innovation. Such standards are required to better track resources across levels of government and potentially develop joint programmes.

The need for improved co-operation across levels of government to address gaps has been recognised in Spain by both central and Catalan levels as well as external evaluations.[19] The current Spanish National Plan (2008-2011) includes a chapter on greater co-ordination between the central level and regions (see Box 3.3). As mentioned above, in the third Conference of Presidents, the special theme in 2007 was S&T, thus leading to an agreement in the National Plan to work more together and to develop a

mapping of large infrastructure through 2015. The National Plan also proposes different models for central-regional relations for R&D&I in Spain, including: *i)* co-information; *ii)* co-decision; *iii)* co-responsibility and co-management; and *iv)* co-funding. However, the tools to do so are not yet in place.

Catalonia has formally recognised that improved co-ordination with the State for S&T and innovation is required. In the context of the Catalan Agreement on Research and Innovation (CARI), a number of co-ordination issues are raised. The most important co-ordination areas highlighted in the CARI are:

- planning and funding of large scale S&T infrastructure;
- revision of the university funding system;
- implementation of CSIC centres;
- regulatory and framework conditions (*e.g.* intellectual property management; competition conditions; taxation of R&D investment; financial markets);
- accreditation of technological parks; and
- alignment and complementarity of priority research and innovation support programmes.

Another important element of co-ordination, overlooked by the CARI, relates to the development of the information system on research and innovation activities including those funded by the respective governments.

Opportunities for supporting systematic co-ordination

There are OECD examples of both formal and informal co-ordinating bodies for S&T policy across levels of government that Spain could consider in its co-ordination efforts (see Table 3.7). Germany is an example of a formal systemic co-ordination mechanism with the Joint Conference for Science, its mission being to co-ordinate R&D policies across regions and with international policies. Another example of a formal structure is the National Conference of Science and Technology in Mexico. The biannual meetings are a forum for the National Council of Science and Technology and the corresponding state councils to share information and discuss possible initiatives.

Box 3.3. **Measures in Spain's National Plan to promote central-regional co-ordination**

A) ***Co-ordination in the planning, monitoring and assessment of R&D&I activities through the Science and Technology Council.*** The agreements regarding the SISE (Integrated Monitoring and Evaluation System) adopted at the Third Conference of Presidents of the Regional Governments (RG) will be analysed in greater depth in order to:

- Jointly draw up the annual National Plan work programmes (the activities of the General State Administration [GSA] and of the RGs), identifying areas of mutual interest that may be the target of co-funded activities and bilateral or multilateral negotiations, and reducing any overlap in order to optimise budget resources;
- Jointly analyse the economic resources allocated to promoting research and innovation activities, according to distribution among beneficiaries, funding instruments and modes of action; and
- Co-operate in drawing up the respective annual reports and follow-up reports on R&D&I activities.

B) ***Funding to complement GSA calls for proposals. Joint GSA-RG calls for proposals.*** A mechanism will be put in place for the RGs to use their resources to complement the funding of the GSA calls for proposals in their respective regions. In other words, the Plans calls for proposals are open to "*à la carte*" participation by interested RGs in the programmes and calls they consider appropriate, through respective specific agreements with the GSA. For example, in a call for proposals on HR mobility, an RG could allocate resources for funding the mobility of the five top-evaluated researchers in their region who have not been funded by the GSA or, alternatively, complement GSA funding for regional researchers that have been awarded grants. This co-funding activity might eventually rule out the need for a specific call for proposals on HR mobility by the RG itself, thus further simplifying the R&D&I system instruments established in the new National Plan and increasing the quality of the results. The co-funding system put forward is, in principle, better suited to the instrumental strands of HR, projects, institutional strengthening and infrastructures, as these activities are associated with a specific regional locations.

C) ***New instrumental strand for institutional strengthening.*** This is a funding mechanism linked with R&D excellence objectives, which will be developed in collaboration with the RGs. As part of this instrumental strand, programmes will be started up directed towards different stakeholders in the system. This programme should become one of the fundamental instruments for GSA-RG collaboration.

Source: CICYT (2007), *The Spanish National Plan for Scientific Research, Development and Technological Innovation: 2008-2011*.

Table 3.7. **Examples of multi-level S&T&I collaboration arrangements**

Country	Definition of co-ordination problem	Collaborative arrangements
France	Regions have increasing and creeping competences in research and innovation, but the relationship between national and regional instruments could be more efficient. The need to increase coherence is particularly acute given the territorialised nature of many national policies and the responsibility of the national State for balanced growth and the attractiveness of regions.	The primary mechanism for co-ordination is through individual contracts with each region (CPER). Under the 2000-2006 generation of CPER there were three main objectives: to develop existing excellence poles, especially in rural areas; to continue the deployment of research capacities in regions with strong university potential; and to preserve the influence and international competiveness of large scientific centres. There are also representatives of the State in each region specifically for this policy area (*la délégation régionale à la recherche et à la technologie* [DRRT] and *Directions Régionales de l'Industrie, de la Recherche et de l'Environnement* [DRIRE]) through the emphasis on decentralisation. However, relations with regions are on a one-by-one basis, rather than co-ordinated through a single point.
Germany	While the scope of federal and regional competences are laid out in the Constitution, the implications for different policy domains remain subject to continuous negotiations. As economic development is a shared responsibility, the potential need for co-ordination is greater. A particular issue is also seen to be horizontal co-ordination between ministries for research and economic affairs, at national and regional levels.	Germany has an elected second chamber of Parliament, the *Bundesrat*, composed of representatives of the regions. This is therefore a general co-ordination mechanism between the *Bund* and the *Länder* across all policy areas. In STI, rather than unilateral contracts, there are a series of more institutionalised forums for co-ordination. The *Kultusminsterkonferenz* is a co-ordination body for university legislation but has no binding decision-making powers. The *Bund-Länder* Commission for Education Planning and Research Promotion (BLK) was a semi-permanent forum for the discussion of all questions of education and research promotion of common interest to federal and state governments. This has now been replaced by the GWK – the Joint Conference of Science. The mission of the GWK is the co-ordination of national European and international R&D policies with the aim of enabling Germany's performance and competitiveness. In addition, the new joint commissions may develop important co-ordination roles (the Council for Innovation and Growth and the Research Union Science-Industry).
Italy	The Constitution in Italy makes it easier to define areas in which the regions do not have competences than those that do. Accordingly, there is potential for multiple actions, instruments and conflicts between national and regional actors in STI.	There is a permanent state-regions committee in the Italian context. In addition, two other general mechanisms for co-ordination include the use of contracts and the National Operating Programmes (PONs). The *Accordi di Programma Quadro* operationalises the *Intesa Istituzionale di Programma* - a broad agreement reached by the central government and the regions or autonomous provinces on the definition of objectives, sectors and areas

Table 3.7. **Examples of multi-level S&T&I collaboration arrangements** (*continued*)

Country	Definition of co-ordination problem	Collaborative arrangements
		where infrastructure essential to territorial development should be built, which may include scientific infrastructure. The PON is a national multi-regional programme aimed at regional development, which stresses STI in underdeveloped regions. Each region has a regional programme (POR). EU Structural Funds are important sources of finance and some degree of co-ordination is necessary.
Spain	Spain has a complex research policy landscape with shared and overlapping responsibilities. There is a clearly defined and documented co-ordination problem both vertically and horizontally, linked in part to political struggles which limit long-term stability in policy directions.	The National Strategy for Science and Technology was endorsed by the State, ACs and other actors. ACs participate in the CICYT's advisory bodies in the General Council for Science and Technology, in the working party of General Directorates drawing on the Spanish RDTI plan and in the sectoral conference of the regional departments with competence for the promotion of R&D. Information exchange is also an essential element to establish co-operation on S&T between regions and central government. Contracts are also used as a mechanism to address overlaps.
United Kingdom – Scotland	Although the division of responsibility in relation to research and higher education funding are clearly defined, the Scottish Executive has a broadly defined science and technology policy with overlapping competences with the UK government. However, it has been noted that it is horizontal and not vertical co-ordination that is the dominating problem in the Scottish case, requiring greater joint thinking between actors at the sub-national level to create strong policy networks for action.	There is a Memorandum of Understanding with the UK government, a range of concordats with UK government departments and the Research Councils, and committees like the Chief Scientific Advisory Committee and the Science and Engineering Base Co-ordinating Committee.

Source: ERAWATCH (2009), *http://cordis.europa.eu/erawatch*; OECD (2007), *Linking Regions and Central Governments: Contracts for Regional Development,* OECD, Paris; and Charles, D. (2007) *Case Study Regional Report Scotland (UK). RIP-Watch. Analysis of the Regional Dimensions of Investment in Research,* available at *http://cordis.europa.eu/erawatch*; Crespy, C. *et al.* (2007), "Multi-level Governance, Regions and Science in France. Between Competition and Equality*", Regional Studies,* Vol. 41(8), pp. 1069-1084; and Lyall, C. (2007), "Changing Boundaries: The Role of Policy Networks in the Multi-level Governance of Science and Innovation in Scotland", *Science and Public Policy*, Vol. 34(1), pp. 3-14.

In the United Kingdom, an active dialogue has recently been established for an informal arrangement that must meet a central government funding requirement. The parties involved are the regional S&T Councils (business and research leaders in the region helping with regional strategies) and the central level Technology Strategy Board. The incentive for this close co-operation was a requirement by central government for alignment of resources between the Board and regional development agency (RDA) spending. As RDAs receive their budgets from central government, compliance with the alignment request was required. One positive result of the resulting series of group and bilateral meetings has been a greater understanding by the central level and other regions of the regional assets and vocations across England, serving as well to increase trust. Another result has been greater alignment of spending to reduce transaction costs and programme clutter and to increase critical mass – albeit limiting somewhat the regional scope for experimentation.

In addition to pursuing agreements at the political level, working groups below the political level can be used to promote co-ordination. In the United Kingdom, at the practitioner level, there is a group called Regional Innovation, Science and Technology (RIST) that brings together RDAs and devolved administrations with central government as a very active forum for information sharing, with several meetings annually. Increasing relationships among professional staff has served to build trust and develop useful information sharing that informs policy development at both levels. The Working Groups associated with the *Consejo General de la Ciencia y Tecnología* might be able to play such a role.

Joint institutions are not easy to build but serve as an opportunity for co-ordination that could increase system efficiency. When regions have scope for independent policy making, there are opportunities for experimentation at low cost but a risk of inflation in the number of bureaucratic institutions. For example, in Spain there are now at least 12 agencies for evaluation research quality between the central government and regions. A joint evaluation agency would reduce the evaluation burden on recipients as well as increase the quality of evaluations in the regions by pulling from a wider pool of objective evaluators and preventing "forum-shopping" (OECD/FECYT 2007). While a joint evaluation agency is one example, others could be considered with respect to R&D funding or related areas.

Catalonia may take the initiative to promote more systemic co-ordination by inviting central level authorities to participate in different Catalan committees. Participation does not imply that a central government representative would have authority over Catalan decision making. However, it offers a form of one-to-one co-ordination with a continual feedback mechanism during strategy development rather than for one

specific programme after a strategy is already in place. Catalonia missed an important opportunity to better involve the central government in the Catalan Agreement on Research and Innovation (CARI) during the extensive consultation process. Furthermore, prior research plans have not explicitly taken into account national level plans in their development. Increased inter-governmental interaction in different committees could increase awareness at central level of Catalan needs and provide additional expertise to Catalonia. It would also support general trust building between levels of government. Ultimately, it could serve to better align common interests and inform national policy development. Given the prominence of Catalonia within the Spanish system, the central government also has clear incentives to support more effective collaboration.

Bilateral agreements (contracts)

While bilateral agreements do not have the same possibility of promoting systemic co-ordination as other mechanisms, they offer many benefits for managing multi-level governance when well designed. Such contracts reorganise the rights and duties of government other than by way of the Constitution (OECD, 2007d). They serve to align resources, build trust, give a longer-term perspective for projects, and reveal useful information from both regional and central government sides. They also should include a clear enforcement mechanism for when the parties do not follow the agreements.

In Spain, the use of bilateral agreements (commonly in the form of *convenios*) has proliferated in recent years. The number of *convenios* signed has grown from 14 in 1980 to 800 in 2004. Such agreements are being used for a range of different programmes. However, the funds that are accorded to regions as part of *convenios* is a small share of overall revenues for a Spanish region (in 2001 2% of overall revenue, 7% of conditional revenues).[20] The format of *convenios* is very flexible, therefore there can be a wide range of examples from very complete contracts to those that are more "relational" and involve a greater element of working together and relationship building for a common goal (OECD, 2007d). One of the negative side effects of the proliferation of agreements is that it is difficult to develop a systematic vision of the kind of co-operation that has been established across the different agreements.

In the context of Spain's INGENIO 2010 programme, a number of bilateral agreements are used to implement different S&T-related programmes (see Figure 3.3). Plan Avanza, for example, is a programme to develop the knowledge and information society in Spain, targeting firms, the public sector and citizens. In its first phase from 2005-2008, the Plan had a

budget of more than EUR 5 billion. Budget sources include the EU Structural Funds, the national budget and multiple ministries. Additionally, regional and local governments co-finance initiatives. For instance in the region of Catalonia, between 2006-2008, the Plan invested a total of just over EUR 1 billion, of which EUR 334 million were dedicated to fostering innovation. Indeed, Catalonia is the second-largest recipient of funds, after Madrid. The second phase of Plan Avanza is now underway, with a greater emphasis on innovation and development of the ICT sector.

The bilateral agreement between the Spanish government and Catalonia to support the construction of the ALBA Synchotron facility has been recognised as an example of a highly effective co-ordination tool. The nature of the agreement is likely similar for other large installations in Spain (but the example of Catalonia is examined in detail). As an important investment for both Spain and the region, that neither has engaged in before, there is a need for contracting that ensures an ongoing relationship to derive the maximum benefit of the project and limit risks. The structure of this agreement includes many of the characteristics of a "relational" contract, one where all the conditions cannot be specified upfront (*ex ante*) so the parties agree to follow the instructions of a common decision mechanism after signing the agreement (*ex post*) (see Box 3.4).[21] The joint financing, execution and management of the facility are important for relationship building across levels of government.

Other bilateral agreements may take a very broad perspective of "agreeing to work together" and then include annual work plans. The Catalan Innovation Support Agency, ACC1Ó, and the Spanish CDTI (Centre for the Development of Industrial Technology) share common objectives for promoting innovation, spinoffs and knowledge transfer. Catalonia is the leading region in terms of CDTI funding receipt, therefore there are clear mutual interests in better collaboration. A 2005 *convenio* serves as a framework to agree to work together through a commission composed of actors on both sides to develop annual plans. In the first work plan, areas such as data exchange, personnel exchange, accepting the other's evaluation assessment, joint financing of projects, and promotion of Catalan projects in EU programmes were raised. These are important first steps but there remain separate and duplicated action lines and administrative processes resulting in a continued burden to firms and system inefficiencies.

The lessons of good practices (from within Spain or other countries) could be helpful for Catalonia as it seeks to develop a framework agreement for S&T with the central government (see Table 3.7). Such an agreement is a stated commitment of the CARI. There is concern in Catalonia that the current bilateral agreements are not enough for effective central-regional

co-operation. However, the scope and contents of what such a framework agreement might look like have not been decided at Catalan level nor discussed with the central level.

In a light form, such an agreement may include a Memorandum of Understanding and concordats, such as in the United Kingdom between central government and Scotland. In a more comprehensive and formal form, there is the French CPER (*contrat de projet Etat-région*). It offers a framework for long-term planning and co-financing for a number of investments related to S&T and innovation between several central level ministries and the region. In the 2000-2006 round of the CPER, areas covered included: *i)* the development of existing excellence poles; *ii)* continued deployment of research capacities in regions with strong university potential; and *iii)* preserving the influence and international competiveness of large scientific centres. Support of S&T and innovation is also part of Italy's central-regional contracts know as the *Accordi di Programma Quadro*.

There is also an opportunity for greater bilateral and multilateral agreements between Catalonia and other Spanish regions. For example, Catalonia's AGAUR is already used by some other Spanish regions as an evaluation agency for the scientific merit of certain research projects. Catalonia is also seeking bilateral agreements with other regions when there is a common interest or complementarity in assets.

Figure 3.3. **Bilateral S&T related agreements between central and regional governments**

Notes: The agreements included in the counts refer to: the Avanza Plan, Online Health, Internet in the Classroom, SARA, and the Programme of Incentives for Employment and Intensification of Scientific Activity. It also includes whether the region has a R&D&IP network point. Updated to January 2007.

Source: Based on information from CICYT (2007), *The Spanish National Plan for Scientific Research, Development and Technological Innovation, 2008-2011*, using information from the general State administration.

Box 3.4. Contracting across levels of government: the ALBA Synchotron

The ALBA Synchrotron is a particle accelerator, a very large and expensive research facility, now located in Cerdanyola, a site near Barcelona that also hosts a university and many technological firms. This project has important spillovers (benefits) to local, regional and Spanish level actors. The type of contract needed for this co-ordination context is co-decision with arbitrage, and that is how the contract is designed. The contracting is relational, based on a permanent partnership between layers of government.

A 2002 *convenio* between the Ministry of Science and Technology and Catalonia splits construction costs 50% between the two levels of government. The amount of payments per year are specified, but the agreement does not specify the obligation to contribute to operating expenses, since these costs are expected to be fully covered by user charges paid by the research teams that use the particle accelerator. However, the agreement says that if an operating deficit appears, the Monitoring Commission (*Comisión de Seguimiento*) could solve the problem by writing a new agreement (*Addenda*) which specifies the distribution of the burden.

In addition to cost and risk-sharing-related construction and operations, the agreement creates the partnership (*consorcio*) that is responsible for managing the facility. The governance structure of the *consorcio* includes a political decision-making body (*Consejo Rector*) and a management body (*Comisión Ejecutiva*). The *Consejo Rector* is formed by a president, which will rotate yearly from one layer of government to the other and have a qualified vote, and by eight representatives (four for each layer of government). Its responsibilities include providing general guidelines of activity, approving the annual budget and the plans of activity and projects, and specifying the rules of the relationship with the users of the facility. The *Comision Ejecutiva* is formed by a manager and four members (two from each layer of government). Among its responsibilities are organising the services offered by the facility and setting the user charges.

The co-ordination context is also characterised by a high level of interdependencies. There are horizontal inter-dependencies derived from the fact that the facility would benefit all the Spanish scientific community, and vertical inter-dependencies derived from the fact that both layers of government have responsibilities on this matter. Moreover, the project's success could have an impact on future R&D programmes that could be carried out by the central government and by the other regions since future programmes will depend on access to the equipment and since all the partners will have to pay for maintenance in the future. Also, the clustering of researchers around the Synchrotron will help the national scientific community in general by fostering the development of scientific programmes in related fields of knowledge.

Box 3.4. **Contracting across levels of government: the ALBA Synchotron** (*continued*)

Both layers of government have a low level of knowledge (relative to other types of agreements). Neither has previously built or managed such a facility. Moreover, the project entails significant risks: the construction risk (*i.e.* exact localisation, detailed design of the building, budgetary deviations), the scientific risk (*i.e.* failures in identifying the most appropriate research policy for the facility, related to the number of light lines defined and to its assignment to research groups and firms), and the management risk (*i.e.* optimisation of the financial returns and possible appearance of operating deficits in the future). Although a great part of these risks can (and should) be dealt with in advance, it is clear that a number of very complex decisions are required.

Source: OECD (2007), *Linking Regions and National Governments: Contracts for Regional Development*, OECD, Paris.

3.3. Other areas of co-ordination

Local communities in Catalonia

Under the level of a Spanish region (autonomous community) are several layers of local government. In 1985, the Basic Law on Local Government (*Ley Reguladora de las Bases de Regimen Local – LRBRL*) formalises the institutions and competencies for the local and provincial levels.[22] In addition, there are historic territories known as *comarques* (counties) that are considered a form of local government and in Catalonia have a representative council. Catalonia contains four provinces, 41 counties (*comarques*) and 946 municipalities.

Through their competencies for economic promotion, local authorities are beginning to support innovation. The tools most commonly used are the land and infrastructure for science or technology parks, usually including incubators. In several cities around Spain, there is also an accent in the city-level innovation plans on the importance of ICT infrastructure and its usage (in households, SMEs and public administrations) as well as developing an innovation culture (Cotec, 2008). The support of local innovation systems is seen as a way to reorient the region, given the job losses in many traditional sectors, and to attract investments from the Spanish or Catalan governments as well as develop knowledge-economy conditions.

In general, the roles of the region and localities are complementary, given differences in competencies. There are numerous examples in Catalonia of local initiatives to support innovation systems. Higher education institutions are often the leaders in these local initiatives and may take a highly proactive approach, such as the University Rovira i Virgili in Tarragona (see Box 3.5) or the University of Girona (see Box 3.A1.1). Other local initiatives may seek to promote a culture of innovation among the general population. For example, the town of Manresa has produced two volumes of stories about local innovators and their work. The town of Reus has promoted, along with neighbouring towns, instruments such as a venture capital fund for private firms. They have also been promoting public sector innovation with creative public service delivery mechanisms (a comprehensive school for immigrants) or in making a holding company for more efficient management of public health service delivery.

The largest possible synergies and duplication occur between the region of Catalonia and Barcelona City. Not only is Barcelona a driver of the regional system, the local government has resources and capacity for significant programmes (see Box 3.6). The city may have some duplication with programmes at the Catalan level, specifically with respect to innovation, such as those promoted by Barcelona Activa. Given geographic and relational proximity, there are already informal ties with Catalan level institutions like ACC1Ó to minimise duplication or to find complementarities.

Unlike many other OECD regions, Catalonia's formal research and innovation plans do not have a territorial focus, but could do more to make this explicit. There are recognised sub-regional specialisations (see Chapter 1) and attempts by the Catalan government to link research and technology transfer infrastructure when possible to those specialisations. The reticence for making sectoral choices in the different research and innovation plans and agreements helps explain in part the lack of a territorial distinction in formal documents. The region does not want to stifle bottom-up initiatives and in some cases seeks to provide soft support in terms of increasing local capacity. However, the region is perhaps too cautious in its willingness to be more explicit on a territorial strategy. The PRI 2010-2013 may seek to address this.

The region has chosen to take the approach of labelling and financing as the primary vehicles for co-ordination with localities to help rationalise *ex post* certain local and regional initiatives. The need for rationalisation has been raised with respect to technology centres and science parks, for example, given the development of a number of institutions but of varying quality (see Chapter 2). By labelling those institutions judged of sufficient quality, the hope is that the most successful will be supported. That support

could take the form of financing or other backing, such as international promotion. The tradeoff is between stifling local initiative and efficiency of investing in an oversupply or inefficient linkages across institutions within the regional innovation system. It would appear that since many of the initiatives are co-financed from the beginning by the region, that the region could take action in some cases a bit earlier instead of allowing the proliferation to reach the point of needing additional labelling systems.

Another co-ordination challenge between the region and localities occurs when the central government contracts directly with the localities. This has been the case with soft loans, such as was done for technology parks, which bypassed the regional level and thus priorities. The central government had launched a programme and evaluated different proposals for localities based on technical criteria. However, that approach did not take into account the regional implications of these technology parks in terms of links with the other local actors or regional priorities (spatial or thematic). Furthermore, given the debt financing approach, the Catalan government is ultimately involved in repaying the loans that localities have contracted. In addition, grant financing for projects that imply an upfront central government contribution and a sub-national contribution for future years can also lead to longer-term sustainability problems for salaries or on-going maintenance in terms of physical infrastructure. To avoid such co-ordination failures in the future for important investments in the regional innovation system, the central government could ensure that local government applicants have received regional support. This is a common solution used in OECD member countries of co-selection and, often, co-financing.

Catalonia in trans-national S&T&I co-operation

Catalonia is located in the Mediterranean basin whose regions and countries may confront some common or interdependent challenges. European regions closer to the Mediterranean in general lag behind many Northern European counterparts. There are several EU-promoted inter-regional initiatives. The previously mentioned Four-Motors Agreement includes co-operation among several leading industrial regions, albeit not all Mediterranean. The Euro-Mediterranean Partnership, formerly known as the Barcelona Process, was re-launched in 2008 as the Union for the Mediterranean.

Box 3.5. **Rovira i Virgili University: building a region of knowledge in Tarragona**

Rovira i Virgili University (URV) is a public university founded in 1992 from already existing university faculties and schools. It offers 52 programmes of study across the different disciplines to over 12 000 students. In terms of its research strengths, URV had EUR 17 million in research grants from different sources in each of the last several years (approximately 10% of URV revenues), including grants from leading EU, Spanish and Catalan programmes. URV also stands out for its high level of citations in Spain, particularly in its centres for Chemistry (fifth), Clinical Medicine (second) and Engineering (fourth).

URV has taken great strides to support its "third mission" of regional engagement by promoting social and economic projects at regional level like the knowledge antennas (*i.e.* URV offices) set up in towns throughout the region or the 19 classrooms for elder people in municipalities and extra-mural activities. Also on the economic side, the URV Foundation was created as a specific structure to support knowledge transfer; some evidence of the URV Foundation activities include:

- EUR 6 million in knowledge transfer revenues, more than half of which comes from private companies.
- 18 entrepreneurs presented to the Catalonia Springboard Network in 2007 to create spin-off firms.
- The number of lifelong learning students has more than doubled from 2003-2007 to over 4 000, including in-company training.

URV is also active in supporting knowledge clusters in the Tarragona province through its teaching, research centres, science and technology parks, and other institutions. Those clusters include: chemistry and energy (Tarragona has one of the biggest petrochemical sites in Southern Europe); nutrition and health; heritage and culture; tourism and leisure; and oenology. Investment in the related science and technology parks has totalled EUR 39 million.

The University has also taken the lead in a strategic initiative to support innovation through its Tarragona Region of Knowledge Office, which has within its main objectives to support fundraising for innovation and R&D projects in companies and to promote territorial strategic projects for companies and for institutions. A Socioeconomic Committee led by URV and including many other regional stakeholders (employers, unions, chambers of commerce, and the Port of Tarragona) has put together a strategic plan for the area that takes into account the latest approaches to the importance of a territory for effectively supporting an innovation system.

Box 3.6. **Barcelona's innovation strategy, including Barcelona Activa and 22@**

Barcelona has a four-pronged innovation plan:

- Infrastructure for innovation (including 22@);
- Innovation in the public administration;
- ICT and technology development; and
- Promoting an innovation culture.

Barcelona Activa is the local development agency of the City of Barcelona and one of the leading implementation agencies for Barcelona's innovation plan. It was created in 1986 to promote quality employment and innovative businesses and started modestly as a business incubator coaching 14 business projects. Some 20 years later, its role and reputation has grown and it is the primary instigator of employment and innovation in the city. To give a sense of scale of firm support activities, in 2008 there were 19 387 participants in activities for business creation, 1 379 business projects coached, 116 innovative start-ups based in the Incubator and Tech Park, 711 companies members of the Xarxactiva network and 350 companies coached in business growth programmes. Other performance indicators include: 84% business survival rate in the business incubator at fourth year, EUR 900 000 average turnover of incubated companies at fourth year, 9.8 average workers per incubated company at fourth year, and 26% foreign entrepreneurs in the business incubator. Business growth and creation are only 21% of the agency's annual budget, but they work with other Catalan programmes and funding sources to increase the impact of their work.

The 22@ Barcelona is an urban renewal project which is developing an urban model that offers modern, technologically advanced, and singular flexible spaces for the top economic activities. The 22@ Barcelona project is also an economic development project which aims at stimulating the creation of a scientific, technological and cultural pole to become one of the main platforms for innovation and knowledge economy in Spain and Europe. The project involves the transformation of 200 hectares of land nearby the waterfront at the heart of Barcelona. The 22@ district will permit the creation of up to 3.2 million m^2 of commercial space for firms (with a focus on certain technology-intensive sectors), in addition to the 400 000 m^2 of new GFS for facilities, social housing and green spaces to guarantee urban and environmental quality. The 22@ district has a good level of connectivity within the city and the metropolitan area, mainly through a well-developed network of public transport. It also hosts a state-of-the-art infrastructure for telecommunications, waste collection, heating/cooling system and power supply. The presence of top level institutions such as the Pompeu Fabra University, the Barcelona Media Innovation Centre and the Parc Barcelona Media makes this district an attractive place to establish a business and work.

Source: OECD (2009), *Promoting Entrepreneurship, Employment and Business Competitiveness: The Experience of Barcelona*, OECD, Paris; Cotec (2008), *Innovaciones tecnológicas con aplicación en el ámbito local*, Cotec, Madrid; and information provided by Barcelona Activa.

The possible rationales for collaboration are many, and the modality for and possible success for the S&T co-operation depends on a number of factors (see Table 3.A1.4). Often the collaboration is used for building critical mass, addressing a common challenge, building on common strengths, increasing specialisation, or recognising functional linkages. The footprint and its scale (whether the regions are contiguous in a functional region or spread out) determine the nature of possible collaboration instruments. While projects in a more strategic framework for co-operation have greater potential to bring longer-term positive spillovers, the transaction costs for such co-operation may be high, which is why many arrangements are either with specific institutions or even more *ad hoc* project-based collaboration. The type of driver, including governments, firms, or other knowledge-generation institutions (universities, research centres, etc.) will also determine the agenda for collaboration.

Catalonia is already involved in some transnational networks of regions that include an S&T or innovation element. They include the Four Motors Agreement, the Community of Work of the Pyrenées (CTP), the Pyrenées-Mediterranean Euroregion and a network of Creativity Districts. Other international examples of this transnational collaboration offer lessons for Catalonia (see Table 3.8). There are many regional networks or neighbouring region collaborations in Europe. ELAt is just one example. It is a tri-county cross-border arrangement that builds on the S&T strengths of the bordering regions for the knowledge-economy links in terms of critical mass and regional marketing. The US-Mexico Foundation for Science is an effort at national level for both countries to use S&T to address inter-dependency issues for the border region and beyond. While the Southern Technology Council is for regions only in the United States, it is an example of co-operation across a large geographic area focused on marketing, investment promotion and culture change in an area that had traditionally been lagging relative to national averages. Finally, the Baltic Sea Knowledge Region seeks to promote experience in transnational collaboration with an ultimate goal of an inter-connected innovation support system across metropolitan areas in the different countries.

Table 3.8. **Examples of trans-national S&T co-operation**

Criteria	ELAt	Baltic Sea Knowledge Region	Southern Technology Council	US-Mexico Foundation for Science
Footprint	Cross-border (international)	Transnational (some cross-border)	Cross-border (national, but large scale)	Cross-border (international)
Scale	3 metropolitan areas (Eindhoven, Netherlands; Leuven, Belgium; and Aachen, Germany)	Initial phase with Hamburg, Oresund and Helsinki with a goal to include entire region of 11 countries and 103 million people	13 US states	Mexico and United States (including but not restricted to multiple border states)
Nature	Strategic and institutional (with 2 formal bilateral agreements)	Institutional with goal to generate more strategic approaches among governments	Strategic	Strategic
Driver	Government/ key research institutions	Universities, research institutions	Government	Foundation (with endowment from two national governments)
Benefits	-Critical mass -complementarity in knowledge areas	-Critical mass -build on common/ complementary strengths	-Common challenges, strengths	-Common or inter-dependent challenges, strengths -economic development of border region -administrative management of projects
Examples	-Mapping and supporting clusters -talent attraction -"lobbying" for public resources/over-coming administrative barriers -transport infrastructure -regional marketing	-information sharing to support clusters (web portal) -build relationships for financing -promote broader regional agenda to other entities	-information sharing -investment promotion -image/culture change	-projects to develop technology-based sectors -S&T human resources development -health and environment research area focus

Notes

1. From the Institut d'Estudis Catalans (1997), *Reports de la recerca a Catalunya: Technologies de la informació I de les communications*, IEC, Barcelona as quoted in Riba Villanova and Leydesdorff (2001). Note that a later study finds that in the late 1990s, the Catalan government accounted for 55% of related spending, while 35% came from the Spanish government and 9% from the EU (see Table 3.A1.1). It is not clear if in this analysis EU Structural Funds are included under the Catalan government expenditures or simply excluded entirely.

2. The data used for this analysis is the Fourth wave of the Spanish Community Innovation Survey.

3. Initially set out by the European Council in 2000, it was simplified in 2005 to be more focused on jobs and growth. One of the two main indicator targets for this strategy is an R&D intensity of 3% by 2010 (total public and private investment in research and development over GDP). The other is an employment rate of 70% by 2010.

4. The Bologna Declaration of June 1999 has helped launch over time a series of reforms regarding higher education to enable greater standardisation across countries and institutions that are more attractive for European and non-European scholars. The three priorities of the Bologna process are: introduction of the three cycle system (bachelor/master/doctorate), quality assurance and recognition of qualifications, and periods of study.

5. In 1988, the Four Motors Regions signed a co-operation agreement in view of the expected Single European Market. The regions include: Catalonia (Spain), Rhône-Alpes (France), Lombardy (Italy) and Baden-Württemberg (Germany). The objective of this group was: to contribute to the internationalisation of the regions and their citizens, as well as to promote the role of its regions in Europe in the process of European construction. A co-ordinating committee meets regularly (approximately three times a year) under the supervision of the presiding region. For more information see *www.4motors.eu*.

6. The four main programmes include: the Co-operation Programme for research-industry links in a transnational framework, the Ideas Programme to support exploratory research, the People Programme to support existing and attract new young researchers and the Capacities Programme to support excellence in research such as research infrastructure, research-driven clusters and SME-relevant research. For more information see *http://cordis.europa.eu/fp7*.

7. Based on the model of the US National Science Foundation, the ERC was launched in 2007 to support leading researchers in Europe with blue sky or "frontier knowledge". The ERC Starting Grants finance promising research leaders to establish or strengthen research teams. The ERC Advanced Grants are for leading researchers to conduct frontier research of their choice – including risk-taking and inter-disciplinary research. For more information see *http://erc.europa.eu/index.cfm*.

8. Law 13/1986 on the Promotion and General Co-ordination of Scientific Research provided the basis for future policy development.

9. According to the same source, the corresponding distribution was 50%, 32% and 18% for subsidies. Loans, in contrast, are mainly allocated to organisations representing public-private co-operation (48%) and the private sector (40%).

10. Data is from INE, the Spanish National Institute of Statistics.

11. Data is from the Ministry of Economy.

12. Law 35/2006, of 28 November (published in BOE 285, of 29 November 2006).

13. Law 35/2006, *Disposición Derogatoria Segunda*.

14. For discussions of this competence sharing, see for example, Bacaria *et al.* (2004); Defazio, D. and J. García-Quevedo (2006); and Sanz-Menéndez, L. and L. Cruz-Castro (2005).

15. The 1979 Statute of Autonomy of the Basque Country included the competence for research and development. However, the region has recently negotiated the transfer of exclusive R&D competency from 2009 onwards, but it must be exercised in co-ordination with the Spanish government.

16. The context of the current fiscal equalisation scheme in Spain that includes Catalonia is beyond the scope of this review, which focuses on S&T and innovation.

17. In terms of financing in Spain, there are 15 regions under the "common regime" that includes both taxes and tax-sharing with unconditional transfers in the context of an equalisation scheme. Catalonia falls under

this regime. Two regions (Basque Country and Navarra) belong to the "foral regime" whereby the region collects taxes directly and pays a negotiated amount to central government for services central government has provided to the region's inhabitants. The relations are therefore in part conditioned by the type of regime within which the region falls.

18. Per Organic Law 6/2006 of 19 July on the Reform of the Statute of Autonomy of Catalonia, Articles 183-192.

19. See, for example, OECD/FECYT (2007), *R&D and Innovation in Spain: Improving the Policy Mix*, *Fundación Española para la Ciencia y la Tecnología*, Madrid and OECD, Paris.

20. For more information, see the *Ministerio de Economía y Hacienda* (2001), "*Informe sobre la financiacion de las CCAA*".

21. On the one hand ***"transactional" contracting*** corresponds to a logic by which the respective duties of both parties can be stated in advance. All co-ordination problems can be stated *ex ante* (before the signature of the agreement) and the arrangement between the parties states the reciprocal duties of each of them. The resulting contracts are "contingent" and "complete" in the sense that they set the obligations of each of the parties as a function of external events (*e.g.* the economic climate) and of the actions of the other party. This guarantees *ex ante* an effective co-ordination and the only challenge is to encourage the parties to enforce their obligations. As a result, such types of contracts implement "incentive schemes" and are supervised by external third parties (such as the judiciary). On the other hand, ***"relational" contracting*** corresponds to a logic by which the parties commit to co-operate *ex post* (after the signing of the contract) and design a "governance mechanism" for that purpose. The parties agree to follow *ex post* the instructions of a common decision mechanism and to implement a specific bilateral mechanism to manage their potential conflicts. Co-ordination problems are solved *ex post* and supervision of the enforcement of the agreement tend to be bilateral and to rely on co-operative spirit. For more information on this contracting approach, see OECD (2007), *Linking Regions and Central Governments: Contracts for Regional Development*, OECD, Paris.

22. There are exceptions for provincial governments in regions with only one province (provincial power merged with those of the region), in the Balearic Islands and Canary Islands, and the three-province Basque Country region. The North African enclaves are municipalities associated with provinces elsewhere.

Annex 3.A1

Table 3.A1.1. **Public funding for S&T and innovation: late 1990s**

Organism or programme	Period	Public funding (EUR million)	Share (%)
Generalitat (Catalan government)	1996-1999	123.20	55.12
Spanish administration (universities)	1996-1999		12.59
Spanish administration — CDTI (firms)	1998-1999	49.96	22.35
EU-IV Framework Programme	1995-1998	21.04	9.40
Local administration (universities)	1996-1999	1.14	0.51
Total annual (average)		223.50	100.00

Note: It is not clear whether any EU Regional Policy funds, such as a portion of ERDF receipts in Catalonia, are included in this table under the Catalan government total, or simply excluded from the calculation.

Source: Bacaria, J. *et al.* (2004), "The Changing Institutional Structure and Performance of the Catalan Innovation System", in *Regional Innovation Systems – the Role of Governance in a Globalized World*, (ed.) P. Cooke, M. Heidenreich and H.-J. Braczyk, 2nd edition. Routledge, London and New York.

Table 3.A1.2. **Responsibilities of central and regional governments in Spain**

State	Autonomous Community (AC)
S1) Exclusive legislative and executive competencies	AC1) Exclusive legislative and executive competencies
• Immigration and emigration • International affairs • Defence • Justice • Commercial, penal, labour, industrial and intellectual property and civil law (except matters regulated by traditional regional law) • Foreign trade • Monetary system, exchange regime, and State treasury and debt • Infrastructure of national scope, (*i.e.* inter-regional roads, railroads and water transportation, and commercial ports and airports) • Sea fishing	• General organisation of self-government • Changes in municipal boundaries and creation of supra-municipal bodies • Land use planning and housing • Infrastructure of a regional scope (i.e. intra-regional roads, railroads and water transportation, and non-commercial ports and airports) • Agriculture, forestry and river fishing • Domestic trade and fairs • Tourism • Culture (i.e. museums, libraries, historical heritage, cultural promotion, etc.) and sports (i.e. facilities and promotion) • Social services • Environmental policy • Other listed in the "Statute of Autonomy" and not included in S1
S2) Power to set basic legislation	AC2) Competencies subject to basic state legislation
• Banking and insurance activities • Health care • Social security • Education • Local self-government	• "Economic development within the national economic framework" • Other listed in the "Statute of Autonomy" but included in S.2 or S.3
S3) The central State also has the power for:	AC3) In addition, the ACs have competencies
• Co-ordinating and promoting scientific and technical research • "Setting the basis for and co-ordinating the general planning of economic activity" • "Guaranteeing the equality of all Spaniards in the exercise of their constitutional rights and duties"	• Any competence delegated by the state

Source: Spanish Constitution with elaboration as appeared in OECD (2007), *Linking Regions and Central Governments: Contracts for Regional Development*, OECD, Paris.

Table 3.A1.3. **Functions of the General Council for Science and Technology**

1. Inform preparations for the National Plan, especially with respect to the best use of resources and means of research available
2. Propose objectives for the National Plan
3. Propose, based on interest, programmes and projects of research by the autonomous communities, with the corresponding presentation by the governors
4. Promote the exchange of information between the State and the autonomous communities regarding their respective research programmes so as to facilitate the general co-ordination of scientific and technical research
5. Promote actions in conjunction with or among them and the State, to develop and execute research programmes
6. Disseminate information and reports, referring to the co-ordination of research developed by public administrations, requested by the inter-ministerial Communion on Science and Technology or the Advisory Cabinet for Science and Technology
7. Constitute a basis of documentation about the different research plans and programmes promoted by public authorities

Source: www.ingenio2010.es.

Table 3.A1.4. **Modalities of international S&T co-operation**

Footprint	Nature of collaboration	Drivers of collaboration	Rationale for collaboration
Cross-border (contiguous)	Strategic (part of broader joint planning process for development)	Government (supra-national, national, regional, or local)	• Functional area or other inter-dependency • Common challenges or strengths
Transnational (non-contiguous)	Institutional (key institutional alliances)	S&T related institutions (universities, research centres, foundations)	• Increase critical mass • Increase specialisation and complementarity • Economies of scale to joint action • Overcome regulatory or institutional barriers • Opportunities for knowledge sharing
	Project-based (*ad hoc* joint projects)	Private sector (Firms, could be a cluster or value chain relationship)	
		Combination	

Box 3.A1.1. **Girona: building local advantage**

Girona is a province of Catalonia with 635 000 inhabitants, located between the French border and Barcelona. Until now, the services sector employs in Girona 62% of the population, within which tourism plays a major role. Within industry, agro-food has about 800 companies, 200 of them devoted to the meat industry. The second most important industrial sector is machinery production. Some other sectors of industrial importance are mineral waters, fiber and regenerated cotton textiles, corks for sparkling wines and bus bodyworks. All of them are traditional sectors. Factors have emerged to change the competitive mode including: *i)* the creation of the University of Girona and the presence in the area of other actors related to R&D; and *ii)* the science, technology and innovation policies implemented by the Spanish government and the *Generalitat* of Catalonia, policies that have helped local initiatives grow.

In execution of the third mission, the University of Girona (created in 1991) promoted, with other actors of the region, a Science and Technology Park inaugurated in 2007. While the university is the lead actor in the region for the knowledge generation and transfer system, several other centres exist and are the consequence of the initiative of local individual and institutional actors. In this respect, Girona has a characteristic that might constitute a competitive strength: the closeness of the agents in the territory. But those local agents have taken advantage of the different programs that develop science, technology and innovation policies, so much of the Spanish government as principally of the *Generalitat*. As regards the influence of these policies in the development of the region, the most notable milestones include:

- The decision of the *Generalitat* of Catalonia, adopted at the beginning of the 1990s, of diversifying the Catalan university map allowing the creation of the University of Girona;
- Previously, the *Generalitat*, with the support of the local food industry, created and distributed in the territory diverse centres of the Institute of Research and Food and Agriculture Technology;
- At the end of the 1980s and beginning of the 1990s, the technology transfer offices were encouraged in Spanish universities by means of programs of the Spanish and Catalan governments. These programs gave form to the current Technology Transfer Office (OITT) of the University of Girona;
- The promotion, on the part of *Generalitat* of Catalonia, of a network of non-university research centres (CERCA programme) has facilitated the appearance in Girona of centres like the Catalan Institute of Water Research (ICRA), the Catalan Institute of Investigation in Cultural heritage and the Institute of Biomedical Research of Girona;

Box 3.A1.1. **Girona: building local advantage** (*continued*)

- Girona develops clusters based on traditional sectors (production technologies cluster and the pork meat sector cluster) and emergent clusters, based on the knowledge actors of the area (biotechnology, IT and water). This promotion of clusters has been strongly influenced by the Spanish programme of Associations of Innovative Companies (AEI);
- The Network of Technological Springboards promoted by Acció of the *Generalitat* has allowed the creation in the region of new companies based on knowledge;
- The IT Network of the *Generalitat* of Catalonia has promoted technology transfer between the University of Girona and the companies of the region. The University of Girona has ten research groups in this Network, a very high number compared with the rest of Catalan universities;
- The programme of the Spanish government directed to promote R&D in Science Parks, a programme initiated in the year 2000, has supported the creation of the Science and Technology Park of the University of Girona, a project that captures the will of change of the competitive model in the area; and
- The presence of the University Hospital, which depends on the *Generalitat*, and the creation of the new School of Medicine will allow the consolidation in the north of the city of the Health University Campus.

Source: Information provided by the Science and Technology Park, University of Girona.