OECD Reviews of Regional Innovation

BASQUE COUNTRY, SPAIN

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Foreword

Strong dynamics of innovation generation in regions are crucial for achieving national innovation policy objectives. In addition, innovation performance can contribute to improving the overall economic competitiveness of individual regions. Policy recommendations are therefore being sought by national science and technology and regional policy actors, as well as by the regions themselves.

OECD member countries and regions are nevertheless struggling with how to best promote regional innovation. How should national innovation policies take into account this regional dimension (i.e. the importance of "place")? How can regional actors support innovation that is relevant for their specific regional context? This role-sharing in a multi-level governance context for innovation is a new area for OECD member countries.

In 2007, the OECD launched the series *OECD Reviews of Regional Innovation* to address this demand by national and regional governments for greater clarity on how to strengthen the innovation capacity of regions. These reviews are part of a wider project on competitive and innovative regions through the OECD Territorial Development Policy Committee. This work also supports the OECD Innovation Strategy. The series includes both thematic reports and reviews of specific regions.

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Acronyms and abbreviations

BERC	*Centros de Investigación Básica y de Excelencia* Centres for Basic Research and Excellence (Basque Country)
BERD	Business enterprise expenditure on R&D
CDTI	*Centro para el Desarrollo Tecnológico Industrial* Centre for the Development of Industrial Technology
CENIT	*Consorcios Estratégicos Nacionales en Investigación Técnica* National Strategic Consortium in Technical Research
CIC	*Centro de Investigación Cooperativa* Centre for Co-operative Research (Basque Country)
CICYT	*Comisión Interministerial de Ciencia y Tecnología* Council for Science and Technology (Spain)
CSIC	*Consejo Superior de Investigaciones Científicas* Spanish Research Council
DUI	Doing, using, interacting
EC	European Community
EFQM	European Foundation for Quality Management
ENCYT	*Estrategia Nacional de Ciencia y Tecnología* National Science and Technology Strategy
EPO	European Patent Office
ERC	European Research Council
ERDF	European Regional Development Fund
ESF	European Social Fund
EVE	Basque Energy Agency
EU	European Union
EUSTAT	Basque Country Statistics Agency
FDI	Foreign direct investment
FP	Framework Programme (EU)
FTE	Full-time equivalent

GDP	Gross domestic product
GERD	Gross domestic expenditure on research and development
GVA	Gross value added
HEI	Higher education institution
HR	Human resources
HRST	Human resources in science and technology
INE	*Instituto Nacional de Estadística de España* National Statistics Institute of Spain
IPC	International patent classification
IPR	Intellectual property rights
ISO	International Organization for Standardization
KIS	Knowledge-intensive services
KISA	Knowledge-intensive service activities
LPS	Local production system
PCT	Patent Co-operation Treaty
PCTI	*Plan de Ciencia, Tecnología e Innovación* Science, Technology and Innovation Plan
PPP	Public-private partnership
PPP	Purchasing power parity
PRO	Public research organisation
RVCTI	*Red Vasca de Ciencia, Technología e Innovación* Basque Network of Science, Technology and Innovation
R&D/ R&D&I	Research and development/ research and development and innovation
SME	Small and medium-sized enterprise
SPRI	Society for the Promotion of Industry
S&T/ STI	Science and technology/ science and technology and innovation
TC	Technology centre
TFP	Total factor productivity
UPV	*Universidad del País Vasco* University of the Basque Country
USPTO	United States Patent and Trademark Office

Assessment and recommendations

Review context

Role of innovation in society leading to a broader definition

Innovation is increasingly seen as the main source of growth for stronger, cleaner, fairer economies. This has been highlighted in recent key reports and strategies, such as the OECD Innovation Strategy and Europe's Innovation Union. This broader approach has resulted in a renewed reflection on what innovation is and is used for. It also leads to a greater recognition of the importance of innovation for regional governments to support their social and economic development needs.

The dynamics of innovation are evolving, with policy implications…

Our understanding of the innovation process is evolving, as is the process itself. Access to external knowledge and collaboration, particularly between public and private entities, is observed to be increasingly important to the innovation process. It has led to more open forms of innovation. The pervasiveness of science-based technologies calls for greater science-industry linkages. There is a rising demand for policies to support non-technological innovations (such as organisational and marketing innovations). Innovations in the service sector are on the rise. Spillovers from inter- and intra-sectoral linkages support the diffusion of innovation across the economy. Consumer demand as a driver of innovation is also more prominent. The availability of skilled human capital remains a pre-requisite for successful development of innovative activities. Markets for skilled human resources are increasingly global, require greater fluidity between public and private sectors, and benefit from lifelong learning educational opportunities. And in a context of financial and economic crises,

which generally have negative impacts on business strategies, public action that supports innovation for long-term recovery should be a priority.

… requiring more comprehensive approaches to innovation to promote Basque Country competitiveness going forward

The Basque Country has experienced crisis before. In the 1970s and 1980s, massive restructuring of the economy in sectors such as steel, shipbuilding and machine tools led to high unemployment and outmigration. The region became a model for its successful so-called "First Great Transformation" to restructure industry and make the region competitive through tailored industrial policies, including the system of technology centres.

However, the success of the prior model may not guarantee conditions for future success. The last transformation was mainly based on incremental and cost-cutting forms of innovation among local firms. In addition to supporting those innovations, the Basque Country will need to foster improved conditions for knowledge (including science) as a driver of innovation. Creating opportunities for innovation to contribute to social goals and needs (such as health, the environment, and other public services) is also part of this newer trend.

Diagnosing the innovation system

The Basque Country is a unique socio-political entity with three provinces

The Autonomous Community of the Basque Country (*Comunidad Autónoma del País Vasco*) is situated in the north of Spain. The term Basque Country has a wider historical and cultural significance than the current administrative boundaries. It borders southwest France and several other Spanish regions. Three historical territories (provinces) of Alava, Biscay and Gipuzkoa comprise the region. These provinces, along with the region of Navarre, are the only jurisdictions that benefit from a decentralised fiscal (foral) regime within Spain. Official languages include Spanish and Basque.

Table 0.1. **SWOT of Basque innovation system**

Strengths	Weaknesses
-Growing wealth levels (GDP per capita), albeit more in PPP than in EUR -Strong industrial capacity (notably medium-low and medium-high tech industry) -Strongly networked society with regional identity (clusters, business associations, social sphere) -Resilient industrial base that survived transformation, including co-operatives -Infrastructure of technology centres and parks -Highly positive trend in R&D intensity -Educated labour force, especially in engineering -Network of technical colleges, some business schools -Active regional and provincial (sub-regional) governments, due in part to uniquely strong fiscal decentralisation -Sustained political commitment to industrial-based competitiveness -Effective government-private stakeholder interaction in policy development process -Committed business people and entrepreneurs	-Total factor productivity as a driver of growth declined 2000-2004, albeit a more positive trend observed since 2004 and pre-crisis -Few firms conduct R&D; innovation more for cost cutting rather than new products and services -Limited scientific capacity (basic research, scientific publications, public research system, high-tech firms) -Inward looking innovation system -Universities poorly connected -Adapted monitoring and evaluation (but many assessments) -Some fragmentation of innovation support programmes with focus on supply to key innovation system actors -Risk of windfall profits to firms (high share of public financing of BERD – direct support and via tax incentives) -Technology transfer and diffusion to many SMEs -Financing and management of scientific/research infrastructure -Mechanisms for inter-departmental planning and co-ordination of STI policy
Opportunities	**Threats**
-Strengthening public & quasi-public research system -Capitalise on new CIC and BERC innovation actors (talent attraction, new knowledge generation) -Innovation beyond technological focus and for social needs (non-technological forms of innovation, innovation in public services, etc.) -International business and knowledge networks (including Basque Diaspora) -Building a culture of creativity, risk and innovation -Better positioned to exit crisis than other Spanish regions (keeping jobs instead of shedding) -Public procurement and other tools to spur demand for innovation -Greater involvement of actors less well represented in innovation policies (including those **not** in the RVCTI)	-Aging of the population (with limited inward immigration) -Path dependency of public policy in STI -Increasing production sophistication and competition of emerging markets -Growing competition to attract Spanish and EU funding sources for research and innovation

Notes: SWOT=Strengths, Weaknesses, Opportunities and Threats, BERC=Basic Excellence Research Centre, BERD= Business Expenditure on Research and Development, CIC=Co-operative Research Centre in English, PPP= Purchasing Power Parity, STI=Science, Technology and Innovation RVCTI=Basque Network on Science, Technology and Innovation in English.

The three provinces have some particularities. Biscay province, including the city of Bilbao, accounts for just over half of the region's population and economy. Alava province is much smaller, only 14% of the population and 17% of the economy. While more rural than the other provinces, it is home to the administrative capital of the Basque Country, Vitoria-Gasteiz. Alava has a much higher GDP per capita and GDP per worker than the other two provinces. Gipuzkoa accounts for approximately a third of the Basque Country population and economy. The province has many co-operatives, such as the world-renowned Mondragon Corporation.

The strong industrial core in medium-low and medium-high technology manufacturing has proven less vulnerable to recent shocks

From 1995-2008, the economic structure of the region changed modestly in favour of an increase in construction. That sector grew from 6% to 10% of the region's gross value added, resulting in minor decreases in the others: agriculture from 2% to 1%, manufacturing from 27% to 26%, and services from 61% to 60%. Within manufacturing, employment has been stable or increased in particular sub-sectors, with very notable increases in the category fabricated metal products. In the current financial and economic crisis, the Basque Country economy has proven more resilient than the rest of Spain across sectors, including less vulnerability in the construction sector. So while Spain experienced a 10.2 percentage point increase in unemployment from Q4 2007 to Q4 2009, in the Basque Country it was only 6 percentage points.

Unlike most of Spain, immigration has not significantly contributed to the region's GDP growth…

The Basque Country's growth model has differed somewhat from many other Spanish regions. With approximately 2.1 million inhabitants and a GDP of EUR 68 billion in 2008 (down to EUR 65.5 billion in 2009 with the crisis), the region accounts for only 4.7% of Spain's population but between 6.1-6.3% of Spain's GDP. Unsustainable demographic trends have not been the driver of growth. Spain experienced massive population increases (1% annually from 1995-2005) fuelled by immigration. In the Basque Country, the population is ageing (18.6% aged 65 or older) and had a net gain of only 3.5% total from 1998-2009 (around 74 000 inhabitants). The foreign born population is only 120 000 but nevertheless increased from 0.7% to 5.4% of the population over the period 1998 to 2008.

… but increases in capital and labour drove growth between 1995-2004, with innovation factors more prominent after 2004 (pre-crisis)

Several analyses of the region have attempted to explain the source of the so-called "Basque competitive paradox." With respect to GDP per capita levels and growth rates, the Basque Country is leading in Spain and above OECD regional averages, driven in part by advantages associated with purchasing power differentials. The region's relative advantage to the OECD average in terms of GDP per worker has nevertheless diminished over the last 15 years. From 1986-1995, capital and total factor productivity (TFP) explained gross value added (GVA) growth, with labour playing a much smaller role. TFP captures effects above and beyond the value of technology embodied in capital investment, including technological change related to intangible investment and incorporation of tacit knowledge aimed at improving labour/capital mixes in production processes. However, in the period 1995-2004, labour was the main explanation for GVA growth, along with capital, while TFP was not as significant a driver. In the period 2004-2006, the role of TFP appears to have increased. The question for the future is how to ensure that R&D investment continues to contribute to productivity growth and that public sources do not crowd out private sources.

Top performance in Spain on many economic and innovation indicators

The Basque Country is a leading region in Spain with respect to several economic and innovation-related indicators (see Figure 0.1). They include: the labour force with tertiary education, business R&D intensity, GDP per worker and the share of employment in high-technology industries and knowledge-intensive services (KIS). Given the more limited public research facilities and higher education research capacity, the figures for government and higher education R&D are lower than Spanish and OECD averages.

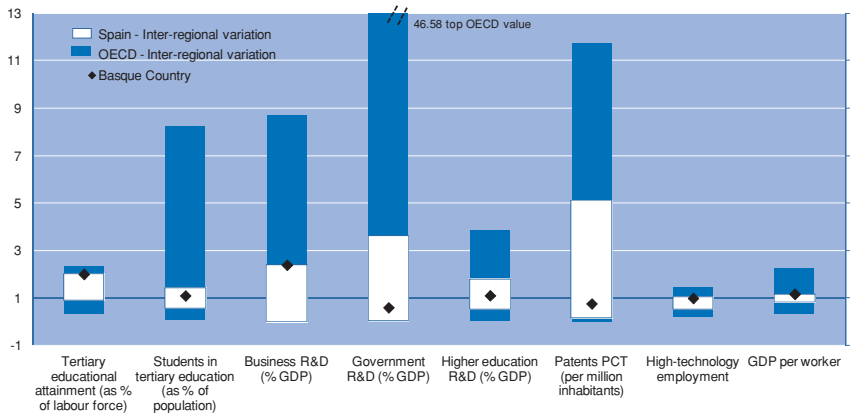
On an OECD-wide basis, the Basque Country is a strong industrial region but not a global knowledge hub

Within the OECD, however, the Basque Country is not among the top regions on most traditional innovation-related indicators. Using classifications of the European Regional Innovation Scoreboard, the Basque Country is in the "medium-high innovator" category, which is the second of

five. Other analyses identify the region's peer group as those in central and southern Europe. An OECD analysis finds that the Basque Country falls in a regional peer group of "medium technology manufacturing and service providers". These regions, while not the leading OECD knowledge hubs with the highest R&D and patenting intensity, are nevertheless regions that have a highly educated labour force and industrial activity that may include design, intangibles and creativity-led sectors in addition to traditional manufacturing activities. Other OECD peer regions include: Rhône-Alpes and Alsace (France), Flanders (Belgium), Quebec and Ontario (Canada) and UK regions, among others. Regions with a strong industrial base that may serve as a reference for the Basque Country include Baden-Wurttemberg and several other German regions, or Southern Netherlands, to name a few.

Figure 0.1. **Regional innovation indicator summary: Basque Country**

OECD regions median=1



Notes: Data for 2007 or latest year available depending on the region. The light colour band represents the range of values for the country. The dark colour band represents the range of values for OECD regions. The diamond is the value for the region. Values are normalised to 1 for the OECD median for available regions. Information on all OECD regions is not available for each indicator.

Source: Calculations based on data from the *OECD Regional Database*.

The Basque Country's high share of business executed R&D requires a more nuanced interpretation based on types of actors and sources of funding

OECD member countries display on average a high share of R&D by the business sector. This is one indication of private sector commitment to innovation. Of total R&D performance in the Basque Country, firms accounted for 76% in 2009 (81% in 2008). Due to the region's firm demography, a relatively higher share of R&D expenses is conducted by small and medium-sized enterprises (SMEs) that generally have greater barriers to R&D investment. However, that figure declined to around 60% in 2008 when entities with a private sector classification but varying shares of public financing (e.g. technology centres [TCs], and newer co-operative research centres [CICs]) are excluded from this accounting. Basque firms benefit from higher levels of public support for their R&D expenditures relative to other regions and countries (25% of business expenditure on R&D, total of 0.47% of GDP for R&D support both direct and indirect – i.e. tax credits – to firms). Note that comparisons of these figures across regions and countries should be interpreted taking into account other forms of public R&D support to firms that do not appear in the statistics, such as subsidised loans.

Patterns of innovation indicate increasing investment but not the share of firms innovating

The Basque Country is seeking to move from a cost-cutting and incremental innovation model to one that is more knowledge intensive. Within Spain, the Basque Country has the highest innovation intensity (spending on innovation activities over sales) of all regions. There is growing firm expenditure on technological innovation (4.1% of GDP in 2008), with an increase in the level and a shift in the composition towards internal R&D away from machinery and equipment purchase. Firms with broadband access increased considerably, from 34% (2002) to 92% (2008). In 2008, among firms with 10 or more employees, the share in the Basque Country that innovated was 32% (for all firms, that share was 16%). However, around the same values have been observed throughout the decade. And the share of SMEs introducing a new product or process innovation did not improve considerably, fluctuating between 30% and 35% between 2003 and 2008.

While the Basque economy is open in terms of trade, other indicators show a need for greater integration in international networks to complement internal networks

Due to socio-political trends that required regional self-reliance, firms have a strong commitment to the region. There are signs that the region has increasingly developed internal networks through policies and intermediaries. Regional innovation system actors reportedly not sufficiently integrated into those networks include universities and many SMEs. In terms of accessing international knowledge, the Basque Country has low but increasing linkages. The Basque economy is relatively open, with an international trade-to-GDP ratio of 61%. It could further capitalise on potential for inward foreign-direct investment (FDI) (currently very low) that has extensive linkages with local industry. It could also benefit from greater levels of foreign-funded R&D (3% in 2009). The region has been increasing its presence in international networks via participation in certain EU Framework Programmes and European Technology Platforms. Networks of high-skilled talent are also important, with regional attraction policies financing 73 new resident or visiting foreign researchers over the last 2 years. The share of co-patents with a co-inventor has increased from one-third to one-half of inventions since 2000, but the share with co-inventors in foreign regions has stagnated and is among the lowest in Spain (around 5%). And while the region has been rapidly increasing the number of co-inventions with foreign regions over time, other regions are increasing their connections faster. The Basque Country did improve significantly from the 28th percentile of regions for its international connections (1977-1987) up to the 54th (1988-1997) but then slipped to the 47th percentile (1998-2007).

STI policy trends

A successful regional STI policy since the early 1980s rooted in industrial competitiveness aided by technology centres (TCs)

With the Spanish Constitution of 1978 and the subsequent negotiations about the role of Spanish regions with respect to STI policy, the Basque Country chose early to develop its own policy. With very limited public and university research resources, the region made a strategic choice in policy orientation to focus on industrial competitiveness. The vehicle chosen to

achieve that goal was the consolidation of an existing set of poorly endowed sector-based TCs or testing labs with support from the Department of Industry and its implementing agency SPRI. The industrial policy implied a focus on technological development. The Technology Strategy Plan 1990-1992 and to a large extent the following one, the Industrial Technology Plan 1993-1996, were prepared under the aegis of SPRI. In an analysis of selected years between 1989 and 2004, the Basque government budget for technology policy ranged from four to five times that of science policy (0.7% to 1.2% of the overall budget versus 0.2% for science policy). However, plans involved little if any co-ordination with the Department of Education, Universities and Research responsible for funding research activities and infrastructure in the academic sector.

The 1997-2000 Plan saw the genesis of integrated thinking for STI policy

The Basque government sought a more integrated STI approach in the late 1990s and early 2000s. The Science and Technology Plan (PCT) 1997-2000 put more emphasis on the development of S&T knowledge capacity, as well as on the articulation between the demand and supply sides of knowledge and technology. Institutional and policy initiatives reflected this increasingly integrated approach. One of the key initiatives was the development of institutions, such as the Basque Technology Network. A formal cluster policy and cluster technology plans supported these developments. Nevertheless, funding for S&T infrastructure declined and projects involving co-operation among innovation system actors remained low.

The 2001-2004 Plan was the first effective attempt to broaden the policy mix…

The Science, Technology and Innovation Plan (PCTI) 2001-2004 promoted institutional initiatives that broadened the scope of the region's policy mix. The Department of Industry and the role of TCs remained pre-eminent, as its budget (which covers technology policy but also includes instruments that support industrially relevant research in centres and universities) grew by 68% over the period while that of the Department of Education (which includes science policy) grew by only 8.1%. About 70% of the total plan budget focused on supply by the TCs as well as demand by firms. But the Plan strengthened support measures to institutions in the Basque Technology Network, developed support programmes for firm

R&D&I investment as well as co-operative projects, and paid greater attention to human resources.

… with new research actors (CICs and BERCs) added to the innovation system

The 2001-2004 Plan marked the creation of, in parallel, two sets of new institutions to strengthen and diversify the Basque knowledge base. The CICs (co-operative research centres), financed by the Department of Industry, were launched to conduct targeted research in areas considered strategic for the region, including emerging sectors for which the Basque Country did not yet have a major industrial base. The BERCs (basic excellence research centres) were developed by the Department of Education to support fundamental, non-targeted research based on researcher excellence. As the number and nature of these new entities increases, there is a need for: *i*) greater clarity in the governance of each entity; *ii*) opportunities to provide common services across centres related to technology transfer; and *iii*) greater overall strategy, co-ordination, and complementarities in the evolution of these centres initiatied on separate tracks.

The 2007-2010 Plan sought in earnest to set conditions for the region's so-called "Second Great Transformation"

The 2007-2010 Plan takes on board the goal of supporting the region's so-called "Second Great Transformation". To do so, several key programmes were created for financing projects. In some cases they were targeted to specific innovation system actors or sectoral/technological priorities. The diversification to high-technology sectors (bioscience, nanoscience, alternative energies and electronics for intelligent transport) and stronger institutions is also promoted through programmes for new research centres or attracting talent (Ikerbasque). Eco-innovation and social innovation are new lines of action in this plan, albeit loosely defined initially. Several other institutions to support networking and governance were also launched at the same time, such as: Innobasque (an innovation agency with a networking as opposed to programme focus like SPRI), the inter-departmental strategic body Basque Council for Science, Technology and Innovation, a retooled and renamed Basque Science Technology and Innovation Network (RVCTI) and a new Innovation Fund (EUR 40 million annually).

Technology centres, a clear strength of the Basque innovation system, should continue to evolve

Technology centres (TCs) are, rightfully, the pride of the Basque innovation system. Building on traditional technology transfer institutions, the region has achieved a number of powerful and diversified TCs. In an effort to further strengthen these actors, the region has promoted the consolidation of centres into two TC networks (Tecnalia and IK4) to rationalise costs and enable them to better compete internationally with actors such as Fraunhofer (Germany) and TNO (Netherlands). TCs are very effective at competing for public funds in and beyond the region, such as through the EU Framework Programme or the Spanish CENIT programme.

TCs continue to hold a central position in the innovation system and in STI policy. As TCs have matured, policy has required increasing accountability for public support. A development model towards international excellence has progressively shifted their focus towards the knowledge generation side. This has left a growing gap in the Basque system for basic technology transfer to SMEs. Public incentives for further SME support could either be factored into the institutional funding of TCs along with measures to stimulate demand by these SMEs or, alternatively or in complement, be supported by other actors, such as cluster associations, local development agencies and technical colleges.

University research, under-developed in prior STI policy approaches, merits greater attention for improving quality and quantity

While actors in the region recognise that there is a "problem" with universities in the innovation system, clear actions are warranted to finally address this. There are challenges in Spain overall for universities to engage with firms due both to regulatory barriers and cultural norms within and outside universities. However, other regions in Spain are increasingly providing incentives to improve the quality and quantity of research, such as in the latest STI Plan for Catalonia. The Basque Country has one large public university (UPV – University of the Basque Country), one private university with an applied orientation building on a polytechnic school origin (Mondragon University, part of the Mondragon co-operative group) and another private university (Deusto University) with a focus on social sciences and teaching. The development of excellence and critical mass in research groups has progressed (20 recognised as excellent, 115 acceptable – others uncertified) as has technology transfer activity. But Basque

universities are not top performers on several indicators for Spanish universities. Accessing knowledge outside the region is important since the region's scale does not allow for critical mass in science in all areas. But more public effort could be oriented towards regional priorities in basic research to achieve the desired transformation in the region's innovation model. Greater integration of Department of Education initiatives within inter-departmental efforts, along with new criteria in performance contracts for universities overall and specific research grants, could be used to ensure that such initiatives do not lead to investments in isolation of regional competitiveness needs. Accompanying measures should support university absorption capacity and efficiency.

Human resources for innovation were under-addressed in the 2007-2010 Plan, apart from the creation of Ikerbasque

The plan did not focus extensively on human resources. The share of R&D personnel per 1 000 labour force in the region is, admittedly, already high (9.4 FTE versus the OECD average of 7.7). However, the composition of R&D personnel, 71% in engineering, may not sufficiently address the region's science needs. Another challenge is that of achieving greater inter-institutional mobility between higher education institutions (HEIs), other research institutions, TCs and firms. While Spanish regulations hinder in part this mobility, and a Spanish programme seeks to address this, mobility remains too infrequent in practice. Regional efforts are required to reinforce the mobility of skilled researchers. Ikerbasque, emulating the model of Catalonia's ICREA, is an entity that attracts, finances and places scientists in regional research institutions. This research talent attraction agency model is used in Spain to overcome regulatory and other barriers to hiring foreign scientists in public institutions like universities. It could be further oriented towards the region's prioritised areas of research to build critical mass. In Biscay province, another programme was developed to help finance firm attraction of top talent as well as facilitate researcher relocation to the area. In addition to talent attraction, a greater opening up of the Basque Country to knowledge networks would favour international linkages of already resident researchers. Other human resource issues merit greater attention as being relevant for the success of future STI plans. They include: improving the performance of students in primary and secondary school, reinforcing life-long learning, and addressing other barriers to international integration such as English language skills.

Basque Country progressively integrating new innovation policy concepts into STI portfolio

There is growing recognition in the region that the STI Plan should take a broader approach to innovation given the changing innovation processes and the policies to support them. The next STI Plan under development has identified a number of strategic axes in this direction. Progress thus far in the region includes: initial work to promote awareness of social innovation (publications, workshops, practical guides used and implemented in social spheres, etc.); development of an eco-innovation strategy with multiple Innovation ECOmmunities; and recognition of the role of "intangibles" in innovation (the region is considering the development of a methodology for measuring investments in intangibles). While excellence in management has been a longstanding effort in the region, other instruments such as for design and creativity are in their early stages. Although not a new sector *per se*, support to knowledge-intensive services is increasingly recognised as having positive benefits for other sectors, yet there are no specific policies in this area.

With sustained public investment in STI that has a leverage effect for greater private investment, the STI policy mix could be adjusted on several dimensions

Continued public commitment by the Basque Country to invest in STI policy is a necessity for the region to compete. Within this investment, the policy mix of different instruments to support STI policy needs to evolve over time, informed by regular feedback. There is no one model for a region's smart policy mix, it is region-specific and should address the current and projected future needs of the innovation system based on its existing assets and global trends. Given the Basque Country's current innovation system, strategy and instruments, several adjustments could be considered in the next STI Plan:

- **Fund science (basic) and technology/innovation (applied):** to support knowledge-driven innovation, the region must invest more in the science part of its portfolio. Evidence in OECD regions reveals a convergence of scientific fields, an increase in collaboration for scientific production (publications), and greater multi-disciplinarity in science. The weakness in science in the Basque Country is recognised in public plans, but resources and accountability mechanisms have not yet caught up. Given the high cost of scientific research and the critical mass required for international competition, science research in areas that are relevant to

the region's economic base should receive priority. Not all knowledge needs to be generated in the region, rather greater access to external knowledge that may be absorbed by the region is also vital. Effectiveness of public investment in science requires accompanying measures to build absorption capacity and institute accountability mechanisms and incentives, particularly to overcome certain regulatory and cultural barriers for Spanish universities more generally.

- **Reinforce non-technological innovation:** one of the region's strengths has been the development of many technological support instruments. Among non-technological innovation programmes, the region has made a longstanding successful effort to support excellence in management. There are initial actions in social innovation and creativity. Much more could be done to promote knowledge-intensive services, and the creation of value added through investment in design and creativity.

- **Design new instruments that create demand:** similar to other regions, Basque Country policy tends to support the supply of instruments over building firm demand. Innovation-oriented public procurement is one tool. Other incentives such as regulations and standards (including consumer standards) may also support innovation if appropriately targeted. Such instruments are particularly helpful for innovation that supports social goals, including public services (health, energy, education, etc.).

- **Continue outreach to SMEs not innovating and growing:** given the firm demographics of the region, there remain important challenges for helping non-innovating SMEs to innovate. This support may take both technological and non-technological forms. There are already several programmes to stimulate demand among SMEs (development of innovation agendas, support to ICT, business management innovation, etc.). Greater efforts are needed to reach SMEs by all actors (network associations, cluster associations, local development agencies, technical colleges, technology centres, etc.).

Some additional characteristics of the current mix of STI instruments may also be reviewed by the region. **Direct and indirect support:** in the Basque Country, the relative shares in 2007 were 52% tax incentives, 48% direct support. As a region and not a country, the number of tools that the public sector may use to support its firms is more limited. Nevertheless, as indirect support complements existing firm R&D projects but does not help create more innovation-active firms per se, the relative proportions may not be tailored to the needs of the vast majority of Basque firms. This is particularly true given the overall relatively higher level of public support as a share of GDP. **Targeting by actor:** resources of major innovation

programmes through SPRI are dedicated approximately 50% to non-profit status members of the RVCTI with separate programmes for actors not in the network (generally firms without a separate R&D unit). The relevance of such a distinction based on tax status should be periodically reviewed. **Competitive and institutional funding of research:** a certain share of funding for technology centres and other research centres (CICs, BERCs) should be institutional support with performance targets. An insufficient share of institutional support can limit centre development. **Project and programme funding:** increasingly, OECD member countries and regions are promoting more long-term programme funding in addition to individual projects, including through consortia in public-private partnerships (PPPs). The Basque Country has begun such programming and could consider expanding.

Other regional innovation strategies seeking transformation and diversification offer lessons for the Basque Country

The Basque Country has developed an STI strategy which seeks to diversify into new sectors deemed strategically relevant. New sectoral strategies and research centres accompany these diversification efforts. There has been a clear trend in regional strategies in the OECD over the last several years that has progressively emphasised ICT, then biotechnologies, then nanotechnologies, and now green technologies. One of the challenges for the Basque Country is to identify unique niches that help it compete effectively with other regions that have greater critical mass in popular technology areas.

In analyses of other regional approaches to this question, a number of success factors can be noted. One common success factor is the design and implementation of mechanisms to favour the generation of endogenous (local) technological and knowledge capabilities that are matched with incentives to support the application within firms. Another success factor is the strong regional leadership to mobilise different innovation system actors. A transition from a traditional manufacturing economy to one that is more knowledge intensive, particularly high-technology manufacturing, is a natural choice. The question is how to support that transformation and work towards a new and unknown technological frontier. In Japan, the Shinshu province transformed a traditional industrial area to a high-technology industrial centre through two steps. First, there was strong support to R&D (infrastructure and incentives to firms) and second, the creation of a particular cluster (smart devices), that used the local research in an environment that supported conditions for its application into business

opportunities. Another choice, beyond upgrading and diversifying the industrial structure, is a shift towards a new economic model. Piedmont (Italy) recently adopted this strategy by supporting on the one hand investment in the ICT sector and on the other, initiatives that respond to more ethical and environmentally friendly techniques for traditional agri-food industries.

Basque Country STI policy in a multi-level governance context

The Basque Country has increasing regional autonomy for STI policy making…

The Basque Country has notable sub-national fiscal autonomy as well as STI policy competency, due both to formal competences and regional strategic choices based on its assets and industrial structure. The success of the region's industrial-oriented innovation policy is well known. The Basque Country has the second highest regional budget spending per capita in Spain after Navarre, the other region under a foral regime. One calculation of regional budget STI spending per capita in 2007 indicates it was more than three times that of Catalonia and almost five times that of Madrid, albeit those regions benefit significantly from Spanish research funding to national research centres and comparatively stronger regional universities. Furthermore, additional competences and funding have been granted to the Basque Country. Starting in 2009, the region is the first in Spain to have been granted competency for R&D policy, to be exercised in co-ordination with the Spanish government. The agreement results in the equivalent of an annual non-earmarked grant of additional resources that the region may use for STI policy. The overall Spanish fiscal climate, and its policies in light of the crisis, nevertheless have an impact on the Basque region.

… but Spanish and EU policies and funding sources set the stage for regional approaches

Other levels of government contribute to Basque STI Plan goals. The 2010 STI Plan expected that, of the approximately EUR 6.7 billion projected over the five-year period, the Basque Country and its provinces would account for 80% of public resources for the Plan, while 20% were expected from outside the region (13% Spain, 7% EU or other external sources). The region projects the same relative shares for the next STI Plan. For Spain's National Plan for Scientific Research, Development and Technological Innovation, the Basque Country has successfully competed for funds that

exceed the region's share of Spanish GDP. And for EU Research Framework Programme Funds, the Basque Country has attracted 10-15% of the total that flows to Spain over the last 20 years, notably by the region's TCs. EU Regional Policy has also influenced the strategic direction of STI policy. For example, the RIS and RIS+ programmes to support regional innovation strategies were important elements in the region's shift from an industrial to an innovation approach. Other EU agendas such as the Bologna Process for higher education harmonisation, the Lisbon Agenda, Europe 2020 and Innovation Union provide a further context for Basque government policy.

The Basque Country is increasingly engaged in a dialogue and other multi-level governance tools with Spain for STI policy

The Basque Country is increasingly engaged in policy dialogue with the Spanish State despite greater autonomy in STI policy. Existing bodies to formally support discussion between Spain and the regions on STI policy (such as the General Council for Science and Technology and its bodies) generally are not, in practice, the primary vehicle for policy dialogue. However, a range of tools is used for inter-governmental collaboration. Contracts to support large infrastructure as part of Spain's Map of Singular Scientific and Technological Infrastructure includes new sites in the Basque Country. The most prominent is the European Spallation Neutron Source (ESS) in Bilbao (headquarters in Lund, Sweden) and support of a Molecular Imaging Centre in San Sebastian. Other co-operation with Spain at the policy level includes contracts with the different Spanish actors. Spain's CDTI agency signed an agreement with the region's Department of Industry for the promotion of innovation in Basque companies, and to foster their participation in national and international R&D programmes managed by CDTI. Another example concerns an agreement between Spain's Public Energy Research Agency CIEMAT and the Basque government's Energy Agency EVE for joint R&D activities in the areas of energy efficiency, energy storage and renewable energy. Finally, another recent contract with the Ministry of Science and Innovation encourages the Basque Country to design and implement programmes to achieve the goals of Spain's Innovation Strategy (E2I), financed by a low-interest loan from the State.

Need for strong leadership at highest levels of Basque government and functioning mechanisms for strategic planning and inter-departmental co-ordination

The Department of Industry has driven STI policy in the Basque Country over the last two decades. The Basque Council for Science, Technology and Innovation, created in 2007 and chaired by the President of the region, was created to address a need for wider co-ordination and to steer strategy and funding of Basque STI policy. However, the Council has not fully played the mission entrusted to it for several possible reasons (lack of practice and leadership for inter-departmental co-ordination, lack of concrete outputs in mandate, non-codified meeting schedule or other political issues). A separate Basque Research Council to advise on research policy and an inter-departmental Science and Technology Committee have also not appeared to fulfil the roles as specified in the PCTI 2010.

The presence of strategic planning and inter-departmental co-ordination is therefore under-developed yet important to implementing a transformation of the innovation system. There is a need for greater integration of the Department of Education as well as other departments such as Agriculture and Health in STI planning and implementation. For example, the Department of Health created the post of Deputy Minister for Health Care Innovation. The need for inter-departmental collaboration is also evident with respect to the management of S&T infrastructure as well as the Innovation Fund (EUR 40 million annually – 34 million from the Basque government and six million from the three provinces). The latter could be better used to support new or pilot programmes as opposed to serving as a gap-filler for existing programmes in different departments. Innovation in public services, and the use of public procurement tools, also require a whole-of-government approach.

Bottom-up inter-departmental collaboration for policy implementation should also be encouraged

In an advanced governance system, where each department and agency has the right incentives, co-ordination bodies may be less necessary. Departments and agencies identify in a bottom-up fashion where it makes sense to collaborate. This type of inter-departmental collaboration in policy implementation has begun in the Basque Country. The most notable examples are joint funding of R&D instruments by other Departments with

the Department of Industry, depending on particular sectoral needs. Furthermore, universities or BERCs (research centres) managed by the Department of Education may apply and receive funds from instruments managed by SPRI (Department of Industry). As a whole-of-government approach is adopted in the region, increasingly such demand-driven collaborations are likely to appear.

OECD examples at national and regional level for promoting greater inter-departmental integration in STI policy development and delivery

Examples from OECD member countries and their regions to address horizontal co-ordination could offer some guidance to the Basque Country. Some countries and regions have merged research and innovation functions under the same department/ministry, including Spain (Ministry of Science and Innovation), New Zealand (also Ministry of Science and Innovation) or the United Kingdom (Department for Business, Innovation and Skills). This has also occurred at the regional level, such as in Catalonia (Spain) with the creation of the Department of Innovation, Universities and Enterprise or Flanders in Belgium which has a Ministry for Economy, Entrepreneurship, Science, Innovation and Trade. However, such mergers are less likely to be successful if there is a strong imbalance between the constituent entities, which appears to be the case in the Basque Country. In lieu of mergers, inter-departmental councils have been created to achieve co-ordination, both for high level strategic planning as well as implementation. In the English regions, Science and Industry Councils were created with public and private participation to inform regional innovation strategies. Catalonia has instituted both a high level council with external experts and an inter-departmental committee with a technical secretariat. Flanders has taken a number of measures to "horizontalise" its innovation policy, including a restructured Council. But not all regions have found it possible or useful to promote formal inter-departmental bodies.

Innobasque, the main public-private forum to promote a broader agenda for innovation, requires a clear mandate recognised by all

The Basque Country has a culture of internal networking given its small size, history, policy and culture. But to achieve the region's so-called "Second Great Transformation", new constituencies need to influence the policy development process. Innobasque was created in 2007 as the region's

innovation agency to support the innovation system generally, with a powerful Board of Directors that includes the leading public and private actors of the region. It is the main regional proponent for exploring innovation in a broader sense, including for public services or other social goals. To achieve effectiveness as a facilitator of dialogue and provider of policy intelligence, it will need to: ensure clarity of mandate that is distinct from other actors in the system; possess the legitimacy to collaborate with all public and private actors; **not** be perceived as competing with other actors for funding; and be held accountable to measurable results, as are other system actors.

Consider empowering SPRI as the lead delivery agency in the innovation system by greater integration of associated tasks

SPRI is an internationally renowned development agency that contributed to the successful turn-around of the region in the 1980s and 1990s. At present, it implements most of the Department of Industry's programmes, but not all. Given the need for greater programme evaluation of the mix of instruments, the Basque Country could consider giving SPRI the capacity and resources to manage the full portfolio of instruments offered by the Department of Industry. This association of financing, implementation and evaluation by the implementation agency is common in the new public management approaches to STI policy delivery. But of course delegation of responsibilities without sufficient resources or capacity would be a counter-productive unfunded mandate.

The three provinces are active in STI policy through their economic development mandate, resulting in experimentation but also overlap and additional complexity

The three provinces in the Basque Country, with greater fiscal powers relative to other sub-regional entities in Spain, are active in innovation promotion. The Basque provinces do not have assigned competences for STI, but nevertheless use their own resources to promote STI actors or innovation policy through their competences in economic development. The partial overlap in *de facto* policy competences can lead to dialogue between levels, experimentation and complementarity, but also duplication. Alava, being the smallest province, has focused most on serving the needs of the SME base. Gipuzkoa has complemented traditional S&T support with promotion of social innovation and entrepreneurship. Biscay province, with

over half the region's GDP and population, has the resources and approach that appear most similar, perhaps partially duplicative, of efforts at Basque government level. And local development agencies are playing an increasing role in promoting local innovation networks. There are examples of policy experimentation at provincial level that have been picked up at Basque level, indicating that room for experimentation can have benefits. Opportunities for greater alignment within the region, including co-financing to reduce duplication, should be pursued.

Many diagnostics of the Basque Country, but investment in information management, monitoring and evaluation of programmes and plans (including budget information) should be strengthened

The Basque government has made significant effort to understand its economy and the factors of competitiveness. However, it has not sufficiently built up data for programme, policy and strategy evaluations. The Basque Country statistics agency (EUSTAT) has considerable data at small geographic levels, facilitating economic analysis. The availability of an additional distinction between technology centres and co-operative research centres as opposed to other firms in the data could facilitate useful analyses of the system and its evolution. The regional government also supports the Basque Institute of Competitiveness (Orkestra) that offers extensive diagnostics and evaluations of the economy and more recently the innovation system. Nevertheless, successive STI plans do not fully evaluate the successes and failures of prior plans in the development of new plans. And evaluations of the "additionality" (i.e. change in behaviour of firms and other innovation system agents) as a result of individual or a mix of policy instruments are lacking. This type of evaluation is a common weakness among OECD regions and member countries. However, given the large share of public funding (direct and indirect) of firm R&D, such evaluations are particularly important in the Basque Country. Internal evaluations to support ongoing policy learning as well as external evaluations that bring in new expertise periodically should continue. Data regarding programme use and cumulative public funding to key innovation system actors would require greater data management resources in implementation agencies. Clear tracking of budgets associated with STI plans, diversification strategies, and other policy areas would further support monitoring and evaluation efforts. Some form of technical secretariat for STI policy (whether in the Basque government or one of its supported foundations) could help ensure that such information is tracked on an inter-departmental basis.

Introduction[1]

The dynamics of innovation are evolving…

Over the past decade, the notion of innovation in OECD member countries has broadened, reflecting important changes in the dynamics, scope and patterns of innovative activities. These changes affect all developed countries or regions regardless of their institutional or structural specificities.[2] While efforts have been made to improve the measurement of innovation,[3] the implications of these changes are taken into account in the policy-making process with a certain time lag. Among the main elements that characterise this evolving scope and dynamics are the following:

- Innovation is increasingly pervasive not only across economic activities but also across functional activities within a firm. The scope of knowledge inputs to innovation broadens, raising the importance of a wide array of **intangible assets** that jointly contribute to firms' innovative performance, and in particular non-technological innovation.
- Supported by efficient market and non-market knowledge transfer institutions, innovation can spur the diffusion of technological and non-technological progress. The diffusion occurs within value chains between firms and their suppliers or clients and facilitates the development of innovative clusters. It also fosters final demand-led innovation and highlights the eminent role of **knowledge-intensive service activities** (KISA) in diffusion processes across the economy, notably at the regional level (OECD, 2006). For many companies, "technology will gradually move from being a **driver** of innovation to becoming an **enabler** of innovation" (FORA, 2009).
- While companies rely more on their intangible assets for their innovative activities, they also put a **greater emphasis on external sources of knowledge** (OECD, 2008). This trend is facilitated by the expansion of market and non-market knowledge interactions involving collaboration and/or intellectual property transactions. The globalisation of R&D activities and the increasing costs of innovation that give firms

an incentive seek to diminish risks associated with exclusive in-house development also contribute to the greater reliance by firms on external knowledge.

- Collaborative innovation strategies are a corollary of the trend towards a **more open innovation environment.** Such collaboration goes beyond mere contractual arrangements, notably through partnerships with external parties such as alliances, consortia, joint ventures, joint development, etc. Evidence suggests that scientific collaboration among firms and research institutions has increased with both domestic and international partners. An OECD cross-country study of innovation at the firm level showed that collaboration fosters innovative activity: in 16 out of 18 countries, firms that collaborated on innovation spent more on innovation than others. This suggests that collaboration is not mainly undertaken as a cost-saving measure, but rather as a means to extend the scope of a project or to complement a firm's competences (OECD, 2009a).

- The frontier between scientific and innovation activities in high-technology sectors such as biotechnology, nanotechnology and ICT becomes increasingly blurred. This fact calls for more intense **collaborative activities between public (or quasi-public) research institutions and private companies** operating in these sectors. This blurring that puts a premium on collaborative ventures opens new opportunities for the creation of innovative firms such as spin-offs from public research or spin-outs from existing companies. For such opportunities to materialise, sound framework conditions regarding the financing of new innovation ventures and the mobility of researchers are required.

- The **importance of demand as a driver of innovation is growing.** This can be observed at various levels. First, individual consumers and intermediary users in production value chains stimulate market demand for innovation and have an influence on standard setting.[4] Second, social demand for innovation that can improve the provision of collective and public goods is also on the rise. It opens the way for a more important role of public procurement in innovation policy.

- Innovation activities are unevenly distributed in national boundaries as their location is strongly influenced by regional institutions and assets. This is hardly a new phenomenon, and despite the globalisation of R&D, **agglomeration economies related to the availability of physical and intangible knowledge assets** play an increasing role in determining regional innovation performance and, ultimately, in fostering regional growth. To better reap the opportunities rooted in

local knowledge assets and endowments, increasing attention is required: *i)* at national level with respect to complementarity/co-ordination between national and regional approaches to innovation policies; and, *ii*) at regional level to strengthen regional innovation systems.

- The **availability of skilled human capital** has always been a pre-requisite for the successful development of innovative activities. However, given the global competition for talent, its importance is on the rise. Human capital needs go beyond the mere supply of skilled personnel in science and engineering to encompass the variety of skills that are increasingly required to foster the absorptive capacity of firms, the management of innovation or the brokerage of knowledge. Two other issues deserve special attention. A first issue to consider is the mobility of high-skilled personnel across institutions, and especially between public research organisations and the private sector.[5] Obstacles to such mobility – in both directions – restrain the flows of knowledge and dampen collaborative prospects. The second relates to the broader notion of social capital and society's ability to generate and boost demand-driven innovation. Such innovations respond both to evolving and more sophisticated consumer tastes and to social or collective needs in areas such as environment, health, energy, water and culture.

… implying several policy challenges…

STI policy priorities, design and implementation are conditioned by the outcome of past policies, as well as by institutional and structural specificities prevailing at national and regional levels. Evolving dynamics of innovation therefore have implications on policy challenges that should be reflected in the ways policies are designed and implemented.

- **Adapted governance structures** with a move towards a whole-of-government approach to policy making, as well as tighter co-ordination mechanisms, are needed. The widening nature of innovation, its central role in the pursuit of economic and social objectives, and the broader scope of actors involved should be reflected in such structures. The co-ordination mechanisms concern different levels of government, ministerial departments, implementation agencies, and non-governmental stakeholders. Such new governance approaches may require institutional reform.
- The **policy mix** of financial and qualitative instruments in support of S&T and innovation must be progressively adapted to the new innovation conditions and specific weaknesses that hinder the reaping of

new opportunities. Taking into account initial conditions that characterise a country's or region's prevailing policy framework, as well as its institutional and structural specificities, the policy mix should foster the emergence of lasting dynamic interactions among stakeholders for the production, diffusion and valorisation of knowledge. Institutional reforms associated with improved governance structures should facilitate the development of new policy mixes.

- The **scope of innovation policy targets has also broadened**. On the one hand, it encompasses non-technological sectors that are either the source of innovation in a firm from within or through outsourced services (e.g. organisation, design, training), or contribute to foster innovation across the economy, such as the wide array of knowledge-based service activities (KISA), including innovation financing services or knowledge diffusion brokerage. On the other hand, it must respond to new social challenges and the expanding demand to satisfy our collective needs through more efficient modes of provision that call for the development and application of new knowledge. These trends result in an increased role of public procurement in innovation policies, notably through regulatory frameworks and the stimuli given to the formation of public/private partnerships for the provision of collective goods and services.

… including the context of the current crisis

Financial and economic crises have contrasting effects on innovation as regards business strategies and government policies.

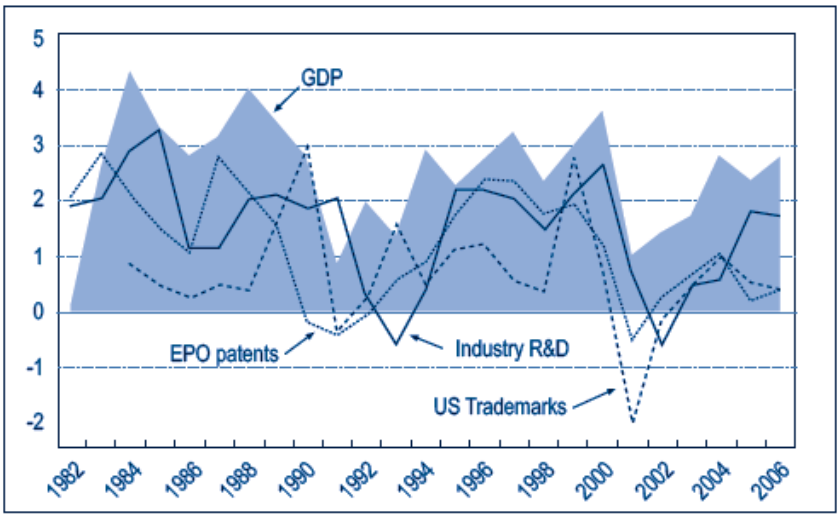
- Business R&D declines because it is mainly financed out of cash flow which contracts in downturns. Banks and institutional or individual investors become more risk averse, reducing potential flows of external financing (see Figure 0.1).
- Small and medium-size innovative enterprises are particularly affected since their development is very often based on intangible assets and conditioned by the availability of external capital. Exit rates increase and the number of new entrants falls.
- Facing a contracting effective demand, firms generally become more risk averse and favour low-risk and short-term incremental innovation over higher-risk and longer-term ventures involving higher R&D costs and recruitment of new high-skilled personnel.
- This bleak innovation climate has a negative impact on the job market for highly skilled personnel and risks affecting the stock and diffusion of

knowledge respectively embodied in, and transmitted through, these human resources.

However, in crisis periods new opportunities can be created. Firms willing and able to take risks and invest in research and innovation to expand their market shares at the expense of more cautious, and often much larger, competitors may benefit from the situation.[6] The resilience of public efforts in support of innovation varies by country and region.

Figure I.1. **The impact of business cycles on innovation**

Business-funded R&D, patents (applications to the European Patent Office), trademarks (filed at the United States Patent and Trade Office) and GDP



Note: Annual growth rates for the total of OECD member countries divided by the standard deviation.

Source: OECD (2009), "Policy Responses to the Economic Crisis: Investing in Innovation for Long-Term Growth", OECD, Paris.

In several OECD member countries, counter-cyclical stimulus packages put in place to alleviate the impact of the current crisis have included measures in support of R&D leading to a volume increase of R&D expenditure, including the share financed by the business sector. In some countries, the crisis has catalysed efforts to engage R&D efforts around so-called new strategic priorities such as green technologies in energy and environmental protection. Such expenditures are deemed to sustain longer-

term growth prospects. In other countries, more affected by the magnitude of budget deficits, there have been pressures to cut or delay public investment in S&T infrastructures and/or public outlays in R&D and innovation support programmes. Those pressures should be resisted. While possibly providing short-term fiscal relief, such cuts would certainly damage the foundations of long-term growth and diversification into emerging sectors.

Conclusion

These trends set the stage for the development of the Basque Country's next Plan for Science Technology and Innovation. The Basque Country has already made a number of efforts to adapt its policies and institutions in response to changes in perception of the role of innovation. In some areas, the region has more work to do. This report will therefore assess the region's innovation system, policies and governance arrangements in light of these international trends that structure the world in which Basque Country firms compete.

Notes

1. Elements of this section draw on the Innovation Strategy developed by the OECD. This strategy, \presented at the OECD Ministerial meeting held in May 2010, aims to promote integrated policy approaches that take into account changing dynamics, scope and patterns of innovation (OECD, 2010a, 2010b).

2. For a comprehensive review and analysis of the evolving innovation dynamics and related policy challenges, see OECD (2009a and 2010b).

3. In particular in the *Oslo Manual* (OECD/Eurostat, 2005), OECD (2007) and the new measurement efforts developed in the context of the OECD Innovation Strategy (OECD, 2010b).

4. In developed economies, 10% to 40% of users engage in developing and/or modifying goods and services they purchase (Von Hippel, 2005).

5. Or, in the case of the Basque Country, between technology centres, co-operative research centres (CICs) and the productive business sector.

6. Some of the leading firms in the ICT sector such as Microsoft or Nokia were born or transformed through innovation during the creative destruction climate of economic downturns, and others such as Google and Samsung strongly increased their R&D expenditures just after the "New Economy" bust of 2001 (OECD, 2009b).

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Chapter 1

Innovation and the Basque economy

The Basque Country region in Spain is well known for its successful industrial transformation and high levels of wealth. Is the innovation system prepared to transition from a model of incremental innovation in manufacturing to a model based on science and other forms of knowledge? This chapter provides an overview of the Basque Country's socio-economic trends, including sub-regional variations. It explores the factors driving the region's growth and productivity, with an emphasis on innovation-related indicators, to explore the so-called "Basque competitive paradox". The chapter concludes with an overview of the key actors in the regional innovation system.

Introduction

The Basque Country is a regional transformation success story. The so-called "First Great Economic Transformation" helped the region recover and thrive after an economic crisis in the 1970s and 1980s that resulted in high unemployment and outmigration (see Box 1.1). Bilbao is well-known example of successful urban regeneration after the closing of a shipyard, perhaps best symbolised by the Guggenheim Bilbao Museum. In the last decade, the Basque Country has maintained strong GDP per capita levels and growth rates among OECD regions. The region has also performed better than others in Spain facing the recent financial and economic crisis.

But is the region prepared for an innovation-driven growth model for the future? With an ageing population, limited inward migration, and increasing global competition, the role of innovation will be increasingly important. In this decade, the region declared a need for a "Second Great Economic Transformation" that includes several initiatives to support a knowledge-driven and productive economy. This initial vision goes beyond technology to increasingly emphasise creativity, social cohesion and the environment.

Box 1.1. **The Basque economy: a brief history**

The 17th and 18th centuries saw major advances in sectors such as fishing, shipping, shipbuilding, international trade, iron smelting and agriculture. In the 17th century, Bilbao became the most important port on the northern coast of Spain. Starting in the mid-19th century, the iron mines located near the Bilbao estuary were operated on a large scale by foreign and Basque firms to export these products to European iron and steel industries, most of which were British. Profits from these mining operations were invested in other types of production (many directed to the iron and steel industry), thus giving rise to a marked process of capital accumulation. This phase of development also attracted a massive influx of migrants from other parts of Spain. The decline and limitations in fishing because of jurisdictional waters (200 miles), and the exhaustion of fisheries resources has reduced the profitability of fishing and the number of vessels. Industrialisation spread from Bilbao during the 19th century towards the rest of the province of Biscay and Gipuzkoa. Those provinces were considered among the most industrially advanced in Spain, along with Catalonia, at the time. Alava only experienced significant change in the 1950s and 1960s.

Box 1.1. **The Basque economy: a brief history** *(cont'd)*

The region's economic development in the 20th century was subject to Spanish economic policies that impeded economic openness. Measures to increase international linkages were instituted in the late 1950s, which also contributed to a second wave of industrialisation that led to major social and economic changes and a new influx of migrant workers. The Basque Country therefore became the site for leading iron and steel firms, shipyards, shipping firms and iron processing as well as electrical, chemical and paper industries. Furthermore, the Basque financial sector became the most powerful in Spain with investments throughout the country. Productive specialisation of Basque industry was strengthened by the intense accumulation of capital during the 1960s and first years of the 1970s. Profitable agriculture, mainly in Alava, remains (primarily grapes and potatoes). Pasture ranching for the most part has given way to farming.

The economic crisis of the late 1970s and the opening of the economy had devastating effects on the Basque economy, resulting in firm closures and the decline of entire sectors (the large iron and steel industry, metal and capital goods companies, shipbuilding, etc.). The unemployment rate was over twice as high as that of other European Union countries at the time. At the end of the 1960s, the Basque Country contributed 7.5% of the Spanish GDP; by 1990 the figure had dropped to less than 6%. The crisis finally began to recede in 1993 when the economy diversified and opened to outside markets. The change in industrial structure was significant. In 1975, the region's GDP was around EUR 8 billion, mainly from industry, which employed more than 50% of the active population. Thirty years later, with a similar share of Spain's population (4.8%), the region's GDP in 2005 was around EUR 58 billion in current prices. Much of the increase was due to a growing service sector, which employed 60% of the active population. The restructured industrial sector contributed 29.3% of gross value added (GDP minus taxes on products) versus services 60.8%, construction 8.9%, and the primary sector 1%.

Source: Basque Autonomous Community (2009), "The Basque Country: Insight into its Culture, History, Society and Institutions", Eusko Jaurlaritzaren, Vitoria-Gasteiz, Spain, *www.euskadi.net/r33-2732/es/contenidos/informacion/ezagutu_eh/es_eza_eh/adjuntos/eza_en.pdf*.

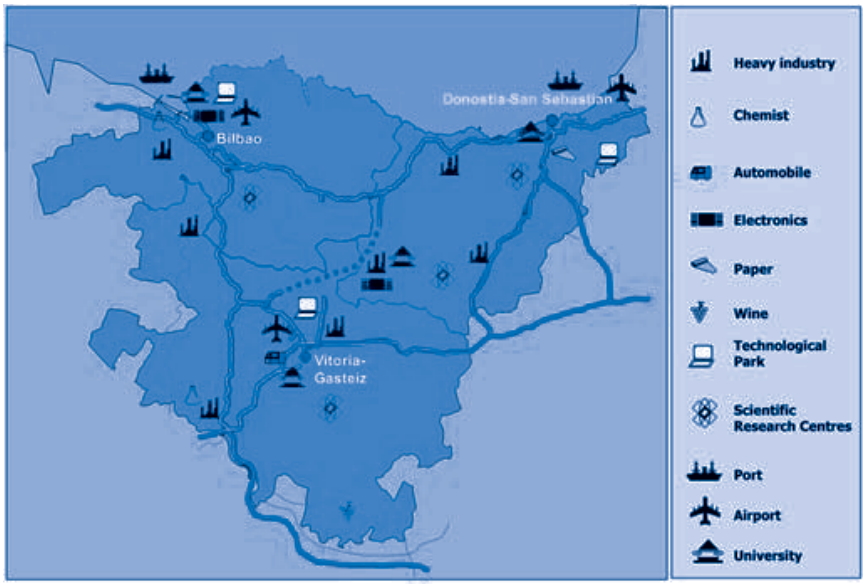
But is the region prepared for an innovation-driven growth model for the future? With an ageing population, limited inward migration, and increasing global competition, the role of innovation will be increasingly important. In this decade, the region declared a need for a "Second Great Economic Transformation" that includes several initiatives to support a knowledge-driven and productive economy. This initial vision goes beyond technology to increasingly emphasise creativity, social cohesion and the environment.

Basque Country: overall economic and demographic trends

A unique region in Spain…

The Basque Country Autonomous Community (*Comunidad Autónoma del País Vasco*) is situated in the north of Spain (see Figure 1.1).[1] It is bordered by the Bay of Biscay and, for a few kilometres, southwest France to the north, the Navarre region to the east, La Rioja region to the south, and Cantabria and Castile and Leon regions to the west. The Basque Country is divided into three "historical territories" or provinces (Alava, Biscay and Gipuzkoa), 20 counties (*comarcas)* and 250 municipalities. While the region's largest city is Bilbao, the political capital is Vitoria-Gasteiz.[2] The official languages are Spanish and Basque.[3] The Basque Country is one of the three historic regions in Spain as recognised in the Spanish Constitution of 1978, Catalonia and Galicia being the other two (see Chapter 3 for more information on the unique governance arrangements of the Basque Country).

Figure 1.1. **Map of Basque Country with key sectors**



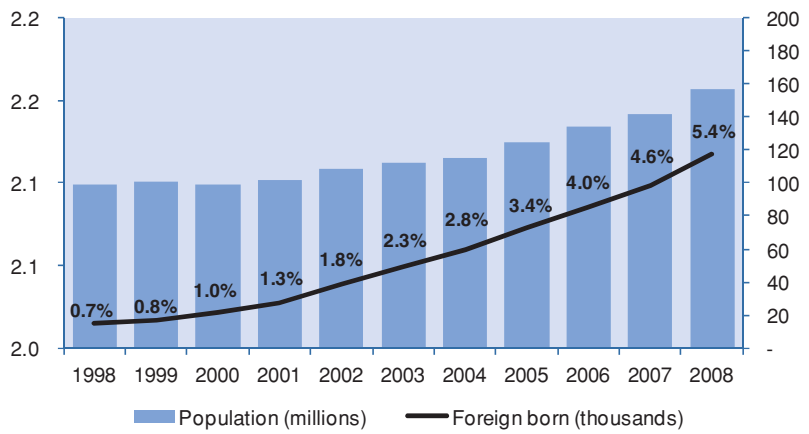
Source: Basque Country Government.

Even though the Basque Country is one of the smallest regions in Spain in terms of surface area, it makes a larger contribution to the Spanish

economy. The Basque Country covers an area of over 7 000 square kilometres (14th in Spain), has a population over 2.1 million (4.7% of Spain), and a population density of around 300 inhabitants per square kilometre (one of the most densely populated). The region's GDP was around EUR 68 billion in 2008, albeit with a drop of 4% in current prices to EUR 65.5 billion in 2009 with the crisis. The Basque Country has therefore accounted for 6.1-6.3% of Spain's GDP since 1995, notably higher than the region's population share.

The Basque Country is ageing with low population growth. With 18.8% of its population aged 65 or older, the region is above the Spanish average of 16.7%, albeit with a share below several Spanish regions like Castile and Leon, Asturias, Galicia and Aragon, where that figure is over 20%. The Basque Country is around the 74th percentile of OECD regions. This compares with an OECD national average of 14%. And unlike much of Spain, which has experienced massive population growth fuelled by immigration over the last ten years, the Basque Country has grown very little comparatively. From 1998-2009, the region experienced a net gain of approximately 74 000 inhabitants, a total increase of 3.5% of its population. In contrast, Spain's population grew approximately five times more, at 17.3% over the same period. The foreign-born population in the region is small (under 120 000) but nevertheless increased from 0.7% to 5.4% of the region's population from 1998-2008 (see Figure 1.2). Looking forward, the Basque Country faces not only a challenge of basic demographics, but also possible labour shortages.

Figure 1.2. **Population trends**



Note: In percent: the proportion of foreign-born over total population in the Basque Country by year.

Source: Data from the Spanish Statistics Institute (INE).

Within the Basque Country, population and production are not evenly distributed across the three provinces. The region of Biscay accounts for 51% of the region's GDP and 55% of its population. Gipuzkoa follows at 32% and 33% respectively. Alava, with only 14% of the region's population and 17% of the economy, has a much higher GDP per capita than the other two Basque provinces (115% of the region's average). Relative to 1990, Alava has accounted for the largest population gain in absolute and relative terms, albeit that change is very modest in all provinces.

With the crisis, unemployment increased dramatically in Spain, but the Basque Country has proven more resilient. Per EUSTAT, the region's unemployment increased by 5.4 percentage points between 2007 and Q4 2009, increasing from 3.3% to 8.7%. Those rates were higher, but down to 8.8% in Q3 2010. Nevertheless, the unemployment impacts have been greatest in Alava, with an unemployment increment of 7.2 percentage points, despite it having the lowest unemployment rate in the region in 2007. Gipuzkoa experienced the lowest increase in Q3 2010 relative to 2007 of 4.1 percentage points. Biscay increased from 4.0% to 9.8% in the same time period, an increase of 5.8 percentage points. Using data from INE, the Basque Country's rise in unemployment of 4.8 percentage points between Q1 2008 and Q1 2009 was much lower than that of Spain overall (7.8 percentage points).

Strong GDP per capita levels and growth, what is the role of productivity?

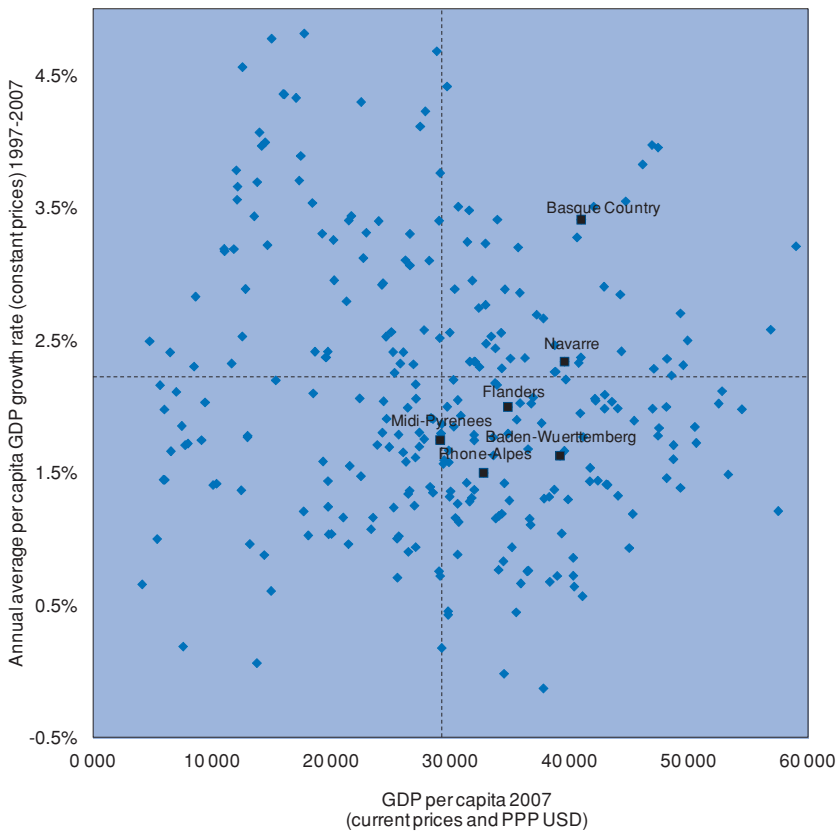
The Basque Country has above average GDP per capita levels and growth rates. Starting from negative growth rates in the beginning of the 1980s, the region reached rates of 5-7% annually in the late 1980s, a large drop in growth rates in the early 1990s, and rates again around 5% in the late 1990s (Orkestra, 2008). At the beginning of this decade, growth slowed to below 3%, but has progressively increased through the pre-crisis period. While a few regions experienced similar growth rates, the Basque Country's average annual growth of 3.41% from 1997-2007 far exceeds other strong Spanish regions like Madrid or Catalonia (2.37% and 2.07% respectively) and OECD regions more generally (see Figure 1.3).

The Basque Country has shown growing labour productivity this decade (GDP per worker) pre-crisis. The province of Alava registers the highest GDP per worker in the region. While the province includes rural counties and doesn't have the same diversification of economic activity as the other regions, the low population levels and some successful sectors contribute to the relatively higher labour productivity values. Alava is followed by

Biscay, which contains the region's largest city of Bilbao, and then Gipuzkoa, which is slightly below the regional average.

Figure 1.3. **GDP per capita: level and annual average growth rate**

OECD TL2 regions



Notes: Purchasing power parity (PPP) adjustments are based on Spanish figures. Costs are higher in the Basque Country than the Spanish average (in 2008, 105.7 versus 100 per FUNCAS) which would reduce the Basque Country advantage in PPP.

Source: OECD calculations based on data from the *OECD Regional Database*. A few outlier regions have been excluded for ease of display.

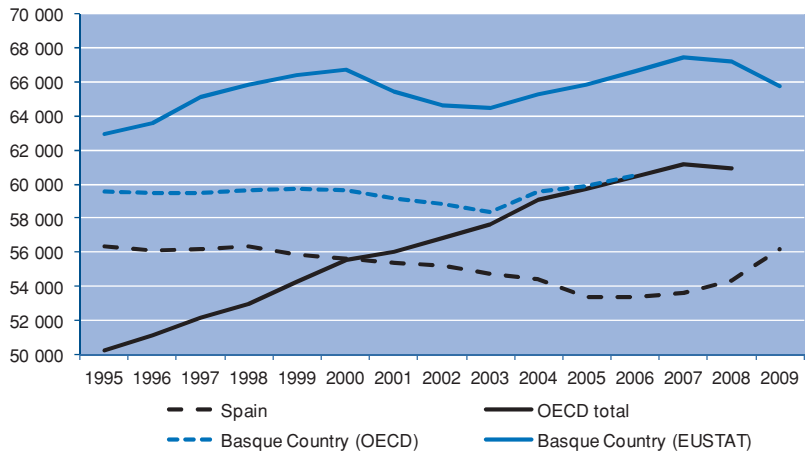
The composition of the Basque economy explains in part the region's high labour productivity levels. An analysis of the sectoral composition reveals that there is a somewhat higher productivity relative to EU-14 due to

specialisation in sectors of higher productivity (energy, water, health and social work, non-metal industry, hotels and restaurants, transportation and communications). The economy is overall more specialised in manufacturing of higher technology sectors relative to the benchmark. However, the sector-specific productivity by industrial branch is actually lower relative to EU-14 countries (Orkestra, 2009).

The Basque Country's highly favourable position in terms of GDP per worker relative to the OECD average has diminished over time (see Figure 1.4). In general, GDP per worker figures in PPP illustrate the advantage for Spain and the Basque region with respect to lower living and labour costs as compared to Northern/Western European locations (Orkestra, 2009). But these advantages may not be sustainable in the long term. The degree of decline in the Basque Country's GDP per worker relative to the OECD depends on the data source.[4] With respect to Spain, the advantage has grown over this decade pre-crisis. It should be noted that price levels in the Basque Country are higher than in Spain generally, in 2008 by almost 6%. The region's relative advantage in PPP is therefore lower than common statistics suggest.[5]

Figure 1.4. **GDP per worker trends relative to the OECD**

Constant prices 2000 USD and PPP



Note: The *OECD Regional Database* obtains data for Spanish regions from Eurostat, which in turn obtains data from INE (Spain). Figures from EUSTAT are considerably different and are therefore shown separately.

Source: *OECD.Stat*, *OECD Regional Database* and EUSTAT.

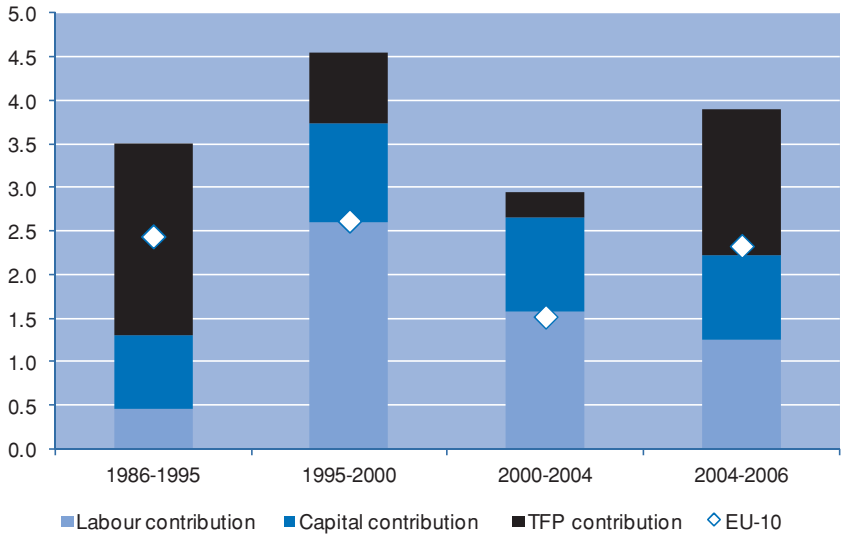
The Basque Country's strong performance in terms of levels and growth of GDP per capita exceeds what would be expected given performance on innovation-related variables (Orkestra, 2009).[6] This trend, known as the "Basque competitive paradox", may be due to various factors. First, given the nature of the Basque Country's industrial structure, specialisation and openness, enterprises may enjoy to a higher than average degree the benefits of international knowledge spillovers of R&D and innovation activities conducted in foreign countries. Second, internal spillovers may also be present. The so-called doing-using-interacting (DUI) mode of innovation that prevails in the Basque Country gives a premium to tacit knowledge transfers and investment in capital embodying upgraded technology, as compared to formal investment in R&D.[7] Technology transfers based on the DUI mode, in addition to other marketing and organisational improvements, would therefore play a non-negligible role in explaining productivity and per capita GDP increases.

The sources of economic growth in the Basque Country have changed considerably over the last 15 years. The three potential drivers of growth in gross value added (GVA) include labour, capital and total factor productivity (TFP) (see Figure 1.5 and Table A1.1).[8] TFP was the main driver of growth between 1986 and 1995 (Erauskin-Iurrita, 2008 with updates). In the late 1980s, there were both massive increases in productivity (GDP per worker) and employment rates. In the early 1990s, labour productivity was a positive factor but the employment rate was a negative factor (due to increases in the employment rate, especially in the service sectors) and passive forms of productivity gains through worker losses (Orkestra, 2008).

From 1995-2004, capital investments and labour were the main drivers of growth, not TFP, but this appears to have changed since 2004.[9] Innovation-related investment played a minor and decreasing role during the period. The share attributable to TFP declined sharply from 63% in the period 1986-1995, to 18% in the period 1995-2000, and then down to only 10% in the period 2000-2004.[10] Between 1995-2005, both employment and employment rates in the Basque Country grew significantly faster that the OECD average. A similar but accentuated trend is observed for Spain where contributions by labour are even more significant, driven in part by massive inward immigration. Among the EU-10 countries, the trend shows a very low contribution of TFP, lower than in the Basque Country, but with capital as opposed to labour being the main driver. The role of TFP in the Basque Country picked up again between 2004 and 2006 (43% of GVA growth).[11] This increase may be related to growth in public and private R&D investment that began in prior years.

Figure 1.5. **Drivers of economic growth by time period**

Annualised growth in gross value added (%)



Source: Graphic created using data from Erauskin-Iurrita, I. (2008), "The Sources of Economic Growth in the Basque Country, Navarre and Spain during the Period 1986-2004", Orkestra, Basque Institute of Competitiveness, Working Paper 2008-1, Deusto Foundation, Donostia/San Sebastian, Spain, with updates. Data forEU-10 from KLEMS; Spain: INE; and Basque Country: EUSTAT.

Industrial structure and international linkages

Well performing firms facing challenges of scale and absorption capacity

One of the challenges for the Basque Country's innovation system is its firm demographics. More than half of the region's employment is in small and micro-enterprises. The small size of Basque firms has been identified as a hindrance to competition in global markets, therefore a prior study of the region recommended company groups to achieve greater scale (Orkestra, 2009). Firm size also has implications for the scale needed to conduct R&D (see Figure 1.15). While only 1.2% of firms in the Basque Country have more than 50 employees, such firms account for 45.3% of the region's employment (see Table 1.1). The province of Alava has a much higher share of employment in large firms (>250) at 44.8% than the other

provinces (Biscay at 19.4% and Gipuzkoa at 16.5%). When taking into account employment outside of the Basque Country, the size of Basque enterprises is larger than what is reported by local units.

Table 1.1. **Employment by size of establishment**

As of 1 January 2009

	Basque Country		Alava		Biscay		Gipuzkoa	
	No. entities	Employ-ment	No. entities	Employ-ment	No. entities	Employ-ment	No. entities	Employ-ment
Counts	182 284	952 510	22 450	172 979	92 181	402 160	63 431	265 868
0-9	93.3%	33.2%	92.0%	23.8%	94.0%	39.5%	94.0%	40.4%
10-49	5.6%	21.4%	6.8%	17.6%	5.1%	23.2%	5.1%	23.9%
50-249	1.0%	18.3%	1.1%	13.8%	0.8%	17.8%	0.8%	19.1%
>250	0.2%	27.0%	0.1%	44.8%	0.1%	19.4%	0.1%	16.5%

Note: "Rest of state" category not displayed. It represents the *comarca* that is found within the Basque Country but actually is administratively attached to another region.

Source: EUSTAT.

Entrepreneurship is another factor considered as integral to the innovation economy. Of course not all new firms will make a strong contribution to the knowledge economy. The region has a tradition of serious entrepreneurs, but shows only average rates with limited innovation and internationalisation profiles (Orkestra, 2008). The region also reports a low number of gazelle firms (high-growth SMEs) and challenges with transitioning ownership structures of family-owned enterprises. The total entrepreneurship activity (TEA) indicator follows a U-shaped function with respect to wealth levels. The rate for the Basque Country (6.9% in 2008)[12] has been at or below the level of Spain, rates that are lower than economies such as the United States but higher than other Western European countries. Since 2001, the rate has been steadily increasing, with the province of Gipuzkoa showing the most notable increases among the three provinces. In terms of barriers to entrepreneurship, social and cultural norms are the most frequently cited. While in Spain finance is one of the most important challenges, in the Basque Country it is of only average importance (Global Entrepreneurship Monitor, 2009). With the crisis, local development agencies have seen a rise in immigrants and those with a higher level of education seeking to start businesses.[13]

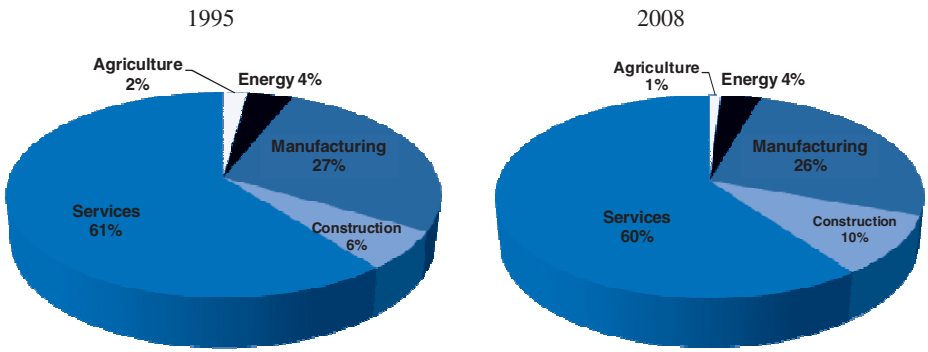
Industrial core in medium-low, medium-high tech manufacturing

Overall structure

From 1995-2008, the economic structure of the region changed modestly in favour of an increase in the construction sector. Construction grew from 6% to 10% of the region's gross value added, resulting in minor decreases in the other sectors: agriculture from 2% to 1%, manufacturing from 27% to 26%, and services from 61% to 60% (see Figure 1.6).

Figure 1.6. **Economic structure of the Basque Country**

Gross Value Added



Employment	1995		2000		2008A		Growth (1995-2008)
	000s	%	000s	%	000s	%	%
Agriculture	19.8	3	28.2	3	21.0	2	0.5
Energy	6.9	1	6.0	1	7.5	1	0.6
Manufacturing	205.0	27	249.6	26	269.1	24	2.1
Construction	58.6	8	76.9	8	99.8	9	4.2
Services	481.7	62	586.3	62	745.8	65	3.4
Total	772.0	100	947.0	100	1 143.2	100	3.1

Note: EUSTAT has slightly different GVA figures and is not available earlier than 2000. EUSTAT shows a composition in 2008 of: agriculture (1%), manufacturing (28%), construction (10%), services (62%).

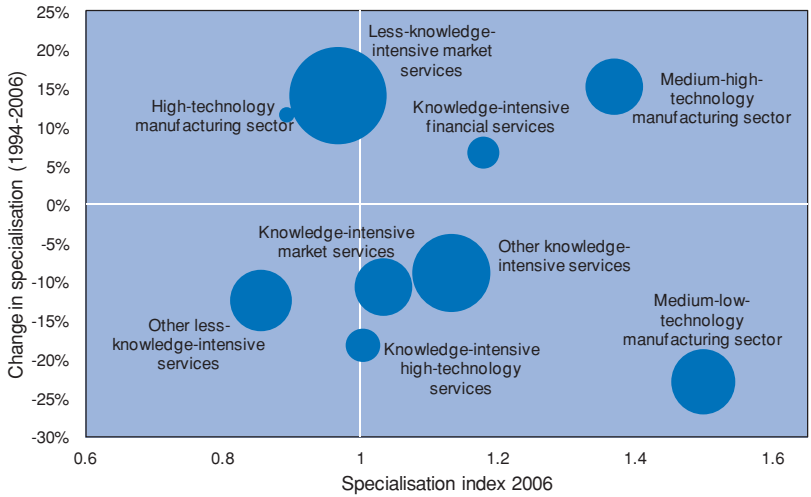
Source: INE, Economic Accounts.

A breakout of employment by level of technology illustrates a shift towards higher levels of technology and knowledge intensity (see Table 1.A.2). Among manufacturing sectors, medium-high technology

employment grew by 3.2% from 1994-2006, as opposed to 1.7% for high technology and 1.2% for medium-low technology. In services, the highest increase was for knowledge-intensive market services (6.0%), and knowledge-intensive high-technology services (5.6%). Relative to Spain, the region is more specialised in medium-high technology manufacturing and knowledge-intensive financial services, and has been increasingly so. While the share of high-technology manufacturing is growing, the Basque Country is not specialised relative to Spain overall (see Figure 1.7).

Figure 1.7. **Sectoral dynamics by technology level**

Change in specialisation using employment, 1994-2006



Source: OECD calculations based on Eurostat data and classification by technology level.

Among manufacturing sectors, GVA per worker has been increasing while employment has remained stable or increased (see Figure 1.A1). Natural resource-based sectors generally have the highest GVA per worker. Other sectors with important increases in GVA per worker – not due to shedding of workers – include: basic metals, chemicals and chemical products, and other non-metallic mineral products. The largest growth sector in terms of employment by far was fabricated metals, followed by machinery and equipment.

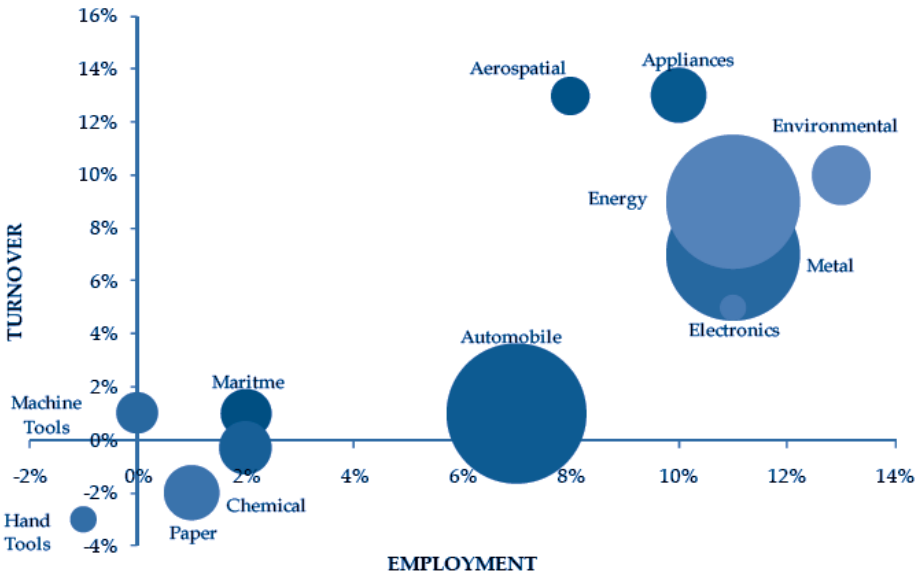
Basque Country clusters

Another lens to analyse the Basque economy is that of clusters. The region has had a long-standing policy to promote clusters and cluster associations (see Chapter 2). Figure 1.8 gives a sense of the relative importance of the different clusters in terms of size and changes in sales and employment. The automotive cluster, the largest, has maintained employment while increasing productivity. Clusters illustrating the highest increases in both turnover and employment include metal and energy, as well as the smaller clusters of electronics (driven in part by the Mondragon Corporation), aerospace and environment. Clusters that appear to have low levels of growth include paper (productivity gains with restructuring), chemicals (low productivity gains), maritime/shipbuilding (productivity gains due to specialisation in higher value-added niches), machine tools (stable) and hand tools (negative trends in employment and turnover) (Fariñas *et al.*, 2009).

A study of off-shoring risks reveals only a medium risk for some of these clusters. Considering the globalisation level of the sector, a medium risk was assigned to automobile (highly globalised) as well as chemical and pulp and paper (medium level of globalisation). There is a relatively low presence of international subsidiaries generally in the region. Those sectors considered of medium level off-shoring risk (given their relatively higher level of international subsidiaries) include automobile, pulp and paper, and chemicals (Deloitte, 2008).

Figure 1.8. **Basque Country cluster performance**

% change 2000-2005



Note: Bubbles represent cluster size.

Source: Fariñas *et al*. (2009), "Structural Change and Globalisation: Case Study Basque Country (Spain)", contract No. 2008.CE.16.0.AT.020 concerning the *ex post* evaluation of Cohesion Policy Programmes 2000-2006 co-financed by the European Regional Development Fund (Objectives 1 and 2), Work Package 4, European Commission Directorate General Regional Policy, Policy Development, Evaluation Unit based on EUSTAT data and Report to the Basque Parliament (2006).

Co-operatives

The Basque Country, and particularly the Gipuzkoa province, are noted for the presence of co-operatives. The most famous of the region's co-operatives is the Mondragon Corporation, the seventh largest business group in Spain (see Box 1.2). In 2008, Mondragon alone accounted for 3.6% of the Basque Country's GDP (6.6% of industrial GDP). The group also plays a significant role in the innovation system in terms of investments in the region and linkages around the world. In 2009, Mondragon invested over EUR 140 million in R&D and innovation and participated in 70 projects in Spain and internationally. And 20% of sales from industry-related co-operatives is generated by new products and services developed over the

prior five years. Mondragon's technology centres and R&D units (spin-off research entities with private non-profit status) had a combined budget of almost EUR 54 million with 742 employees in 2009 (Mondragon, 2010).

International linkages

Trade occurs mainly with EU countries, as the region has limited presence in Asia, North America, and Eastern Europe (Orkestra, 2008). The Basque Country exports 70% of the regional GDP. From 2000 to 2003, the ratio of exports to GDP declined from nearly 70% to 60%, but steadily recovered through 2008 (see Figure 1.9). International imports and exports have grown since the beginning of the period by an average annual rate of 4.8% and 3.8% respectively, while exchange with other Spanish regions has been growing at a lower annual average growth rate (1.8% and 1.1%).

Exports are predominantly in medium-low and medium-high sectors in equal proportions. Most of the shift over the last several years has been from medium-low to medium-high sectors. Exports in high technology sectors have fluctuated over the last 15 years but remain low (below 5%), which is considerably lower than advanced OECD and EU countries. The share in low-technology sectors has declined somewhat but remains around 8% of exports.[14] Top exporting sectors include motor vehicles, machinery and mechanical equipment and metallurgy/iron. The top ten countries for imports and exports account for approximately two-thirds of volume. Leading export countries include France, Germany, the United States, Italy and the United Kingdom, with leading import countries being Russia, France, Germany, Italy and China (EUSTAT, 2009).

Box 1.2. **Mondragon Corporation**

The group

Begun in 1956 at the initiative of priest José María Arizmendiarrieta, *Mondragón Corporación* has grown to be the largest business group in the Basque Country and the 7th largest in Spain. The corporation's mission combines the core goals of a business organisation competing on international markets with the use of democratic methods in its business structure, the creation of jobs, the human and professional advancement of its workers, and a pledge to develop within its social environment. In 2009, the corporation had over 85 000 employees (down from over 93 000 in 2008) across the globe, including 75 production plants and 9 corporate offices. The 2009 total revenue of EUR 14.8 billion is drawn from its co-operatives in finance, industry, retail and knowledge sectors.

Mondragon University

Begun as a polytechnic school in 1943, Mondragon University was established in 1997 merging three different co-operatives that are now the three faculties of Engineering, Business, and Humanities and Education. Combined, they enrolled around 3 100 students in degree courses and 400 in post-graduate courses for the academic year 2008/2009. Recent projects involving the university that contribute to the Basque innovation system include: the Basque Culinary Center; a new engineering building with a joint research centre to meet the needs of local business; and a research and technological innovation centre in electronics and embedded systems.

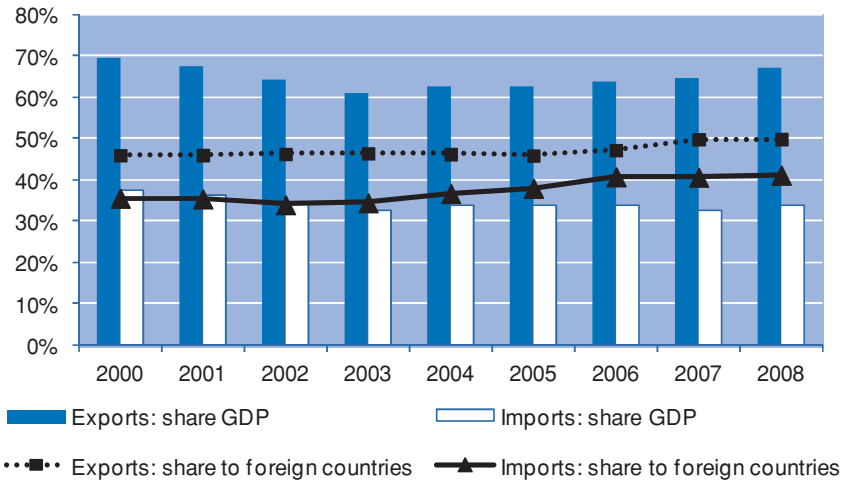
Science, technology and innovation

In 2009, Mondragon spent over EUR 140 million on R&D and innovation. Of that amount, EUR 15 million were invested through the Science & Technology Plan 2009-2012. The corporation as a whole owns 705 invention patents and has been involved in 18 CENIT (Spanish programme) projects, 9 ETORGAI (Basque Country programme) and 34 international projects linked directly to the fields covered by the plan. The plan addresses the following subject areas: new materials and manufacturing systems; information and communications technologies, technologies for energy and sustainability; health technologies; technologies for business management; and research into values and involved management. The plan has 22 strategic R&D lines involving 37 co-operatives, all its technology centres and the university. Mondragon Health and Mondragon Energy were launched in 2009, for the development of activities in these fields of priority interest. Mondragon also supports the ten-year-old Garaia Innovation Park, one of four major sites in the Basque Country along with the other three technology parks.

Source: Mondragon Corporation, *2009 Annual Report*, *www.mondragon-corporation.com*.

Figure 1.9. **Imports and exports as a share of GDP in the Basque Country**

As a share of GDP (bars)/share to foreign countries (lines)



Source: EUSTAT, Economic Accounts.

An analysis of Basque exports from 1996 to 2005 illustrates that the region's exports were increasingly "sophisticated" in terms of technology level (Minondo, 2008).[15] The results show that Basque Country exports were similar to the top 25% of the world's exporting countries, however this leaves a gap of 20% to many EU countries, or 40% relative to the top country (Ireland). The region had the highest growth in this export sophistication index of of any Spanish region as well as most EU-15 countries, albeit more so in the late 1990s than in the first half of the 2000s when EU countries had higher growth rates. Within the region, Alava had a quality-adjusted export sophistication index higher than that of Gipuzkoa, both of which were much higher than that of Biscay province (Minondo, 2008). Nevertheless, since 2003, exports of high and medium-high classified sectors have been declining while those of medium-low sectors have been increasing (Orkestra, 2008).

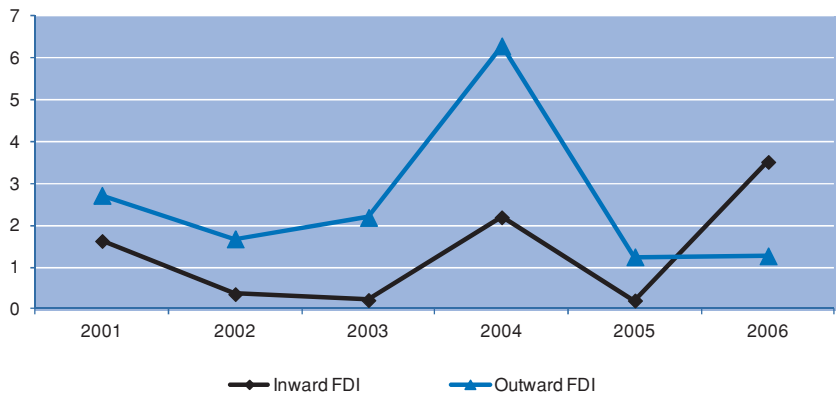
The Basque region has higher levels of outward as compared to inward FDI. It is one of the three regions in Spain whereby outward FDI is greater than GDP. However, inward FDI flows and stocks are lower than GDP (Orkestra, 2009). With respect to inward FDI, leading sectors in 2006 included: banking and other financial intermediation (for 51.6% of inflows, explaining the uptick in FDI receipt in 2006), wholesale trade (12.9%), and fabrication of non-metallic mineral products (11.7%). In prior years, with a

slightly different sectoral categorisation, leading sectors of inward investment included: other manufacturing, commerce, and financial services. Outward FDI in 2006 followed a very different profile, mainly in the fabrication of non-metallic mineral products (28%), information technology (17%), metallurgy (13%), textiles (13%) and food and drink production (13%). Inward FDI supporting firms conducting R&D with linkages to local industry would be an asset for the region's innovation system.

Approximately 40-50% of inward FDI originated in EU-15 countries between 2004 and 2006. The Netherlands was one of the top countries over the period. Non-EU OECD member country sources (ranging from one-fourth to one-half of FDI in a given year) are mainly the United States and to a lesser extent Switzerland. There is very little FDI from Asia and Africa, but there have been increases in the share from Latin America, with periodic large investments by Brazil and Mexico.

Figure 1.10. **FDI trends 2001-2006**

In billions EUR

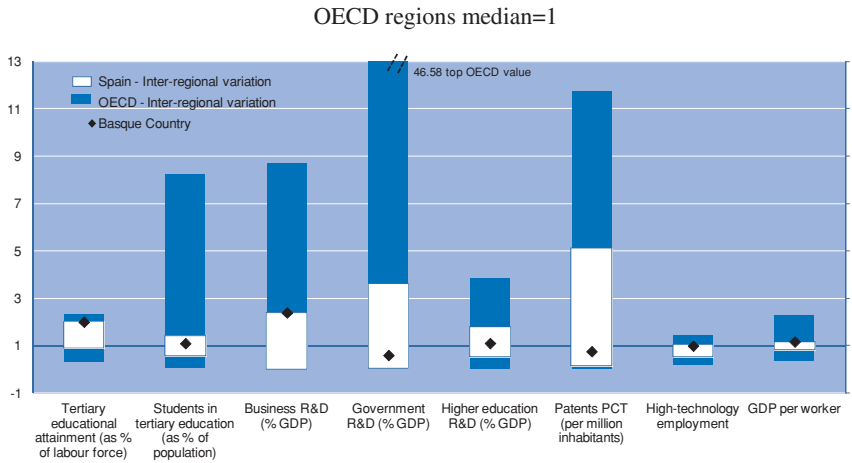


Source: EUSTAT.

Innovation system and performance

The Basque Country is a leading region (top or among the top) in Spain with respect to several innovation-related indicators. They include: the labour force with tertiary education; the share of employment in high and medium-high technology industries and KIS, and GDP per worker. Business R&D intensity is also reported at the top for Spain, albeit this figure requires further interpretation (see Section R&D financing. Given the lack of public research facilities in the region, and the more limited higher education research capacity, the figures for government and higher education R&D are lower than Spanish and OECD medians. Within the OECD, the Basque Country is generally at or below the OECD median on several variables, although the skill level of the labour force stands out as high in international comparison.

Figure 1.11. **Regional innovation indicator summary: Basque Country**



Notes: Data for 2007 or latest year available depending on the region. The light band represents the range of values for Spain. The dark band represents the range of values for OECD regions. The diamond is the value for the Basque Country. Values are normalised to 1 for the OECD median for available regions. Information on all OECD regions is not available for each indicator.

Source: Calculations based on data from the *OECD Regional Database*.

Highly educated workforce, engineering specialisation, growing R&D employment

Educational attainment and performance

The Basque Country has a highly educated workforce in national and international terms. It is at the top of Spanish regions, with 48% of its workforce having tertiary educational attainment. This is a much higher share than Navarre (41%), Madrid (41%) or Catalonia (31%). This is also well above the OECD regional average of 24%. The region has the lowest share of the labour force with only a primary education, with only 30% versus 35% in Madrid, 38% in Navarre or 42% in Catalonia. However, the region has noted a shortage of PhDs and PhD students. In terms of those with some secondary education, there is a high share of persons who do not go beyond lower secondary and a low share of the population with higher secondary education (Orkestra, 2008). Of the total with a secondary education, 37% have had further professional training, versus only 25% for Spain overall. The population aged 20-24 with at least secondary education has steadily declined somewhat from 81.2% (2002) to 78% (2008). Among current students in higher education, many are enrolled in fields of direct relevance to local firms. The students enrolled in tertiary education as a share of the population (3.7%) is near the top of Spanish regions and a little below the OECD regional average.

How prepared is the future labour force? The learning outcomes for 15-year olds, as measured through the OECD Programme for International Student Assessment (PISA) scores, are one indication. Among the 10 regions in Spain with data (2006), the Basque Country is ranked 6th in terms of mathematics, 8th in terms of science and 2nd in terms of reading. It is therefore not at the top of Spanish performance. The region scores slightly above the OECD average for mathematics, but slightly below in science and reading. These results call for strengthening education at primary and secondary levels. In terms of the population (25-64) benefiting from lifelong learning, the 13.5% rate in the Basque Country is higher than Spanish (10.4%) or German (7.9%) and EU-27 (9.6%) averages. That rate was around 3% from 2002-2004, jumping to over 12% in 2005, suggesting a possible change in statistical measurement on this indicator. It is also reported in the region that English language skills are a barrier to greater internationalisation of the Basque innovation system. This language barrier calls for greater attention in terms of schooling and lifelong learning programmes.

Research and development personnel

The region has a high share of R&D personnel and a positive growth trend, with the majority in engineering fields. The ratio in the Basque Country is 15.0 R&D personnel per 1 000 active population, as compared to an EU average of 10.4 and Spain 10.5 (see Table 1.A1.4). The Basque Country is also strong with respect to the rate of researchers per 1 000 active population, a subset of R&D personnel. That rate grew from 7.0 in 2002 to 9.4 in 2008, surpassing OECD rates that increased from 6.9 to 7.7.

In total, there are over 14 400 FTE R&D personnel, and over 9 200 FTE researchers (see Table 1.2). Those figures for 2007 were up 59% and 68% respectively from 2000 totals. Of all R&D personnel, 64% were researchers, although that share was much higher in universities at 87.5% than tax-exempt firm R&D units at 65.6% (those registered in the region's STI network [RVCTI]) or 52.2% among firms (for-profit entities). The low share of non-research R&D personnel in universities is a common challenge for efficiency of research spending given the lack of funding streams to finance technicians and other non-research personnel. Basque Country R&D personnel are heavily concentrated in engineering at 71% of all R&D staff (64.3% of researchers; 82.3% of technicians and auxiliaries). There has been a notable change in the share of female R&D personnel, from 24% in 1997 to 33% in 2007. In 2009, almost 70% of total R&D personnel were in engineering, with fewer than 10% in exact sciences (see Figure 1.12).

Table 1.2. **R&D personnel by type of employer**

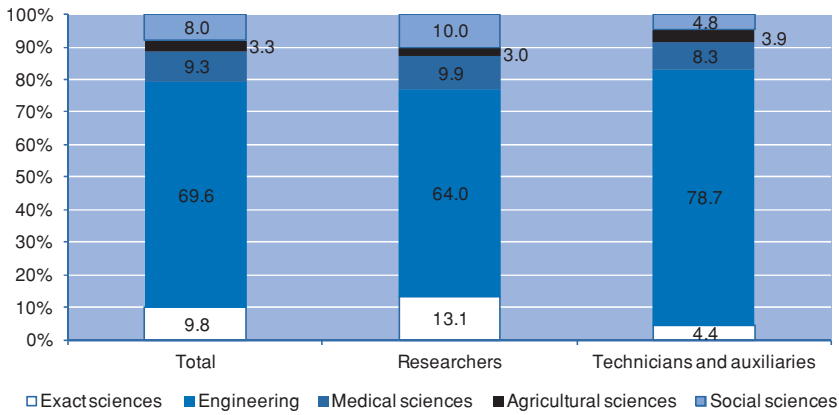
2007

	Total	Universities	RVCTI (minus universities)	Firms (minus those in the RVCTI)
R&D personnel total	22 595	6 394	5 698	10 503
R&D personnel in FTE	14 435	2 957	4 791	6 687
Share by actor	100.0%	20.5%	33.2%	46.3%
Share of R&D personnel in FTE/all R&D personnel	63.9%	46.2%	84.1%	63.7%
Researchers in FTE	9 220	2 587	3 144	3 489
Share by actor	100.0%	28.1%	34.1%	37.8%
Share of researchers in FTE/R&D personnel in FTE	63.9%	87.5%	65.6%	52.2%
Share of total R&D spending share by actor	100.0%	15.2%	38.3%	46.4%
R&D spending per researcher FTE (EUR)	118 250	64 152	132 941	145 124

Source: Based on data from EUSTAT as presented in Navarro, M (2009), *Sistemas de Innovation*, Orkestra-Basque Institute of Competitiveness, Deusto Foundation, Donostia, December 2009 (unpublished).

Figure 1.12. **R&D personnel by discipline**

2009



Source: EUSTAT.

The share of PhDs among R&D staff, one indicator of R&D personnel quality, is highest among academic researchers, followed by public administration and then firms. Firms account for more than 46% of all R&D staff in the region.[16] There is also a low number of PhD-qualified research staff in firms. The cost per R&D personnel (in FTE) is approximately one-third lower in the Basque Country than in the EU-14 (Navarro, 2009a). And the R&D spending per researcher for the region overall is almost twice that of the spending per researcher in universities, that account for 28% of FTE researchers but only 15% of R&D performance.

One indication of the relevance of PhDs for firms is the take-up of a Spanish programme (Torres Quevedo) for hiring such graduates. Even if the Basque Country accounts for less than 5% of Spain's population, 18.6% of those participating in the programme between 2001 and 2008 were integrated in the private sector of the Basque Country (as opposed to other regions). The region is in second position, just after Catalonia with 22.9% and before Madrid with 10.1%.

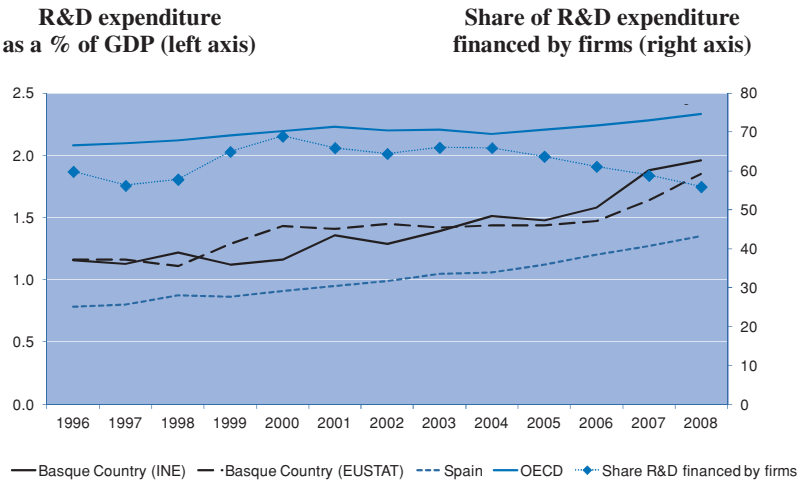
Sustained increases in R&D intensity with focus on applied research

R&D financing

Like Spain generally, the Basque Country has experienced steady and tremendous growth in its R&D investment and R&D intensity. With a threefold increase in investment between 1998 and 2009, outpacing regional GDP, R&D intensity reached 2.06% according to INE (Spanish statistical agency), or 1.98% per EUSTAT (Basque Country statistical agency) (see Figure 1.13). This is compared to a much lower 1.38% for Spain in 2009 overall. The Basque Country is the second-ranked region in Spain, after Navarre (2.13%) and tied with Madrid (2.06%), representing 9.2% of the national total expenditure (notably higher than its share of the Spanish economy). The growth in R&D has therefore continued despite the recent financial and economic crisis. Among the three provinces (using 2008 EUSTAT data), Gipuzkoa (2.23%) has an R&D intensity notably higher than the other two provinces, with investment more than doubling since 2001, and a greater dispersion in the location of spending throughout the province. Biscay (1.73%) and Alava (1.46%) have lower intensity and a greater concentration of that investment. Nevertheless, these figures are lower than the OECD member country average (2.33%) and EU Barcelona objectives – set at country level – of 3%. A couple of further clarifications are required on these figures. First, R&D does not measure expenditure on innovation, but is one input generally associated with technology-related innovation. Second, only approximately 1% of firms in the Basque Country conduct R&D, versus a much larger share (over 16%, all firm sizes) have innovated (see section Patterns of innovation activities in firms).

As absolute levels of R&D conducted by different actors in the Basque Country have increased over time, the share financed by public sources has also grown. That share decreased in the second half of the 1990s to 27% in 2001, and then steadily increased to over 40% in 2008. The share of funding from firms has followed the opposite pattern, and has declined from a high of 69% in 2000 to 56% in 2008 (see Figure 1.14). This trend, unlike that observed in most advanced countries, indicates that R&D activities performed and financed by the private sector have not increased in parallel with public investment. Efficiently designed policies should achieve a positive leverage of public investment in R&D on private investment, if not immediately, at least in the medium term. Basque firms finance little academic R&D, per one calculation only 4% (Navarro, 2009b). The share from foreign sources hit a peak in 2001 and 2002 when it was between 7.3% and 8.3%, but has been relatively constant over the last few years between 3.1% and 3.5%.

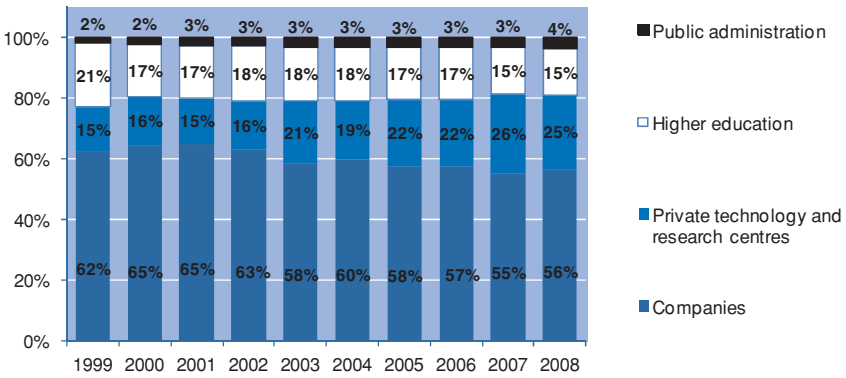
Figure 1.13. **R&D expenditure trends: 1996-2008**



Note: Basque Country values differ depending on the source.

Source: OECD.stat, *OECD Regional Database* and EUSTAT.

Figure 1.14. **R&D expenditure by sector of performance**



Source: EUSTAT.

While the share of R&D reportedly performed by firms has hovered around 80% over the last several years (but declining to 76% in 2009), a more detailed analysis is required to interpret this figure.[17] Separating firms from private status technology centres and research associations reveals a

different trend. From 1992-2008, the share of R&D performed by firms declined from 62% to 56% while the share to private technology and research centres and non-profit firm R&D units (tax-exempt entities created by firms to integrate the regional STI Network) increased from 15% to 25%. This increase is due in part to the growth in R&D units and greater participation in EU programmes. The region's main technology centre networks have a higher share of private financing relative to public sources, and are classified in regional statistics as firms although they have a non-profit status. The classification renders analysis of the innovation system less clear for international comparisons (see Box 1.3). A further refined breakout by type of firm indicates that technology centres accounted for 32% of firm R&D in 2007, 60% by domestic private firms, 7% by multi-national firms, and 1% by public firms.

Box 1.3. **Classification of business-serving non-profit institutions**

According to the OECD *Frascati Manual* (2002), non-profit institutions (NPIs) providing R&D services to businesses are usually financed by contributions or subscriptions from the businesses concerned which provide institutional support for their R&D. They should be included in the private non-profit sector. NPIs that carry out similar functions but are either controlled or mainly financed by government – for example if their existence depends on a block grant from government – should be included in the government sector. This is typically the case of technology centres.

However, among OECD member countries, there are diverse interpretations of the *Frascati Manual* for the classification of technology centres. For instance, Spain (as the Basque Country) classifies them in the business sector, due to a financing structure that is more than 50% private. Since 1992, Germany classifies the Fraunhofer Institute in the government sector, as such institutions have more than 50% of their total financing (institutional and competitive) from public sources.[1] In the Basque Country, independent firm R&D units are created under a private non-profit status to be eligible for programmes of public support. There are different regulatory frameworks, including EU regulation, that differentiate by tax status. Although these R&D units can (and do) provide R&D services to other enterprises, their main client is overwhelmingly their parent firm. While the *Frascati Manual* does not provide explicit guidance regarding their classification, it seems most accurate to be included in the business sector where they are currently recorded. Their parent firm (profit-making enterprises) remains eligible for other public programmes, including tax incentives.

1. A working group has recently been created within the OECD to review the different practices and set guidelines for the classification of research institutions and technology centres that receive institutional funding from governments.

Source: OECD (2002), *Frascati Manual*, OECD Publishing, Paris.

Furthermore, R&D performed by firms (BERD) has an unusually high share financed by public sources. Approximately 25% of BERD comes from public financing, albeit excluding technology centres that figure declines to around 22% (see Figure 2.2). This compares with 16.4% in Madrid, 16.3% in Spain overall, and between 5% to 7% for Wallonia and Flanders in Belgium. In addition, there are fiscal incentives via tax credits that also support R&D spending by firms (see Figure 2.3). R&D conducted by technology centres in 2007 was 49% for applied research, 39% for technological development and 12% for basic research.

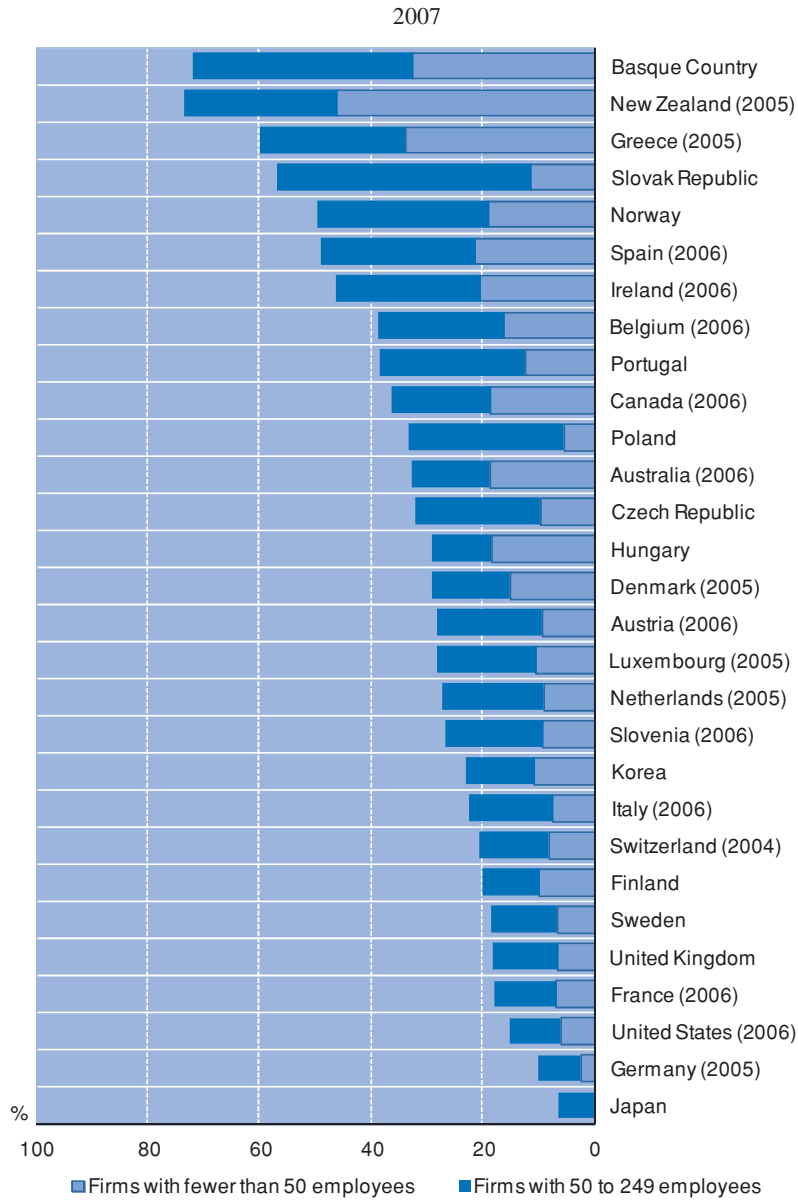
Firm size is another consideration in an analysis of R&D trends. The Basque Country is unusual for the low share of R&D conducted by large firms. In fact, 85% or more of R&D expenditure comes from large companies in countries like Japan, Germany and the United States. In the Basque Country, that figure was only 28% in 2007 (see Figure 1.15). The lack of large firms, as well as firms specialised in high-technology centres, poses challenges for increasing R&D investment in the Basque Country relative to leading regions of knowledge-intensive countries. This is the rationale behind the region's explicit policy choice to support firm R&D.

With few public research facilities in the region outside of universities, the administration (public research) accounts for 4% of R&D performance, up from 2.4% in 2000. The share of R&D performed by universities declined from around 25% in the mid-1990s to approximately 15% in 2008, although it increased to 18% in 2009. Provincial values in share of R&D by actor vary given the location of different innovation system actors.

The share of R&D by sector has changed over time (see Table 1.A1.5). In the mid-2000s, 88 firms accounted for 79% of firm R&D. In terms of sectors, market services account for around half of R&D investment, followed by transportation materials (approximately 15%), as well as metal products/equipment, machinery/mechanical equipment, and electronics/electronic equipment (each around 10%) (Fariñas *et al.*, 2009). Service sector industries increased their share of R&D spending from 44% to 60% while the industry sector declined from 54% to 39% of spending. However this change is also due to statistical issues, as firm R&D units that are non-profit are classified as service firms, different from the sectoral classification accorded to the for-profit parent firm. Furthermore, as Basque firms outsource R&D or create R&D units, the statistics overestimate the transition from manufacturing to service sector R&D. Agriculture and fishing fluctuated between 1% and 2% during the period. In terms of R&D spending by industrial classification for technology level (using the OECD classification), almost half of spending is in medium-high technology industries. High technology and medium-low technology industries account

for almost a quarter of investment each, with that share declining from 2002-2004 before a notable positive trend in 2006 and 2007.

Figure 1.15. **Share of R&D investment by SMEs**



Source: EUSTAT and OECD.

Other sources of financing for innovation

One of the major barriers to innovation is the lack of financing, particularly in a period of economic downturn. An analysis of Basque manufacturing firms reveals a somewhat different financing structure than other regions in Spain. Differences include a lower apparent cost of debt and a lower degree of leverage. There is also a greater share of long-term financing and lower reliance on short-term financing. This structure is due in part to a well-developed financial system and mutual guarantee firms. Basque firm financing structures enable them to better manage the crisis and if, they choose, to take business strategies or innovation investments with higher risk and broader scope (Orkestra, 2009).

Venture capital is an important type of financing in innovation, particularly for technology-related start-ups. Venture capital has been slow to develop in Spain, but since 2001 the amount of new funds for both private equity and venture capital has grown, peaking in 2007 before the crisis. Venture capital dropped considerably in the OECD in general, by 60% in Q1 2009 compared to Q1 2008 (OECD, 2009). Spain ranks 5th out of 26 OECD member countries for venture capital volume, but only 13th with respect to venture capital as a share of GDP in 2008. In terms of volume, Spain is just below Germany. In terms of intensity, this was 0.095% of GDP. That rate was higher than that of France (0.091%), but significantly below many Nordic, Anglo-Saxon and Benelux countries. In 2006, Spain's venture capital was 29% for seed capital and start-ups versus 71% for early development and expansion. This share for start-ups is above the OECD-27 average (22%) but below the EU-20 average (34%). The main sources of financing for private equity and venture capital in Spain include financial institutions (albeit a declining share) at 31.3%, followed by contributions from individuals and funds of funds, both at 13%. The leading recipient sectors include energy (41.3% in 2008), industrial products and services (13.5%) and communications (11.5%) (ASCRI, 2009).

The Basque Country accounts for a small share of venture capital and private equity flows as well as smaller transaction sizes than other leading recipient regions in Spain. Only 1.5% of total investment (EUR 36.5 million) and 2.5% of venture capital investment flowed to the Basque Country in 2008 (ASCRI, 2009). This was down significantly from 2007 due to the crisis, with EUR 136.1 million in total investment (3.4% of Spanish investment). The average size of an investment appears to be rather small, given that the Basque Country had 62 transactions for that 1.5% of flows, versus Madrid (41.7% of flows, 191 transactions), Catalonia (13.8%, 200 transactions), or Galicia (6% and 60 transactions). The Basque Country administration manages several public venture capital funds, with a

total portfolio of EUR 58 million. The province of Biscay has supported its own venture capital fund for the last 20 years which reports having created over 1 000 new jobs.

Table 1.3. **Basque Country public venture capital funds**

As of December 2008

Fund	Year created	Investment target	Portfolio (EUR million)	Firms
Funds managed by the Basque Country administration				
EZTEN FCR	1986	Early stage financing	29.6	36
SUZTAPEN FCR	2001	Firms already established or in development	21.5	11
ELKANO XXI FCR	2001	High-tech firms	2.0	5
EKINTZAILE XXI FCR	2002	Firms with a science or technology base, innovative firms	3.3	11
SEED GIPUZKOA SCR	2007	Start-up firms with a technology base, innovative firms – in the province of Gipuzkoa	1.7	6
Total			58.0	69
Funds managed only by Biscay province				
SEED CAPITAL BIZKAIA	1989	Innovative business projects at the start-up stage		

Source: Gestión de Capital Riesgo del País Vasco SGECR, S.A, *Annual Report 2008*; *www.seedcapitalbizkaia.com*.

Performance on intermediate outputs and innovation in firms

Scientific production

The region is under-performing in scientific production. From 2000-2007, the region's share of Spain was 3.5% of the Thomson Scientific "Web of Science" publications, 4.5% from Spain's *Science and Technology database* (ICYT), and 4.3% of the *Social Sciences and Humanities database* (ISOC).[18] The region has a much larger share of Spain's R&D personnel. But it should be noted that a large share of those R&D personnel are in firms, not universities and research centres, which helps explain in part the lower rates of production per researcher in the Basque Country. Nevertheless, Basque universities appear to lag relative to peers in terms of

the quantity and quality of scientific production (see section Knowledge generation institutions).

Intellectual property protection

Protection of intellectual property is not an innovation per se, but indicates a potential innovation of commercial benefit. In terms of patenting intensity of Patent Co-operation Treaty patents (PCT patents per million inhabitants), the Basque Country is at 39, lower than Navarre (97), Catalonia (65) and Madrid (56). The median for OECD regions is 65. There are an increasing number of patents from high-technology sectors. For example, PCT patent applications over the last 20 years included 61 biotechnology, 74 green technology, 2 nanotechnology and 205 ICT applications.[19] Most of the green technology patents have been applied for since 2005. In terms of national applications for patents and utility models, the combined total has fluctuated between 288 and 341 over the last decade. The general trend for patent applications has been increasing while that for utility model applications decreasing, implying a possible substitution effect. The Basque Country's performance on other forms of intellectual property protection does not reveal exceptional performance. The region accounted for 5% of trademark, 4% of brand and 4% of industrial design applications to the Spanish Patent and Trademark Office, as compared to the region's share of GDP just over 6%.

As has been noted in prior analyses, the Basque Country appears to generate fewer patents than one would expect relative to the R&D investment made (Orkestra, 2008). And in terms of economic growth, the region performs better than what would be expected relative to other regions from patent performance. Patent inventors are not the same as patent owners, the latter being the location where economic impacts are more likely to be derived from a patent. Domestic ownership of foreign inventions is not the explanation. Only approximately 5% of PCT patents owned by a Basque Country actor have a foreign inventor, and it is more likely that there is a foreign owner for a patent with a Basque Country inventor (around 9% of patents).

Related indicators on business improvements

Other indicators of business practices may indicate non-technological innovation. For example, the number of ISO 9000 certifications grew from 784 to 4 443 between 1997-2005 (see Table 1.4). SMEs have accounted for an increasing share of these certifications. The Basque Country has a greater intensity of certifications (with respect to GDP) than other countries. It

should be noted that intensity is not necessarily correlated with level of economic development or innovation, as countries in Europe with the greatest intensity (above those of the Basque Country) include Italy, the Czech Republic and Hungary.

Another indicator is excellence in management. The European Foundation for Quality Management (EFQM) grants awards and prizes for excellence in business management and processes. With respect to EFQM excellence finalists, prize winners and award winners from 2000-2010, the Basque Country alone accounted for 23 out of the 31 in Spain, compared with 28 for the United Kingdom, 26 for Germany, or 17 in Turkey (Euskalit, 2010). Per a prior study, it appears that EFQM is easier to implement in the tertiary sector (education and health), and less so in industry as it is too complex for the traditional industrial SME (Heras *et al.*, 2009).

Table 1.4. **ISO certifications: 1997-2005**

	1997			2001			2005		
	Number	% cert.	IC GDP	Number	% cert.	IC GDP	Number	% cert.	IC GDP
United States	18 581	8.32	0.30	37 026	7.25	0.26	44 270	5.70	0.20
Japan	6 487	2.91	0.58	27 385	5.36	1.07	53 771	6.92	1.38
EU-27	135 984	60.90	2.03	253 488	49.64	1.65	344 705	44.39	1.48
Spain	4 436	1.99	0.79	22 079	4.32	1.72	47 445	6.11	2.43
Basque Country	784	0.35	2.27	2 687	0.53	3.40	4 443	0.57	3.69

Notes: Certificates issued by the end of the financial year – December each year. IC GDP: certification intensity calculated as a ratio between the percentage of participation in the number of global certificates issued and the percentage participation in the world GDP for 2005, measured in USD (data provided by the World Bank except in the case of the Spanish GDP and that of the Basque Country, calculated according to data provided by Eurostat and Eustat, respectively).

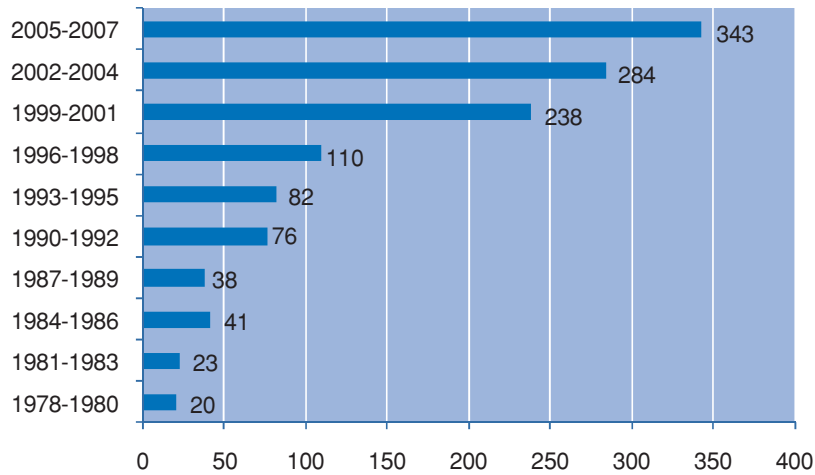
Source: Heras *et al.* (2009), *Quality Management and Competitiveness of Basque Firms*, Orkestra: Basque Institute of Competitiveness, Deusto Foundation, Donostia/San Sebastian (Spain), as compiled by the authors from ISO reports, Forum Quality reports and Eurostat data.

Patterns of innovation activity in firms

Evidence illustrates positive or stagnant performance depending on the indicator. For example, the number of firms initiating R&D activities per year has tripled over the decade (see Figure 1.16). The Basque Country accounted for 7.2% of all firms in Spain with innovation activities in 2008, a share a bit higher than its GDP (just over 6%). Of firms with 10 or more

employees, 41.2% reported innovation in 2006-08, higher than the rate for Spain at 34.8%. A breakout by type of innovation shows that 31.5% reported a technological innovation (product or process) while 27.4% reported a non-technological innovation (organisation or marketing method). And innovation intensity, as measured by the ratio of innovation expenditures over turnover multiplied by 100, is much higher in the Basque Country than in other leading Spanish regions. Innovation intensity was 1.55, greater than Navarre (1.3), Madrid and Catalonia (both at 0.95).[20]

Figure 1.16. **Number of firms initiating R&D activities**



Source: Eustat (2007), "*Esetadistica sobre Actividades de Investigacion Cientifica y Desarrollo Tecnologico (I+D)*".

The rate of technological innovation expenditure is increasing, with a shifting share towards expenses more associated with a knowledge economy. Of that spending (4.1% of GDP in 2008), 44% is for internal R&D, 29% for machinery, 15% for external R&D, 5% for commercialisation and 2% for each of the following: other knowledge, training and design. Over time, there has been a general shift from purchase of machinery equipment towards internal R&D (technological expenditures 3.9% of GDP in 2003 with 39% internal R&D and 36% purchase of machinery and equipment).

The share of SMEs introducing a new product or process innovation did not improve considerably, fluctuating between 30% and 35% between 2003 and 2008. There has been a modest increase in the share of SMEs innovating

in-house over the last few years (from 27% to 30%) and an increase in SME collaboration with others (from approximately 6% to 10%). There are also positive signs with increasing new-to-market sales as a share of turnover from around 6% (2004) to 8% (2008). Among perceived barriers to innovation for firms having difficulties to innovate, economic factors are reported among the highest number of firms, particularly industry, relative to internal factors and other factors. There are continued improvements in areas affecting incremental innovation. For example, firms with broadband access increased considerably, from 34% (2002) to 92% (2008).

There is a shortage of innovative companies in the region's business structure that undergo a process of rapid growth and internationalisation. Although a notable percentage of companies conduct innovation activities, they largely fail to transform their innovation efforts into new products. And even if new technology companies are founded, the potential for internationalisation could be much greater than it is at present (Peña *et al.*, 2009).

There appears to be better innovation performance among SMEs with higher technology or knowledge intensity . New firms in medium-high and high-technology manufacturing generally have a higher total factor productivity than those less in less technology-intensive sectors, although for those in non-metropolitan counties (*comarcas*) the results are not statistically significant. For new firms in services in metropolitan areas, those in knowledge-intensive services had a 9.3% greater average productivity than those in less knowledge-intensive services. There is also some evidence of a higher return on assets among SMEs in more technology or knowledge-intensive services. Finally, there is a higher five-year survival rate among firms that are in medium-high and high-tech manufacturing in metropolitan areas, as well as intensive versus non-intensive services in both metropolitan and non-metropolitan areas (Vendrel Herrero *et al.*, 2009).

Strengthening internal system linkages and increasing international collaboration

Socio-political trends requiring regional self-reliance have contributed to a strong sense of social cohesion and commitment among regional actors. Industrial policies that promoted the use of technology centres and later clusters, as well as the many business groups and other networks, have continued to build internal collaboration networks. The share of PCT patents that are the result of collaboration (co-patents) has increased from one-third in the late 1990s to 50% or above since 2000. The main hubs in these networks appear to be the University of the Basque Country (UPV) and several technology centres, albeit with different types of co-patenting actors.

There are nevertheless remaining challenges for linkages internal to the region. SMEs report limited results of formal collaboration in research projects. Other evaluations of the Basque Country innovation system have also noted weakness in linkages between universities and research entities with firms (Navarro, 2009b).

Public and university PCT patent activity is relatively recent in the Basque Country. University patents are observed consistently after 2002-2003, and other public sector patents from 2001. The UPV is the most active. No patents have been requested by hospitals. During the last 20 years, among the over 1 500 PCT patents that involved Basque Country actors, 70% were from firms, 22% from individuals, 5% from private non-profit entities, 3% from universities and 1% from other public entities.

Table 1.5. **Patent Co-operation Treaty patents by type of actor**

2000 and 2007

	Individuals[1]		Companies		Government		Universities + hospitals		PNP[2]		Total[3]	
	00	07	00	07	00	07	00	07	00	07	00	07
Catalonia	35	94	138	254	1	4	7	29	0	11	187	411
Navarre	3	11	7	42	0	0	1	2	1	2	11	55
Basque Country	8	17	16	42	0	0	0	9	1	9	27	81
TOTAL Spain	129	398	287	614	1	10	39	177	4	32	524	1 299

Notes: 1. Includes patents filed by owners of small enterprises. 2. PNP=private non-profit organisations. 3. Includes patents filed by unregistered applicants.

Source: *OECD Regional Database* based on REGPAT.

Several measures show a low level of international linkages. A study in the late 1990s illustrated that Basque firm innovation (relative to firms in other industrial regions like Wales, Styria and Tampere) frequently involved partners, but those innovation partnerships were concentrated within the region (Kaufmann and Todtling, 2000). Inward FDI flows are low, but could be a benefit to the system if effectively linked with local industry (see Figure 1.10). Foreign sources of R&D funding in the Basque system are also low. There is a clear potential for attracting R&D centres of multi-nationals to take advantage of the Basque Country innovation system and its policies.

The region has been increasing its international linkages by participating in certain EU Framework Programmes that involve inter-regional collaboration (see Chapter 3) and European technology platforms. Networks of high-skilled talent and researchers are another strategy for accessing external knowledge. The number of foreign researchers has increased,

supported by the Ikerbasque Foundation. After two years Ikerbasque has hired 60 international researchers and 13 visiting researchers.

While Basque Country international linkages are increasing, those of competing regions may be increasing at a faster rate. The share of PCT patent co-inventors from the Basque Country has been very stable over the last several years at 83%, 13% with other Spanish regions. Only 5% of co-inventions involve foreign regions, the second lowest region in Spain.[21] In terms of its position in international co-patenting global networks, the Basque Country did improve significantly from being at the 28th percentile of regions for its international connections in the period 1977-1987 up to the 54th in the period 1988-1997.[22] But in the latest period, 1998-2007, the region slipped to the 47th percentile. So while the region has been rapidly increasing the number of regional connections over time, other regions are increasing their connections faster.

Basque Country positioning in typologies of regional innovation performance

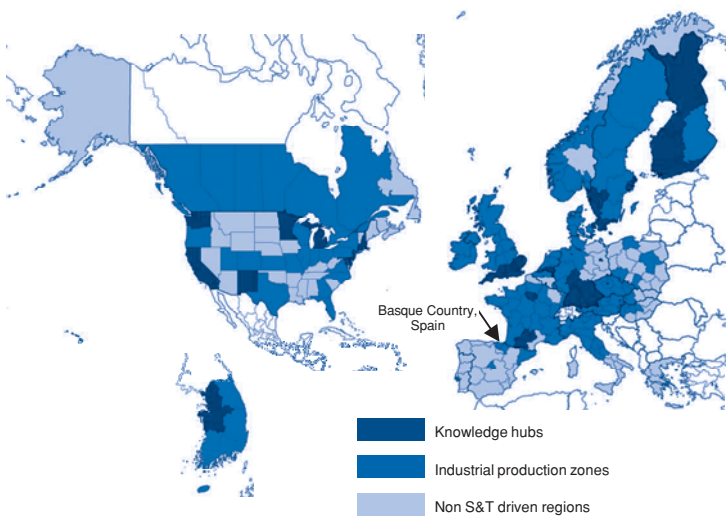
The most widely used assessment of innovation for regions in Europe is the Regional Innovation Scoreboard. The Basque Country has maintained its position as a medium-high innovator (the second highest out of the five categories) for overall regional innovation performance (2009 Scoreboard).[23] Among the sub-categories, the Basque Country scores as medium-high for "enablers", medium-high for firm achievement and high for outputs. As stated above, an analysis of the Basque Country notes that it scores lower on innovation variables like those used in the European Innovation Scoreboard (done at country level) than its GDP per capita in PPP would imply (Orkestra, 2009).

Another analysis of regional innovation systems with more refined categories shows the Basque Country's closest peers. It is in a category of "central regions with medium prosperity and technological sophistication" that includes Aquitaine, Trento, Tuscany, Wallonia, and Catalonia. As the Basque Country advances, given its industrial structure, benchmarks include regions in the group "regions with financial and technological capacity", that includes Emilia Romagna (Italy), Lower Saxony (Germany) and Limburg (Netherlands) (Orkestra, 2009).

An OECD analysis finds that the Basque Country falls in a regional peer group of "medium technology manufacturing and service providers" (see Figure 1.17). These regions, while not the leading OECD "knowledge hubs" with the highest R&D and patenting intensity, are nevertheless among the OECD "industrial production zones". Regions most similar to the Basque

Country share common characteristics such as a highly educated labour force, and thus strong knowledge absorption capacity, and industrial activity that may include design, intangibles and creativity-led sectors in addition to traditional manufacturing activities. The different sample of countries included in the OECD versus EU accounts for the somewhat lower ranking of the region's performance relative to EU-based regional typologies.[24] The medium technology manufacturing and service providers cluster also contains several Canadian (Ontario, Quebec), French (such as Rhône-Alpes and Alsace), Spanish (Madrid, Catalonia, and Navarre) UK regions and Flanders (Belgium), among others. Regions in the "knowledge hub" category that have a strong industrial base and may serve as additional examples for the Basque Country include Baden-Württemberg and several other German regions as well as Southern Netherlands, to name a few.

Figure 1.17. **Map of OECD regions**



Note: Composite maps cropped for ease of display.

Source: OECD (2011) *Regions and Innovation Policy*, OECD Publishing, Paris.

There is evidence of distinct local innovation nodes at the county (*comarca*) level within the Basque innovation system. Case studies in the region have illustrated the importance of these local nodes and the role of sub-regional governments in supporting networking and spillovers (Aranguren *et al.*, 2010) One cluster analysis of the 20 Basque counties reveals 5 local innovation system types (Zubiaurre *et al.*, 2009).[25] Over two-

thirds of the economy and population is located in counties that are capital urban zones with a diverse industrial mix. In addition to the approximately one-fourth of the economy in average industrial agglomerations, there are interesting cases of local innovation systems that are advanced (due in this category to the presence of the famous Mondragon Co-operative) or have a unique specialised industrial structure (in one case based on wine).

Table 1.6. **Typology of innovation profiles: Basque counties**

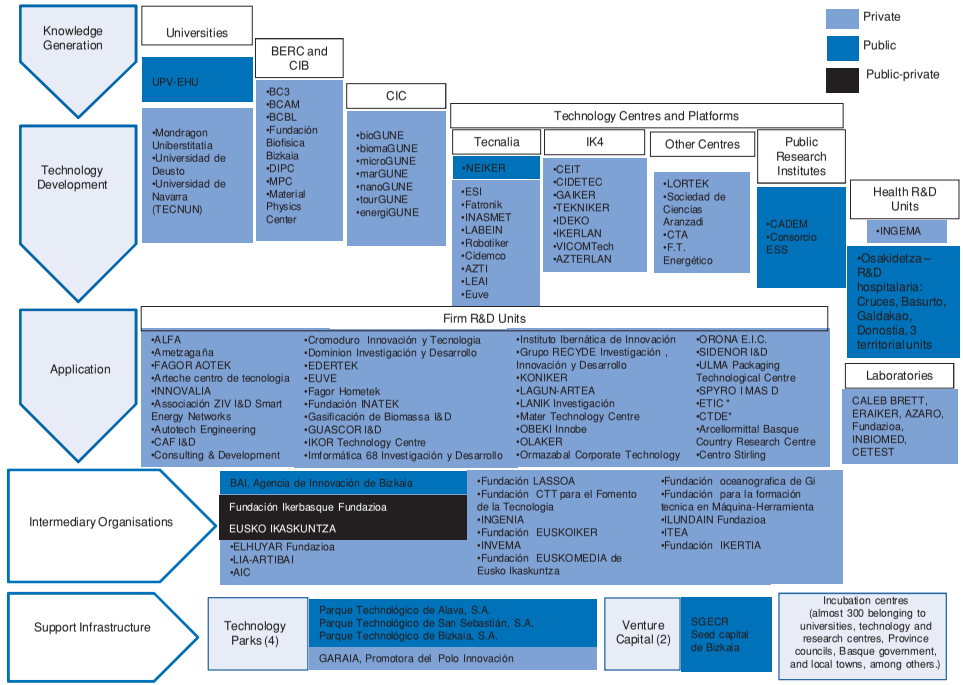
Category	% BC GDP	% BC population	County names	Description
Capital-urban zones with diverse industry mix	67%	69%	Gran Bilbao Plentzia-Mungia Donostialdea Llanada Alavesa	Provincial capital city areas, high population density, diversified economic structure, knowledge-intensive industries, location of research infrastructure and universities
Advanced industrial agglomerations	6.4%	5.4%	Alto Deba Bajo Deba	Manufacturing industries of high and medium-high technology, larger firm size and industrial R&D, location of MCC group (*Mondragon Corporación Cooperativa*), skilled workforce and suppliers
Industrial agglomerations with average technological performance	23.6%	23.6%	Bajo Bidasoa Duranguesado Urola Costa Catábrica Alavesa Goierri Arratia-Nervion Tolosaldea Markina-Ondarroa Gernika-Berneo Encartaciones	Average values for the Basque Country, more endogenous growth and less mobility, manufacturing counties with diverse levels of technology, weaker support of technology infrastructure than above categories
Small industrial counties	1.36%	<1%	Estribaciones del Gorbea Valles Alaveses	High entrepreneurial dynamism, in addition a few large firms, extremely specialised manufacturing counties, high per capita income, weak scientific and technological infrastructure
Small rural counties	1.24%	<1%	Montaña Alavesa Rioja Alavesa	More aged population, one county highly specialised in high quality, one with advanced facilities and highest per capita income

Source: Table based on Zubiaurre, A., K. Zabala and M. Larrea (2009), "Local Innovation Capacity: A Typology for Basque Counties", *Ekonomiaz: Revista vasca de economía*, Basque Government for Economic Analysis and Debate, San Sebastin, Spain, Vol. 70, pp. 282-303.

Basque innovation system actors

The Basque innovation system is distinctive among OECD regions for its strong institutions to support applied research, the degree of public-private collaboration, and low level of public research. Many of the most prominent innovation system actors are part of the Basque Network on Science, Technology and Innovation (RVCTI), with the notable exception of firms that have not created a private non-profit R&D unit distinct from the parent company (see Box 2.3 for more on the RVCTI). The three sub-systems of the network include: *i)* scientific and university sub-system (including universities and excellence research centres); *ii)* technological development and innovation subsystem (technology centres, firm R&D units, health R&D units, etc.); and *iii)* support to innovation subsystem (technological parks, intermediaries).

Figure 1.18. **Implementation agents in the Basque innovation system**



Source: Basque Country Innovation Agency, Innobasque.

Basque government and related foundations

The main entities in the Basque government most responsible for STI policy are the Department of Industry, Innovation, Trade and Tourism (to be referred to as Department of Industry), and the Department of Education, Universities and Research (to be referred to as Department of Education). Other departments contribute to R&D spending (the Departments of Agriculture and Health most notably)/ The President's Office is playing a new lead role for STI Planning (see Chapter 3). Over the last few years, the Basque government has created new entities to improve public action through networking and development of the knowledge generation sub-system. Additional foundations and agencies include (for Innobasque, see section intermediary organisations and support infrastructure):

- **Society for the Promotion of Industry (SPRI):** (1981) SPRI is the region's business development agency whose goal is to support the competitiveness and global market positioning of Basque firms. It is the main implementation agency of the Basque government's Department of Industry. The SPRI Group includes over 150 staff in several entities that support finance (venture capital), industrial parks, business and export promotion, and programmes for innovation and technology support.

- **Ikerbasque:** (2007) the Basque Science Foundation was created by the Basque government's Department of Education. Its mission is to attract skilled foreign scientists to lead or participate in research projects developed in, or in collaboration with, Basque research or technological institutions. This type of agency exists in other regions of Spain, with ICREA in Catalonia being a forerunner. Ikerbasque, a rather small and agile institution with a staff of less than ten people, is chaired by the Minister of Education. Its resources come from the Basque government (70%) as well as Spain and the European Community. Its annual budget is approximately EUR 6 million. Ikerbasque provides financial and logistical support incentives to interested scientists who are selected for excellence, on a joint basis with a Basque research institution. There are currently around 90 foreign scientists in the Ikerbasque programme, of which close to 80% come from outside of Spain, mainly from the EU.

- **Basque Council for Science, Technology and Innovation:** (2007) the Council is an inter-departmental body responsible for strategy and leadership for science, technology, research and innovation policies. It is composed of members of several Basque government departments, as well as representatives from the three Basque provinces, the region's universities, and other key foundations, notably Ikerbasque and

Innobasque. However the Council has not fully played the missions entrusted to it (see Chapter 3).

- **Euskalit:** (1992) the Basque Foundation for Quality (EUSKALIT) is a private, not-for-profit organisation created with the support of the Basque government's Department of Industry. Its mission is to promote improvement and innovation in management through a culture of total quality management (TQM) throughout Basque society as a tool for regional competitiveness. It focuses on providing information and training on TQM/business excellence in industrial and service sector companies, education centres, not-for-profit organisations, consultancies, public administration and health centres.

Knowledge generation institutions

The Basque Country contains two small private universities (Deusto and Mondragon) and one large public university (University of the Basque Country or UPV). Deusto University has strengths in the social sciences and is oriented more towards teaching than research. Mondragon University, part of the Mondragon Corporation, has a co-operative structure. It has a history of engagement with local firms and co-operatives, notably through its Faculty of Engineering that began as a polytechnic school. UPV is by far the largest university in terms of students (78%), researchers (90%), and research units with an "excellent" accreditation from the Basque government (93%).[26] Basque Country students also have access to Spain's National University for Distance Learning (UNED) as well as some faculties of the University of Navarra located in the Basque Country.

Universities in Spain suffer from regulatory and cultural challenges that can serve as barriers for university engagement in regional innovation systems. Beyond the autonomy enjoyed by universities, the national regulatory framework applied to Spain's public universities (personnel status, career and wage management) imposes some constraints hindering a flexible and efficient mobilisation of resources on priority research programmes or projects.

Prior analyses have argued that Basque universities are not performing to the level of their peers in competing regions (Navarro and Buesa, 2003). In 2007, R&D spending per researcher in the Basque Country was around EUR 63 000, versus 48 400 in Navarre and 54 500 in Madrid, but close to that of Catalonia (64 000). In terms of scientific publications per 10 000 inhabitants between 2000-2008, the rate of 6.1 for the Basque Country was around half that of other economically leading Spanish regions like Navarre (12.5), Catalonia (11.0) and Madrid (14.3). In terms of volume, the

University of the Basque Country (UPV) is 9th in Spain.[27] In terms of quality as determined by Spain's Commission to Evaluate Researcher Activity (CNEAI), based in large part on scientific publications, Basque universities do not perform well. A ratio of designations (*tramos*) by researcher places UPV at 41st place in Spain.[28]

Table 1.7. **Universities in the Basque Country**

	University of the Basque Country (UPV/EHU) 2009/2010	Deusto University 2009/2010	Mondragon University 2010/2011
Faculties and technical schools	31	6	3
Students (graduate and post-graduate)	46 575	9 934	3 450
Staff[1]	4 239	388[2]	433
Researchers (full-time equivalents)	2 299[3]	166	94
Research units (excellent)	256	16	4

Notes: 1. Teaching and administrative staff. 2. Includes only teaching staff. 3. Permanent and those in doctoral programmes.

Source: Department of Education, Universities and Research (Basque Country government).

There are signs that universities are improving their capacity. For example, in the context of the next four-year strategic plans concerning Research and Technology Transfer, the Basque University has been recognised as a Campus of International Excellence through Euskampus, a joint initiative with Tecnalia and Donostia International Physics Center. In terms of European Framework Programme research projects, in the 6th Framework Programme UPV was among the top five Spanish universities for the number of projects. Furthermore, the University of the Basque Country, as compared with other large Spanish public universities, is increasingly involved in technology transfer (see Box 1.4). In terms of national patents from 2000-2008, UPV was ranked 18th in volume.[29] It was among the top eight regions in 2009 in terms of associations with technology platforms.

Over the last decade, the Basque Country has created two types of centres of excellence to improve the research base of the innovation system. The basic excellence research centres (BERCs), managed by the Department of Education, are created based on the presence of a critical mass of excellence in research. The six centres combined had 131 researchers and annual operating budgets of over EUR 9.5 million in 2010 (see Table 1.8). The seven centres for co-operative research (CICs), managed by the Department of Industry, were created to support regional goals with respect

to sectors of priority in the current industrial structure or sectors that the region seeks to develop. They had a combined total of 287 researchers and annual operating budgets of EUR 33.7 million in 2009 (see Table 1.9).

Box 1.4. **University of the Basque Country: technology transfer statistics**

	2005	2006	2007	2008	2009
R&D contracted by firms (EUR millions)	10.0	13.2	12.9	12.0	11.4
R&D other (EUR millions)	36.4	35.6	47.9	42.8	(*)
Total R&D (EUR millions)	46.4	48.8	60.8	54.8	(*)
Patents (Spain, EU, US, PCT and others)	16	27	34	42	52
Licensed	16 companies between 2005-2009				

Notes: *= pending.

Source: UPV.

University	Research and teaching personnel (FTE)	R&D contracts (EUR thousands)	National patents	PCT patents	Licences (EUR thousands)	Number of spin-offs created
University of the Basque Country	2 089	10 880	7	12	40.7	7
Madrid Autonomous University	2 454	22 036	15	14	81	10
Barcelona Autonomous University	2 836	14 200	26	9	100	5

Source: Red OTRI Universidades (2008), *Annual Survey*, Madrid.

Table 1.8. **Basic excellence research centres**

Name and area	Year created	Full-time equivalent researchers,[1] 2010	Annual budget EUR (2010)	Approximate share of 2010 budget from institutional funding
BCAM Basque Center for Applied Mathematics	2008	20	1 640 000	84%
BC3 Basque Center for Climate Change	2008	11	1 450 000	94%
BCBL Basque Center on Cognition, Brain and Language	2008	22	3 150 000	91%
DIPC Donostia International Physics Center	2000	19	900 000	71%
UB Biophysics Unit UPV/EHU-CSIC	2000	24	1 500 000	61%
MPC Material Physics Center, UPV/EHU-CSIC	2000	35	900 000	58%
Total		131	9 540 000	

Notes: 1. Senior researchers and postdoctoral fellows. PhD students are not included. The centres created in 2000 became registered as BERCs in 2008.

Source: Figures provided by the Department of Education, Universities and Research.

Table 1.9 **Co-operative research centres**

Name	Sector	Purpose of creation	Year created	Full-time equivalent researchers (2009)	Annual budget (2009)	% operating budget from Basque Government
marGUNE	Manufacturing	Improve firm competitiveness	2002	6	481 096	77.0
tourGUNE	Tourism	Improve firm competitiveness	2006	10	1 158 593	87.5
bioGUNE	Biosciences (biotechnology applied to health)	Diversification (biosciences)	2002	140	10 528 259	56.5
biomaGUNE	Biosciences (biomaterials)	Diversification (biosciences)	2002	74	5 639 516	80.9
nanoGUNE	Nanosciences	Diversification (nanosciences)	2006	48	14 054 918	30.7
microGUNE	Micro-sciences	Diversification (nanosciences)	2004	4	1 110 322	82.0
energiGUNE	Alternative energy	Diversification (alternative energy)	2007	5	692 328	100.0
Total				287	33 665 032	

Source: Figures provided by the Department of Industry, Innovation, Trade and Tourism and SPRI.

Technology development and innovation

The Basque Country innovation system is well known for its technology centres (TCs) which are among the best in Spain and have international scope.. The Department of Industry has promoted a merger of the core TCs into two networks, Tecnalia and IK4 (see Table 1.10). A study of the impact of TCs in the region noted their multiplier effects in the Basque economy as well as the application of research to social needs (Deloitte, 2007). It found that during the period 1997-2006, the centres generated EUR 1 billion in GDP (75% of expenditures made in the region), maintained 3 471 direct or indirect jobs, and attracted considerable funds from central government (EUR 104 million) and the EU (EUR 141 million). Their research activity contributed to projects that aim at a better quality of life (22% of researchers) and sustainability (15% of researchers).

Table 1.10. **Tecnalia and IK4 networks of technology centres**

	Tecnalia (2009)	IK4 (2009, income 2008)
Business units	20	8 (7 centres)
Total staff	1 636	1 250
Staff with PhD	242	250 (approximately)
Income (EUR millions)	141.5	80 (approximately)
Clients	4 059	1 500 (private)
EU VIIth Framework Programme (EUR millions)	40.6	30.0
EU VIIth Framework Programme (total projects)	136	58
EU VIIth Framework Programme (leader of projects)	25	12
Patents/licences	Applications for 56 patents/ 7 plant varieties 7 patents granted 6 patents and 4 plant varieties licensed	Applications for 42
Shareholding in new technology-based companies	32 (117 employees)	

Source: Tecnalia and IK4.

- Tecnalia's network of 20 business units covers a wide range of fields: natural resources (agriculture, foodstuffs environment, marine research), health, ICT, sustainable development (construction and energy), innovation and society, and industry/transport (aerospace, automotive, iron and steel, among others). Combined, the centres had 1 636 staff and a total income of EUR 141.5 million in 2009 (10.4% growth from 2008).

- IK4 is an alliance of seven centres CEIT, CIDETEC, GAIKER, IDEKO, IKERLAN, TEKNIKER and VICOMTech (eight scientific and technological entities). The areas of expertise include: biotechnology, micro- and nano-technology, the environment and recycling, energy, industrial management and production, mechatronics, materials and processes, and ICT. The network had a staff of 1 250 and an annual income of over EUR 80 million in 2008.

Intermediary organisations and support infrastructure

There are four sites that compose the Basque Country Technology Park Network. The Bizkaia Technology Park was the first, established in 1985. The Alava and San Sebastian Parks joined Bizkaia in the 1990s to develop the network. The fourth, Garaia Innovation Pole, joined in 2005. All four seek to transfer knowledge and promote co-operation among universities, R&D centres, other innovation support actors, and businesses. Basque technology parks are among the first in Spain, and are well developed compared to many other parks that are more business than science parks. One area where parks could improve is their integration with universities.

Cluster associations are among the many institutions that promote networking among firms within the Basque Country (see Table 1.11). Of the 13 clusters, 12 are funded by the Department of Industry. They are all located in the provinces of Biscay and Gipuzkoa. Their membership includes well over 1 100 firms, and they represent a signature share of the region's manufacturing output.

Many different networks are supported by public actors throughout the region to build up intermediaries. Innobasque, the Basque Innovation Agency is a private non-profit association established in 2007 to co-ordinate and promote innovation throughout the Basque Country. Its mission is to serve as a platform for co-operation among system actors (see Box 1.4). Innovanet is one network promoted by the Basque government via SPRI. It gathers different institutional and private agents, local development agencies, the province councils, innovation consultants, centres of vocational training, clusters, etc. Innovanet invested some EUR 3 million in 2010 to reinforce this network of local innovation actors in order to fill the gap with SMEs. Local development agencies are increasingly engaged in networking as well (see Chapter 3).

Table 1.11. **Cluster associations of the Basque Country**

Sector	Created	Members	Cluster association name	HQ province
Home appliances	1992	11	ACEDE	Gipuzkoa
Machine tools	1992	94	AFM	Gipuzkoa
Automotive	1993	90	ACICAE	Biscay
Environment	1995	93	ACLIMA	Biscay
Port of Bilbao	1995	151	UNIPOR BILBAO	Biscay
Telecommunications	1996	238	GAIA	Gipuzkoa
Energy	1996	78	ENERGY CLUSTER	Biscay
Shipping	1997	192	BASQUE MARITIME FORUM	Biscay
Aerospace	1997	36	HEGAN	Biscay
Paper	1998	20	PAPER CLUSTER	Gipuzkoa
Socio-linguistics	2004	21	SOCIOLINGUISTICS CLUSTER	Gipuzkoa
Audiovisual	2004	54	EIKEN	Biscay
Transport and logistics	2005	88	TRANSPORT AND LOGISTICS CLUSTER	Gipuzkoa

Notes: Co-ordination of 12 of the clusters is led by the Department of Industry. The transport and logistics cluster is associated with the Department of Transport. The socio-linguistics cluster is independent.

Source: Based on Aranguren, M.J., X. de la Maza, M.D. Parrilli, J. Wilson (2009), "BC Cluster Associations: Performance and Challenges", Basque Institute of Competitiveness: Deusto Foundation, Donostia/San Sebastian.

Box 1.5. **Innobasque**

Innobasque was created in 2007 as the Basque County's innovation agency. The creation accompanied a series of other measures to strengthen the Basque innovation system governance in the context of the 2006-2010 Science, Technology and Innovation Plan. The agency differs from SPRI, the regional development agency that implements instruments to support firm competitiveness and innovation. The Board gathers 57 of the region's public and private leaders, including: the Secretary General of the Basque Presidency and three regional ministers, the three Presidents of the Basque Country provinces, the Secretary General of Innovation (Spanish government), the rectors of the region's three universities, the President of the Mondragon Corporation and many of the CEOs of the region's most important firms.

Box 1.5. **Innobasque** *(cont'd)*

The agency's stated mission is to lead the transformation process in the Basque Country towards a society fully innovative in all fields and to become the European benchmark for innovation. Innobasque in its initial stages is seeking to:

- comprehensively promote innovative and entrepreneurial values throughout Basque society;
- contribute to the generation of innovation dynamics in all organisations;
- become an essential tool for co-ordinating, promoting, monitoring and evaluating the Basque innovation and entrepreneurial system;
- promote the internationalisation of the Basque innovation and entrepreneurial system;
- promote the image of the Basque Country as the epicentre of innovation;
- become an essential forum for debate, analysis, research, study and forecast in innovation;
- propose action plans enabling Basque innovation and entrepreneurial agents to respond to strategic innovation challenges;
- develop any activities as they arise with the aim of boosting and consummating innovation in the Basque Country.

Different initiatives are managed or supported by Innobasque in light of its mission. It promotes the region's international visibility, policy intelligence and the use of new innovation indices, assisting in the development of key regional plans, and supporting the networking and integration of the system as a whole. Its interface with society at large through different reflection groups and workshops, such as World Café-type events (WOKA), seeks to engage citizens to support societal transformation. It is also exploring other gaps in the innovation system that it could address and take advantage of its membership of literally thousands of regional actors.

Source: www.innobasque.com.

Notes

1. The cultural region of the Basque Country refers to an area that spans beyond the region in Spain known as the *Comunidad Autónoma del País Vasco*. It also includes parts of the neighboring Spanish region of Navarre and areas in France that are part of the *Pyrénées Atlantiques* sub-region (*département*).

2. The province of Alava (Álava in Spanish, Araba in Basque) has as its capital Vitoria (Vitoria-Gasteiz including the Basque name). Vitoria is also the capital of the Autonomous Community of the Basque Country. The capital of the Biscay province (Vizcaya in Spanish, Bizkaia in Basque) is Bilbao (Bilbo in Basque). The Gipuzkoa province (Guipúzcoa in Spanish) has as its capital San Sebastián (Donostia, in Basque).

3. The Basque language is unrelated to neighbouring languages and pre-dates Indo-European languages.

4. The data used for Basque Country GDP per worker comes from the *OECD Regional Database* which is based on data from Eurostat, which in turn is based on data reported by INE, the Spanish Statistical Agency. It always differs from data reported by EUSTAT, the Basque Country statistical agency.

5. Funcas (*Fundacion de las Cajas de Ahorros*) reports price levels for 2008 in the Basque Country at 105.7 relative to a Spanish average price levels of 100 (see *Cuadernos de Información Económica*, January/February 2010). Other regions with higher price levels than the Basque Country include Catalonia (108.8) and neighboring La Rioja (107.7).

6. At least on the basis of cross-section statistical analyses that correlate composite innovation indices such as those from the EU Innovation Scoreboard to GDP per capita.

7. For discussion of this doing-using-interacting (DUI) form of innovation, see Lorenz, E. and B.Å. Lundvall (Eds.) (2006), *How Europe's Economies Learn: Coordinating Competing Models*, Oxford University Press, Oxford, United Kingdom.

8. TFP represents the contribution to output growth that cannot be attributed to the growth of labour and capital. It reflects the aggregate effects of technological and organisational changes due in particular to knowledge spillovers, more efficient labour/capital mixes in production processes and investment in intangibles such as those related to R&D.

9. This is also noted in Bilbao-Osorio (2009).

10. In a prior analysis from 2008, the same author found a negative total factor productivity (TFP) for the period 2000-2004. Therefore the absolute values are perhaps less important to observe then the general trend of declining TFP from 1995-2004 relative to the prior ten-year period, and the seemingly more positive trend in the following two-year time period.

11. Unfortunately, there does not seem to be available statistical information to check the contribution of TFP to growth after 2006.

12. Share of the population 18-64 years of age involved in entrepreneurial initiatives for up to 42 months.

13. Per OECD interview with GARAPEN, association of Basque Country local development associations.

14. Data through 2006 only due to comparability problems with later years.

15. The OECD has a standard classification of industries by technology level. The index used by the author in this analysis seeks to address some limitations to the OECD classification, notably a low level of disaggregation, a lack of quality distinction, and the fragmentation of production in different countries. It therefore uses the income level of the export at disaggregated levels and incorporates a classification of three levels of quality to develop a quality-adjusted export sophistication based on the weighted average of the income associated to each quality level, with the weights being the share of each quality variety in the country's total exports.

16. Some R&D staff in firms with separate R&D units are counted under the network category RVCTI.

17. This point is acknowledged in the PCTI 2010 (Basque Country Government, 2007) which states that *"*...The Basque Country in 2005 is part of the European countries in which the greater proportion of expenditure on R&D is attributed to companies (1.15% of GDP in 2005). However, it is necessary to point out that if the contribution of expenditure on R&D by technological centres and co-operative research centres) is subtracted the percentage represents 0.86 %, which is below the EU average which stood at 1.30% in 2004". This bias is also acknowledged in a document published by EUSTAT: "We understand

that the inclusion of this agent [CTs) in the enterprise sector, while methodologically correct, distorts the R&D statistics" (Olazarán and Otero, 2007).

18. Data reported in EUSTAT based on data from CSIC, Ministry of Science and Innovation.

19. Data from the *OECD REGPAT database*. The category of "green" patents was developed by the Environment and STI Directorates for use in OECD analyses.

20. Data from INE (2008).

21. This calculation is based on fractional counts, whereby each co-inventor is given a weight such that the sum of all inventors per patent sums to 1.

22. As defined by the number of regions with which a Basque Country co-inventor was active.

23. Of the regions studied, 16 changed categories from the prior Scoreboard (11 improved, 5 dropped to a lower category). Among those regions that improved, four were in Spain.

24. The typology contains OECD TL2 regions (for which data is available) except for regions belonging to the following countries: Australia, Iceland, Japan, Mexico, New Zealand, Switzerland and Turkey as well as recently admitted countries of Chile, Estonia, Israel and Slovenia. Non-EU OECD member countries include Canada, Korea and the United States that often rank higher than many EU regions on several variables. The OECD model has a much more restricted set of variables than those used in other typologies with only European regions, which benefit from a much wider set of harmonised variables.

25. The factorial and cluster analysis used 21 variables from a local database containing 200 variables on indicators of innovation, competitiveness and economic performance.

26. The excellence criteria system, similar to the Spanish accreditation system, is considered controversial among some academics.

27. Researchers from a BERC may sign their publications with both the BERC and the university affiliations, which may have an impact on publication counts with universities.

28. R&D per researcher based on data from INE, scientific publications based on SCISearch, Thomson Reuters, *Instituto de Estudios Documentales sobre Ciencia y Technologia* (IEDCYT) and CSIC as cited in Fundación CYD (2009).

29. Data from the Spain's OEPM, as cited in Fundación CYD (2009).

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Annex 1.A1

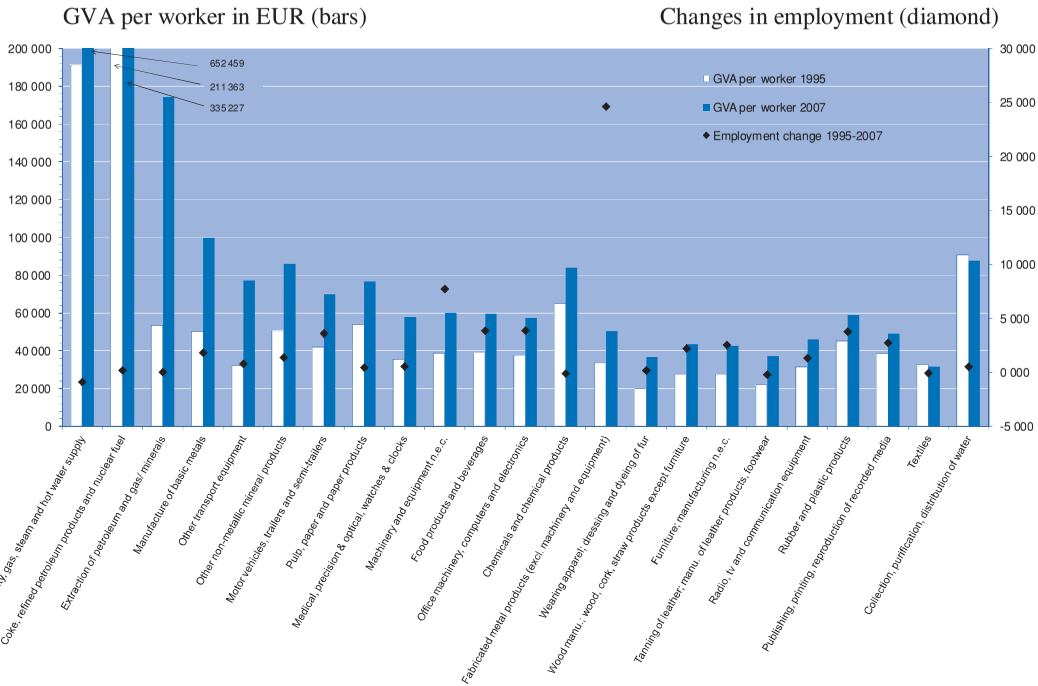
Table 1.A1.1. **Factors driving GDP per capita growth**

1995-2005

	GDP per capita average annual rate change	Productivity annual average rate change	Employment rate average annual percentage point change	Employment annual average rate change	Population average annual rate change
OECD average	2.1%	1.7%	0.2 p.p	1.1%	0.7%
Spain	2.7%	-0.5%	1.7 p.p	4.2%	1.0%
Basque Country	2.9%	-0.4%	2.1 p.p	3.4%	0.1%

Source: OECD calculations based on *OECD.Stat* and the *OECD Regional Database*. Note that the OECD data for Spain comes from Eurostat, which in turn is drawn from INE, the Spanish Statistical Agency. There are differences in statistics between those from INE and those generated from EUSTAT, the Basque Statistical Agency.

Figure 1.A1.1. **Productivity of manufacturing sectors**



Source: OECD calculations based on EUSTAT.

Table 1.A1.2. **Sectoral dynamics by technological level: the Basque Country and Spain**

1994, 2006

	Spain				Basque Country			
	1994 (%)	2006 (%)	Change in employment	Growth	1994 (%)	2006 (%)	Change in employment	Growth
Manufacturing sector	19.8%	15.9%	713 483	2.0%	28.6%	24.7%	46 056	1.6%
High-technology manufacturing	0.6%	0.4%	12 621	1.2%	0.7%	0.6%	1 182	1.7%
Medium-high technology manufacturing	4.8%	4.0%	212 523	2.4%	8.2%	8.6%	28 065	3.2%
Medium-low technology manufacturing	4.7%	4.6%	334 735	3.6%	13.2%	10.7%	14 713	1.2%
Low technology manufacturing	9.7%	6.8%	153 602	0.9%	6.4%	4.7%	2 097	0.4%
Service sector	60.3%	65.7%	5 630 931	4.5%	59.8%	65.5%	233 930	3.5%
Knowledge-intensive high technology services	1.7%	3.0%	378 865	8.3%	2.1%	3.0%	14 949	5.6%
Knowledge-intensive financial services	2.7%	2.2%	116 600	2.4%	2.9%	2.6%	5 765	2.0%
Knowledge-intensive market services	5.1%	8.4%	1 043 424	7.9%	5.8%	8.7%	45 308	6.0%
Other knowledge-intensive services	12.3%	14.3%	1 324 598	5.0%	15.1%	16.1%	54 700	3.3%
Less knowledge-intensive market services	27.5%	25.9%	1 770 105	3.3%	23.1%	25.0%	87 130	3.4%
Other less knowledge-intensive services	11.0%	11.8%	997 339	4.4%	10.7%	10.1%	26 078	2.4%
Primary sector + mining and quarrying	10.0%	5.2%	(178 390)	-1.2%	3.3%	1.3%	(10 003)	-4.4%
Electricity, gas, water supply and construction	9.9%	13.2%	1 388 900	6.1%	8.3%	8.5%	26 594	3.0%

Source: OECD calculations based on Eurostat data and classification by technology level.

Table 1.A1.3. **Sources of output growth 1986-2006**

In percent

	1986-1995			1995-2000			2000-2004			2004-2006		
	EU-10	Spain	Basque Country	EU-10	Spain	Basque Country	EU-10	Spain	Basque Country	EU-10	Spain	Basque Country
GVA growth	2.44	2.96	3.52	2.62	3.86	4.54	1.52	2.99	2.94	2.33	3.55	3.89
Labour contribution	0.44	0.73	0.45	0.89	3.06	2.60	0.55	1.85	1.57	0.46	2.64	1.25
Capital contribution	1.16	1.16	0.86	1.37	1.36	1.14	0.95	1.26	1.08	0.91	1.26	0.98
TFP contribution	0.84	1.06	2.20	0.37	-0.56	0.80	0.01	-0.12	0.29	0.96	-0.35	1.66
Share of total GVA growth												
Labour contribution	18	25	13	34	79	57	36	62	53	20	74	32
Capital contribution	48	39	24	52	35	25	63	42	37	39	35	25
TFP contribution	34	36	63	14	-15	18	1	-4	10	41	-10	43

Source: Erauskin (2008) with update, based on the following data sources EU-10: KLEMS; Spain: INE; Basque Country: EUSTAT.

Table 1.A1.4. **R&D personnel and researchers**

	R&D personnel per 1 000 active population			Researchers per 1 000 active population		
	2002	2006	2008	2002	2006	2008
Spain	7.7	9.5	10.5	4.8	5.8	6.4
Basque Country	12.4	12.6	15.0	7.0	7.8	9.4
EU-27	9.7	10.3	10.4	5.5	6.1	6.4*
OECD	n.a.	n.a.	n.a.	6.9	7.6	7.7*

*Full time equivalent.

Source: Own calculations from OECD and EUSTAT data.

Table 1.A1.5. **Key innovation statistics by branch**

	Number of businesses	Average employment	R&D	Research personnel (FTE)	R&D spending per researcher
Total	1 474	87	1 024 603 .0	11 791.5	86 893
	%	%	%	%	EUR
Agro-livestock and fishing, mining and energy	15	171	1.4	0.8	146 549
Chemistry and oil refining	55	66	2.4	3.1	67 735
Rubber and plastic	48	110	1.4	1.9	64 427
Non metal industry	20	103	0.6	0.6	83 285
Metallurgy	49	246	2.6	2.3	98 438
Metal articles	163	98	5.6	6.4	75 421
Tool machine	41	76	2.0	2.6	67 080
Domestic devices	6	696	2.9	3.4	75 376
Other machinery	119	91	5.8	6.4	77 981
Electrical material	44	147	3.3	2.5	116 877
Electronic material	22	93	2.1	2.7	68 504
Precision material	24	38	1.3	1.7	67 782
Transport material	48	296	8.9	5.5	139 579
Other manufacturing	112	67	1.6	2.1	63 956
Construction	41	58	1.0	0.7	135 273
Computer activities	143	45	5.1	7.8	56 490
R+D activities	140	33	36.8	34.8	91 726
Other business services	220	33	7.3	8.3	76 330
Other services	164	106	7.8	6.2	109 530

Source: Based on EUSTAT.

Chapter 2

Basque Country STI policy

Over the last 30 years, the Basque Country has implemented an STI policy driven by a need to boost industrial competitiveness adapted to the region's industrial footprint. This chapter first reviews the evolution of STI policy in order to understand the region's position today in terms of policy mix and system actors. It then analyses the region's current STI policies and programmes to assess the relevance of different measures for current and future innovation challenges. Finally, it reviews aspects of the policy mix that merit further adjustment in future STI plans, including emerging areas in innovation policy.

Introduction

The Basque government has focused its STI policy on a strong industrial approach to innovation policy. It has been influenced – or even determined – by concerns related to the restructuring, competitiveness and diversification of the Basque economy. The Department of Industry assumed leadership for innovation policy design and implementation. This approach has given a premium to technology-based policies. The development of scientific capacities, almost absent in the region 30 years ago due in part to past Spanish policies, has been slower to develop. Such orientations have led to undeniable successes in terms of productivity gains and diversification towards more technology-intensive activities. Drivers of this success included the development of a strong system of technology centres, a substantial increase of public support for business-led R&D and innovation activities, and a strong co-operative or collaborative culture that permeates Basque industry.

The most recent Science, Technology and Innovation Plan (PCTI 2010), marked a clear shift in the region's efforts to develop more robust scientific capacities. This includes the creation of new institutions (research centres known as BERCs and CICs) and the enhancement of basic oriented research in the technology centres. The development of more linkages between science and industry was also an important objective.

Going forward, the question remains as to whether this model is adapted for the new patterns of innovation observed globally. Such trends include greater dependence on scientific knowledge acquisition and diffusion, as well as the need to harness investment in R&D and innovative activities to better respond to social needs (such as health, energy, environment and transport). Thus, one of the main challenges that the Basque innovation policy has faced since the mid-1990s, has been strengthening the region's scientific base to foster knowledge absorption by firms. It requires a comprehensive innovation system to support both industrial and services sectors, and to better articulate the relationships between scientific research and industry for the development of market-led innovations and innovative responses to social needs. As in any region, the path dependency associated with prior policies and strategies may make it more difficult for the Basque Country to evolve in pace with changing conditions of competitiveness.

To support a comprehensive system, there is a need for a consistent set of complementary policies. To date, policy initiatives have often been taken in a pragmatic way by various governmental departments to address specific weaknesses but not in an overall systemic way. The consolidation of a comprehensive STI system that addresses the main current and prospective

innovation challenges faced by the Basque Country[1] is predicated upon the concrete responses that the forthcoming PCTI will give to the following issues:

- **Governance:** involvement of government, business and scientific community stakeholders in the definition of priority policy areas; balanced and efficient inter-departmental co-ordination in policy design, implementation and related budgetary resources appropriation.
- **Multi-level government co-ordination and portfolio of funding sources:** improved complementarity and efficient co-ordination mechanisms across levels of government (EU, State, Basque Country government, Basque provinces).
- **Science system:** prospective role of the academic sector and excellence research centres in the consolidation and strengthening of the Basque Country scientific base; financing and management issues; S&T infrastructures issues.
- **Technology transfer system:** evolving balance between supply and demand strategies; broadening of outreach to less innovative SMEs; financing and management issues; possible new roles in innovative firm development.
- **Business R&D and research personnel:** open innovation and the model of enterprise R&D units; inter-institutional mobility issues and imbalances between public research (academic and other research centres) and/or technology centres and the business sector.
- **Leveraging public resources:** development of public/private partnerships and research/industry consortia to respond to the social demand for innovative goods and services, including through public-procurement related innovation.
- **Support programmes and policy mix:** the policy path dependency dilemma: incremental changes of, and additions to, the current policy portfolio or more radical policy mix changes involving policy streamlining with a premium to synergies and complementarities.
- **Accountability:** monitoring and assessment of policy management, delivery, implementation and outcomes.

The first stages of the Basque Country STI policy

An assessment of today's Basque STI policy, including its governance and policy mix, must take into account the resilience of a technology and

competitiveness focus over the last three decades. The evolution of the Basque innovation policy began with the granting of the autonomous community status in 1979. The region underwent major crisis in the 1980s (see Box 1.1). Industry, heavily concentrated in a few sectors such as steel, shipbuilding and machine tools and their respective supplier networks of SMEs, suffered. The resulting strategic orientations taken by the Basque government emphasised technological upgrading as the means to restore the international competitiveness of the manufacturing sector. Since then, the technological component of the Basque innovation policy has remained very important, although progressively integrated in a more comprehensive approach. The corollary of this early emphasis on technology upgrading is reflected in the primary role of the Department of Industry in shaping STI policy, including support to building scientific capacity.

At the beginning of the 1980s, the Basque government chose to use its financial autonomy to develop its own STI policy. This took place while a constitutional conflict unfolded between the regions and the Spanish government, which kept authority over R&D. At the time, the Basque STI system was almost non-existent. The region had no public university of its own, no research infrastructure, an unemployment rate above 25%, R&D intensity of 0.069% (R&D expenditures over GDP) as compared to 0.30% investment coming from the State. Apart from rare exceptions in a few firms in the capital goods industry, innovation-related investment by the private sector was minimal. None of the 92 Spanish CSIC public research centres was located in the Basque Country (today there are 2 joint centres with the region's public university). Scientific research concentrated in the academic sector was very weak both in terms of output and quality. Universities had minimal interaction with industry.

Given the lack of scientific infrastructure and the declining competitiveness of Basque industry, STI policy began with a strong industrial focus.[2] As highlighted by Sanz-Menéndez and Cruz-Castro (2005):

> In contrast [with Madrid and Catalonia], the ideas of the Basque S&T policy were linked to an underlying model regarding the role of research in the innovation process. The option in favour of private applied research and technology transfer centres located close to the region's SMEs was also based on the idea that the university, as it was in the 1980s in the Basque Country, was not a feasible institution as the main engine of the S&T system.

The rationale for such an approach can also be traced to economic and socio-political factors. They include: the predominance of the manufacturing sector in the Basque economy, its sectoral specialisation and

the socio-political weight of the industrial business community, as compared to the academic community, in influencing innovation policy orientations in the context of the competitiveness crisis of the 1980s (Moso and Olazarán, 2002).

The economic and STI strategies developed by the region to address this challenging situation included:

- keeping industry alive through reconversion and restructuring processes;
- creating conditions to modernise the Basque industrial fabric, strengthening the existing but weak technology infrastructure (technology centres);
- promoting R&D activities in firms;
- creating technology parks;
- developing training programmes for researchers; and
- initiating technology and industrial policies.

Industrial restructuring and promotion of technological infrastructure

STI policy began with the strengthening of technology supply capacity. The approach was to consolidate an existing set of relatively poorly endowed technology centres or testing labs, generally with a private legal status and organised around sectoral lines of business. This process was promoted by the Department of Industry through their eventual integration into the Basque Association of Research Centres[3] and, more importantly, through substantial funding provided by the Department using support programmes managed by its implementation agency SPRI (*Sociedad para la Promoción y Reconversión Industrial)*. The agency, initially created in 1981 to promote industrial reconversion, had a portfolio of responsibilities that rapidly included the promotion of innovation as a specific activity. SPRI was entrusted with responsibilities to evaluate R&D and innovation projects proposals made by technology centres and to make recommendations on their funding by the Department of Industry.

The initial efforts bore many fruits in increasing R&D intensity, driven in part by technology centres (TCs). From 1982 through the mid-1990s, direct R&D support to TCs exceeded that to firms. While in principle financial support to the centres was granted on a competitive basis, around 50% of grants labelled as competitive could in fact be assimilated to institutional funding. These grants mainly funded so-called "generic research projects" (up to 50% of a TC's budget) aiming at strengthening their research capacities as well as their technology diffusion and transfer activities. The first programmes to support Basque firm R&D and innovation projects, mainly in terms of seed financing, were launched and gained rapid momentum.[4] It is to be noted that the quasi-institutional funding from the Department of Industry to the TCs rose from EUR 1.18 million in 1982 to EUR 6.9 million in 1990 (almost six-fold), and that over the same period financial support of business R&D increased by more than twelve-fold from EUR 0.95 million to EUR 12.5 million. Nevertheless, the budgetary allocation to the scientific policy remained stagnant as a proportion of the Basque government budget. Public R&D support by the Basque government and its multiplier effect on TCs and firm R&D expenditures resulted in a higher R&D intensity of 0.34% by 1984. The ratio of R&D expenditures over GDP in the Basque Country had almost quadrupled in four years, surpassing Spain's ratio.

In the early 1990s, the Basque Country experienced another industrial recession. The Basque government therefore pursued a deeper restructuring process, providing a general industrial action framework, including:

- short-term programmes stressing: restructuring, industrial reconversion and labour and employment reorientation (3Rs programme in Spanish); and
- Medium- to long-term programmes covering several areas (competitiveness programme; policies for clusterisation of the economy, including sectors for tomorrow; 1st Industrial Technology Plan; and Science policy: training of researchers).

Policy design, funding and implementation was led by the Department of Industry and its implementation agency SPRI to further support the industrial restructuring process. The first plan, the Technology Strategy Plan 1990-1992, and to a large extent the following one, the Industrial Technology Plan 1993-1996, were prepared under the aegis of SPRI by its Strategic Technology and Innovation Unit (UETI) created in 1989.[5] With the creation UETI and the role this unit assumed in policy design and implementation, as well as the definition strategic priority areas,[6] the Department of Industry retained the major role in the governance of the

Basque innovation policy even if, formally the Basque Technology Council (CVT) was supposed to assume that responsibility.[7,]

This governance arrangement for STI policy had its advantages but also some shortcomings. On the positive side, it enabled a consistent strategy with financial means commensurate to the challenges. These challenges included falling industrial competitiveness, lagging technological infrastructure and low business R&D and innovation investment. Indeed, this policy option produced positive results on these three fronts within a decade after its inception. The shortcomings related to the risks that this exclusively industrial focus leads to system imbalances in terms of the relationship between supply and demand of technology, as well as between the research and innovation sides of a comprehensive STI policy. The Department of Education, Universities and Research was not sufficiently active in these early development stages.

Promotion of technological demand and collaboration

Policies in the 1990s supported greater collaboration among innovation system actors. In the context of the Competitiveness and Industrial Technology Plan 1993-1996, prepared by the Department of Industry, a new component was added to the technology policy of the Basque government. In collaboration with industrial groups, a cluster policy was developed to foster innovation and technological demand through dedicated support to sets of enterprises committed to engage as a cluster through specific agreements with the Department.[8] Public support to so called "generic projects", up to then restricted to TCs, was broadened to include clusters as well enterprise R&D units. A higher share of total support was also devoted to those projects that entailed co-operation between clusters and TCs (share of collaborative projects in the total amount of grants increased from 44% in 1993 to over 52% in 1996).

TCs remained the cornerstone of the Basque innovation policy, albeit with an improved balance between the build-up of knowledge capacity and technology transfer. The share of TCs in Basque government public R&D support declined from 66.5% (1993) to 48.3% (1996), and the share of firm financing in TC R&D expenditures grew from 35.5% to over 42.2% during that period. However, this also was accompanied by a shift in firm expenditure away from R&D support towards technological expenditures. The share of research (basic and applied) in total enterprise R&D and innovation expenditures was 27.7% in 1990, dropping to 16.4% in 1997 (Buesa, 2001).

The problem of a low level of research capacity in fundamental science was not addressed during this period. This is due in part to the fact that

science policy was the authority of Spanish policy. Other regions endowed with more science infrastructure nevertheless placed a greater accent on science in their plans. The resources of the scientific policy as measured by budgetary appropriations remained approximately five times lower than those devoted to technology policy (see Table 2.A1.1). This problem was manifest by the lack of investment in S&T infrastructure and the support to collaborative programmes or projects. Policy co-ordination among stakeholders was also supposed to be facilitated by the Basque Technology Board composed of management level representatives from major institutions carrying out S&T activities (Moso *et al.*, 2002). However, the Board never seems to have reached operational level.

First attempts to better integrate science and technology policies

With an expansive economic expansive cycle in the second half of the 1990s, policy accented investments as well as a more integrated approach to STI policy design and implementation. The Science and Technology Plan (PCT) 1997-2000 and Science, Technology and Innovation Plan (PCTI) 2001-2004 included institutional and policy initiatives to reflect this integrative approach. The orientations gave more emphasis to the development of S&T knowledge capacity, as well as to the articulation between the demand and supply sides of knowledge and technology. RIS and RIS+ plans, supported by EU programmes, also introduced the concept of a regional innovation system approach.

Policies were developed to support these new orientations,[9] as was the establishment of the Basque Technology Network (RVT) in 1997.[10] RVT was an initiative to strengthen a wider range of innovation system actors and to foster the supply of scientific and technological knowledge to Basque enterprises through better co-ordination among major public and private stakeholders active in basic and applied research as well as technological development. Moreover, the eligibility to dedicated support programmes aimed at strengthening supply capacities was restricted to members of the network, with collaboration among members encouraged.[11] The network constituted a timely and useful mechanism to formalise and foster co-ordination among stakeholders, mainly in technology centres and the academic communities and selected firm R&D units (separate private non-profit legal entities from the parent firm to be eligible for receipt of public funds for R&D). A private association constituted by its members (SARETEK) facilitated the interface between these stakeholders and policy makers, with a core role for technology centres.[12] Private firms outside the network were also eligible for receiving other public funds for R&D activities, but the network was created with the goal of boosting the research activities and associated investments among members.

Priority actions proposed in 1996 by the cluster associations in the cluster technology plans contributed to the Science and Technology Plan 1997-2000 in two important ways. First, they collected the technological offers and demand of these sectors, and made them available to other important actors in the innovation system, such as the eight technology centres at the time.[13] Second, some co-operative R&D and other integrated projects were encouraged with the participation of associated firms and other actors in the innovation system (Ahedo, 2004).[14]

On balance, the PCT 1997-2000 objectives aimed at strengthening the STI system by integrating system actors do not appear to have fulfilled plan goals quantitatively or qualitatively. Because the governance of the system did not fundamentally change, new initiatives were designed to correct the shortcomings of the existing system without challenging its overall architecture. Indeed, the implementation of the plan produced mixed effects on the STI system integration. First, over the duration of the plan, resources devoted to its implementation and financing of support remained quite stable, between ESP 10.1 and 10.4 billion per annum. Second, there was an actual decline in the funding of S&T infrastructure. Third, while financial support for R&D and innovation projects increased by 12% over the period, the number of those that involved co-operation – in particular with universities – as well as their share in total funding remained rather low, highlighting a chronic weakness of the Basque innovation system.

In the context of an expansive economic cycle in the first half of the 2000s, policy emphasis began to evolve. Strategies included:

- an Economic Promotion Plan;
- a PCTI 2001-2004, that sought to shift from supply towards demand-driven policies; and
- the beginnings of industrial diversification strategies, such as for biotechnology.

The Science, Technology and Innovation Plan 2001-2004 (PCTI) is the first effective institutional exercise aimed at developing such a comprehensive approach. Institutional initiatives were taken to broaden the scope of the policy mix, focusing on the development of stronger linkages between industry and science through institutional arrangements. They did so via efforts to strike a better balance and complementarity regarding public support to technological and diffusion activities on the one hand, and basic and applied scientific ones on the other. It also included measures to foster business R&D activities. The PCTI benefitted from substantive and increasing resources for its implementation as its budget grew from EUR 132.4 million in 2001 to EUR 173.86 million in 2004 (Table 2.1).[15]

Table 2.1. **Budget of the PCTI 2001-2004 by type of action**

(EUR million)

Actions	2001	2002	2003	2004	Total	%	Rate of growth
HRST development and international co-operation	15.74	17.10	18.50	18.82	71.16	11.6%	19.57%
Strengthening S&T supply capacity	34.36	39.57	44.40	48.55	167.18	27.2%	41.30%
Support to R&D and innovation projects	55.85	60.68	65.70	70.39	252.62	42.2%	26.03%
Promotion of NTBFs	3.91	4.75	5.55	6.21	20.42	3.3%	58.82%
SME innovation	15.08	16.85	18.61	20.17	70.72	11.5%	33.75%
S&T diffusion actions	3.19	3.37	3.58	3.79	13.93	2.3%	18.81%
Management and evaluation	4.00	4.32	4.65	4.93	17.88	2.9%	23.25%
TOTAL	132.42	146.64	160.99	173.86	613.91	100%	31.29%

Source: PCTI 2001-2004, Basque Country government.

Beyond the magnitude and regular annual growth of this budgetary endowment, the Plan's achievements were mainly due to a set of key initiatives. They served to*: i)* rationalise the system of support to R&D and innovation; *ii)* define clearer priorities; *iii)* allow the initial development of programmes and institutions designed to strengthen both the basic and applied research capacities of the Basque innovation system; *iv)* facilitate collaborative arrangements between different institutions; and *v)* foster the creation and development of new technology-based enterprises. New actors were introduced in the Basque innovation system to achieve these goals.

- **Co-operative research centres (CICs)**. CICs were created by the Department of Industry with the mission to develop targeted (basic and applied) research in the region's priority sectors and technologies.[16] Such centres can be organised as associations between various stakeholders,[17] or be virtual networks. They are autonomous institutions notably as regards personnel management and collaboration arrangements. Their main sources of funding are institutional (or quasi-institutional) grants, competitive grants,[18] and proceeds from collaboration arrangements with enterprises. They were created as institutions embedded in a general business strategy to facilitate the rapid generation of knowledge. This knowledge was oriented to certain research domains aligned with the strategic diversification strategies (e.g., bio-science, nano-science, alternative energy sources). Such sectors are areas where the region had previously poor performance. These sectors were also areas where the region wanted to attract high-skilled foreign researchers.

- **Basic excellence research centres (BERCs).** Created by the Department of Education, the mission of BERCs is to develop fundamental non-targeted research activities, most often in association with university research centres.[19] BERCs are organised as associations that also enjoy an autonomous status that give them more flexibility in resource management than university research centres. Their main sources of funding are institutional (or quasi-institutional) grants and competitive grants.

These new institutions were created to support the region's strategic efforts to build up research excellence and develop structures with accountability mechanisms to meet industrial and social needs.. But the governance bodies of these centres, as well as their co-ordination, merit greater attention to support more effective co-ordination and collaboration between CICs, BERCs and TCs (see Chapter 3 for more on governance).

Additional changes included:

- **RDI support programmes to Basque STI Network.** The consolidation of measures to support the RDI activities of institutions belonging to the RVCTI into two main categories of support programmes: *i)* those aiming at the development of S&T capacity and infrastructure (e.g. SAIOTEK); and *ii)* those aiming at fostering the development of new R&D and innovation projects in strategic areas (e.g. ETORTEK). The instruments were designed to generate knowledge and added value for businesses and society while serving the region's sectoral diversification goals to increase value added in its industries.

- **Firm support.** The development of support programmes to foster enterprise investment in R&D and innovation activities, as well as the development of S&T co-operation projects involving firms and research and/or TCs belonging to the RVCTI (e.g. INTEK), to SMEs and the creation of new technology-based firms (e.g. NETs).

- **Human resources.** A greater attention was given in the plan to the development of human resources in S&T,[20] and the provision of incentives facilitating the mobility of qualified S&T personnel between S&T institutions and enterprises.

Most of the budget, approximately 70%, was dedicated to programmes that focused on supply by TCs and demand by firms. Over the period there was a trend towards a rebalancing between these two types of action. The former, dedicated to the strengthening of S&T capacities, grew the fastest, with TCs being the main beneficiaries. The latter, mainly support to R&D and innovation projects in enterprises belonging to the RVCTI, is the best endowed with more than 40% of plan resources. Public financing of

technology centres may have therefore encouraged a strengthening of research and technological development capacity that facilitates collaboration with domestic or foreign enterprises endowed with sufficient absorptive S&T capacities. However, the funding programmes did not provide incentives for TCs to maintain traditional technology transfer activities towards the large set of SMEs with low innovative experience. In other terms, the portfolio of support programmes maintained a bias towards supply measures at the expense of those that would have strengthened the demand from SMEs or facilitated its emergence.

Inter-departmental co-ordination somewhat improved in the framework of the Plan during the period. However the major impulse for the promotion of fundamental and applied research, as well as S&T infrastructure, came from programmes managed by SPRI despite their label as "technology policy" in the budgetary nomenclature.[21,22] The Department of Industry programmes therefore experienced the largest budget increases under the plan. The Department of Industry technology policy budget grew by 68% between 2000 and 2004, while that of the scientific policy of the Department of Education grew by only 8.1%.[23,24] Overall, this policy mix has certainly had positive effects on the articulation between science and industry. But it may not have facilitated the strengthening and consolidation of the academic research system and the development of multi-disciplinary research programmes that can be more easily implemented in a higher education institution environment. Over the three-year period covered by the Plan, the enterprise sector R&D expenditures grew by close to 25% and that of TCs by more than 50%, raising their share in the total from 18.6% to 22.7% (EUSTAT, 2005). The Basque and provincial governments remained the major source of funding of TC R&D activities.[25]

The PCTI 2010: towards a comprehensive approach to STI policy

The mid-2000s was a continued period of economic expansion for the Basque Country. The region developed several strategies, including the:

- Basque Strategy 2015;
- Business Competitiveness and Social Innovation Plan;
- PCTI 2010; and
- Business diversification strategies (Biobasque 2010, NanoBasque 2015).

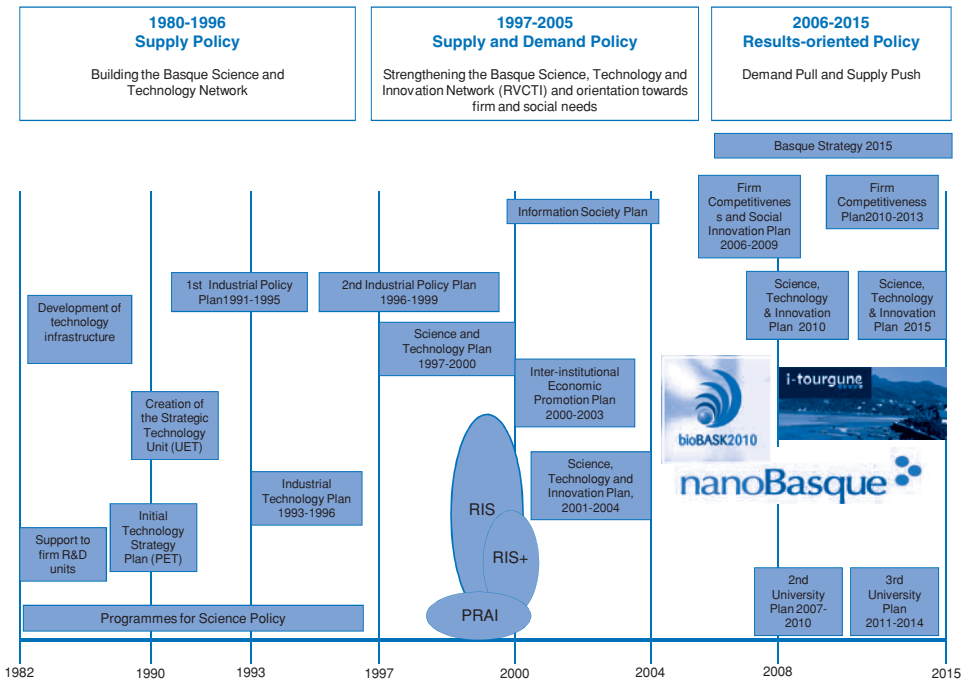
Launched in 2007 under the aegis of the Department of Industry, the 2010 Science, Technology and Innovation Plan (PCTI 2010) is one of the main building blocks of the so-called "Basque Second Economic

Transformation".[26] It represents an ambitious exercise designed to put science and technology at the core of the Basque Country competitiveness strategy in a globalised world. The PCTI builds upon the initiatives and achievements of the previous STI Plan to set the framework of an integrated and comprehensive approach to the Basque innovation system. Putting the emphasis on the essential role played by the dynamic interactions among the agents within that system, it defines lines of actions and policy instruments that should foster such interactions and ensure better leverage of public support on private R&D investment and innovation activities. This Plan represents the shift in the region's STI policy development trends (see Figure 2.1).

Transition and transformation

The plan incorporates many principles of the innovation system conceptual framework promoted by the OECD, EU and academic researchers.[27] Its general lines of action focus in an integrated way on the factors that impinge on the performance of the Basque S&T and innovation system as a whole, including in its social dimension, and more generally on the competitiveness of the Basque economy. Its policy initiatives and funding instruments strike a fair balance across the spectrum of programmes in support of the creation, diffusion and valorisation of knowledge. They emphasise collaboration among diverse. Programmes included non-targeted projects as well as those targeted to priority S&T.[28] The difficulty lies in the organisation of a transition that can build upon the present architecture of the system, both in terms of governance approaches and innovation system actors.

Figure 2.1. **Basque Country STI policy timeline**



Source: Basque Country government.

Searching for socio-economic transformation or for new frontiers is a challenge that regions face once (or multiple times) in their development trajectory. Economic development is a cumulative dynamic process, shaped by path-dependency, localised technical change and recurrent shifts in technological paradigms which change the way in which production and knowledge diffusion occur in economic systems. These shifts affect not only the sectors in which they originate, but permeate the whole economic apparatus. At the same time, development also allows for catching up and leap-frogging, when certain conditions are in place to profit from windows of opportunity. There are no blueprints for how to identify the best strategy for supporting the transformation, nor for identifying the most promising "direction" of the change.

International experiences show that a success factor in the transformation strategy is a certain degree of continuity in policy support, mixed with capacity to design schemes which favour experimentation. It is the coupling of efforts for creating new knowledge with support to knowledge diffusion and absorption which allows for a given experience to take off. Supply side, demand side and regulation mechanisms are needed. Another common success factor is a strong leadership of the regional community and the capacity to mobilise different actors in the system to support the innovative efforts. The transformation is sometimes the result of targeted and co-ordinated economic policy efforts, in other occasions it follows from the capacity of public policies to identify demands and aspirations from the regional system (universities, firms and civil society) and to deploy policy mechanisms to support them. Transformation strategies usually respond to visions, which derive from strong leadership in the community, or from a more participatory and challenge-led processes. While in some cases the transformation means to upgrade and diversify the industrial structure (such as in the case of Shinshu in Japan and Detroit in the United States), in other cases, the transformation might involve a more radical shift towards a new economic model (such as for Piedmont or the Toronto Hydrogen Village) (see Box 2.1).

Box 2.1. **Examples of regional transformation strategies**

In **Japan**, the Shinshu province transformed a traditional industrial area into a high-tech industrial pole (**Shinshu Smart Device Cluster).** The strategy supported industrial development that prioritised quantity and quality of employment generation in the region. The development plan followed a two-step process. The first phase centred on the Knowledge Cluster Initiative Program started in 2002 aimed at fostering R&D in key technological fields such as high precision processing technology, precision holding technology and device technology benefiting from the accumulated expertise in engineering of the Shinshu University. The second stage started in 2007, and builds on the achievements of the first phase, prioritising the creation of the Shinshu Smart Device Cluster which fosters high-tech firm start-ups and the commercialisation and diffusion of research results in innovative firms. In this phase, the emphasis is on creating the conditions for applying research results into business opportunities. The two-step approach supported research and experimentation and targeted more "production-oriented" support to specific technologies. The programme is the result of a combination of strong political will from the provincial level with well articulated support by the national government and a commitment of the business and research sectors. In 2007 the cluster was composed of 319 firms, 106 research members and 121 supporting organisations.

Box 2.1. **Examples of regional transformation strategies** *(cont'd)*

Nuevo Leon in **Mexico** is another example of a state facing the challenge of supporting a transformation of its production system from a traditional manufacturing area towards a knowledge-based economy. The region has a strong accumulated capacity in technological and research institutions, a high-skilled labour force and a comparative advantage in logistics for business. The region is currently prioritising four sectors: ICT, biomedical devices, food technologies and aerospace, while at the same time offering support for maintaining the competitiveness of existing clusters, such as automotive. The state is offering a series of incentives for knowledge-based firms, including some innovative conditionalities and selection criteria, for example offering higher support for firms which pay higher salaries to their workers (*Cordinación de Ciencia y Tecnología de Gobierno de Nuevo León*, 2010). Nuevo Léon is investing in knowledge generation to open up possibilities of catching up and connectivity in the future, while at the same time investing in the preservation of current advantages in manufacturing.

The region around **Detroit, Michigan (United States)** is confronted with the need to reinvent its socio-economic specialisation and improve employment opportunities. The regions has experienced economic shocks with the recent crisis and the environmental sustainability challenges to the existing automotive industry. The challenge for Michigan is to preserve industrial leadership in the next generation of cars. The state has not been a first mover in electric cars, but has aimed at creating local capacities in battery assembly, assuming that vehicle assembly will follow given the region's accumulated local capacities. The state is also home to major technical schools and universities with a long tradition of applied research for industrial applications. But China, India, as well as the states of California and Indiana, are attracting some big players in the electric car business, calling into question the centrality of Michigan in the world automotive industry. The challenge today is to capitalise on local experiences within firms and institutions to create the necessary synergies for discovering the new frontier in the automotive industry. The accumulated capital in Michigan is too high to abandon the old industry; so the region is seeking opportunities to change the frontier it is used to operating in.

Box 2.1. **Examples of regional transformation strategies** *(cont'd)*

Piedmont, a traditionally wealthy and fairly industrialised region in **Italy**, recently launched a transformation strategy. They have supported on the one hand investment in the ICT sector, and on the other hand initiatives which respond to a rising demand for more ethical and environmentally friendly techniques in traditional agro-food industries. The economic structure of Piedmont is characterised by large-scale firms strongly connected with a network of small and medium-sized firms operating in traditional industrial sectors, such as automotive, aeronautics, agro-food and textiles. The region is facing the challenges of reversing its decline in global competitiveness due to the exhaustion of the profitability of local industrial activities. Strengths include an accumulated "*savoir faire*" embedded in firms, a strong research base, and a mix of universities and polytechnic schools which favour the linkage between research and production. Since 2005, the region has prioritised the strengthening its SME and research base and has invested in promoting innovation networks. To support the search for a new frontier, the region prioritised two major activities: the creation of a number of committees and spaces for policy dialogue to build a shared view among different regional stakeholders; and an outreach strategy supporting a functional approach to innovation, fostering the implementation of new policy instruments which do not target purely local actors, but which target the aid to any provider (local or foreign) who offers a solution to a selected regional development challenge.

Regional governments can play a decisive role in creating capacities to achieve new technological frontiers by testing solutions for emerging challenges. In **Canada, the Toronto Hydrogen Village** involves more than 35 companies, and it includes developers and end-users. The programme is administered by Hydrogen and Fuel Cells Canada, and receives financial support from the Ontario Ministry for Research and Innovation and the CTFCA Program of the Canadian National Research Council. The project aims at creating the conditions for early development in supply and use of green energy in the Greater Toronto Area. The programme has a comprehensive approach and includes direct support to technology development; the creation of a sustainable and effective infrastructure for energy delivery; promoting social corporate responsibility; codes, standards and regulations for sustainable development; and general public awareness through educational institutions and media. It benefits from an integrated approach which includes support to; technological research and development; demand generation for new product;, services and applications; and a shift in mind-set towards more sustainable consumption and production choices.

Source: OECD (2011), *Regions and Innovation Policy*, OECD Publishing, Paris.

PCTI main policy orientations and related support programmes

The policy orientations defined in the PCTI reflect issues that condition the success of the so-called "Second Great Transformation", in particular as they relate to the performance of the innovation system. Notable programmes can be classified into three categories:

- improving firm competitiveness;
- sectoral and technological diversification, including greater interactions; and
- eco and social innovation.

Improving firm competitiveness. The region seeks to support firm competitiveness through the promotion of investment in R&D and innovation activities (technological and non-technological), linkages with TCs and cluster development.[29] This line of action is not new and its related programmes were established prior to the PCTI in the first half of the decade. They grant support either to firms in the business sector (GAITEK, INNOTEK, IKERTU and ALDATU)[30] or to members of the RVCTI network (SAIOTEK) or can be restricted to TCs as a source of their institutional funding (EMAITEK). These programmes finance projects on a competitive basis. They are funded by the Department of Industry and managed by SPRI. Sectoral or technological priorities may apply in the selection of projects.[31]

Diversification towards new sectors and technological areas fostering interactions among agents. This line of action actually addresses the core question of the transition to a more integrated and balanced innovation system. As such, it is also the one that led to the development of new policy initiatives aimed at strengthening the S&T infrastructure (e.g. CICs and BERCs),[32] the links between science and business, and the collaboration among different agents of the system (e.g. ETORGAI, NETs). Consistent with practices followed in many OECD member countries, this line of action combines non-targeted support programmes with others that are dedicated to sectoral or S&T strategic priority areas (see Box 2.2).[33] Complementarity and co-operation between supported projects is encouraged.

The Eco-Innovation and Social Innovation lines of action are more loosely defined in the PCTI in terms of dedicated programmes or resources devoted to research and innovation activities. Work groups, including through the Basque Competitive Forum 2015, have been focusing on eco-innovation in later years of the plan. The region has subsequently made

progress in the development of eco-communities and the Eco-Euskadi 2020 Strategy. In the case of social innovation, the PCTI falls short of rightfully stressing the importance of the issue both in its own right for improving the well-being of the population, and as an enabling factor of increased competitiveness and innovation capability in the business sector. Innovation for social challenges is expected to be much more prominent in the next STI Plan which is under development (see also section Measures to support emerging areas of innovation policy).

Box 2.2. **"Building the future": the Basque diversification strategy**

To "build the future" of the Basque Country, several new strategic priorities were selected for the region: biosciences, nanosciences, alternative energies, and electronics for intelligent transport (EIT). The first plan developed is Biobasque 2010, followed by Nanobasque 2015. The latter involves an expected EUR 552 million of investment through 2015 with an expected creation of 1 200 jobs through 2020. Approximately 80 firms are using micro- and nano-technologies in the region.

To support these strategies and scientific capacity more generally, new research centres with an industrial interface were created as well as talent attraction strategies, both very appropriate steps. The creation and development funding of autonomously managed co-operation research centres (CICs) in these priority areas testifies to the will of the Basque government to reduce the region's lag in problem-oriented scientific research (basic and applied), including through the capacity to attract world class researchers notably through the Ikerbasque programme. Given the importance of competitive funding with respect to (quasi) institutional funding in the CICs total resources, they have a clear incentive to develop their research and knowledge transfer activities in co-operation with other institutions, which was one of the objectives behind their creation.

Regions across the OECD have followed a similar trend in terms of "hot" technologies. Many strategies initially supported consecutively ICT, biotechnology, nanotechnology and now green technologies. As some of the science requires significant investment and critical mass, the concept of "smart specialisation" is gaining ground in European circles as a way of targeting action to priorities revealed within the region and identifying those enabling technologies for which the region can develop capacity internally or have the absorption capacity to access from elsewhere.

Contrary to many other OECD member country or region strategy documents on STI policy, the PCTI places little emphasis on human resources in S&T. The plan includes only a few explicit priority lines of action in these areas. One possible reason this subject receives less attention

may relate to the fact that the Basque Country shows a positive evolution in the level of R&D personnel. In fact, at 15 per 1 000 active population, this rate is almost 50% higher than Spanish (10.5) and EU-27 averages. However, these researchers are mainly in the engineering fields and less so in other sciences (see Chapter 1). Another reason is perhaps due to the governance of plan development, as the lack of inter-ministerial collaboration minimises the plan's comprehensiveness.

It should also be noted that the important question of the programming and financing of S&T infrastructure is largely overlooked. The issue is more acute when most of the basic and applied research is funded through competitive programmes or projects. Support for such infrastructure requires a greater share of institutional funding generally (OECD, 2003a).

The PCTI acknowledges the importance of building up science capacity with increasing budgets in absolute and relative terms, but the share of resources devoted to this remains limited relative to STI plans of comparable regions. Among these weakness addressed are the public research system, mainly concentrated in the higher education sector, the rather scarce Basque government resources devoted to science policy in the past, and the low level of doctorate holders in scientific fields.[34] The plan therefore highlights programmes meant to strengthen the contribution of the science policy to the performance of the innovation system as a whole. The most important programmes funded by the Department of Education are:

- **Development and mobility of Basque research personnel.** This includes expansion of grants and fellowships to increase the number and qualifications of researchers, broadening the scope of their specialisation and facilitating knowledge diffusion through inter-institutional mobility within the RVCTI;[35] and

- **Attraction of foreign researchers.** Over the past ten years, there has been a growing awareness in the region about the persistent weakness in research capacity. Not only is it important for innovation performance, but there is a growing gap *vis-à-vis* competing regions in terms of research excellence. This has led the Basque government to emulate Catalonia, as well has other European countries or regions in attracting foreign scientists in the region, through the creation of the Ikerbasque Foundation under the auspices of the Department of Education. Free of the regulatory obstacles that hinder public universities and research centres, it is responsible for carrying out all of the necessary activities to attract and recruit researchers of renowned prestige from outside the Basque Country whose final destination will be an agent of the RVCTI.[36]

The ambition of the PCTI 2006-2010 to strengthen and better integrate the Basque STI system is predicated upon an important mobilisation of public resources (see Table 2.2). In 2006, the first year of the PCTI, the budgetary resources devoted to R&D and innovation more than doubled with respect to 2005 as measured by the Spanish Ministry of Finance. Per the planned PCTI budget, the projected increase in Basque government spending on STI between 2006 and 2008 was almost 50% (EUR 300 million to EUR 432 million, including its share of the Innovation Fund).

In the Plan scenario, the share of public funding for R&D and innovation was expected to increase and that of the business sector to decrease (from 58.4% to 55.4% of the plan resources). This shift could make sense if it were due to increasing investments in science that required an initial period before achieving a leverage effect on private expenditure. In the future, the ability of public investment to leverage additional private investment, and not substitute for it, will be important to monitor. A large share of R&D investment is conducted by SMEs given the region's industrial composition, but there has been a continued positive trend in terms of firm R&D expenditure and intensity despite the crisis.

Important institutional initiatives were taken in the framework of the PCTI 2010, either during the preparation of the plan or in the course of its implementation.

- **Basque Science, Technology and Innovation Network** (RVCTI). In 2005, the scope of the Basque Technology Network (RTV) was broadened to become the RVCTI (see Box 2.3). This network, which presently regroups more than 100 institutional entities involved in STI activities, essentially serves two purposes. On the one hand, it provides an accreditation label required to benefit from certain support programmes (e.g. SAIOTEK and ETORTEK) or to participate in co-operation projects submitted by individual firms. A firm may choose to enter the network if it creates a separate tax-exempt R&D unit. If it is not able or chooses not to create a separate R&D unit, it may apply to other public programmes. The accreditation function most probably remains useful; but the distinction between support programme beneficiaries according to their membership to the RVCTI should be periodically reviewed for on-going relevance.[37] Overall, the share received by RVCTI agents has grown by more than 15 percentage points while that of enterprises not belonging to the network has slightly decreased and that of the higher education sector dropped by more than 15 points (Navarro, 2009). The role of its representative association, SARETEK, on the design of the region's STI policy merits clarification.

Table 2.2. **Expected growth of resources devoted to R&D and innovation in the PCTI 2010**

	2006 (target)		2008 (target)		2010 (target)		2006-2010[1] (forecast)	
	EUR (millions)	%	EUR (millions)	%	EUR (millions)	%	EUR (millions)	%
Total public funding	416.23	41.6	588.53	45.0	699.60	44.1	2 920.06	44.6
Basque government (including share of Innovation Fund)	299.46	30.0	432.25	33.1	507.46	32.0	2 141.29	32.7
Basque provinces (including share of Innovation Fund)	31.47	3.1	39.49	3.0	41.88	2.6	191.86	2.9
Budgetary resources of the Spanish administration	52.70	5.3	76.70	5.9	100.70	6.4	383.50	5.9
European Union and other foreign resources	31.55	3.2	38.87	3.0	47.89	3.0	196.47	3.0
Other sources	1.05	0.1	1.22	0.1	1.67	0.1	6.94	0.1
Private funding	583.58	58.4	719.03	55.0	885.92	55.9	3 634.44	55.4
TOTAL	999.81	100.0	1 307.56	100.0	1 585.52	100.0	6 554.50	100.0
GERD/GDP	1.54%	1.84%	2.25%	–				

1. Information was not available to compare expected vs. actual performance in the different Plan years.

Source: PCTI 2010.

Box 2.3. **Basque Science, Technology and Innovation Network (RVCTI)**

The Basque Technology Network (RVT) was instituted in 1997 in the framework of the Science and Technology Plan 1997-2000. Its aim is to foster and better co-ordinate the supply and transfer of scientific and technological knowledge developed by accredited non-profit institutions to the Basque productive sector. Support programmes were developed to provide grants to S&T capacity building projects presented by members of the network including:

- generic research projects focusing on supply/demand linkages in areas considered as strategic by enterprises and clusters;
- generic R&D programmes in priority S&T areas; and
- S&T infrastructure.

These funding schemes were integrated in the SAIOTEK and ETORTEK support programmes created in 2002 in the framework of the 2001-2004 Plan for Science, Technology and Innovation (PCTI 2001-2004) targeted to members of the network. Over the period 1997-2004, members of the RVT received more than half of the RDI support provided by the Department of Industry, with technology centres (TCs) receiving the larger share from the generic R&D programmes in priority areas financed by the SAIOTEK and ETORTEK support programmes (or their predecessors). Such an evolution reflects the emphasis put on the development and broadening of the scope of the S&T supply capacity of technological centres. In 2005, the scope of the RTV Technology Network was broadened and changed its name into the Basque Science, Technology and Innovation Network (RVCTI) which presently regroups more than 100 non-profit institutions including principally:

- 14 TCs and the foundations that regroup them (Tecnalia and IK4);
- over 35 intermediary institutions involved in knowledge and technology diffusion;
- 7 co-operative research centres (CICs);
- 4 basic excellence research centres (BERCs);
- 3 public research centres;
- 2 health sector research units;
- 9 higher education institutions;
- over 40 enterprise research units;
- 6 certification and testing laboratories;
- 8 technological parks.

Source: Information compiled from the Innova+Euzkadi portal, *www.euskadinnova.net/es/innovacion-tecnologica/index.aspx*.

- **Ikerbasque Foundation** was created to attract and recruit researchers of renowned international prestige from outside the Basque Country. It has proven successful thus far in attracting foreign scientists. They have been instrumental in the creation and/or promotion of Basque excellence research centres and in obtaining competitive research grants from the EU and Spain. One may, however, wonder whether this programme should benefit all RVCTI entities or be restricted to research institutions and universities that are really facing regulatory obstacles in benefits they can offer to their personnel. There is also a case for making the system more demand rather than supply oriented by giving a more prominent role to research institutions in the selection process and an orientation of research areas towards regional sectoral or technology priorities.
- **Innobasque,** the Basque Innovation Agency, was set up in 2007 as a public-private foundation composed of members of the Basque Science, Technology and Innovation Network (RVCTI) and other socio-economic agents (see Box 1.5). Innobasque is a member of the Basque Council for Science Technology and Innovation and was anticipated to assume its technical secretariat. Apart from this responsibility, which gives it an important role in the definition and steering of innovation policy, its main missions are of a support and management nature to promote the co-ordination of all the agents in the field of science, technology and innovation. It also actively promotes a broader concept of innovation, including social innovation, within the region. Innobasque seeks to identify gaps in the system where it may play a role to address them given their network of prominent regional public and private stakeholders.
- **The Basque Innovation Fund** created in 2007 (see Box 2.4) has a dual role. It acts as a seed funding mechanism for new programmes and projects until their management and funding can be effectively assumed by the competent ministries through normal budgetary procedures. It also acts as an arbitration structure to fund projects. The fund does not seem to have taken a proactive role in fostering better integration of the Basque innovation system, for instance through the provision of catalyst resources in support of co-operative research and innovation programmes in priority areas, or of multi-user S&T infrastructure.

Box 2.4. The Basque Innovation Fund

The Innovation Fund was established in 2007 by the Basque Council of Finance with a view to complement budgetary resources allocated to Basque government departments to fund and manage STI programmes under their direct responsibility. The fund has been initially endowed with a budget of EUR 200 million for five years (EUR 40 million per year) financed by the Basque government (85%) and the three provincial governments (15%).

The allocation of the fund's resources to institutions, programmes and projects is in principle determined by the Basque Council for Science, Technology and Innovation chaired by the President of the Basque Country. Projects include those with the Department of Industry, the Department of Education and the most important members of the SARATEK network. Since the fund's creation, the main recipients have been the following institutions or programmes:

- BERC S&T infrastructure and research projects (around 25% in 2010);
- CIC S&T infrastructure and research projects (around 25% in 2010);
- Enterprise strategic projects (ETORGAI programme, around 12.5% in 2010);
- institutional funding of RVCTI institutions (ETORTEK programme, around 12.5% in 2010);
- institutional infrastructure in support of the Basque innovation system (e.g., Innobasque agency, around 12.5% in 2010);
- seed funding for new innovative projects (e.g., research infrastructure for the Basque Culinary Centre).

Basque STI policy mix

Policy mix issues refer to the relative balance of programmes designed to achieve the objectives set for S&T and innovation policy within a given budget. There are no norms in this matter. An appropriate policy mix should serve the Basque Country's transformation goals towards a more science-intensive innovation model, in addition to conditions required by other global innovation trends. Policy mixes evolve over time depending on several factors. In terms of governance, there is the institutional setting for developing strategy and fixing priorities (sectors, actors) as well as the efficiency of delivery agencies. A region's policy path dependency associated with prior policy mixes also has a significant influence on the state of current imbalances but also the future, as disruptive changes can be problematic for innovation system actors. The state of the innovation system

in terms of industrial structure, degree of international openness (economic exchanges and knowledge networks) and maturity of different types of actors (capacity to generate, diffuse, and absorb knowledge) also play a role.

Science, technology and innovation support: traditional instruments

Department of Industry, Innovation, Commerce and Tourism

Most of these programmes are financed by the Department of Industry and managed by SPRI (see Table 2.3). They reflect the innovation policy strategic orientations and have been designed (or adapted from pre-existing ones) in the context of the PCTI implementation. By design, funding and management procedures, the programmes are differentiated according to a two criteria that reflects: *i*) the PCTI vision to improve competitiveness and foster the diversification of the Basque industry;[38] and *ii*) the differentiated roles of enterprises as actors in the Basque innovation system (see Table 2.4).

Table 2.3. **Department of Industry STI support programmes (2008-10)**

Programme (date of creation)	Main features	2008			2010	
		EUR millions	%	Number of projects (accepted/ presented)	EUR millions	%
GAITEK[1] (2005)	Grants R&D+I New products Individual or in co-operation; with or without RVCTI entities	22.1	22.56	342/543	22.2	13.03
INNOTEK[1] (2005)	Grants R&D+I New products or processes Firms: individual or in co-operation; with or without RVCTI entities	22.0	22.46	369/618	34.1	20.05
NETs[1] (2005)	Grant for creation and development of NTBFs Firms: individual or in co-operation Beneficiaries: all enterprises and RCTVI entities	5.6	5.77	68/76	4.0	2.35
ETORGAI (2008)	Pluri-annual RDI grants (three years) Strategic areas and sectoral diversification Beneficiaries: consortia of at least three firms including one SME and one LE and at least one RVCTI member as subcontractor	20.0 for 2008-2010 2.0 in 2008	2.05	12/15 (in 2008)	22.0	12.93
ETORTEK (2002)	Pluri-annual grants for strategic projects in priority S&T areas Beneficiaries: RVCTI members Co-operation requirement	29.8 for 2008-2010 12.44 in 2008	12.73	20/27	28.0	16.46
HEDATU (2005)	Grants for S&T diffusion to firms Beneficiaries: firms, foundations, RVCTI entities	0.3	0.26	29/39	0.20	0.12
SAIOTEK (2002)	Pluri-annual grants to generic and fundamental R&D projects Beneficiaries: RCTVI entities not benefitting from TC/EMAITEK or CIC support programmes	15.8 for 2008-2009 7.1 in 2008	7.31		14.0	8.23

Table 2.3. **Department of Industry STI support programmes (2008-10)** *(cont'd)*

Programme (date of creation)	Main features	2008			2010	
		EUR millions	%	Number of projects (accepted/ presented)	EUR millions	%
CICs[2] (2008)	Grants to strengthen CIC S&T excellence (infrastructure and talent attraction) based on evaluation/fulfilment of performance contracts (quasi institutional funding) Beneficiaries: 7 CICs	28.0 for 2008-2010 9.0 in 2008	9.21		10.0	5.88
CLUSTERS (1997)	Grants to support cluster strategic activities related to knowledge acquisition and valorisation, communication and internationalisation	2.44 (fixed amount up to 0.24 per year per cluster)	2.50		2.6	1.55
IKERTU (2005)	Fellowships and grants to support HRST development Beneficiaries: individual researchers and/or technology-based SMEs	1.71	1.75		1.0	0.58
ALDATU (2008)	Grant for provision of services related to the development of technological and non-technological innovation activities Beneficiaries: mainly SMEs (more than 10 employees). LE and business associations can also benefit.	6.0	6.14		6.0	3.53
TOTAL		99.7	100.00		170.1	100.00

1. These three programmes used to be grouped in a single one, INTEK. They are co-financed by the EU (FEDER).

2. The first CICs were created in 2002.

Source: Data compiled from Basque government budgetary documents (Department of Industry and Department of Economy and Finance).

Table 2.4. **Taxonomy of Department of Industry support programmes**

Programme focus	Main beneficiaries			Budget share (2009)[2]
	RVCTI members	Non-RVCTI firms	Mixed	
Improving competitiveness (support the present)	EMAITEK[1] SAIOTEK	GAITEK INNOTEK NET IKERTU ALDATU	HEDATU	41.4%
Diversification through innovation (building the future)	ETORTEK CICs	ETORGAI		57.0%
Mixed			CLUSTERS	1.6%
Budget share (2009)[2]	49.0%	49.3%	1.7%	100%

Notes: 1. Restricted to technology centres and alliances. This programme provides institutional funding. 2. The estimations of budget shares do not correspond exactly with figures given in Table 2.3 where RVCTI members (HE excluded) have a much higher share, even accounting for the fact that the basis info is different (EUSTAT and SPRI).

Source: Compiled from Department of Industry and SPRI documents.

The current taxonomy for programmes could be reviewed for future plans. Different aspects of the instruments in terms of beneficiaries and type of finance could be explored. Key distinctions for priorities could include: *i)* support to programmes in priority economic sectors as defined in the PCTI; and *ii)* programmes that focus on so-called strategic technology areas. In the context of more open innovation strategies of firms, programmes outside of these sectoral or technology priorities should not create unnecessary artificial barriers.[39] Operating consortia in priority technology areas, as well as medium-term co-operation projects involving universities and enterprises in pre-competitive research and innovation in strategic areas could be further developed (see for example, Israel's MAGENT Programme, Box 2.A1.1 or more on public-private partnerships generally, Box 2.A1.2). Sectoral government departments could also fund projects in their priority areas by contributing to the relevant Basque programme with their own budgetary resources.

Institutional and competitive funding serve different purposes depending on the kind of institution. Typically, programme distinctions are made for the funding modalities of public research institutions (including those in the higher education sector). These entities receive either institutional funding or competitive grants. In turn, competitive grants may be either so-called "blank" research projects (as revealed in a call for proposals) or in the framework of priority research programmes where the themes are pre-specified. For quasi-public research institutions (BERCs, CICs) an appropriate balance should be struck between relatively stable flows of

institutional funding – predicated upon performance evaluation – and competitive project funding. For more business-oriented TCs, the balance between institutional and competitive funding should be different. In this regard, Tecnalia and IK4 compares favourably with Germany's Fraunhöfer Institute and Finland's VTT Centre (Table 2.5), which have higher shares of institutional funding. However, one can wonder whether the Basque TCs' portfolio sufficiently includes SMEs with low absorption capacity, particularly given the relatively lower institutional funding. This type of firm is of greater prevalence in the population of Basque enterprises, than in Germany or Finland.

Table 2.5. **Technology centres: sources of funding in international comparison**

(EUR millions)

	Germany	Finland	Basque Country	
	Fraunhöfer	VTT	Tecnalia[2]	IK4
Government base funding	621.4[1]	85	15.3	12.3
Own activities	940.5	184	106.3	81.8
Government funding (research projects)	391.0[1]	–	21.4	15.3
Government contracts	15.0[1]	–	–	–
Business contracts	427.8	–	74.5	57.2
External research funding institutions	106.7	37	10.4	9.2
Other	88.9	–	–	–
Total government funding	1 027.4	–	36.7	
TOTAL	1 650.8	269	121.6	94.1
Share base funding (public)	38%	31%	13%	13.1%
Share total public funding (includes base funding)	62.2%	–	30.2%	29.4%
Share own resources	62%	69%	87%	86.9%

Note: 1. Including federal and Lander funding. 2. Data from Tecnalia differs from the *Annual Report* 2009 due to a recent merger of additional technology centres.

Source: Annual Reports for Fraunhöfer and VTT; data provided directly by Tecnalia and IK4.

Cluster policy

The Basque Country is known world-wide for its cluster policy. The region was one of the first to work with Michael Porter in the early 1990s (Ahedo, 2004). There are 14 clusters formally recognised by the government, 12 of which are supported by the Department of Industry (see Chapter 1). As the cluster associations represent a significant share of the industrial base and thus Basque economy, they serve as a liaison between firms and public officials. One of the particularities of the public approach is the participation of public officials assigned both to specific sectors and to

specific transversal issues across sectors such as internationalisation, quality in management and technology (OECD, 2007a).

The clusters and cluster associations have been the subject of several studies.[40] One analysis found that firms with innovation efforts have the advantage of being a member of a cluster association. Beyond the direct effects of innovation activities, there are positive indirect effects on productivity growth of these innovation activities when a firm is a member of a cluster association (de la Maza-y-Arumburu *et. al.,* 2010).[41] Another set of evaluations of the telecommunications and paper clusters found that firms generally performed better in terms of innovation, internationalisation, and quality when they belonged to a cluster as opposed to those who did not (Aragon *et al.*, 2010).[42]

While most cluster associations have been in existence since the early to mid-1990s, co-operation is still a barrier. In fact, 85% of respondents from cluster firms reported co-operation as being one of the most important problems facing the success of cluster associations, followed by visualisation of results of the cluster action at 54%. Other challenges for the associations included the variety of members (in terms of size, presence of foreign capital, sector of firm and localisation of firm). Other than the Basque Country government, cluster members expressed concern about training and research institutes and other local administrations in the region as helpful partners.[43] Cluster members praised the relevance of Basque government policy (Department of Industry) but suggested that the cluster approach could be espoused by all departments, thus promoting greater inter-departmental co-ordination (Aranguren *et al.*, 2009).

Department of Education, Universities and Research

The Basque Country Department of Education, Universities and Research has responsibility over the design and implementation of part of the region's research policy. The other active Basque Country departments in this field are the Department of Industry and, to a lesser extent in terms of spending, the Departments of Agriculture and Health. It is common for these duties to be split, as in most OECD member countries the sectoral ministries have budgetary resources to develop research capacity and programmes in their area of competence. What is a more unique approach in the Basque Country is the important role of the Department of Industry in the promotion of basic and applied research in non-academic institutions (mainly in the RVCTI). This distinctive regional approach is likely due to several factors: *i)* perceived weaknesses of the higher education sector; and *ii)* priority in the region of applied research.

The governance of the S&T and innovation policy demands strong co-ordination between the two main departments (Industry and Education) in terms of policy design and implementation. In the context of not so strong co-ordination, this division of responsibilities among departments does not facilitate the development of a comprehensive and coherent research policy that promotes synergies among public and quasi-public research institutions.[44]

The main programmes funded by the Department of Education, Universities and Research in support of basic and applied research, as well as the development of human resources in S&T, are detailed in Table 2.6.[45] This information highlights some salient features of the orientations and implementation of the Basque Country scientific policy carried out under the aegis of this department, beyond the low level of funding overall:

- **Role of institutional funding.** There is apparently no budget for institutional funding of research in universities (apart from regular salaries paid to academic personnel involved in research activities). BERCs appear to have institutional or quasi-institutional funding.
- **Underinvestment in S&T infrastructure.** The amount devoted to scientific infrastructure seems to be rather small, in absolute as well as relative terms, and it seems that most of the financing of that infrastructure is tied to that of projects, which may limit the scope of potential users. New joint investments with Spain in two major scientific installations are in process.
- **Collaborative research.** Programmes aimed at enhancing collaborative research between universities and enterprises are poorly endowed. No premium seems to be given in other support programmes to projects that contemplate such collaboration. In 2008/2009 only two such collaborative projects were financed, although more were expected in subsequent years. While these amounts are low, universities are also eligible to compete for funding in programmes offered by the Department of Industry. Universities are members of the Basque RVCTI Network. Programmes cover the marginal costs (overheads plus other costs). In total, the amount to universities is approximately EUR 7 million per year. This implies that for EUR 7 million, a total of EUR 30 million is spent on R&D projects as the other EUR 23 million would be paid by the Department of Education, through researcher's salaries).

Table 2.6. **Department of Education, Universities and Research: main science policies**

Basic and applied research (date of creation or regulatory norm)	Main features	2008		2009	
		Budget (K)	%	Budget (K)	%
Competitive research grants for special actions (2008)	Grants to foster excellence capacity in basic and applied research Facilitate application to EU framework programme, mobility and organisation of scientific meetings and courses. Beneficiaries: researchers from RVCTI institutions	681	2.74	989	2.18
Basic and applied research projects (2007)	Grants for basic and applied research projects (including social sciences) Premium to co-operative projects Beneficiaries: RVCTI institutions	359	1.44	468	1.03
Grants to university research groups (2007)	Competitive grants Funding of research projects including infrastructure Beneficiaries: academic research groups from universities located in the Basque Country	7 689	30.92	8 138	17.96
Scientific equipment (2008)	Grants for purchase of large and current equipment Beneficiaries: RVCTI institutions except UPV and enterprises R&D units	305	1.23	750	1.65
University/enterprise co-operative projects (2007)	Grants for collaboration in applied research projects between academic and TC researchers and enterprises' research units Beneficiaries: universities except UPV in 2008	244	0.98	4 177	9.22
Support to patent application (2008)	Grant for application to Spanish Patent Office, European Patent Office and Patent Co-operation Treaty Beneficiaries: RVCTI institutions except UPV Only one grant in 2008	124	0.49	128	0.28
International Physics Centre (2000)	Grant Infrastructure and researchers salaries	1 032	4.15	990	2.18
BERCs[1] (2008)	Grant Infrastructure and researchers salaries	0	0	9 305	20.54

Table 2.6. **Department of Education, Universities and Research: main science policies** *(cont'd)*

Basic and applied research (date of creation or regulatory norm)	Main features	2008		2009	
		Budget (K)	%	Budget (K)	%
Sub-Total		10 434	42	24 945	55
HUMAN RESOURCES IN S&T					
Post graduate scholarships		10 066	40.48	12 800	28.25
Ikerbasque		4 365	17.55	7 564	16.69
Subtotal		14 431	58.03	20 364	44.94
TOTAL[2]		24 865	100.00	45 309	100.00
Global budget for science policy[3]		28 178		37 187	

Notes: 1. BERCs were entirely funded by the Innovation Fund in 2008 (EUR 15.1 million) and partially in 2009 (EUR 3.6 million). These amounts are not included in Table 2.6. In total, EUR 1.9 million of Innovation Funds were administered by the Direction for Science Policy in 2008, EUR 11.95 million in 2009. 2. Including programmes not included in this table. 3. Figures provided directly by the department.

Source: Estimates from Basque government budget and programme evaluation documents.

- **Highly qualified S&T personnel.** Programmes aimed at fostering the quantitative and qualitative development and/or availability of highly qualified S&T personnel seem to be high on the policy agenda, at least relatively in terms of the share of resources devoted to them in the department's budget, if not in the total STI budget of the Basque government. However, and notwithstanding the value and success of Ikerbasque, this institution appears to account for a large share of the current budget allocated to this policy area relative to other possible programmes in a policy mix for building a base of highly qualified S&T personnel.

Science, technology and innovation mix

To build the relevant science base and knowledge generation capacity in competition with other comparable OECD regions, continued commitment to investment is required. Along with the present one, prior assessments of Basque STI policy have highlighted the relatively weak scientific and research capability of the Basque S&T and innovation system.[46] They also note the relatively low level of budgetary resources allocated to strengthen this capability, in particular in the higher education sector. The policy mix orientation was consistent with the prior goals of upgrading the productive sector technological capability to restore its competitiveness. Today, it is less consistent with the current strategic orientations as highlighted in the PCTI.

The level of resources devoted to the science programmes remains limited. Some steps have indeed been taken to remedy this situation, but probably not to the extent required. While having increased greatly, it remains around a third of that devoted to innovation policy. This observation should of course be nuanced by the fact that the Department of Industry funds several initiatives that could be considered important for science policy. The CICs are funded through the technology/innovation budget managed by the Department of Industry. And certain of their programmes support R&D research consortiums that involve universities.

A second question is that of the patterns of funding for strengthening research capabilities. The Basque Country is singled out among OECD member countries or regions for its low level of institutional funding of university research and certain research centres. It is reported that over time, the share of competitive grants in total R&D funding for universities has increased, albeit this can be a positive sign when it means attracting new resources from outside the region. Institutional funding is the mode that best safeguards the research centres' ability to launch and develop longer term

research programmes and to finance the S&T infrastructure required to implement them.

Many regional actors express concern about the absorptive capacity of the region's universities for additional science funding and their lack of orientation towards the region's industrial needs. In Spain generally, there are concerns about the regulation and culture of public universities that limit their effectiveness in regional innovation systems. Some regions have chosen to develop alternative structures for research and researcher attraction to overcome these barriers. But there are nevertheless strategies that regions can take within Spanish regulatory frameworks to support research capacity. Measures include additional criteria in professor evaluations and incentive contracts for universities, among others (OECD, 2010e).

Public financing of firm R&D (efficiency and mix of direct and indirect support)

Direct public financing through support programmes

The first consideration with the current policy mix is the magnitude and efficiency of public funding to support private sector performance. There is a pattern of a decreasing share of private R&D funding and performance in the context of growing public R&D funding (see Figure 1.13). While a transition towards a more knowledge-driven innovation system requires greater public investment, the goal is for this investment to ultimately leverage private investment. Again, the region faces special challenges for increasing R&D intensity of firms given the high share from SMEs, and the limited number of firms in high-technology sectors. The positive impacts on total factor productivity will also need to be tracked to find evidence of the return on these public investments, although some investments may require a time lag for evidence to appear in the data.

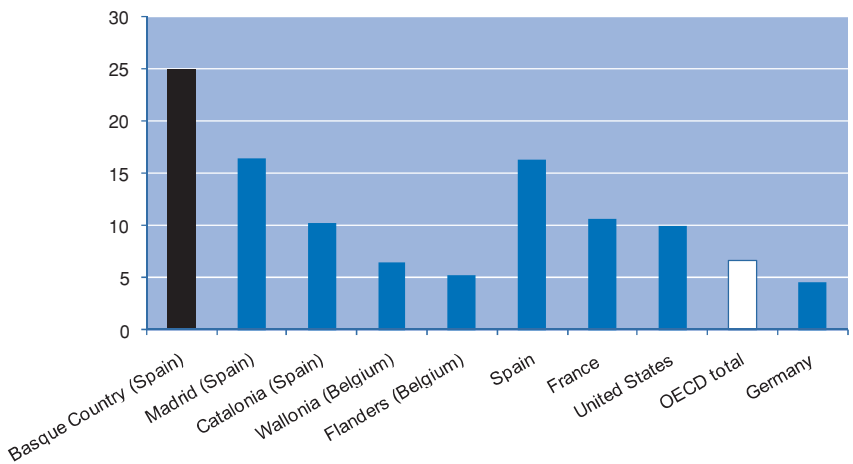
The Basque Country appears to have exceptionally high shares of public support to private R&D relative to other leading regions in Spain or in Belgium, for example. Data from the region shows that approximately 25% of R&D performed by firms (BERD) comes from public financing, albeit excluding technology centres that figure declines to around 22% (see Figure 2.2).[47] That is compared with 16.4% in Madrid, 16.3% in Spain overall, and between 5% to 7% for Wallonia and Flanders in Belgium. The share for OECD total and several countries are displayed for general comparison, but it should be noted that there are some distinctions when comparing regions and countries. Countries have a wider range of tools to

support firm R&D spending. Tax credits are one alternative that can have a major impact on such comparisons, and to a much lesser extent loans and certain forms of public procurement. Adjusting for tax credits, the relatively higher levels of public support in the Basque Country persist (see Figure 2.3). The same is true for the structure of innovation spending by Basque, which is also high relative to other Spanish regions, somewhat higher than the other foral regime region (Navarre) and about triple the rates in Catalonia and Madrid (see Table 2.7).

There are potentially positive indications of the impact of public programmes on innovative intensity. The Basque Country has the highest rate of innovation spending over sales in Spain. However, the weight of public funding of private R&D expenditures in the Basque innovation system accentuates the importance of spending efficiency. It may result in possible crowding out effects of support programmes and the risks of windfall profits. This highlights the importance of policy evaluation (see Chapter 3).

Figure 2.2. **Business R&D financed by government – selected regions and countries**

2007



Notes: Firms in the case of the Basque Country includes certain technology and other research centres that in other countries may be classified as government R&D performance.

Source: Data obtained from OECD, *www.belspo.be*, IDESCAT, Instituto de estadística (Madrid), and EUSTAT.

Table 2.7. **Structure of innovation financing by sources of funds 2007: selected regions**

	Own funds	Other firms	Public funds	Foreign funds
Basque Country	55.0%	14.9%	26.0%	4.1%
Navarre	71.5%	4.8%	21.2%	2.5%
Catalonia	68.6%	2.2%	8.8%	20.4%
Madrid	73.4%	5.6%	8.7%	12.3%

Source: Based on data from INE.

Tax incentives in support of business R&D and innovation

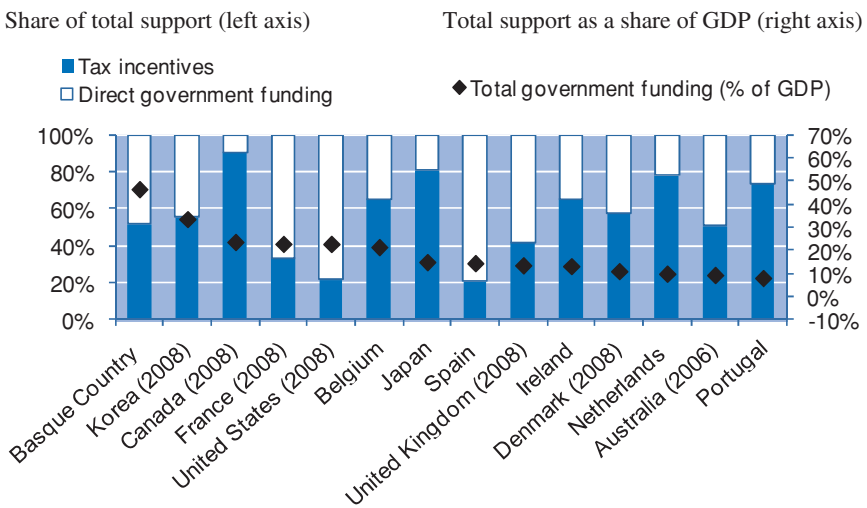
R&D tax credits are widely used in OECD member countries to support business R&D investment.[48] This incentive is generally used to complement enterprise own resources in the development of incremental innovation projects. It is less frequently used for more experimental R&D investments.[49] Thanks to the fiscal autonomy of the Basque Country's three provincial governments, they have developed tax incentives in support of business R&D and innovation (see Box 2.A1.3). The Basque Country tax incentives, like those of Spain, allow for a higher share of tax relief associated with one unit of R&D expenditure.[50] Not only are tax credit rates higher than in most OECD member countries, but they apply to both volume and incremental investment. In the province of Gipuzkoa, non-technological innovations may be included. This pilot project is testing the validity of enablers for new intangible assets at firm level.

The tax incentive is not automatic, which implies administrative costs that should be considered. A recent agreement between SPRI and the three provincial councils has designated SPRI to oversee the assessment process.[51] Administrative assessment procedures usually entail larger transaction costs than automatic ones. Administrative assessments are appropriate in some instances. If there is a ceiling in the volume of total tax credits that can be granted, an assessment is required to limit the value of such credits in terms of lost public revenues.[52] Another common use of assessments is for tax incentive that favour certain policy priorities (e.g. sectors, technologies, size of enterprises, etc.). Apparently, in the Basque Country there are neither provincial budgetary ceilings for the incentives nor policy priorities taken into account in the selection criteria. However, for eligibility criteria, the Basque system distinguishes among three categories of projects and for each of them there is a separate assessment procedure. This probably entails relatively high transaction costs if assessments are performed in a rigorous manner. In light of international practices, the value of such a distinction by type of projects is not clear, especially since it does not encompass policy

priority criteria. It should be noted that applying for tax incentives has no direct costs for the applying company.

By international standards, the amount of support granted through R&D tax credits is also very high and merits evaluation (see Figure 2.3). Overall for the Basque Country, 0.47% of GDP is given to firms in the form of either direct support through programmes (48%) or indirectly via tax credits (52%) for R&D expenditures. That intensity compares with Korea (0.34%), Canada (0.24%), France and the United States (0.23%) or Spain (0.15%). Again, the same concerns stated above for Figure 2.2 about cross-country comparisons generally, and between a region and a country in particular, apply with respect to other possible forms of public support to firm R&D (subsidised loans, procurement).

Figure 2.3. **Government direct and indirect funding of business R&D**



Notes: Firms in the case of the Basque Country include the categories: other R&D service firms, firm R&D units, and other firms which are not members of RCVTI as used in Navarro (2010) based on data from EUSTAT. Support to technology centres and other private status but public oriented research centres are excluded. For OECD member countries fiscal incentives do not include those granted at sub-national level. The United States estimate covers the research tax credit but excludes the expensing of R&D.

Source: OECD (2010), *Measuring Innovation: A New Perspective*, based on OECD, R&D tax incentives questionnaire, January 2010; and OECD (n.d.), *Main Science and Technology Indicators Database*, March 2010; Basque Country: tax incentive data form provincial governments, R&D expenditure data from EUSTAT as used in Navarro (2010).

The volume of tax credits represents a large share of business R&D. In the Biscay province, in 2008, the budgetary cost of the R&D tax incentive,[53] a proxy for the amount of support**,** amounted to around EUR 152 million (albeit in 2007, the figure was only half that amount at EUR 75.9 million). This figure can be compared to the EUR 457.7 million of business R&D expenditures in the province that year, of which tax credits represented 33%. In Gipuzkoa, the amount of support granted through tax credits was estimated at around EUR 52 million in 2008, which represented more than 12% of total business R&D expenditures in the province. The volume and tax credit conditions (what is technically termed the level of "generosity") should be evaluated.

The level and sectoral orientation of tax credits are public policy choices. Case studies analysing the outcomes of innovation projects facilitated by this instrument would be useful to assess their efficiency (cost/benefit) and efficacy (viability of innovation projects and R&D investment learning curve). The additionality effects of such investments would be important to document (see Chapter 3).

Another tax incentive was established in 2008 to promote patenting activities. This incentive seeks to address the notably low patenting rates in the Basque Country. The levels are low overall, and in comparison with regions that have similar innovation-related expenditures as a share of GDP or value added in the enterprise sector. This new incentive is aimed at promoting intellectual property (IP) activities of the Basque Country's innovative enterprises and research institutions and at encouraging the licensing of IP rights and the internationalisation of innovative companies (Box 2.5). Along with the R&D tax credits, this IP tax incentive should make the Basque Country a highly attractive location for R&D headquarters of multi-national groups, as well as foreign IP licensing companies. It is still too early to assess the results of this measure.

Concerning the Basque Country, three separate issues deserve to be considered in terms of the combination of direct and indirect R&D support. They include: *i)* the balance between direct support and indirect support measures (grants versus tax incentives); *ii)* the norms that regulate direct support programmes including eligibility criteria; and *iii)* the evaluation of support programmes, notably as regards their economic impact and additionality effects to the extent that such evaluations can lead to changes in the policy mix. Typically, R&D tax incentives and direct support serve different purposes. The tax credits mostly benefit enterprises that already have experience in developing research activities and are mainly used by these firms to complement own resources for incremental innovation projects.[54] It is therefore not the right instrument to induce non or low innovative enterprises to invest in R&D. Direct funding allows for more

targeted support of R&D, providing governments with the opportunity to direct resources to areas believed to yield the greatest social returns. Funding can be directed toward industries or technologies deemed important to regional needs or toward research programmes with longer term paybacks. Many programmes fund the full cost of the proposed R&D, but a growing number require some degree of cost-sharing with industry. While the Basque Country is constrained by the range of instruments it may use to support firm R&D as a region and not a country, given the volume and nature of support relative to the industrial structure and large share of SMEs, the region may consider a mix that more favours direct support measures. At 52%, the share of indirect support is also, interestingly, a much higher share than in Spain overall (20%) despite some similarities in the structure of tax credits.[55]

Box 2.5. **Patenting incentives in the Basque Country**

In 2008, taking advantage of its provinces' constitutional powers over corporate income taxation, the Basque Country introduced a patent box type of incentive. In certain respects, it outmatches the patent box regime in the rest of Spain, as well as other patent box schemes applicable in other European countries. Under the new regime, 60% of revenues arising from the licensing of the right to use self-developed IP rights are tax exempt. If the IP rights are not self-developed but acquired from a third party (whether related or unrelated), then 30% of revenues from the licensing of the right to use such IP rights are tax exempt. Other patent box schemes are much narrower than the Basque one with regard to the qualifying IP income (for example, the Belgian regime only applies to income from self-developed or self-improved patents, and the Dutch incentive is limited to self-developed patents and certified R&D).

Source: Matute, A. (2009), "Basque Patent Box Regime: An Attractive Location for IP", *International Tax Review*.

Support to SMEs

In addition to the many programmes listed above, there are an additional set of programmes specifically for SMEs in the Basque Country. Such programmes address issues of technological innovation as well as non-technological innovation to improve competitiveness, including areas around excellence in management, use of ICT, and other investment (See Box 2.6). In addition, local development agencies and provinces also provide micro and other SMEs with additional programmes developed at provincial and local level.

Box 2.6. **Basque Country programmes for SMEs**

A number of SME support programmes are offered in the SPRI portfolio of instruments to support SMEs for innovation and expansion.

- Technological and non-technological innovation:
  - COMPITE *Iniciativas–Agentes*. Support to intermediate innovation agents such as local development agencies, sectoral or business associations, etc., promoting networking and participation of small companies in the public innovation support programmes. Budget 2010: EUR 3.7 million.
  - COMPITE *Iniciativas–Empresas*. Support to SMEs to design and develop different projects to improve their competitive position. Budget 2010: EUR 10 million.
  - ITINERARIOS *de innovación y competitividad*. Support to SMEs to develop a strategic assessment of their competitive position and establish specific innovation itineraries. Budget 2010: EUR 7 million.
  - ALDATU *Innovación excelente*. Support projects of excellence-related innovation, for individual firms or firm groups. Budget 2010: EUR 6 million.
- Information and communications technology (ICT):
  - HOBEKI DIGITALA for SMEs making use of ICT for improving their internal processes. Budget 2010: EUR 4.04 million.
  - KZ LANKIDETZA for business associations making use of ICT for improving their internal processes. Budget 2010: EUR 1.91 million.
  - MIKROENPRESA DIGITALA for micro SMEs to have access to Internet and and basic equipment. Budget 2010: EUR 0.95 million.
- Support to investments:
  - GAUZATU INDUSTRIA. Support for creating new technology-based SMEs. Budget 2010: EUR 26 million.
  - GAUZATU IMPLANTACIONES EXTERIORES. Support to locate new manufacturing premises in foreign countries. Budget 2010: EUR 6 million.
  - GAUZATU TURISMO. for strategic projects around the tourism sector. Budget 2010: EUR 2 million.
  - AFI. Investment finance support for SMEs. Budget 2010: EUR 8.56 million.

Regional level policy support to SMEs often focuses on technology transfer and the stimulation of SME demand for technology. The success of the region's innovation policies aimed at industrial restructuring and competitiveness enhancement has been the development of stronger technology transfer institutions. The evolving mission entrusted to the technology centres in the Basque Country has placed greater emphasis on the development of applied research capacities in priority areas, shifting away from their initial functions of basic technology transfer to SMEs. A number of non-innovating firms therefore lack absorptive capacity, limited access to knowledge sources and weak managerial skills. In most industries, SMEs contribute to the innovative process in a very different way than other firms. They operate in medium- to low-technology environments and innovate without engaging in formal R&D activities. They focus on improving production processes through the use of codified knowledge embedded in up-to-date equipment and on improving product design and marketing techniques through the use of tacit knowledge embedded in human resources.

Lessons from OECD member countries and regions illustrate several strategies to address the diverse but large number of non-innovative SMEs. Conducive framework conditions for entrepreneurship and access to useful services are a first step. Policies to reduce persistent SME financing gaps include: *i)* subsidised loans and loan guarantees; *ii)*provision of seed financing and support for the development of venture capital; and *iii)* tax incentives and/or grants to correct market failures that lead to under-investment in R&D. Measures to support innovation capabilities in SMEs have generally been delivered through supply-driven technology diffusion. But evidence has shown that such efforts had a bias towards manufacturing and did not recognise the importance of interaction in the innovation process and the missing organisational and management skills. New programmes that have emerged focus on: *i)* fostering an entrepreneurial culture; *ii)* building innovative and absorptive capacity through skills development and improved management; and *iii)* promoting e-business and other business infrastructure. Finally, measures to promote networking and partnership are not new per se, but several aspects have been progressively improved in recognition of the fact that SMEs depend more on external sources of information, knowledge, and technologies to build their own innovative capability and to reach their markets. Policies that address networking market failures include: *i)* raising awareness of networking opportunities and helping search for partners; *ii)* organising, financing and operating networks; *iii)* interfacing scientific and innovation networks through public-private partnerships; and *iv)* creating international linkages and building global networks (OECD, 2007b).

In the Basque Country, some of these measures are in place. The ALDATU Programme constitutes an important initiative to help such SMEs integrate the concept and modalities of innovation. ITINERARIOS supports the development of an innovation agenda for SMEs as well as the private firms that provide these advisory services. But these programmes stop short of providing these enterprises with the necessary incentives to make the difficult and risky transition to invest in the physical and intangible resources required to develop innovative projects. The Basque Country has also made concerted and successful efforts in supporting excellence in management among SMEs, a concept used at regional and sub-regional levels to support SME development.

There are several options for the Basque Country to address the unmet needs for SMEs in terms of technology transfer. In countries where technology centres are comparable in scope of activities to those of the Basque Country (such as Germany, the Netherlands and Finland), SMEs generally have better absorptive capacities and easier access to sources of knowledge and innovation finance. One possibility is to provide financial incentives to the Basque technology centres to better serve this population. A complementary or substitute measure is to support intermediaries that help group demand. Local development agencies and the network of Basque professional schools could play a greater role in helping SMEs articulate demands that could be further addressed by technology centres. Local development agencies in the region have taken an increasingly active role in entrepreneurship and networking support as part of their job creation mission (see Chapter 3). Yet another option is for public support to cluster associations to provide incentives to better integrate local SMEs into their supply chains. The region's Innovanet Network (EUR 3 million in 2010) sponsored by the Basque government and SPRI is seeking to fill this gap for SMEs by reinforcing linkages among system agents with greater outreach. Such actors include local development agencies, provincial councils, innovation consultants, centres of vocational training, and clusters, among others.

Measures to support emerging areas of innovation policy

"Intangible" innovation drivers, including knowledge-intensive services, design and creativity

Many innovations take place without R&D, in both service and industrial sectors. A notable share of innovative firms without R&D are introducing new-to-market product innovations. The challenge for public authorities is to find the right levers and justifications for public action. This

is particularly difficult in the service sectors. OECD work on services has noted that success for large service firms is often based on: *i*) open markets; *ii*) innovation and ICT; and *iii*) work organisation and human resources (OECD, 2005a). Furthermore, studies of innovation in knowledge-intensive service activities (KISA) show that such firms serve as sources, facilitators and carriers of innovation (OECD, 2006a).

Understanding these intangible innovation drivers is also a goal for the Basque Country to better understand its "competitive paradox." That is to say, understanding the region's strong economic performance despite lower levels of R&D and patenting than peer regions. The region is inspired by the NESTA Innovation Index under development in the United Kingdom. Associated research finds that only 11% of innovation measured by the index is from R&D. The calculation includes other investments such as design, organisational improvement, training and skills development, software development, market research and advertising, and other expenses (such as copyright development and mineral exploration) (NESTA, 2009). Innobasque is studying the possibility of developing an index in the Basque Country that the region's statistical agency, EUSTAT, could begin to measure.

The Basque Country has invested in successful efforts for supporting management and quality, including institutions and strategies. The Plan to Promote Quality in the Industrial Sector (PPCSI) is one example. Another is EUSKALIT, the Basque Foundation for Excellence founded in 1992 at the initiative of the Department of Industry. It gathers several public and private organisations to promote innovation through total quality management and other excellence methods. These and other regional efforts have borne fruit in terms of ISO 9000 certifications and EFQM excellence in management awards. Prior studies have noted a need for EUSKALIT to go beyond business sectors with a broader vision of innovation in management. In addition to support from the Department of Industry, quality initiatives have been promoted by the Department of Housing and Social Affairs (Eraikal Programme) and the Province of Biscay (Heras *et al.*, 2009).

Some of the programmes to support ICT in firms and in society also support the region's efforts to address certain aspects of these investments in intangible innovation assets. In addition to the supporting public programmes mentioned before (HOBEKI DIGITALA and KZ LANKIDETZA), there are also some examples of innovative projects or initiatives. IT4ALL is a decentralised co-operation network of local authorities aiming to reach an inclusive information society with ICT. CIFAL Bilbao is an International Training Centre for Local Authorities (CIFAL) specialised in information society, created in 2003 by the United

Nations Institute for Training and Research (UNITAR) and the Basque Country to train local authorities in this matter.

Given the region's strengths in engineering and manufacturing, policy support for design is a natural option for the Basque Country. Statistics on intellectual property indicate that the region accounts for a lower share of Spain's industrial designs than its GDP (4% versus 6%). Public support for industrial design has a long history: the British Design Council was created in 1944, the Finnish Council in 1901, and the French Agency for the Promotion of Industrial Creation (*Agence pour la promotion de la créativité industriel* – APCI) in 1980. What is new today is the role of design as a driver for firm competitiveness. Countries which are leading this trend and prioritising this type of innovation in their policies are Denmark, the United Kingdom, Finland, India and Korea. There are a range of public strategies to support industrial design, ranging from specialised agencies and firm incentives to signalling and public competitions (see Box 2.7).

Box 2.7. **Strategies for supporting design: OECD examples**

Agencies that support design. Policies can promote networking and collaboration for innovation by creating visibility for design service providers and offering collaboration opportunities. In general, those types of support benefit from a sectoral perspective which groups stakeholders from converging production and technological areas. In France, for example, VIA (the Agency for the Valorisation of Innovation in Interior Design) provides incentives and physical infrastructure for facilitating collaboration between different business sectors and design competences in the field of interior design. The centre works as an "R&D centre" which integrates designers, firms and retailers as well as capacity building collaboration between firms and designers. At the level of the **European Union** the platform "IMProve" favours best practice exchanges between regions and countries in the EU in relation to design and SME performance. The Aquitaine region (France) created the agency 4Design over 20 years ago. The agency offers comprehensive support to design through a wide range of services and incentives to SMEs using a one-stop-shop model, including an Incubator of Products from Aquitaine. The Regional Council covers up to 75% of the contribution of a designer to a project. In the **United Kingdom,** Design Wales was created in 1994 to support design in the region. The agency works in partnership with the International Institute of Design Policy and Support (IIDPS) of the University of Wales. The agency offers supports to design services, favours international networks and finances research to understand the role and contribution of design to regional development.

Firm incentives for design-led innovation. Another policy function is to favour investment in R&D for design, which differs in timing, procedures and infrastructure requirements from scientific R&D. This can be done by introducing some targeted conditionalities in traditional R&D schemes, through the introduction of specific instruments. The approach to design, and consequently firm needs for innovating by design, is highly sector specific. The automotive sector tends to have in-house resources dedicated to design, while kitchen ware for example, tends to operate though different types of external networks of collaboration with designers. In France, for example, OSEO follows the first approach by recognising the expenses related with design-led innovation in the frame of traditional instruments for business innovation support. There are no specific instruments for supporting design-led innovations, but OSEO recognises design-related expenditures in their financial incentives to SMEs innovation. OSEO covers, by grant or loan at a 0% interest rate, up to 60% of design-related expenses of total project costs. In Canada, the province of Quebec has recently introduced in its innovation strategy a targeted mechanism to support innovation in design for local firms operating in manufacturing, ICT and service design activities. Eligible firms need to be part of a network composed of at least three firms. The province offers incentives in the fields of industrial, fashion, interior, graphic, architectural and urban design. Activities, supported include:

Box 2.7. **Strategies for supporting design: OECD examples** *(cont'd)*

i) organisation of competitions for innovative product design (grants up to 40% of project costs); *ii)* use of external design services (grant up to 40% of consultancy fees for contracting for the first time a designer to improve firm competitiveness, or of the fee or salary of a design trainee in the firm); *iii)* contribution of up to EUR 5 000 for covering the costs of an assessment of design challenges for a firm, or up to EUR 10 000 for a group of firms.

Fostering country and regional branding. Design has traditionally been a means to support a country's or a region's competitiveness in global markets by creating strong associations between quality and the location of production. Usually agencies supporting design tend to act both domestically and in foreign countries to create and diffuse the image of the country or regional brand. The Quebec Innovation Strategy includes support to: open a satellite office for design innovation in a foreign country; export domestic design products; participate in international design awards; and conduct missions to foreign countries to identify market practices and trends. The incentive is a grant of up to 40% of eligible expenses. The total cumulative support received by the government should not be above 50% of the total project cost.

Supporting design-led innovation by signalling. Signalling is a crucial element in supporting design-driven innovation. Design requires an environment and a diffused business culture which recognises it as an opportunity for business. In fact, common instruments used by institutions to support design-driven innovation are fairs, prices and awards to "best" ideas and products. For example, the French Agency for the Promotion of Industrial Creation assigns on a yearly basis the label "*Observeur du design*" to products and services which innovate by using design. This includes not only introduction of new aesthetics and original artefacts or services for an "elite" of consumers, but which introduce novelties in the markets, by combining functional and aesthetic approaches to create new experiences for a wide range of customers in respect of environmental and social sustainability. The label of *Observeur* favours the linkage between producers and designers, by screening the best available options. The institution also works as an observatory for design development of the business sector.

Supporting public sector innovation by open competition. Design can also be fostered to introduce innovation in the public sector by framing problems in a more strategic and comprehensive approach. Finland is particularly active in this field. SITRA is pioneering activities to identify how the design approach can help frame policy strategies in a comprehensive way in order to address the complex and multi-faceted social and environmental challenges of current global knowledge societies. The public sector can also view design as a mechanism to address challenges in service delivery, for example. When the aim is to find a solution for a social challenge, an appropriate mechanism to support design-driven innovation would be an open call which clarifies the need and allows competition among potential solvers to propose an innovative solution.

The importance of creativity for innovation has received increasing attention in research and policy circles. From the concept of the "creative class" coined by Richard Florida to the EU's 2009 Year of Creativity and Innovation, promoting creativity is one of the policy levers to consider. Promotion of creativity receives little but growing consideration in the current policy mix for innovation policy. DISONANCIAS is a platform aimed at companies, research centres or public entities interested in collaborating with artists in order to promote their innovation. DISONANCIAS Euskadi 2008/09 gathered together eight research projects to be developed between October 2008 and July 2009. A total of nine months of collaboration to develop a prototype, procedure or idea based on a concept defined by the participating organisations and the preliminary projects presented by the artists. The fourth edition of the programme is supported by the Basque government and SPRI. The provinces have also been promoted the role of culture and creativity. The urban regeneration effort of Bilbao, symbolised by the Guggenheim Bilbao, is one example. The province of Gipuzkoa has also been building on cultural assets and promoting cultural changes for a more creative and entrepreneurial society (see Chapter 3).

Efforts to support creativity are being undertaken by other strong industrial regions in the OECD. In an analysis of the United Kingdom, including northern UK cities with their industrial history, reveal that spatially blind national policy efforts to support creativity may not be enough to support their transformation into more knowledge-intensive regions (de Propis *et al.*, 2009). Baden-Württemberg (Germany), a strong industrial region that the Basque Country views as a model, has identified public support to creative clusters as important to its innovation strategy. The region recognises a need for instruments tailored to these different kinds of firms that could also improve the productivity of their industrial base (see Box 2.8).

Meeting social needs: social innovation and eco-innovation

Contemporary societies are facing several transformations. They include demographic restructuring, reorganisation of production and service activities across the globe, and rising environmental challenges. Those changes, matched with new communication and organisational tools which favour new forms of collective thinking, are creating new demands for solutions which respond to the public interest. Social innovations are one of the responses to increasing complexity. The multi-dimensionality of problems requires sophisticated and systemic solutions which bring together stakeholders and competences from different backgrounds.

Box 2.8. **Supporting creative clusters: the case of Baden-Württemberg**

The strategic importance of better harnessing the potential of innovation and knowledge, cutting across and connecting all sectors, is commonly acknowledged. The same holds true for the need in Europe to better relate priority setting and programme design between regional, national and EU levels in order to tap synergies of actions and policies. However, the focus of public innovation-related interventions has to be carefully chosen: not to distort competition or maintain "dying sectors" artificially, but to optimise framework conditions, reduce market and system deficiencies and maximise spill-over effects.

In this respect, the culture and creative industries (CI) play a strategic role. The CI sector is one of the emerging lead markets of the European knowledge economy, already ranking fourth in EU GDP contribution (EUR 626 billion in 2007). CI employment growth rate was double that of the general economy in recent years and is forecast to continue at an average of 10% annually. In addition, studies show that co-operation with CI enterprises increases the innovativeness in all sectors. Efficient knowledge generation and its creative application can transform the traditional industrial landscape into a competitive industry base and modern service sector, thus contributing to the generation of new markets and high-quality jobs.

ICT constitute the technology base enabling the development of innovative CI products and services. Therefore research progress in ICT is a key ingredient for sustaining competitive CI and, hence, regional and sector competitiveness in general. Also from this perspective, it is a good public investment to support strategic ICT research and to encourage a more systematic, forward-looking and "outward-looking" (open innovation type) use of its innovation potential. To fully harness this potential for the CI, it is vital to develop new strategic guidance and research & innovation support schemes, as this sector is characterised by a high percentage of micro-enterprises and non-conventional forms of employment.

Recognising this need, 15 years ago the government of Baden-Württemberg (BW) established, MFG BW as the innovation agency focusing on information technology, software, telecommunication and the CI. With an annual business volume of EUR 15 million and more than 60 employees in its Stuttgart headquarters, MFG has developed into one of the leading innovation agencies in Europe. By networking the creative and the technology sectors, MFG strengthens BW as a business location, supports co-operation in Europe and enhances collaboration in global value chains.

Box 2.8. **Supporting creative clusters: the case of Baden-Württemberg** *(cont'd)*

The BW government invested early in a solid regional CI-support base. Regional enterprises and research organisations were highly successful in applying for national and European funds when related programmes were developed more recently. In the EU 2020 communication, the European Commission highlights the importance of creativity and knowledge creation for sustained and sustainable growth. It aims to be an impetus for overcoming the current crisis and advocates a new approach that explicitly addresses the complex interdependence across levels of government. In different functions and networks, BW experts and public officials promote the development of national and EU support, while the BW government continues to adapt its support tools to the new challenges faced by the creative industries and society as a whole.

Notes: CI=Music, Publishing/Print, Film/Video, Broadcasting/Television, Advertising, Software & Games, Visual & Performing Arts, Architecture, Design.

Source: Clar (2010), Personal Communications, 18 November 2010.

Social innovations aim at turning "values" of given communities into actions. They require shared commitment and mobilisation of stakeholders to deliver a solution to a specific challenge. Social innovations require the commitment of a community of people (firms, individuals and public sector institutions) to occur. The major features of social innovations are: the innovation as a solution to a specific challenge/problem as expressed by a collectivity; the process of innovation as a collaborative effort of a network of agents with different profiles and competences; and platforms (virtual or physical) for effective collaboration between different agents involved in the process. Several actors are involved in social innovation: social entrepreneurs, communities of practice, universities, and traditional firms, each performing different roles.

The concepts of social and eco-innovation were introduced in the PCTI 2010. Over the last few years, these areas have been more actively developed in the Basque Country. In OECD member countries and regions there is a rising interest in "social innovation"; however, no one definition exists. A common denominator among the different options is that social innovations are applications and solutions to specific social and environmental challenges which operate in the public interest, regardless if they are originated through a for-profit or non-profit business model.

Innobasque is a leading proponent of the work on social innovation in the Basque Country, through research, benchmarking, publications and

workshops. The agency is working on a definition of social innovation and fostering collaborative actions and joint research with different agents in the Basque Country. A large number of workshops have been held already. They are also exploring strategies to support the creation of new social firms (a fourth sector). The region is integrating different international networks in this area, such as the Institute for Large Scale Innovation. Provinces are also promoting social innovation (see Chapter 3).

Examples from OECD member counties illustrate the different roles of the public sector in the field of social innovation. Policies might support social innovation practices as in the case of the Social Innovation Camp in the United Kingdom. Universities might play a role in supporting social entrepreneurship and awareness, as in the case of Stanford. Social innovation networks might also play an advisory role in policy making, as is the case of the Center for Social Innovation in Toronto, Canada. In all cases strong local leadership and commitment are required for success (see Box 2.9).

Box 2.9. **Social innovation: international examples**

The **Centre for Social Innovation** in downtown Toronto, Canada was launched in 2004 by a small group of social entrepreneurs. The purpose was to create a space to support the generation and diffusion of new ideas to address the social, environmental, economic and cultural challenges. The centre was created as a self-recovery cost model. Given the peculiarities of the project, there have been difficulties in finding the financial resources for the first investments. But commitment of initial members was determinant to launch the operation. The guiding principal for its creation was the recognition that innovative solutions require collaboration across different fields of sciences, competences and specialties. Therefore, the centre introduced a new model for collaboration. It facilitates the development and diffusion of social innovations and at the same time plays an important role in policy advocacy. The centre operates through three main channels:

- **co-location:** physical spaces shared among different organisations;
- **co-working practices:** sharing workspace among freelancers and other independent workers; and
- **community hubs:** shared spaces that provide direct services to the geographic community in which they are situated. Those hubs co-host several providers that offer a range of supports such as language instruction, job training, and after school programmes to the community.

Box 2.9. **Social innovation: international examples** *(cont'd)*

The centre also offers an incubation service of strategic, administrative and financial support to small projects oriented towards developing community-oriented solutions. In 2008, the centre carried out an evaluation survey (2 000 respondents): 52% of members described themselves as working in the area of the environment, 39% in culture, 31% in social justice, and 25% in technology (respondents were allowed to select multiple sectors). There are members from the private for-profit and non-profit sectors mainly of small size. Ninety-four per cent of members have three or fewer full-time equivalent staff, and two-thirds of members are under 40 years old.

The **Social Innovation Camp is a UK initiative**, expanding to other parts of the globe, which develops web-based solutions to social problems. The organisation aims to bring together experts in software technology with designers and individuals or communities expressing "needs" and "demands" to deliver innovations to support social change. Over 300 ideas were submitted to social innovation camps in the UK in 2008 and 2009, and 20 software prototypes were built. The mission of the Social Innovation Camp is to deliver the software in two working days through the self-organisation of different members. The initiative is supported by the UK government and the European Social Fund.

At **Stanford University, the Center for Social Innovation** is involved in research and support in the field of social innovation. In 2009 the Business School launched a new fellowship award that provides financial and strategic support to graduates starting social ventures. The fellowship programme is designed to help mission-driven MBAs create non-profits that benefit society, particularly marginalised populations. The one-year fellowships carry a stipend of USD 80 000 per student, or USD 120 000 per two-member team, that must be led by a graduating Stanford MBA. Fellowship winners must be committed to building a successful non-profit venture or innovation that addresses a particular social or environmental challenge, and must work full-time for their ventures during the fellowship year. Fellowship winners receive strategic assistance and entrepreneurship expertise deemed necessary by a team of senior staffers from the Business School's Center for Social Innovation.

Source: Centre for Social Innovation (n.d.), *http://socialinnovation.ca;* Social Innovation Camp (n.d.), *www.sicamp.org;* Stanford Graduate School of Business (n.d.), Centre for Social Innovation, *http://csi.gsb.stanford.edu.*

Eco-innovation is a high priority in OECD member countries and regions in light of recent agendas such as Europe 2020. Supporting innovation with an environmental focus is one aspect of "green growth". The OECD will deliver a Green Growth Strategy in 2011. Two special considerations are noted with respect to eco-innovation as opposed to innovation more generally: *i)* eco-innovation represents innovation that

results in a reduction of environmental impact, regardless of whether that effect is intended or not; and *ii)* the scope of eco-innovation may go beyond the conventional organisational boundaries of the innovating organisation and involve broader social arrangements that trigger changes in existing socio-cultural norms and institutional structures. There is a breadth of examples in the OECD taken at national and sub-national levels: from the *Vélib* system of urban transit by bicycle in Paris, the Top Runner Programme in Japan for flexible standard setting in energy efficiency, or the lighter weight cars developed by an initiative of 35 steel makers in 18 countries (OECD, 2009e).

Launched in 2009, the Eco-Euskadi 2020 strategy will serve to reach an agreement among public and private agents about how to build a Basque sustainable society by 2020. The strategy was developed under the auspices of the Departments of Industry and Environment with the participation of several regional stakeholders (cluster associations, firms, Innobasque). A number of eco-communities are part of that strategy to address different aspects of eco-innovation, from climate change and energy to urban planning and transport (see Box 2.10). The development of these eco-communities is reinforced by European Community agendas, standards and regulations that are under consideration. The diversity of groups, subjects and level of maturity illustrates the importance of testing many different fronts.

Box 2.10. **Basque eco-innovation activities**

Eco-innovation in the Basque Country refers to "any form of innovation that reduces environmental impact and optimises the use of resources". It can only be deployed in all its force through close collaboration between: *i)* the government that passes the frame for the environmental demand; and *ii)* the private sector that transfers eco-innovation to the market, thus generating wealth. The need for this networking is the basis of the Innovation ECOmmunities, a concept inspired by the "knowledge and innovation communities" that the European Commission has designed through the European Institute of Innovation and Technology.

Box 2.10. **Basque eco-innovation activities** *(cont'd)*

The development and consolidation of these emerging ECOmmunities depend mainly on the capacity to agree on clear common goals, appoint leaders for each ECOmmunity, delegate duties and tasks between the various members, and monitor progress efficiently. Progress will be measured by a panel with seven indicators which should encourage public and private commitments to R&D in eco-innovation. This can be done by activating the demand for eco-innovation via innovative green public procurement and systematic networking, the commitment of the private sector to eco-innovation with a range of newly created companies, increased eco-invoicing by existing companies and the eco-innovative business culture.

The **Climate Change ECOmmunity** is the one that has made the fastest progress in recent years, largely due to the creation of clear goals in the Basque Plan to Fight Climate Change 2012 and priority promotion from the European Commission. The consolidation of applied research with the Basque Centre for Climate Change (BC3) and the K-Egokitzen Network for adapting to climate change has been further reinforced by transferring knowledge to the local level via the Udalsarea 21 Network, although the contribution of private initiatives to this ECOmmunity is still in its infancy.

The **Energy ECOmmunity** is one of the most mature ECOmmunities through intense efforts of the Basque Energy Board (EVE) and its long association with the business sector, which is very proactive in this field. The existence of consolidated structures such as the CIC Energygune, the leadership of two major Basque companies (Iberdrola and Gamesa), the high level of networking on both a national and international level, and the global strategic commitment to a low-carbon energy system drive this ECOmmunity.

The **Transport & Mobility ECOmmunity** has the largest development potential in the short term. Thanks to the European Commission's commitment to a modal change of transport, the growing awareness of the public and local government, high oil prices and a business sector awaiting decisions on new initiatives on the regional, national and European levels, this is one of the most important ECOmmunities.

The **Urban Planning & Building ECOmmunity** is just beginning to emerge. In the field of sustainable building, numerous innovative initiatives have been developed and must now be incorporated into a coherent strategy. They must also receive firm support from local government, which holds the key to building and renovation licences and permits. Decisive commitment can make a major contribution to the creation of green employment. However, this ECOmmunity will only make progress if the regional, provincial and local governments adopt a firm commitment to sustainable urban planning.

Box 2.10. **Basque eco-innovation activities** *(cont'd)*

The **Ecodesign ECOmmunity** is more modest but very pragmatic. After a decade of intense public-private collaboration, and with the European Commission's firm commitment to introduce regulations and incentives concerning the greening of products consumed in Europe rather than actual production processes. The advanced management of this ECOmmunity could support the Basque Country's efforts in developing this area with a clear positive spillover for the private sector.

The **Enviro-Clean ECOmmunity** is the oldest such community and its aim is to minimise the risks for human health and ecosystems arising from emissions into the air, water and soil, largely as a result of human activity. It also aims to close the resource cycle by increasing the value of general waste. It is a mature ECOmmunity with public leadership input from the Vice Ministry of the Environment (Ihobe) and private involvement from Aclima. However, it needs to reinforce its public-private collaboration in order to send the correct signals to the market to reduce the perceived business risk and allow new initiatives to blossom, especially in the field of advanced services and equipment/facilities for preventing and treating pollution.

The **Ecosystem Services ECOmmunity** is still in its infancy. The enormous pressure of human activity in the region had relegated the importance of biodiversity to a back seat in the Basque Country. This ECOmmunity benefits from scientific capacity in the region, a recent commitment from the Basque government and an emerging business sector.

Source: Basque Country government.

Demand-side innovation policies, including public procurement

The new generation of innovation policies has to be adjusted to a broadening concept of innovation, seen as a market-driven, complex phenomenon (OECD, 2010b). To thrive, innovation activities need many more elements than the availability of new technologies and of results of R&D activities. In particular, the market acceptance of innovations plays a key role in stimulating more firms to become innovative and in creating entirely new sectors of activities. This requires, from the point of view of the companies, the ability to identify and anticipate new consumer needs, as well as a high degree of creativity and capacities to develop new products, services, organisation and marketing strategies. Consumer preferences are changing (e.g. there is an increased demand for environmentally and ethically sound products and services) and societal challenges becoming more pressing and generating the need for user-oriented innovations (e.g. new connectivity equipment adapted to the specific needs of elderly

people). Evolving and new markets are key driving forces for the development of innovative activities in the private sector. A summary of types of common instruments may be found in Table 2.8.

Table 2.8. **Main demand-side innovation policy instruments: key features**

Features	Public procurement	Regulations	Standards
Objective	New product or service	Market uptake, increased competition, societal goals	Market uptake, inter-operability, transparency
Main player	Government	Government	Industry
Inputs	Money, performance requirement, skills	Legal process, need to co-ordinate	Standards agencies, need to co-ordinate
Participation incentive	Sales, preferential treatment (e.g. SMEs)	Mandatory	Voluntary
Effects on success	Improved public services	Reducing market risk	Reducing market risk
Potential risks	Insufficient skills in public sector	Conflicting goals, length of process	Technology lock-in

Source: OECD (2010), "Demand-side Innovation Policies", DSTI/IND/ST(2010), OECD, Paris, unpublished.

Innovation policies have traditionally cared for the supply of technology, human and financial resources, often oriented towards R&D activities. However, there is also room for policies to stimulate the demand-side of innovation, i.e. the emergence or reinforcement of new markets with high innovative potential. Governments cannot substitute for private actors in creating commercially viable markets: their intervention can only be indirect, and take the form of creating stimuli and adequate framework conditions for increased demand for innovation. Instruments for a demand-oriented innovation policy can be classified into two categories: the first one intends to stimulate the demand for innovation in the public sector, while the second one targets the private demand for innovation (OECD, 2010b) (see Box 2.11).

The Basque Country has anticipated introducing public procurement into its policy mix. The volume of goods and services procured by the Basque administration in areas where technological change is rapid and its applications can substantially improve the delivery and quality of public services may be high. Given the region's responsibilities for providing health services, there are numerous opportunities in terms of procurement and innovation in public services (see Chapter 3) in basic health care, aging populations, or other areas, In practice, however, the development of innovation-related public procurement policies may raise some legal and/or regulatory issues at the levels of the Spanish State or the European Commission.

Box 2.11. **Demand side innovation policy instruments**

1. **Stimulating demand for innovation in the public sector through innovation-oriented public procurement.** Public procurement is a traditional area through which governments, at various levels, influence economic activity. Public procurement is becoming an important policy tool in national and regional innovation policies (Edler and Georghiou, 2007) as part of this demand-driven innovation approach. Following EU recommendations (Aho *et al.,* 2006), a wide array of OECD member countries and regions are increasingly using public procurement as an integral part of their policy mix to foster business R&D and innovation activities and promote industry/science collaboration. By placing – sometimes very large – public orders, public authorities can use their purchasing power to create new, or inflate existing, markets. Public procurement has traditionally covered infrastructure investments, e.g. where techniques and outputs are relatively standardised and competition is mainly price-based. But public procurement may become an instrument of innovation policy when it limits the specifications of the products and services to be supplied to functional elements, while leaving the freedom to private actors to develop the new products or services themselves. This creates an innovation drive in the private sector, since bidders compete not only on cost elements but also on quality, originality, and effectiveness. This sometimes requires companies to undertake new research or development activities, internally or in co-operation, and to enhance their innovative capacities to develop new products or services that are not yet on the market. The creation of such public markets transfers part of the risk linked to innovation on the public sector, which can act as an early user before a commercial market is established. Experience to date with innovative public procurement in OECD member countries is mixed: this possibility seems to be largely under-valued to date, and fragmentation across authorities often acts as a limiting factor to reap the full benefits from such an instrument. The imperfect openness of those public markets towards foreign competition is also a limit to its effectiveness.

2. **Stimulating innovation demand in the private sector.** Generic macroeconomic policies and those affecting framework conditions for economic activities (such as competition policy or regulations for establishing new companies), are of course very important for companies engaged in innovation in a given national context. Beyond these, however, many other government policies have the potential to influence the evolution of private demand towards more innovative products and services. By integrating the goal of promoting innovation in the design of these policies, they can become part of a demand-oriented policy mix for innovation. The establishment of rules,

Box 2.11. **Demand side innovation policy instruments** *(cont'd)*

regulations and standards is a wide area with an important role for governments. Technical specifications for products, certification procedures, and introduction of regulations for the introduction of new technologies, may all have a wide impact on innovation demand. New regulations for more environmentally friendly and energy-saving products and systems in the building industry, for example, have created important new markets and transformed consumer preferences. The controversial cases of health and environmental regulations applicable to the large industries such as chemicals and pharmaceuticals put in evidence the huge impact of these instruments on the economic and innovative activities of companies in these key sectors. In the case of regulations too, the fragmentation between policy areas and lack of co-ordination among relevant agencies and ministries, make it difficult to combine innovation promotion objectives with other considerations, such as health and safety, for instance. The establishment of standards may hamper or facilitate innovation. According to the timing chosen and the orientation, standards can lead to technology lock-in or, on the contrary, to new developments. Consumer policy is also an instrument that can help to enhance awareness and acceptability of innovation by end-users, as well as facilitating the interaction between customers and producers, thus improving the latter's information on current and future market potential. "Lead market" initiatives, such as the German High-Tech Strategy or the European Union Lead Market Initiative are efforts to support the creation of new markets through integrated demand-side policies. At the core of these initiatives lies the synergetic use of the above policy instruments (regulations, standards, public procurement). Current experience within OECD member countries with such private-market-oriented innovation policies acting on the demand side is still at the preliminary stage.

Source: OECD (2010), "Demand-side Innovation Policies", DSTI/IND/ST(2010), OECD, Paris, unpublished and additional citations as noted.

Conclusion

Continued public commitment by the Basque Country to invest in STI policy is a necessity for the region to compete. Such public commitment needs to have, ultimately, a leverage effect for greater private investment. The policy mix of different instruments to support STI policy needs to evolve over time, informed by regular feedback. There is no one model for a region's smart policy mix, it is region-specific and should address the current and projected future needs of the innovation system based on existing assets and global trends. Given the Basque Country's current

innovation system, strategy and instruments, several adjustments could be considered in the next STI Plan:

- **Science (basic) and technology/innovation funding (applied):** to support knowledge-driven innovation, the region must invest more in the science part of its portfolio. Evidence in OECD regions reveals a convergence of scientific fields, an increase in collaboration for scientific production (publications), and greater multi-disciplinarity in science. This science weakness for the Basque Country is recognised in public plans, but resources and accountability mechanisms have not yet caught up. Given the high cost of scientific research and the critical mass required for international competition, science research in areas that are relevant to the region's economic base should receive priority. Not all knowledge needs to be generated in the region, rather greater access to external knowledge that may be absorbed by the region is also vital. Effectiveness of public investment in science is also dependent on accompanying measures to build absorption capacity and institute accountability mechanisms and incentives, particularly to overcome certain regulatory and cultural barriers for Spanish universities.

- **Reinforcing non-technological innovation:** one of the region's strengths has been the development of many technological support instruments. Among non-technological innovation programmes, the region has made a longstanding successful effort to support excellence in management. There are initial actions in social innovation and creativity. Much more could be done to promote KIS, and the creation of value added through investment in design and creativity.

- **Designing new instruments that create demand:** as elsewhere, public policy tends to support the supply of instruments over building firm demand. Innovation-oriented public procurement is one tool. Other incentives such as regulations and standards (including consumer standards) may also support innovation if appropriately targeted. Such instruments are particularly helpful for innovation that supports social goals and public services (health, energy, education, etc.)

- **Continuing outreach to SMEs not innovating and growing:** given the firm demographics of the region, important challenges remain for helping non-innovating SMEs to innovate. This support may take both technological and non-technological forms. Several programmes already exist to stimulate demand among SMEs (development of innovation agendas, support to ICT, business management innovation, etc.) Greater efforts are needed to reach SMEs by all actors (network associations, clusters associations, local development agencies, technical colleges, technological centres, etc.).

Some additional characteristics of the current mix of traditional STI instruments may also be reviewed in the context of ongoing adjustments:

- **Direct and indirect support:** in the Basque Country, the current relative shares in 2007 were 52% tax incentives, 48% direct support. As a region and not a country, the number of tools that the public sector may use to support its firms is more limited. Nevertheless, as indirect support complements existing firm R&D projects, but does not help create more innovation-active firms per se, the relative proportions may not be tailored to the needs of the vast majority of Basque firms. This is particularly true given the overall relatively higher level of public support as a share of GDP in the region.

- **Targeting by actor:** resources of major innovation programmes through SPRI are dedicated approximately 50% to non-profit status members of the RVCTI with separate programmes for actors not in the network (generally firms without a separate R&D unit). The relevance of such a distinction based on tax status should be periodically reviewed.

- **Competitive and institutional funding of research:** a certain share of funding for technology centres and other research centres (CICs, BERCs) should be institutional support with performance targets. An insufficient share of institutional support can limit centre development.

- **Project and programme funding:** increasingly, OECD member countries and regions are promoting more long-term programme funding in addition to individual projects, including through consortia in public-private partnerships (PPPs). The Basque Country has begun such programming and could consider expanding.

Notes

1. Or, in the terminology adopted in the PCTI, how to combine actions devoted to "Support the present" with those for "Building the future".

2. Until the mid-1990s, the science policy represented 0.2% of the region's total budget while the technology policy accounted for 1% (Moso and Olazarán, 2002).

3. This private government-backed R&D structure was composed of five technology centres: MCC's Ikerlan, devoted at the time mostly to the machine tool sector; Labein, associated with the Engineering School of the University of the Basque Country (UPV); Inasmet belonging to the Foundry Firms' Association of Gipuzkoa; CEIT, a centre of the Engineering School of the private University of Navarre, located in San Sebastian), and Tekniker connected to the Polytechnic School of Armoury in Gipuzkoa (Moso and Olarzarán, 2002).

4. It is not clear whether there were any sound assessments of their efficiency during this rapid growth phase.

5. Theoretically, the Department could also fund (basic) research activities in the private sector but this option was never pursued: first because of the limited means of the Department; and second because of the "silo" behaviour of ministerial departments generally, responding to different constituencies and headed by members of different political parties.

6. In the Technological Strategy Plan 1990-1992, the three priority areas (new materials, production technology and information technology), were largely selected given their crucial role for innovation in the metal transformation sector.

7. It is to be noted that the CVT was instituted in 1993, three years after UETI. Chaired by the President of the Basque Country, the Council included the Ministers of Industry and Finance and the presidents of the three provincial governments. Its role remained purely formal.

8. Initial clusters set up in 1992 included firms from the automotive and household appliances industries. The machine tool, environment and telecommunications, followed by the aerospace industries, constituted cluster groups at a later stage (1996-1997).

9. These programmes related more particularly to the funding of S&T infrastructure, of projects focusing on supply/demand linkages in areas considered as strategic by enterprises and clusters and of generic R&D programmes in priority S&T areas.

10. The scope of membership in the RTV was broadened in 2005 and its name was changed to the Basque Science, Technology and Innovation Network (RVCTI).

11. As non-profit institutions, members of the RVCTI could benefit from more generous subsidy rates than profit-making firms according to EU rules regulating the granting of support to R&D activities.

12. It has been argued that this interface was biased by the overwhelming weight of the technology centre and industrial interests in the network and its representative association SARATEK, as discussed in Olazarán and Otero (2007).

13. These eight centres were grouped in the EITE Association, which in 1997 became a key member of the Basque Science, Technology and Innovation Network (RCTVI).

14. In January 1997, the cluster agreements were signed with the seven established cluster-associations. The Basque government directed EUR 3.61 million to this agreement. Every cluster-association received about EUR 500 000 for a period of three years to implement their action plans presented to the government and foster co-operation action among their members, notably in the technology area. During these three years, the Department of Industry did not establish monitoring mechanisms to follow-up the implementation of the action plans (Ahedo, 2004). For a recent evaluation of the Basque cluster policy, see Aragon *et al.* (2009).

15. Contrary to the previous plan, whose budget stagnated at around EUR 64 million per year over the period 1997-2000.

16. Two CICs were created during the PCTI 2001-2004: BioGune in life sciences and MarGune in the area of new production processes.

17. In general belonging to the RVCTI.

18. From the Basque government, the Spanish State and the EU.

19. Only one BERC was formally created during the PCTI 2001-2004: the Donostia International Physics Centre which grew out of a UPV Research Centre.

20. Including the granting of support to postgraduate studies abroad and the attraction of foreign talent in Basque research and technological centres.

21. Projects of the "University-Enterprises" Programme, created in the 1990s to foster collaborative research and or contractual research, were jointly funded and managed until 2000 by the Ministries of Industry and of Education. In 2001, the Ministry of Industry, whose share in funding this programme was 90%, withdrew its support and decided to fund similar projects of its own through its Saiotek and Innotek support programmes. This reflects a co-ordination failure that can be related to the prevailing balance of power in the governance structure.

22. Over the plan period, the TCs' share of basic and applied research in total R&D expenditures increased from 36.5% to 54.5% with a symmetric decrease of the share of technological development (Eustat, 2005; Olazarán and Otero, 2007).

23. Unfortunately, there does not seem to be information available which allows a match of funding by type of action and by type of support programme.

24. The Department of Education's annual allocation remained stable at around EUR 15 million, while that of the Ministry of Industry grew from EUR 57.24 million in 2001 to EUR 91.1 million in 2004.

25. Per EUSTAT, the share of public funding of TCs, which was close to 50% in 2000, actually decreased over the period to around 35% by 2005.

26. Along with the Business Competitiveness and Social Innovation Plan 2006-2009, the PCTI is considered an essential driver of the "Second Economic Transformation" that underlies the development and competitiveness strategy pursued by the government. This strategy, which refers explicitly to the 2005 Lisbon Agenda, is based on three pillars: knowledge creation and diffusion as the core of the growth and social development paradigm, performance of the S&T and innovation system predicated upon the efficient interaction among its agents, and total quality in the productive sector.

27. See for instance OECD (2002 and 2005b) and the European Union RIS/RITTS project.

28. In developing its lines of action, the PCTI has also benefitted from an extensive review of best policy practices developed in other regions or countries, mainly but not only, from the OECD area. OECD S&T policy documents detailing such practices are referred to in government acts establishing new programmes or modifying existing ones (e.g. ETORGAI programme in BOPV, 26 August 2008).

29. This line is often referred to as "support the present through innovation."

30. See Table 2.3 for the main characteristics of these support programmes.

31. Priorities include high performance manufacturing processes, energy, new materials, food safety, ICTs, tourism commerce, and language industries.

32. The first three CICs were created in 2002: bioGune in the biosciences area, energiGune in alternative energies and marGune in advanced production technologies. They were followed by microGune (2004) and nanoGune (2006) in micro/nanosciences, and biomaGune (2006) in biomaterials. It is to be noted that there is no CIC dedicated to intelligent transport, whereas tourGune, a CIC in the area of tourism, was created in 2007.

33. This distinction can sometimes be fuzzy as being in a priority area may be an implicit criterion in the selection of projects in non-targeted support programmes.

34. In 2005, the proportion of Ph.D. students was 4.8% of student enrolment in the Basque higher education sector as compared with 11.7% in the Madrid Autonomous University and 9.11% in the University of Barcelona.

35. The Ministry of Industry has also introduced a programme to support the development of human resources in S&T through the granting of fellowships to scientists working in or under contract with technology-based SMEs (IKERTU Programme).

36. To attract foreign scientists, Ikerbasque recently sponsored an article in the review *Nature* highlighting the research opportunities in the Basque Country and the benefits offered to scientists willing to conduct their research activities in Basque research institutions (Ikerbasque, 2008).

37. This system is in part designed to comply with EU regulations depending on whether beneficiaries have non-profit status or not.

38. See PCTI 2010, Chapter 8.

39. This weak record is substantiated in Olazarán and Otero (2007).

40. These studies are conducted by Orkestra, the Basque Institute of Competitiveness, which has several leading international cluster experts on its Board such as Michael Porter.

41. The analysis explored the impact of different variables on labour productivity growth, notably dichotomous dummy variables for: *i)* effort in technology management (firm has ISO9K quality certification); *ii)* effort in environmental management (firm has ISO14K quality certification); and *iii)* effort in R&D activities (if firm performs them). The sample is based on 1 779 industrial firms.

42. For more on special methodological issues involved in cluster policy evaluations, see Aragon *et al.* (2009).

43. Average scores of relevance of actors as partners or allies from 1 to 4 (4 being the highest) were: enterprises (3.4), Basque regional government (3.4), institutions linked to technological innovation (2.8), academic or training institutions (2.4), provincial councils (2.2), external local consultants (2.2), international institutions (1.9), county development agencies (1.9), Spanish government (1.6), city and town councils (1.5), and international external consultants (1.4).

44. Such as is the case with the creation of CERCA in Catalonia (OECD, 2010d).

45. It is to be noted that the UPV is excluded from several of these programmes as it gets part of its financing through separate budgetary lines on the Ministry of Education, Universities and Research.

46. See in particular Navarro (2009), Bilbao-Osorio (2009), European Commission (2006), Olazarán *et al.* (2004).

47. Using data provided by EUSTAT and in Navarro (2009).

48. More than 20 OECD member countries provide fiscal incentives to support business R&D (OECD, 2010d)

49. Because tax incentives are taken against earnings, they may be more likely to favour R&D projects that will generate greater profits in the near-term (incremental) rather than longer-term exploratory projects and investments in research infrastructure. In addition, weaker spillover benefits to other firms and industries can be expected from tax incentives in comparison to R&D directly financed by governments (OECD, 2003b).

50. The level of "generosity" is calculated as the amount of tax relief associated to one unit of expenditures on R&D (OECD, 2007c). Among those in place in OECD member countries, Spain's tax incentive system is one of the most generous. Given the similarity of the regimes of corporate tax in Spain and the Basque Country, it is very likely that the generosity of the Basque system is also high by international standards.

51. Per OECD questionnaire, Alava reports that the approval process is automatic.

52. That was the case of Mexico until the tax credit was suppressed in 2009.

53. Estimated through foregone tax revenues. See OECD (2007c).

54. This is mainly the case for SMEs, and less so for large enterprises.

55. Although the generosity of the fiscal incentive scheme the Basque Country is comparable to that of Spain, the share of fiscal incentives in total support is much lower in Spain. This is probably to more stringent eligibility criteria in Spain to qualify for such incentives.

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Annex 2.A1

Table 2.A1.1. **Evolution of shares of budget devoted to science and technology policy (1989-2004)**

(EUR million)

	1989	1995	1997	2000	2004
Total Basque government budget (ESP million)	2 282.98	3 979.82	4 266.37	5 173.65	6 659.08
Scientific policy budget (Department of Education)	4.89	7.93	8.92	11.30	12.22
Technological policy budget (Department of Industry)	27.58	26.53	36.95	42.09	70.55
Share of science policy in Basque government budget (%)	0.2	0.2	0.2	0.2	0.2
Share of technology policy in Basque government budget (%)	1.2	0.7	0.9	0.8	1.1
Share of science policy in Department of Education budget (%)	0.8	0.8	0.8	0.8	0.7
Share of technology policy in Department of Industry budget (%)	18.7	11.8	13.2	19.5	25.7

Source: Basque government budgetary table, as appears in Olazarán, M., C. Lavía and B. Otero (2004) "¿ Hacia una segunda transición en la ciencia ? Política científica y grupos de investigación", *Revista Española de Sociología*, No 4, pp. 143-172..

Table 2.A1.2. **Government financing of R&D expenditures by category of agents**

	2007				2000			
	Total	HE sector	RVCTI (except HE)[1]	Firms[2] (except RVCTI)[3]	Total	HE sector	RVCTI (except HE)	Firms[2] (except RVCTI)[3]
Government financing (EUR million)	409.5	129.1	170.5	109.9	162.7	75.9	38.9	47.9
Government financing (%)	100.0	31.5	41.8	26.8	100.0	46.7	23.9	29.4
Share of government financing in R&D expenditures	37.6	77.8	40.8	21.7	27.4	74.9	25.5	14.1

Notes: 1. HE= Higher Education. 2. Available EUSTAT data do not provide separate data for firm R&D units. 3. RVCTI=Basque Network for Science, Technology and Innovation.

Source: Navarro, M. (2009), Sistemas de Innovation, Orkestra: Basque Institute of Competitiveness, Deusto Foundation, Donostia/San Sebastian, Spain, December (unpublished) based on EUSTAT data.

Table 2.A1.3. **R&D expenditures and personnel by performing institutions**

	R&D expenditures				R&D personnel					
	2007		2000		2007			2000		
	Volume (K EUR)	%	Volume (K EUR)	%	Number (FTE)	%	R&D exp. per R&D personnel (K EUR)	Number (FTE)	%	R&D exp. per R&D personnel (K EUR)
Higher education sector (HE)	165 962	15.22	101 406	17.04	2 947	20.42	56.32	2 158	23.74	46.99
RVCTI (except HE)	417 966	38.34	152 902	25.69	4 791	33.19	87.24	2 134	23.47	71.65
Public research centres	46 890	4.30	17 518	2.94	525	3.64	89.31	132	1.45	132.71
Excellence research centres (CICs and BERCs) (1)	48 445	4.44	0	0.00	215	1.49	225.33	0	0.00	–
Technology centres (2)	156 310	14.34	81 024	13.61	2 102	14.56	74.36	1 235	13.58	65.61
R&D services (3)	71 222	6.53	31 406	5.28	918	6.36	77.58	377	4.15	83.31
Enterprises R&D units (4)	95 099	8.72	22 954	3.86	1 031	7.14	92.24	390	4.29	58.86
Other enterprises (5)	506 337	46.44	339 806	57.10	6 687	46.32	75.72	4 800	52.80	70.79
Total business sector[1] (1)+(2)+(3)+(4)+(5)	877 413	80.48	475 190	79.85	10 953	75.88	545.23	6 802	74.80	278.56
Total firms[2] (3)+(4)+(5)	672 658	61.70	394 166	66.23	8 636	59.83	245.54	5 567	61.24	212.95

Notes: 1. Business sector included in the RVCTI; it was not possible to exclude BERCs from this total. 2. Firms in the productive sector.

Source: Own compilation based on Navarro, M. (2009), *Sistemas de Innovation*, Orkestra: Basque Institute of Competitiveness, Deusto Foundation, Donostia/San Sebastian, Spain, December and EUSTAT.

Box 2.A1.1. **Israel's MAGNET Programme**

The objective of the MAGNET Programme,[1] launched in 1994 and managed by the Office of the Chief Scientist of the Israeli Ministry of Industry, Trade and Employment, is to strengthen industrial firm capacity to draw from a vast and varied research and technological pool, giving them the capability to develop innovative, high value-added products with important export potential. It has contributed significantly to the creation and initial growth of new technology-based firms, a process which has been particularly dynamic in Israel.[2]

The programme provides financial support to "pre-competitive" R&D projects developed jointly by enterprises and academic research institutes organised in the framework of a consortium specifically dedicated to the project and governed by "collaborative agreements" among parties. The intellectual property rights derived from technologies developed by a consortium belong to the members that developed it; however, other members receive a licence at no charge to use the technology to further develop their own products.

Eligibility, management and selection criteria

- Every Israeli industrial entity can apply; consortia must be formed as legal entities with a non-profit status. There is no limit on the number of companies participating in the consortium. There is no sectoral criterion.
- Projects presented by consortia are selected by the MAGNET Committee headed by the Chief Scientist of the Ministry of Industry, Trade and Employment. The majority of members are external to his/her office.
- Projects are selected on the basis of: *i)* expected innovation output; *ii)* expected returns (benchmark is USD 10 in expected sales for USD 1 of R&D investment); *iii)* potential exports; and *iv)* academic contribution and partnership contributions. The MAGNET Committee checks if the consortium has the financial and human resources to carry out its proposed project.
- Outcomes are evaluated on a yearly basis with an impact on the following year's financing; a more in-depth evaluation is undertaken after three years. A comprehensive evaluation of the programme is carried out approximately every seven years.

Funding

- The annual budget of the MAGNET Programme is around USD 60 million to be disbursed as grants to the selected consortia (about 20% of total direct support to industrial R&D in Israel).

Box 2.A1.1. **Israel's MAGNET Programme** *(cont'd)*

- Project expenses eligible for financing by the MAGNET Programme are: salaries to the direct employees of the consortium plus overhead; research equipment and materials; patent- and licence-related costs.
- MAGNET grants to enterprises can amount to 66% of the approved budget. The consortium adds the rest, with the breakdown determined by the members of the consortium.

Notes: 1. MAGNET is the Hebrew acronym for "Generic Pre-competitive Technologies and R&D". 2. Most of the approved consortia are in the areas of ICT, mechatronics, pharmaceuticals and health and biotechnology.

Box 2.A1.2. **Public-private partnerships for research and innovation**

An important conclusion of recent OECD work on the role of government in fostering knowledge-based growth is that greater use of public-private partnerships (PPPs) can enhance the contribution of science, technology and innovation policy to economic performance. PPPs for research and innovation offer a framework for the public and private sectors to join forces in areas in which they have complementary interests but cannot act as efficiently alone (risk-sharing and mutual leveraging effects). They can fill some gaps in innovation systems more effectively than other policy instruments.

PPPs are unique tools to promote collaborative research in areas where innovation is deeply rooted in science:

- Major programmes to promote strategic R&D co-operation among universities, public research institutes and private firms have been launched or reinforced in many OECD member countries since the late 1990s, following the pioneering examples of the Australian CRC and Swedish Competence Centre programmes (e.g. Kplus and Kind/Knet in Austria, the Innovation Consortiums in Denmark, the National Technological Research and Innovation Networks in France, the Technology Leading Institutes in the Netherlands, the AERIs programme in Mexico and the CENIT Programme in Spain).
- PPP is the best approach to building innovative networks in new multi-disciplinary research fields, either as stand-alone initiatives (e.g. Genomics in the Netherlands) or as part of broader PPP programmes (e.g. nanotechnology, Gehomme and Genoplante networks in France, and the Kplus Centre on bio-molecular therapeutics in Austria).

Box 2.A1.2. **Public/private partnerships for research and innovation** *(cont'd)*

In addition to providing effective springboards for frontier and pre-competitive R&D in areas of strategic importance, PPPs can contribute to other objectives and yield broad benefits:

- **Input, output and behavioural additionality.** Cost-sharing arrangements and industry leadership within PPPs (as in the case of Spain's CENIT Programme) translate into high leverage of public support on business R&D and innovation. PPPs have also a lasting effect on the behaviour of public and private researchers, by contributing to build trust and personal networks that facilitate further formal and informal co-operation.
- **New avenues for commercial spillovers from public research.** PPPs provide participating firms with easier access to public research outputs and facilitate the creation of new technology-based firms, especially spin-offs from public research, as well as the mobility of human resources between the public and private sectors (e.g. Israel's MAGNET Programme).
- **Linking SMEs with scientific research.** Most innovative SMEs find it difficult to establish direct contacts with universities and public labs. PPPs can play the role of effective bridging institutions (e.g. ProInno in Germany).
- **Increased synergies within and between regional innovation systems** (e.g. Korea's Regional Innovation Centre Programme). National PPP programmes can enhance co-operation between local innovative clusters in order to ensure critical mass and better exploit complementarities.

Whereas PPPs can potentially achieve what other policy instruments cannot, handling them is a delicate matter since the partners must engage in sustained co-operation with partners from different managerial cultures and partly conflicting goals. OECD work points to the following critical factors for success:

- Long-term commitment from both government and industry, based on a shared vision.
- Critical mass but also depth of the national and regional innovation systems. PPPs should not create "high-technology islands" but be embedded in local and regional innovative clusters, and benefit innovative SMEs as well as large firms. Programmes to promote large PPPs can be complemented by measures to support smaller PPP research teams (e.g. Austria's CDL Programme, Australia's ARC Linkage Grants and Fellowships Programme).

Box 2.A1.2. **Public/private partnerships for research and innovation** *(cont'd)*

- Building on existing networks without neglecting areas where potential actors are still dispersed (e.g. multi-disciplinary research) and/or inexperienced in accessing government support.
- Efficient steering mechanisms that ensure a sustainable balance between public and private interests, especially: *i)* competitive selection of projects and participants; *ii)* optimal financing; *iii)* efficient organisation and management; and *iv)* rigorous evaluation.

Source: OECD (2004).

Box 2.A1.3. **Basque Country fiscal incentives for R&D and innovation**

In the Basque Country, the granting of the tax incentive is not automatic. There is an *ex post* checking on the R&D nature of the expenditures against which corporate tax is credited, but submitted to a previous administrative assessment for possible approval. The assessment procedure used to be carried out at provincial level but in 2008 an agreement was established between the provincial governments and the Basque administration to centralise the eligibility assessment procedure and draw on SPRI expertise to entrust this agency with the oversight of the assessment on behalf of the provincial administrations. Characteristics of the tax credit include:

A. Government bodies granting the incentive: Basque provincial governments

B. Type of fiscal incentive: Tax credit (no ceiling); volume and increment

C. Eligibility

- All firms undertaking projects, individually or in co-operation, involving R&D and innovation activities (including non-technological innovation for the Gipuzkoa province); fiscal incentives are not exclusive from other R&D and innovation support programmes of the Basque government.
- Three types of eligible projects: *i)* development of new products; *ii)* technological innovation for major improvement of production process or products; and *iii)* creation and development of new S&T-based enterprises.[1]

D. Management of tax incentive

- Discretionary selection of beneficiary projects based on evaluation criteria.[2]

Box 2.A1.3. **Basque Country fiscal incentives for R&D and innovation** *(cont'd)*

- *Ex ante* evaluation organised under the aegis of SPRI (agreement with the provincial governments); *ex post* assessment by provincial governments.

E. Tax credit rates

1. Tax credit for expenditures in R&D activities and advanced software (all three provinces)
   - 30% of expenditures incurred in the year plus 50% of increment over the average of the two preceding years.
   - Additional 20% for the part of the project budget contracted with universities, public research institutions, technological and innovation centres and other RVCTI institutions.
2. 10% in fixed capital investment devoted to R&D activities (except buildings and land). Tax credit for technological innovation activities (all three provinces)
   - 15% of expenditures devoted to technological diagnosis, industrial designs, process engineering and acquisition of advanced technologies (20% in Gipuzkoa).
   - Additional 20% for the part of the project budget contracted with universities, public research institutions, technological and innovation centres and other RVCTI institutions, as well as for expenditures incurred for the certification of quality standards.
3. Tax credit for technological and non-technological innovation activities (Gipuzkoa province)
   - **Technological innovation:** 20% of expenditures incurred in the year plus 40% of increment over the average of the two preceding years; 10% for IT investment expenditures.
   - **Non-technological innovation:** 15% of expenditures incurred in the year plus 35% of increment over the average of the two preceding years.

Notes: 1. This is the only category of firms for which R&D activities not directly linked to an economic outcome can benefit from the fiscal incentive. 2. In the selection criteria a premium is given to projects oriented towards an economic outcome.

Source: Larrea, S. (2010), "Fiscalidad como instrumento de apoyo a la I+D empresarial", mimeo, SPRI.

Table 2.A1.4. **Data for the calculation of direct and indirect public support to firm R&D**

Province	Value of R&D&I tax incentives		Sector of R&D performance	R&D financed by public administration	R&D expenditure (all sources)
	2007	2008		2007	2007
Biscay	75 906	152 010	Rest of R&D service firms	22 851	71 222
Gipuzkoa	54 678	51 517	Firm R&D units	17 278	95 099
Alava	28 900	26 500	Other firms non-RCVTI members	109 859	506 337
Total	159 486	230 029	Total firms	149 988	672 658
			Technology centres (TCs)	56 245	156.31
			Total firms +TCs	206 233	828 968

Source: Tax incentive data from Basque provincial governments per OECD survey. R&D data from EUSTAT as found in Navarro, M. (2010), *Retos para el País Vasco, tras tres décadas de desarrollo del sistema y de las políticas de innovacion*, unpublished paper.

Chapter 3

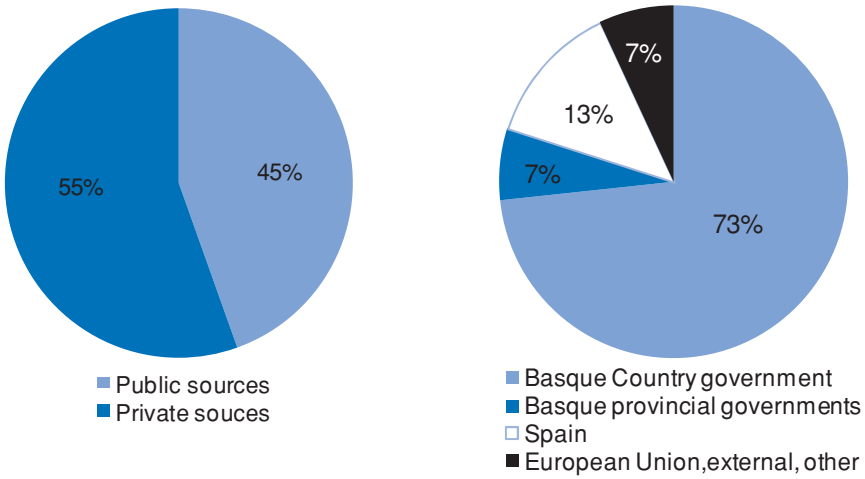
Multi-level governance of Basque Country STI policy

This chapter first highlights the special position of the Basque Country within Spain with respect to its fiscal regime and STI competences. It then analyses the policy influence and level of resource flows from higher levels of government, notably Spain and the European Union. It reviews the horizontal governance arrangements within the Basque Country government among the different public and private stakeholders that are (or should be) responsible for setting the STI strategy and policy agenda as well as implementing a whole-of-government approach to innovation. The role of sub-regional entities, including the three provinces and local development agencies, is discussed as they are active in some instruments related to STI policy. Finally, the importance of filling gaps in monitoring and evaluation is raised.

Introduction

The Basque Country is embedded in multiple levels of government with respect to science, technology and innovation (STI) policy. Within Spanish and EU frameworks, the region has a distinct STI policy. The three provincial governments comprising the region also support innovation system actors with their own resources. For example, in the PCTI 2010, out of the approximately EUR 6.6 billion projected in the plan over the five-year period, the public sector share was 45%. Basque Country government accounts for 73% of those public resources and 7% is from the Basque province budgets (see Figure 3.1). Out of the 20% of public resources flowing from outside the region, 13% are from Spain, 7% EU and other external sources). Projections in the 2015 STI Plan are for a similar split across different public funders but the levels will ultimately depend on the ability to successfully bid for competitive resources from Spain as well as other future political decisions and agreements.

Figure 3.1. **Financing of Basque Country STI Plan 2010**



Note: The EUR 40 million Innovation Fund, co-financed 85% by the Basque government and 15% by the Basque provinces, was allocated as such.

Source: PCTI 2010, Basque Country.

Spain country context

Decentralised fiscal responsibilities and STI competences

The Basque Country has a special fiscal status within Spain. The Basque Country and its provinces (historical territories) are recognised in the Spanish Constitution of 1978: "the Constitution protects and respects the historic rights of the territories with '*fueros*'". An Economic Agreement between the State and the "foral territories" (the three provinces) is anticipated by the Spanish Constitution as well as the Basque Country Statute of Autonomy, and was first codified by Decree in 1981. The current Agreement stipulates that the Basque Country must transfer to the Spanish State funds to compensate for spending related to competences that have not been transferred to Basque institutions. The share of that related State spending is currently set at 6.24% (roughly the weight of the Basque Country in the Spanish economy). Internal to the Basque Country is a separate agreement that clarifies the shares transferred from the provinces (which are responsible for tax collection) to the Basque Country government.

How does this status affect levels of public spending in general? Spain is one of the OECD member countries with a relatively greater fiscal role for sub-national authorities, as they were responsible for over a third of public revenues and almost half of public expenditures in 2009. As a share of the region's GDP, spending by the Basque Country government is just below the regional average for Spain. But this low share is due in part to a high GDP per capita. When considering public spending per capita, the Basque Country (over EUR 3 200 in 2003) is second only to Navarre (almost EUR 5 000), the other foral regime. Navarre has an unusually high rate of regional public spending, double that of Madrid or Catalonia (see Table 3.1).

In the case of most OECD member countries, counter-cyclical budgetary or tax measures are more difficult to implement at regional levels, often because regional fiscal and budgetary prerogatives are limited. The Basque Country, more so than other Spanish regions (autonomous communities), has greater control over its direct spending. The amounts reported by the region's Department of Finance indicate continued increases in STI-related spending despite the crisis.[1] The region has also committed to use at least part of the additional funds associated with the recent transfer from the State of R&D competences for its Innovation Fund, as opposed to a reallocation to other policy areas. With the financial and economic crisis, Spain has taken a number of measures that of course impact the Basque Country's budget and the funding accessed by its regional innovation system actors.

Within Spain, the Basque Country has a relatively higher share of its budget dedicated to STI, as well as higher regional per capita STI spending. Navarre shows exceptionally high regional STI spending of approximately EUR 205 per person, relative to the Basque Country at EUR 117 in 2007. Using figures from the Basque Country STI Plan, non-comparable, that figure was EUR 211. However, that regional spending is more than three times the per capita spending of Catalonia and almost five times that of Madrid (see Table 3.1).[2] Note that such calculations exclude spending by other levels of government in the region, such as Spanish funding to its network of research centres (CSIC) and the more research intensive universities in Catalonia and Madrid. The share of the regional budget dedicated to STI is therefore a decision related to regional budgetary priorities as well as net flows from other levels of government. The Basque Country has shown consistently high levels of commitment relative to other Spanish regions. That budget share more than doubled from 1.10% in 2002 to 2.85% in 2007 (peak at 3.11% in 2006). This is a high ratio, surpassed only by Navarre that jumped from 1.90% (2006) to 3.14% (2007) of the region's budget. The next closest region is Castile and Leon at 2.34%.

With respect to STI competences specifically, the Basque Country also holds a special status within Spain. 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." The Statute of Autonomy of the Basque Country states in Article 10.16 that it has exclusive competence for "scientific and technological research in co-ordination with the State." There have been debates in Spain about the role-sharing between regions and the State, culminating in a suit filed by Catalonia and a 1992 Constitutional Court ruling that it would not decentralise R&D funds generally. However, there has been explicit devolution to Spanish regions for selected areas of research funding, including university funding, the public health system and its associated research, and agricultural research.[3]

The Basque Country has recently been granted the State's functions in research generally, a regional first in Spain. The January 2009 Royal Decree recognises a transfer of State functions to the Basque Country in areas of scientific and technological research and development as well as innovation.[4] The transfer of competency must be exercised in co-ordination with the Spanish government. This transference means that the Basque Country will not pay for these services to the central government. A portion of the current 6.24% Basque share of Spain's expenses for non-devolved responsibilities that is transferred to the state will therefore be withheld (over EUR 80 million annually) from the quota paid by the Basque Country.

Basque Country actors will nevertheless remain eligible to compete for funds of many Spanish STI programmes.

Table 3.1. **Regional government public spending: overall and STI-related**

	Basque Country	Navarre	Catalonia	Madrid
Regional public spending as share of regional GDP (%) 2003	14.0%	21.0%	11.5%	9.5%
Regional public spending per capita 2003 (EUR)	3 200	4 900	2 500	2 300
Regional RDI spending as a share of regional budget 2007	2.85%	3.14%	0.93%	0.83%
Regional spending on RDI 2007 (million EUR)	249.35	122.38	253.18	150.26
Regional population	2 124 235	596 236	7 085 308	6 052 583
Regional RDI spending per capita 2007 (EUR per capita)	117	205	36	25
Regional spending per PCTI 2007 (million EUR)	447.76			
Regional spending per capita PCTI 2007	211			

Notes: 2007 RDI figures exclude spending by the Spanish government directly to actors located in these regions. For Madrid and Catalonia, this is particularly important given the presence of many CSIC centres (Spanish network of research centres) located in those regions. Navarre's RDI spending more than doubled between 2006 and 2007. The regional spending in PCTI 2007 includes spending by the Basque Country government (excluding provincial councils) and the EUR 40 million Innovation Fund. The amounts reported by the Spanish government are notably lower than those included in the Basque Country PCTI calculations. The region was not able to provide information to reconcile such notable differences.

Source: Regional public spending figures from Gil-Ruiz Gil-Esparza, C.L. and J. Iglesias Quintana (2007), based on data from INE, IGAE; regional RDI spending figures from FECYT (2009), Tables 1.4.1. and 1.4.2. based on data from the Ministry of Economy and Finance (Spain). PCTI figures from Basque Country PCTI 2006-2010.

Spanish programmes and impact on Basque Country actors

STI policy at Spanish level was historically less relevant than the same policy at the level of the Basque Country and some other regions. Spanish policy had focused on issues related to public researchers and the Spanish system of public research centres (CSIC). The presence of the CSIC in the Basque Country today is limited to two joint centres with the University of the Basque Country.[5] The region has been a forerunner in technology-related policies, for example being among the most advanced group of Spanish regions in promoting technology parks. But as Spanish policy has evolved, the Basque Country has been highly successful at competing for Spanish STI funds, notably in areas of technology and innovation.

Spain's recent STI policies have included considerable increases in public investment to address the science and technology gap with leading OECD member countries. The National Reform Plan seeks to improve Spain's competitiveness overall, and within this plan is INGENIO 2010. The initiative's target was 2% R&D intensity (as a share of GDP) by 2010. Instruments in the policy packages are accessible to Basque Country actors, including the promotion of public-private partnerships (CENIT) for innovation, venture funds, and programmes to increase research capacity (CONSOLIDER and CIBER). The funds coming from Spanish government tend to be more focused on long-term and large projects, as well as for more experimental or higher risk research. Regional governments are encouraged to collaborate in the start-up of the programmes as well as to co-finance the subsequent activity in their regions (OECD/FECYT, 2007). For analysis and comparison of State investment in the Basque Country, as well as that of the region itself, there are two important considerations. The first is the particular fiscal status of the Basque Country. The second, starting in 2009, is the transfer of RDI competences which involves the deduction of over EUR 80 million from the quota paid to the Spanish government.

The National Plan for Scientific Research, Development and Technological Innovation is, per the 1986 Science Law, the main programming instrument for STI policy. It is therefore complemented by the efforts in the National Reform Plan and INGENIO 2010. The latest (sixth) National RDI Plan was approved in the context of the third Conference of Presidents, which is chaired by the Prime Minister and includes the leaders of each regional government. It aims to provide a general framework of principles and broadly shared objectives for future national and regional STI plans. The objectives represent several long-term shifts in Spain's STI policy (see Box 3.1).

A new Science Law that would supersede the 1986 Law is expected to enter into force by 2011. One of the key objectives of this new Science Law is to create the framework and instruments that are required for a more efficient co-ordination and alignment of STI policies among regions and between the regions and the State. In addition, and among other aspects, the new law will address issues related to the mobility of researchers between public research organisations, institutions with a private legal status and industry, as well as implement a series of instruments to tackle the need for greater technology transfer from Spain's scientific research.

Box 3.1. National Plan for Scientific Research, Development and Technological Innovation (2008-2011)

The plan 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 qualifications.
- **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 (1) international 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 EU-15 average in the percentage of GDP devoted to ICT.

Box 3.1. **National Plan for Scientific Research, Development and Technological Innovation (2008-2011)** *(cont'd)*

The objectives of the latest plan represent some changes in the STI policy trends within Spain, including:

- 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 subsequently a re-emergence of subsidies;
- an increasing role of 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;
- growing attention to the varied and changing needs and requirements of business sector R&D and innovation, inducing a diversification of policy instruments; and
- an increasing emphasis on policies to foster human resources, including at the post-doctoral level.

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

The Basque Country has successfully competed for Spanish National Plan Funds, generally exceeding its share of Spanish GDP in the different plan areas (see Table 3.2). The average Plan spending for Spain was EUR 80 per capita in 2007. For the Basque Country, that figure was EUR 185, higher than in the capital region Madrid (EUR 155) or Catalonia (EUR 113). Between 2004 and 2007, the Basque Country's share of resources was relatively stable or grew in the different categories financed by Spain's National Plan. The area where the Basque Country consistently performs well, Competitiveness Support, is for programmes that involve firms. The area where the region obtains a relatively lower share of funds is in human resources development programmes. For the programme EuroIngenio (to support Spain's ability to compete for EU Framework Programme Funds), the Basque Country has shown tremendous performance, accounting for almost 66% of all the funds in 2008 and more than six times the share of the next region (Catalonia).[6]

Table 3.2. **Regional use of Spanish National Plan funds by category**

In percent (unless otherwise noted)

Share of Spanish total	RDI projects		Complementary actions		Human resources development		Competitiveness support		S&T equipment & infrastructure		Total 2007 EUR per capita
	2004	2007	2004	2007	2004	2007	2004	2007	2004	2007	2007
Basque Country	9.2	10.7	8.4	8.5	2.7	2.3	14.3	13.3	5.5	15.1	185
Catalonia	28.1	22.8	14.2	18.4	19.5	18.9	29.2	24.1	14.7	21.1	113
Madrid	26.2	33.6	45.9	35.1	24.9	30.8	7.5	15.8	10.4	11.2	155
Total 3 regions	63.5	67.1	68.5	62.0	47.1	52.0	51	53.2	30.6	47.4	140

Note: These figures include both grants and loans.

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

Under INGENIO 2010, the Torres Quevedo Programme is designed to increase the mobility of skilled R&D personnel to firms. The Basque Country, like other regions in Spain, faces both a cultural bias and lack of firm demand for skilled R&D staff. This programme provides financial incentives, mainly for SMEs, to incorporate such staff to conduct technical feasibility or R&D projects. It helps to create demand by SMEs as well as promote knowledge transfer from the public to private sector. The programme objective was to create more than 1 000 R&D-related jobs for new PhDs by 2010. These incentives could be further utilised in the Basque Country.

First endorsed in 2009 and implemented in 2010, the new E2I Spanish Innovation Strategy (*Estrategia Estatal de Innovación*) is a cross-ministerial strategy to improve the innovation performance of Spain. The efforts are co-ordinated around five action areas to create the "pentagon of innovation." They include: finance, markets, internationalisation, people and territorial co-operation. These same areas of action were recognised at EU level during Spain's Presidency of the EU in the first half of 2010.[7] The strategy fixes quantitative targets for Spain for 2015: 500 000 new jobs in medium and high-technology sectors, 40 000 additional innovation active companies, and an additional EUR 6 billion in private innovation investment. Other strategy goals include a higher return on European programmes and a substantial improvement in the technology balance of payments. A number of new programmes with funding by competitive calls will also be available as part of this programme.

Multi-level governance co-ordination mechanisms

The Basque Country is more autonomous than other Spanish regions with respect to STI policy. But shared policy spaces and dialogue promote more effective action towards shared STI goals. The Basque Country is increasingly engaged in policy dialogue with the Spanish government's Ministry of Science and Innovation. There are both formal inter-governmental bodies as well as multi-level governance contracting tools for STI policy between Spain and its regions.

Formal bodies

There are several inter-governmental State-region co-ordination bodies in Spain, some for general matters and others for STI specifically. The Conference of Presidents, created in 2004, gathers together leaders of Spain's regions and the Spanish Prime Minister. The meetings (one every year or two) cover a wide range of topics but have special themes. STI was a theme in 2007 when the Conference approved the latest National RDI Plan. The Basque Country-State Bilateral Commission is the official governance body managing overall relations between the Spanish State and the Basque Country. The last decision for Spain in 2009 to improve the transfer of R&D competences to the region was decided in this body prior to ratification by royal decree.

The main consultation body in STI policy for Spain and its regions is the General Council for Science and Technology. Created by the 1986 Science Law (13/1986), this Council serves as the consultation body within the inter-ministerial Commission for Science and Technology (CICYT). It is charged with promoting the co-ordination of science and technology policy among regions and between the regions and the State (see Table 3.3). The Council members include representatives of several Spanish ministries as well as each region. In 2006, the Council created a working group to further develop some themes. In practice, the General Council for Science and Technology is not considered as the most effective vehicle for multi-level governance dialogue (OECD, 2010a). This is not surprising. According to an OECD Survey, it is common for OECD member countries to rate tools that promote greater on-going dialogue as more effective than many of the formal consultation mechanisms (OECD, 2011).

The Working Group to the Council also has an associated Group for Information Exchange State-Autonomous Communities (SISE) to facilitate information sharing and common indicators. It seeks to promote greater standardisation of indicators across regional governments and with the State. But there remain differences in definitions for key indicators within Spain.

For example, the Basque Country statistical agency (EUSTAT) reports different figures for R&D expenditure than the Spanish statistical agency (INE). And there are differences in the definitions as to what types of public spending should be considered R&D and innovation (see Table 3.1). Such commonly agreed indicators are required to better track resources and progress in the context of multi-level governance in STI policy.

Table 3.3. **Functions of Spain's 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, research programmes and projects of 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 autonomous communities 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 Commission 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: Ingenio 2010 (n.d.), *www.ingenio2010.es.*

Contracting across levels of government

Contracting between Spain and the regions is used as a multi-level governance tool in many policy fields, including STI. The generally bilateral agreements (*convenios*) between the State and a region serve to align resources, delegate programme implementation or work together towards a common goal. Additional by-products of these contracts include building trust, providing a longer-term perspective for certain projects or investments, and revealing useful information from both parties. There are several different forms of contracts being used for STI policy between Spain and the Basque Country.

Large infrastructure projects

The Map of Singular Scientific and Technological Infrastructure has been designed as a strategic 15-year-horizon planning tool. It contributes to territorial balance and cohesion by choosing the optimal location for the new infrastructure according to their goals and the industrial, technological and scientific environment. These large-scale infrastructures are created and

maintained with the financial and political support of the regions and the Spanish government. There are more than 20 installations of this type in Spain, with others in the process of obtaining this classification. All of them are based on co-financing, joint oversight committees with rotating leadership, and joint risk sharing. The Basque Country contributes to this Spanish Map with two installations under development. One example is the sub-headquarters of the European Spallation Neutron Source (ESS) in Bilbao (headquarters in Lund, Sweden). It is also part of the European Union Roadmap of Large Science Facilities. Spain will receive the vice chair of the Governing Council of the ESS and 10% ownership. It represents an investment of EUR 180 million, shared 50% between the Spanish and Swedish governments. Construction will begin in 2011 and the Bilbao sub-headquarters is projected to employ 80 people. In addition, the Molecular Imaging Centre in San Sebastian includes significant support for technology centre infrastructure (EUR 80 million total).

Innovation co-operation at policy level

These contracts set the framework whereby the two parties work together at a policy level. They may be supported by annual work plans to clarify in more detail common actions. In 2007, Spain's CDTI agency signed an agreement with the Basque Country Department of Industry, Trade and Tourism for the promotion of innovation in Basque companies, and to foster their participation in national and international R&D programmes managed by CDTI. As of October 2010, this agreement has included financing of 153 enterprises with 176 projects (36% of them co-financed between the 2 administrations). CDTI financing totalled EUR 112 million of which EUR 40 million were not reimbursable. Another recent example of this mechanism is the agreement between the public energy research agency CIEMAT and the Basque government's energy agency EVE. It aims to provide the framework for joint R&D activities in the areas of energy efficiency, energy storage and renewable energy.

The INGENIO 2010 Programme, part of Spain's National RDI Plan, includes many bilateral agreements to implement different S&T-related programmes, including with the Basque Country. The new Spanish Innovation Strategy (E2I) is also using this contracting approach, which includes Axis Four entitled territorial co-operation. Its main role is to recognise and empower the regional policies for innovation through three-year action contracts which:

- define the regional objectives of E2I in terms of new company creation, new innovation employment and additional private investment in research;

- agree on the subset of regional actions that are co-managed, by the injection of soft financing from the Spanish government to the region; and
- agree on the quotas and actions to maximise the potential of international R&D programmes, in particular the EU FP7.

The Basque Country is one of the first four regions to sign a contract with Spain to implement the E2I strategy. Within the E2I Programme "INNTEGRA", the Spanish Ministry of Science & Innovation and the Basque government's Institute of Finance have signed an agreement for joint financing of infrastructure in technology parks, strategic innovation projects, and complementary actions aimed at fostering innovation in strategically important enterprises in the Basque Country. In the context of this agreement approved in March 2010, the Basque Country will receive a low-interest loan of EUR 150 million over 15 years, without repayment during the first 5 years, for the execution of innovation-oriented actions over the next 3 years (2010-2012). It sets a commitment for 2015 of 2 500 new innovation companies, 31 000 new innovation jobs and EUR 376 million additional private investment for research. In addition, the Basque Country has obtained competitive funding from the E2I Programmes INNOVACION 2010 and INNPLANTA 2010 to improve infrastructure at the University of the Basque Country (EUR 11.9 million) and other actors of the Basque Network of Science & Technology Parks (EUR 29.3 million).

European Union: agendas and funding

With Spain's integration in the EU in 1986, a number of different agendas and policy streams have influenced the Basque innovation system. EU regulations and sectoral policy streams have an impact on the framework conditions for firms in the Basque Country. There are also key initiatives of relevance to Basque innovation system actors. 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.[8] The renewed Lisbon Agenda approach in turn influences EU policies that seek to support greater R&D investment. The Bologna Process seeks to harmonise higher education systems across member countries for one European higher education system.[9] This harmonisation will facilitate student exchanges for Basque students and universities.

An increasing share of Structural Funds, the main instrument for EU regional policy, has supported Basque Country efforts to strengthen its regional innovation system. Such funds include the European Regional

Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund. From 1994-1999, approximately 13.5% of ERDF and ESF funds (ECU 94 million) were spent on RTDI, and 44.1% (ECU 307 million) were spent on "Support to Employment and Firm Competitiveness"(Fariñas *et al*., 2009). The 2000-2006 Operational Programme dedicated 20.6% of the EUR 611 million to "Improvement of Competitiveness, Employment and Development of Productive Fabric" and a much higher 36% to "Knowledge Society (Innovation, R&D, Information Society)". Programmes under the latter category included scholarships, RTDI project co-financing, RTDI equipment and technology transfer, and ICT for the Basque Network of Science, Technology and Innovation. The EU budget for the 2007-2013 period is EUR 347 billion. The Operational Programme for the Basque Country of EUR 500 million for the "Regional Competitiveness and Employment" objective includes EUR 241 million in ERDF funds (balance from Spain), 72% of which is being used for "knowledge economy, innovation and business development" activities with a strong accent on RTDI projects.

Other EU regional policy instruments have had a notable impact on Basque Country STI policy. EU INTERREG programmes have promoted cross-border efforts with France. The region participated in RIS and RIS+ programmes. They supported technology foresight exercises and a regional innovation systems approach. They helped provide the basis for policy changes from industrial to technology-focused approaches in regional planning as well as the shift to diversify into new sectors.

The EU Research Framework Programmes (FP) are the guiding plans for EU research policy funding. Over time, the Basque Country has progressively increased its share of these funds relative to Spain and the EU overall (see Table 3.4). The share in Spain has grown from 10.6% in the FP3 to 12.7% thus far in FP7. FP7, *Building the Europe of Knowledge*, runs from 2007-2013.[10] It reflects a 65% budget increase from FP6, growing from an annual average spending of EUR 4.4 billion to EUR 7.2 billion. The new European Research Council (ERC) programmes include ERC Starting Independent Researcher Grants and ERC Advanced Investigator Grants.[11] While the funding amounts of such ERC grants may not be significant in volume relative to other FP7 programmes, they are a sign of success in terms of top research talent. Unlike Madrid and Catalonia, the Basque Country has not obtained any of these grants for star researchers.

The technology centres in the Basque Country have been the most effective of innovation system actors at obtaining EU Research Framework Programme Funds. Estimates of FP7 funds thus far (2007-2009) to the region were approximately 63% to technology centres (including CICs and BERCs but in a lesser proportion), 18% to firms, 9% to universities, and 9%

to others.[12] Per Spain's CDTI, that classification is somewhat different (53% technology centres, 30% firms, 5% universities, 4% public administration, 1% public research centres and the remaining in other.) In the FP5, that split was 51.2% technological centres and associations, 43.3% firms, 3.4% universities, and 2.1% other.[13] Universities account for a small but increasing share of EU Framework Programme funds. Among institutions participating in FP6, the University of the Basque Country (UPV) was the 8th recipient in Spain by number of projects (67 total, leader in 8). Institutions in Spain with a greater number of projects included the Spanish Research Council CSIC network, two firms including Telefonica and four other leading Spanish universities (UPM in Madrid,; UPC, UB and UPF in Catalonia).[14]

Table 3.4. **EU Framework Programme: Basque Country**

Programme period	Years	Total budget EU (EUR billions)	Increase from prior period annual average (%)	Basque Country			
				Share of Spanish total (%)	Total received (EUR millions)	Average annual (EUR millions)	Increase from prior period (%)
Third	1990-1994	6.60	23%	10.6%	24.8	6.2	–
Fourth	1994-1998	13.12	99%	14.0%	60.0	15.0	142%
Fifth	1998-2002	14.96	14%	14.8%	92.9	23.3	55%
Sixth[1]	2003-2006	17.50	17%	12.0%	117.2	29.3	26%
Seventh[2]	2007-2013	50.52	65%	12.7%	106.1	35.4	21%

Notes: 1. Exact figures vary depending on source. 2. Figure for the years 2007 and 2008 based on provisional data as of March 2009. The Basque County reports FP7 receipts in the region of EUR 49.8 million in 2007, EUR 43.7 million in 2008, and EUR 34.2 million in 2009, or approximately EUR 20 million higher than the amount reported by Spain's CDTI.

Source: OECD calculations based on data from EU, Spanish and Basque government sources.

Co-ordination within the Basque Country

Leadership required for effective institutions promoting inter-departmental co-ordination

The high political commitment given by the Basque government to the innovation agenda is reflected by budgetary resources and the creation of new bodies in the Basque innovation system. This commitment should also be reflected in governance structures that ensure an appropriate mix of

research and technological development as well as other emerging areas in innovation policy. Such approaches require procedures that ensure a formal or *de facto* co-ordination between the Department of Industry and the Department of Education, among other Departments, from STI policy design to budgetary allocation.

Councils

The **Basque Council for Science Technology and Innovation** was created at the time of the PCTI 2007-2010. It is chaired by the President of the Basque Country region and is the institution responsible for the main aspects of the region's STI policy governance. One of its missions is to ensure the necessary interdepartmental co-ordination in policy design and setting the budgetary framework for policy implementation (see Box 3.2). This inter-departmental approach marks a shift with respect to planning for prior STI plans that were developed by the Department of Industry. In principle, this Council should have an important role in steering and funding Basque STI policy. It could provide conditions for efficient inter-departmental co-ordination among ministerial departments involved directly or indirectly in STI policy. The Council's composition includes the three provincial governments. It therefore should also promote multi-level governance co-ordination between the Basque government and the provincial governments.

However, the Council has not fully fulfilled the missions entrusted to it by the 2007 decree. There are several possible reasons for its lack of success. First, for practical purposes, the Council's mission remains of a general nature; the decree does not specify either specific outputs expected from the Council (e.g. budget appropriations or S&T infrastructure funds). Second, there is no particular schedule determining the Council's meeting dates with respect to policy-making processes. In fact, since its creation, the Council has met very few times. Third, there are other formal or informal networks of STI stakeholders and representatives of strong institutions or associations that continue to have notable influence on policy orientations, design of support programmes and budgetary appropriations. The Council has also not taken sufficient advantage of the role of Innobasque as its Executive Secretariat. The case of Chile's National Council of Innovation for Competitiveness (*Consejo Nacional de Innovación para la Competitividad*) is interesting in that regard, and some of its functions could be emulated by Innobasque (OECD, 2007b).

Box 3.2. **Basque Council for Science, Technology and Innovation**

This Council, created by decree in July 2007, is formally the institution responsible for determining the science, technology and innovation policy of the Basque Country. The Council is chaired by the President of the Basque Country. Its main missions are:

- the definition of the strategic orientations and objectives of the STI policy;
- ensuring that public policies are implemented to follow these orientations and fulfil these objectives;
- the definition of technological or scientific areas that should be considered as a priority given their strategic interest for the Basque Country;
- the promotion of S&T infrastructure in line with the strategic orientations of STI policy and the S&T priority areas;
- the setting of financing and budgetary frameworks to fund policy actions and support programmes designed to implement STI policy.

The Council is composed of 12 high-level government members and other officials:

- four ministers: Finance; Industry, Innovation, Trade and Tourism; Education, Universities and Research; and Health;
- the Presidents of the Basque Country's three provincial governments (Alava, Biscay and Gipuzkoa);
- the rectors of the three universities of the Basque university system (University of the Basque Country – UPV/EHU, Deusto University, Mondragon University);
- the Presidents of the Basque Science Foundation (Ikerbasque) and of the Basque Innovation Agency (Innobasque).

The PCTI 2010 anticipates other planning and implementation bodies that do not fully achieve their missions. The Basque Research Council is entrusted with several tasks, including the promotion of excellence in research, development and innovation and integration within the Basque system and international networks. It is not clear that this Council is active and fully performing its missions. Many countries and regions have expert advisory councils (with regional and international experts) to advise on research and strategic direction. As there are research needs for different departments across the Basque government, the region should consider how to fully activate this entity or, if not, consolidate certain functions of the two councils (research and STI), with associated working groups as needed. A further Science and Technology Committee was, in theory, charged by the PCTI 2010 with inter-departmental implementation of the PCTI. Again, the governance structures to achieve this are not firmly developed.

Inter-departmental co-ordination is required for several purposes:

- **strategic planning** for STI policy with a more whole-of-government approach that recognises new areas where innovation can add value to the Basque Country, including priority setting;
- **implementation** and follow-up of the STI Plan, including the translation of the priorities set in the plan into concrete actions with associated monitoring;
- **infrastructure** needs that will reinforce the system as a whole; and
- **a broader approach to innovation** that would go beyond joint R&D planning, including innovation in public services among other areas.

Effective inter-departmental co-ordination has proven a challenge for OECD member countries and regions. In several countries, the ministries have been merged in an attempt to internalise part of this co-ordination under the same ministry. This has been done, for example, in Denmark (Ministry of Science, Technology and Innovation), the United Kingdom (Department for Business, Innovation and Skills) and in Flanders, Belgium (Ministry for Economy, Entrepreneurship, Science, Innovation and Trade). *OECD Reviews of Innovation Policy* note that many countries have tried to develop high-level STI policy councils following the acclaimed Finnish model (which is headed by the Prime Minister). But often such councils fall short of expectations. Korea's National Science and Technology Council is perhaps one exception, particularly since one of its tasks is addressing inter-ministerial rivalries to achieve greater policy coherence (OECD, 2009).

There are examples at regional level of co-ordination bodies. A longstanding effort has been made in Catalonia. The Inter-ministerial

Research and Technological Innovation Commission actually began in the 1980s. However the Commission took many years before it overcame governance challenges to execute this inter-departmental role given the dominance of the research community voice relative to that of industry (OECD, 2010a).[15] As a consequence of challenges in inter-departmental co-ordination in Castile and Leon, the 2001 Law for the Promotion and General Co-ordination of Scientific Research, Technological Development and Innovation established two bodies. The Co-ordination Commission for Science and Technology includes representatives of all relevant regional government departments (8 of the 12). The Advisory Council of Science and Technology includes leading innovation system actors, both public and private, as a forum to work together in strategy design and development. In 2007, a Science and Technology Commissioner was also created to advise the region's President and government as well as to report periodically on progress (Cunningham, 2008). Flanders has also made interesting efforts to develop more horizontally integrated policies (see Box 3.3).

Box 3.3. **Flanders: "horizontalisation" of ministerial responsibilities and advisory body**

Flanders (Belgium) has for several years considered innovation a goal for policy across departments. The Ministry of Economy, Entrepreneurship, Science, Innovation and Trade gathers many of these functions. The approach to regional competitiveness is based on innovation, as opposed to R&D, policy. High-level policy documents have stated:

- "The Flemish success in innovation is not only dependent from the policy domains in science and innovation. There is a need for an integrated horizontal policy involving the whole Flemish government, its ministries and agencies" (Policy Letter Science and Innovation 2005-2006).
- "The interactions between R&D, enterprise and international enterprise, with an eye on land planning aspects and knowledge intensity, imply that a fragmented policy approach is insufficient. These interactions can only be translated in an integrated policy approach, which endeavours to create as much synergies as possible between various policy domains."

Box 3.3. **Flanders: "horizontalisation" of ministerial responsibilities and advisory body** (*cont.*)

There is an important accent on creativity, entrepreneurship and innovation with a broad approach that includes services and the public sector. Key priorities include: building a strong knowledge base in the public sector, valorisation of this base in outcomes relevant to societal needs, promoting entrepreneurship, creating critical mass in technology and innovation, rationalising public support, and evaluating public actions. In addition, the socio-economic development plan "Flanders in Action" (2006) placed "creativity, innovation culture and entrepreneurship" as its top priority with a recognition of open innovation and a focus on human resources.

The former Flemish Council for Science Policy – VRWB – (created in 1985) has also been upgraded to support this approach. In 2007 it became the Strategic Advisory Council for Science and Innovation. The mission was changed to focus more on analysis and policy advice than *ex post* evaluation. Its mandate also involves taking a broader approach to innovation, as the mission includes consideration of "factors such as taxation, education, labour organisation in the enterprises, personnel management, social and political concertation procedures, government regulations, etc." (VRWB Advice 30).

Source: Cunningham (2008), *Monitoring and Analysis of Policies and Public Financing Instruments Conducive to Higher Levels of R&D Investments: The "Policy Mix" Project: Thematic Report Governance*, study funding by the European Commission-DG Research, March 2008.

The Basque Country is also facing an imperative to build up its S&T infrastructure. The current endowment of basic and applied research institutions is perhaps less than that of competitor regions. In addition, to build critical mass for investment in such infrastructure, as well as ensure cost effectiveness of investment, collaborative programming and cost-sharing procedures are required. Duplication in the current system is also possible due to the lack of a consultation process across government on investments that could be relevant for more than one Basque Country department.[16] In this regard, the Basque Country could emulate the process implemented in Israel for the funding of research infrastructure (Box 3.4).

Innovation in public services

The inter-departmental approach can go beyond joint planning for S&T infrastructure and R&D instruments to include innovation in the public

sector more generally. Innovations associated with online procedures and e-government is one area where public actors have been seeking to both engage citizens and provide a better user experience. Another area where governments have been seeking to innovate is service delivery. In rural areas, for example, the innovations are used to overcome challenges of distance and lack of critical mass that prevent governments from meeting the goals of equal service access (OECD, 2010b). More recently, there has been a desire to support not only public sector budget cuts, but also to use new technologies in the public sector, respond to demand by citizens, or to address global challenges. One public service innovation programme backed by EC Framework Programme funds (Publin) outlined a range of types of innovation: new or improved service innovation, process innovation; innovations in administrative approaches or system approaches; new concepts; or radical change in culture.

OECD member countries and regions are beginning to highlight public sector innovation in their strategies. At the country level, examples include Australia, Finland, Korea and the United Kingdom. The United Kingdom's NESTA Lab for Innovating Public Services is one example of an experimentation lab and advisory service for public sector innovation. South Africa's Centre for Public Service Innovation and Korea's Foundation for Innovation seek to provide expertise. Finally, an innovation culture can be supported through incentives for public sector innovation, including awards or special funding schemes. There are a number of award schemes in the United States. Types of public sector innovations receiving awards range from police trying to find better ways of restoring stolen goods to their rightful owners to a web-based social network for the military that is suitable for the Department of Defence firewall.[17]

There are also initiatives that seek to measure innovation in the public sector. One option is to take a sectoral approach to measure in a more refined way new products, processes, organisational and marketing methods in sectors commonly associated with the public sector, like education and health. Another approach being explored is to document the presence of an innovation culture in any type of sector, like in an innovation survey to firms. One initiative for measurement, sponsored by the Danish Ministry of Science, Technology and Innovation, is a project with Nordic countries to develop a framework for measuring public sector innovation.[18] NESTA in the United Kingdom is also piloting an organisational innovation diagnostic tool in the development of a Public Sector Innovation Index.

Recent work among OECD member countries on innovation in public service delivery is exploring demand-driven approaches known as co-production. Co-production is defined as "a way of planning, designing and delivering public services which draws directly on input from citizens,

service users and civil society organisations." The motivation for this kind of innovation is reported by OECD member countries to be more related to citizen engagement, service quality, outcome and trust more than productivity increases or expenditure cuts. Results indicate that co-production is often used for pilot projects of an incremental nature to add to an existing portfolio rather than a substitute measure to reduce costs. Examples may come from the field of public safety (women as urban social mediators in Brazil), environmental protection (monitoring of bush fires in Australia) or social services (self directed care budgets for the mentally ill in the United States) (OECD, forthcoming).

Mobilising private stakeholder involvement in STI policy

To respond to the changing nature of innovation and the need to bring in new stakeholders, OECD regions are seeking to make governance go beyond government. Councils, agencies, and public consultation methods, including web-based tools, are among the vehicles being used. The new paradigm for regional innovation agencies is to be a change agent in the system and a facilitator with a strategic and more holistic perspective. The traditional paradigm focuses on financing and instrument delivery to address market failures. Public-private linkages for these agencies take different forms. In many cases, their legal structure requires private actors to be on the Board of Directors, which ensures that private-sector ideas are taken into account for strategy development. If the agency delivers services to clients, this is yet another public-private interface that provides valuable information. And the agency, along with other actors, is a fellow member in the same innovation system.

There are different approaches used in regions to achieve that transition of regional innovation agencies. One option is a change in the nature of the service delivery agency to adopt that new role. The agency Aster in Emilia-Romagna (Italy), for example, evolved from a technology transfer delivery agency towards a networked model approach. Bretagne Innovation in Brittany (France), created by the regional government with a non-profit status, seeks to support the innovation system in a holistic manner. In a recent innovation strategy development exercise, the agency sought to bring more coherence and effectiveness to a wide set of intermediaries, facilitators and financers that had sprung up in the region over the decades. The Basque Country model has been to create a new structure to help serve this need for a facilitator and change agent (OECD, 2011).

Innobasque was created in 2007 as the region's innovation agency to support the innovation system generally, with a powerful board that includes the leading public and private actors of the region. It is a leading regional

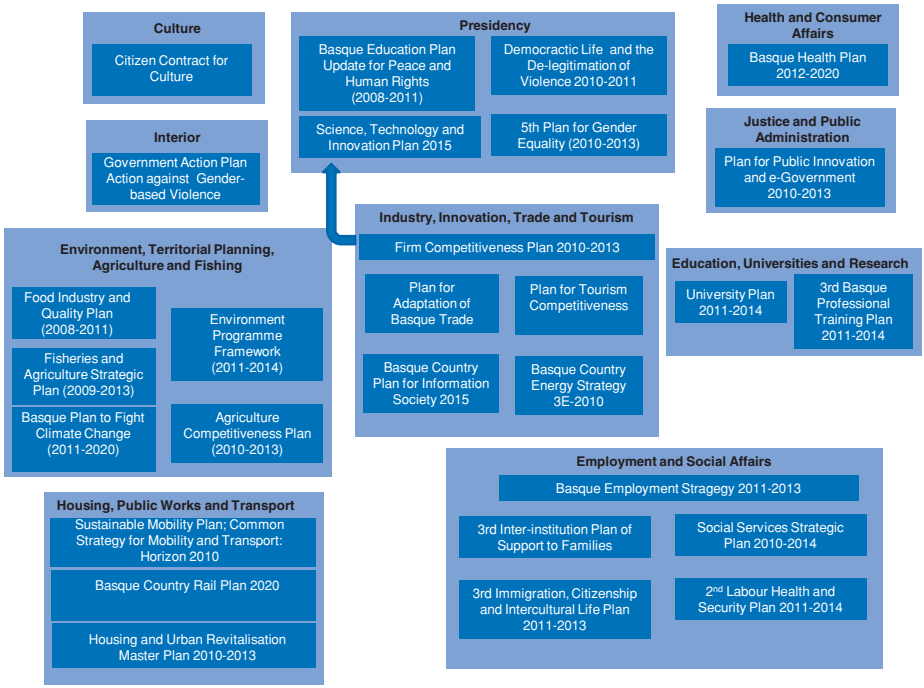
proponent for exploring innovation in a broader sense, including for public services or other social goals. Bringing together public and private stakeholders in different fora is one of Innobasque's main missions and has a valuable function for the region. On a regular basis that matches the PCTI planning cycles, and other relevant plans, Innobasque could engage stakeholders in participatory and foresight exercises that have the advantage of being both product and process oriented. They facilitate consensus building over priorities and commitments and foster the development of linkages among participants. In this context, Innobasque could be inspired by the CARI exercise undertaken by the government of Catalonia (Government of Catalonia, 2008).

As a relatively new agent in the Basque innovation system, Innobasque's role is still being defined and interpreted by itself and other innovation system actors. To achieve effectiveness as a facilitator of dialogue and provider of policy intelligence, it will need to: ensure a clarity of mandate that is distinct from other actors in the system; possess the legitimacy to collaborate with all public and private actors; **not** be perceived as competing with other actors for funding; and be held accountable to measurable results, as are other system actors. The valuable gap-filler role should include identifying where there is a missing element in the system and suggest what policy or agency is most uniquely suited to address that gap (be it Innobasque or another actor).

The 2015 STI Plan

The hierarchy of strategic plans in the Basque Country is relevant to the co-ordination efforts across ministries for STI-related policies. The 2009 elected Basque Country government seeks to develop a new social contract with four strategic objectives based on the vision of "a Basque Country of citizens that are free, solidarity-based, sustainable and competitive." There are at least 28 anticipated plans for the region on different topics (see Figure 3.2).

Figure 3.2. **Basque Country government plans 2009-2013**



Source: 2010-2013 Firm Competitiveness Plan, Basque Country.

Those most directly related to the STI Plan are the Firm Competitiveness Plan and the University Plan. However, with the broader approach to innovation expected, others could become more directly linked. The University Plan is in progress. The Plan for Firm Competitiveness 2010-2013 (approved mid- 2010) was led by the Department of Industry. The Competitiveness Plan has some implications for other departments. However, the plan notes explicitly the challenge of inter-departmental collaboration as a barrier to the development of a more global Basque Competitiveness Plan – one that goes beyond firm competitiveness.[19] Other plans cover fields such as energy, the environment, agriculture, health, employment, training, social services, ICT, public administration and mobility.

For the development of the next STI Plan (see Box 3.5), the Basque government President's Office will take the lead. To achieve a broader whole-of-government approach, strong leadership from the top is necessary. The change in governments in 2009 required an adjustment phase. But since

government-wide leadership had not been in place throughout the entire prior plan period, a number of steps for developing the new Plan have not yet been addressed. There have been several diagnostics of the Basque Country, notably in terms of the competitiveness of the region with respect to different quantitative indicators. The *White Book on the Basque Innovation System Horizon 2010,* developed several years ago, served as a diagnostic for PCTI 2010. There were no specific foresight exercises associated with the new Plan. There was not an active monitoring and evaluation of the plan's targets throughout the last plan period, or any mid-term checking or evaluation. A plan for co-ordination of PCTI 2010 implementation and deployment, to offer concrete feedback on the strategy in progress, did not materialise.

Importance of adapted monitoring, evaluation and information systems

There are a number of different forms of monitoring, assessment and evaluation, but they all rely on strong information systems. Such evaluations of plans, policies, and individual system actors (universities, TCs, CICs, firms, etc.) should confirm whether they have met stated goals. Another important criterion for evaluation is their capability of an innovation system actor to respond to the social, economic, industrial, scientific and technological needs of the region. Such evaluations can also help determine needed adjustments to face future challenges.

The Basque Country benefits significantly from the Basque Institute for Competitiveness (Orkestra), which provides comprehensive and data-rich assessments with international comparisons. Subjects of their studies include the competitiveness of the economy, the performance of the innovation system and its actors, and in some cases Basque policies. EUSTAT, the Basque Country statistical agency, has a rich set of data at very low levels of aggregation. It maps its innovation data to those used in the European Innovation Scoreboard for regular international comparison. There are nevertheless areas for improvement that could support policy making.

Box 3.5. **STI Plan 2015: strategic orientations**

The next STI Plan (PCTI 2015) was in development at the time of this report. The Plan notes the importance of globalisation and the rise of emerging economies, as well as major global issues concerning the environment, energy, migration, social exclusion, aging and health. Important regional initiatives in progress include the science park at the University of the Basque Country, the development of the electric car in the region, and the Biscay Marine Energy Platform (BIMEP) to capture wave energy. Plan development takes into account important Spanish strategies (National Plan for Research 2008-2011, Spanish Strategy for Innovation E2I) as well as EU strategies (Europe 2010) and programmes (Framework Programme). It also proposes a greater accent on co-ordination through leadership by the Basque Country President's Office, better use of the Basque STI Council after evaluation, and an inter-departmental committee for plan implementation and monitoring. Strategic orientations of the plan include:

1. increasing R&D and innovation investment;
2. supporting collaboration, working in networks and global alliances, including public-private partnerships;
3. a productive system that adds value based on knowledge and addresses global challenges;
4. providing incentives for social innovation and research that meets society's needs;
5. developing an internationally recognised science system;
6. strengthening and better valorisation of the Basque STI Network;
7. attracting scientific and technological talent to firms;
8. engaging society and citizens.

Source: "Lineas estrategicas y economicas basicas del PCTI 2015", working document dated 30 June 2010.

A balance must be struck between the need for periodic adjustments based on evaluations and stability of support programmes to ensure their long-term impact on the behaviour of beneficiaries. However, the continuity of certain policy approaches may not all be based on assessments of the outcome of existing support programmes in terms of management, efficiency, effectiveness, R&D additionality or wider economic impacts.[20] There is a cost-benefit ratio with respect to the use of evaluations; therefore areas of large public expenditure (or foregone revenue) merit particular attention. This is particularly true in the case of the Basque Country with

respect to the high share of public financing of business R&D expenditures, both directly and through tax incentives. Regular audits should also check that budgetary appropriations earmarked for S&T are effectively spent in that area.

Evaluations of input and output additionality[21] and opportunity cost as well as "behavioural additionality"[22] would be helpful in this regard. The latter concerns the evolution of firm innovation behaviour over time.[23] Behavioural additionality is an indication that support programmes have a positive effect on the dynamics of the innovation system, notably as regards the interactions and knowledge flows among agents and institutions, and that they catalyse the development of virtuous circles between generation, dissemination and application of knowledge in innovation systems (OECD, 2006). The purpose of support programmes is not restricted to addressing market and systemic failures. They are also designed to facilitate the emergence of such virtuous circles. Therefore, systemic evaluations should be an intrinsic part of a policy-making process that adapts the policy mix to outcomes of previous policies involving financial support or institutional reforms. Such evaluations do not appear to have been conducted in the Basque Country, contrary to the situation prevailing in a number of OECD member countries, or even some advanced regions.

The information system needs to provide the right data for monitoring the performance of the S&T and innovation system. It underpins sound and regular policy assessment in terms of efficiency, outcomes and more generally socio-economic impact. S&T statistics and indicators compiled by EUSTAT are certainly developed according to demanding OECD standards. However, as already mentioned (see Chapter 1 and Box 1.3), the classification used to compile R&D expenditures does not provide the full information needed to understand the system and its evolution. Innovation actors that have a more or less quasi public role and financing, such as CICs, BERCs, and to a lesser extent technology centres that are mainly funded by private sources, are classified in the business sector. In parallel to the classification, EUSTAT should therefore be encouraged to develop more functional aggregations of S&T statistics and indicators that allow the development of a more policy-relevant monitoring system. Such a functional aggregation should distinguish between the higher education sector, the government sector (including quasi public research centres), the business sector (including all firms in the productive sector whether or not they belong to the RVCTI) and, given their important role in the Basque system, technology centres. The improvement of the information system could also offer greater consistency between budgetary data on support programmes and data compiled by managing agencies such as SPRI.

The region could also consider empowering SPRI as the lead delivery agency in the innovation system by greater integration of associated tasks to reinforce this monitoring and evaluation role. SPRI is an internationally renowned development agency that contributed to the successful turn-around of the region in the 1980s and 1990s. At present, it implements most of the Department of Industry's programmes, but not all. The management of programmes that entails project evaluation and resource transfer to beneficiary institutions seems to be organised in an efficient way.[24] However, the Department of Industry retains the authority to formally approve projects and disburse funds. Following international best practices, the political bodies responsible for defining priorities and policy design should be distinct from agencies in charge of implementing them, the latter being accountable to the former. And given the need for greater programme evaluation of the mix of instruments, the Basque Country could consider giving SPRI the capacity and resources to manage the full portfolio of the Department of Industry instruments. This association of financing, implementation and evaluation by the implementation agency is common in the new public management approaches to STI policy delivery. But of course delegation of responsibilities without sufficient resources or capacity would be a counter-productive unfunded mandate.

The provinces and localities: synergies, duplication and experimentation

Provincial spending and programmes

Within Spain, there are no parallels to the level of competences at sub-regional level as those found in the Basque Country provinces (historical territories). The Basque provinces do not have assigned competences for STI policy per se, but nevertheless use their own resources to promote STI actors or innovation policy through their competences in economic development. The partial overlap in *de facto* policy competences can lead to dialogue between provinces and the region, experimentation and complementarity, but also duplication.

Provinces may experiment and/or duplicate Basque Country programmes because they have resources to do so. Their overall budgets cumulatively totalled nearly EUR 5 billion in 2010 (See Table 3.5). Per planned budgets in the STI Plan 2010, the share contributed by provinces is approximately 8.2% of the total Basque Country contributions during the plan period (or around EUR 40 million annually). These funds likely come from the provincial budgets for economic promotion and innovation activities. Across the three provinces, those specific budgets totalled almost EUR 186 million in 2008, down to a projected EUR 137 million in 2010.

Table 3.5. **Basque Country and provincial government STI spending**

Year	Basque Country government[1]		Provincial governments[1]	Biscay Province		Gipuzkoa Province		Alava Province	
	PCTI 2010 (planned figures)			Economic promotion		Innovation and knowledge society		Innovation and economic promotion programmes	
	EUR millions	Share of budget	EUR millions	Share of budget	EUR millions	EUR millions	Share of budget	EUR millions	Share of budget
2007	441.76	5.2%	38.36	6.8%	102.7	36.0	4.6%	34.6[2]	1.5%
2008	432.25	4.6%	39.49	7.0%	121.6	53.2	6.2%	11.1	0.0%
2009	460.36	4.1%	40.66	5.5%	102.0	41.5	4.3%	10.9	0.4%
2010	507.46	5.0%	41.88	4.7%	81.6	46.7	4.8%	9.0	0.4%

Notes: 1. Figures for Basque Country and provincial governments include their respective shares of the Innovation Fund. 2. The 2007 budget figures for Alava province include budgets for the Department of European Affairs and the Department of General Services. In later years, those budgets were moved to the Department of Treasury, Finance and Budgets.

Source: PCTI, Basque Country government, individual provinces.

The provinces spend their funds in different ways to support their own industrial structure, innovation system actors and policy priorities. Provinces engage in analyses of their own systems, benchmarking their innovation performance internationally. They bring in international experts in the same way that the Basque Country government does at a larger scale. Their initiatives include several "firsts" in Spain. They also compete to a certain extent. This competition and its associated resources may also be used to influence location decisions of firms or other STI infrastructure. Given the relatively small surface area of the Basque Country, this competition may not always serve the best interests of the region. There exists a wide range of programmes promoted at provincial level.

Biscay is the largest province in terms of GDP, population, and public spending on economic promotion. Its 2010 budget was dedicated 33% to infrastructure, 22% to innovation promotion, 18% to firm support, 19% to employment and knowledge generation, and 8% to remaining services, including IT. The province promoted the first technology park in the Basque Country (and Spain). BEAZ Bizkaia is the province's public agency with a mission to foster firm competitiveness and turn the province into a more innovative, creative, dynamic and entrepreneurial region. The agency supports firm innovation projects, a seed capital fund, a business incubator (the first in Spain) and an innovation network (BIZKAIA:XEDE). It also supports innovation and research talent attraction to firms, with reimbursement of certain costs for the hiring of an international candidate as well as relocation support. The PREMIE programme for micro and small firms supports organisational innovation using the EFQM Excellence Model to support "people-based" firms (over 800 firm participants). The region also produces publications, such as a *Guide for Transformation* that seeks to help firms and other civil organisations become more competitive and sustainable.

Alava, the smallest province, tends to focus more on its firm base that is not as well served by other Basque Country programmes, particularly SMEs or firms in more traditional sectors. Alava also spends a relatively larger share of its economic promotion budget on training compared to other provinces.

Gipuzkoa has taken a dual approach to supporting its innovation system. On the one hand, there are programmes for traditional clusters as well as those associated with the spirit of cooperatives, largely represented in the region and symbolised by Mondragon. The Gipuzkoa Science, Technology and Innovation Network Programme supports those RVCTI (Basque Network) actors located in the region. They include five out of the region's seven CICs, and half of its BERCs and R&D business units. This complements spending by Basque government programmes. The TXEKIN

programme promotes start-ups, BARNETEKIN for spin-offs from firms, and EMEKIN for female entrepreneurs. The GIPUZKOA BERRITZEN programme seeks to achieve greater economic benefit from R&D&I investments. The province has also taken some other measures that are distinctive in terms of culture change and seizing advantages in creative sectors (See Box 3.6).

Box 3.6. **Gipuzkoa: building a creative, entrepreneurial and "intelligent" society**

The province of Gipuzkoa promotes a range of programmes that seek to change the society at large to make it more entrepreneurial, creative and successful.

Entrepreneurship: the *Kosmodisea*, now in its fourth edition, involved 80 teachers and over 1 400 students including 12 groups from 41 educational institutions. The programme is a co-operative game among students based on extensive use of ICTs. The programme's purpose is to develop values associated with a culture of entrepreneurship in education outside of the university. Other programmes are targeted at students via the HASI ETA HAZI teaching manuals. And the region is encouraging entrepreneurship in higher education institutions.

Emotional and social intelligence: the concepts of emotional and social intelligence, popularised by Daniel Goldman, illustrate characteristics of individuals that contribute to greater success in personal and professional lives. The province has promoted this concept widely. Curriculum guidelines have been developed on social and emotional intelligence and thus far are integrated into the teachings of between 30% to 40% of schools. There are publications that discuss the concept for the workplace, communities, and children and families. The model is also being promoted in sports and trainings for businesses.

Basque Culinary Center: San Sebastian is a Michelin star capital (more stars per capita than any other city). Building on the region's strong culinary tradition, the Basque Culinary Center will include a university degree programme through the University of Mondragon and state-of-the-art facilities for research and teaching. The project combines training, research, innovation and transfer of knowledge and technology in the different areas of food and science. The centre will have a Faculty of Gastronomy and Culinary Sciences, and a Research and Innovation Centre. The centre will develop six research lines: education and eating habits, social alimentary responsibility, eating trends, innovation in managing technologies, developing associated technologies, and producing, presenting and conserving food.

Local development agencies: supporting SMEs and innovation networks

Local development agencies (LDAs) are another type of actor gaining prominence in the innovation support landscape of the Basque Country. They were generally created in the 1980s during a period of severe industrial restructuring and job loss. Their initial mission of job creation has evolved over time. In the last few years, they have taken a more active role in supporting SMEs and building networks to support innovation. However, more opportunities are needed for co-ordination with higher level policies so that the agencies are not simply filling gaps in policies that could be better designed at Basque level.

Local development agencies as a group have a notable weight and outreach. In 2009, there were 33 LDAs with 503 staff serving 165 municipalities covering 84% of the total Basque Country population. The combined budget of these agencies totalled EUR 79 million, financed in part by the municipalities (43%) and revenues/other sources (11%). Almost half of the funding came from higher levels of government, including the Basque Country provincial governments (13%), the Basque Country government (19%), Spain (11%), and the European Union (3%). Approximately half of the collective LDA budgets (51%) were used for employment-related projects. The other half was divided among different firm support efforts in terms of firm creation, commerce, tourism, strategic projects, etc.

Several studies have been conducted on the network development activities in these local areas. These efforts seek to change the collaborative mindset of local actors. For example, it was found that after the Ezagutza Gunea was implemented: there was a more collective approach of firms; local councils went beyond "hardware" to include "software" programmes; and local development agencies broadened their scope to consider networking as a local development tool beyond direct service provision (Aranguren *et al.*, 2010). These local level actions support the Basque government's goals for building a more networked society with a broader approach to innovation.

Conclusion

The Basque Country has a long history of successful autonomous STI policy making that has been a model for many OECD regions. This is due in part to the significant level of resources at regional level (relative to other regions in Spain or many other OECD regions) as well as strategic choices to fill needed gaps in policies from higher levels of government adapted to

the region's industrial structure and innovation system actors. The Basque Country has increasingly mobilised funds from outside the region via Spanish and EU programmes. It has also engaged in opportunities to partner with the Spanish government on the implementation of key national strategies and the development of large ST & infrastructure.

The most urgent governance need in the Basque Country is for a functioning inter-departmental co-operation for STI policy. High-level leadership from the President's Office may be required to establish this, not only among the two most active departments in the field (Industry and Education), but also others with research and S&T infrastructure (such as Health and Agriculture). Furthermore, a broader approach to innovation involves a wider range of departments than the "usual suspects" in STI policy. Such co-operation can help address the need for a more unified R&D agenda across departments, identify more creative uses of the Innovation Fund, as well as support S&T infrastructure planning. All of these matters could be increasingly oriented towards the most pressing social challenges in the region, as well as towards its industrial strengths. Innovation in public services is another area that such inter-department co-ordination and awareness could promote. There are many OECD examples on inter-departmental collaboration and "horizontalisation" of innovation policy to which the Basque Country may refer.

Adapted monitoring and evaluation systems are also needed. This comment is generally true in any OECD region. But in the Basque Country, certain aspects of the current public support that are significantly higher in international comparison, not the overall spending on STI policy per se, make evaluation more of an imperative. The "additionality" of such investments is an area under-developed in current assessments and evaluations. Many assessments of the region already provide valuable information to policy makers. This can also be complemented by investments in, and promotion of, adapted monitoring systems that enable programme managers to more effectively administer programmes.

Finally, the multiple layers of governance have the benefit of experimentation with adaption to local needs but also entail some duplication. Mechanisms for better alignment are needed to reduce clutter and address failings at Basque Country level that provinces and localities address. Therefore, beyond the Basque STI Council, which as an official body may also confront political issues, different forums for practitioners to meet and discuss are vital. Innobasque, Innovanet and other actors can provide these regular opportunities for discussion and common action to promote greater complementarity or alignment in programmes at different levels of government within the region.

Notes

1. These amounts do not correspond to the amounts projected in the PCTI, which are significantly higher and must reflect a wider range of expenditures.

2. The amount reported in FECYT (2009) of EUR 249.35 million in 2007 is lower than that reported in the Basque Country PCTI 2006-2010, which reports EUR 407.76 million in that same year. For comparisons across Spanish regions, the standardised calculation made by FECYT using data from the Spanish Ministry of Economy and Finance was used.

3. For discussions of this competence sharing, see for example, Bacaria *et al.* (2004) and Sanz-Menéndez, L. and L. Cruz-Castro (2005).

4. The Royal Decree 3/2009 of 1 January 2009 recognises the decision of the 11 December 2008 meeting of the Mixed Commission to proceed with a transfer.

5. They are: the Centre of Materials Physics in San Sebastian and the Unit of Biophysics in Leioa.

6. Data from Spain's Centre for Technological and Industrial Develpoment (CDTI) as reported in the COTEC *Informe* 2009.

7. As noted in the *Conclusiones del Consejo Europeo de los días 25 y 26 de mayo de 2010* (ST10266/10).

8. 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.

9. 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.

10. 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*.

11. 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*.

12. Based on data provided by Innobasque.

13. Data from the Spanish Ministry of Science and Innovation and its agency CDTI, October 2003 presentation "V Programa Marco (1999-2002): Participación de las Comunidades Autónomas." And April 2010 presentation "Participación Espanola en el VII Programa Marca: Resultados provisionalles por CCAA (2007-2009)".

14. As reported in Table 5 of "VI Programma Marca de I+D (2003-2006): Análysis Resultados de la Participación Española", CDTI, last revised August 2007.

15. CIRIT was recently reorganised and is now the CIRI, Inter-ministerial Research and Innovation Commission.

16. An example of such duplication was brought to the attention of the OECD during the fact finding mission.

17. See for example, *www.innovations.harvard.edu*.

18. For more information, please see *www.mepin.eu*.

19. Development of that plan involved several steps. One step was obtaining outside analysis (notably by Orkestra). A project committee was established with several actors: Orkestra (think tank – focus on technical advisory), Innobasque (Basque innovation agency – focus on work groups and proposals from them), Euskalit (Basque Foundation for Quality – work groups and implementation of actions). The work groups on key themes supported by the project committee were followed by interviews with a range of key stakeholders (public, innovation system actors, etc).

20. One study by Deloitte looks at the multiplier effects of technology centres as firms, but not on the policies they benefit from. Furthermore, the

Basque Country's agencies entrusted with S&T and innovation policy implementation seem to have a rather limited set of evaluations of programmes and financial instruments in support of R&D and innovation projects that they manage. The most often used evaluation indicator is the ratio between proposed and accepted projects, which does not say much on efficiency or impact.

21. Public support that has a positive multiplier effect on private R&D expenditure is an example of input additionality. Public support that leads to positive outcomes in terms of productivity, patents or market shares, for example, is output additionality.

22. Meaning that public support enhances a learning process through which firms improve and diversify their modes of knowledge acquisition and broaden their modes of innovation, notably through increased co-operation (OECD, 2006).

23. Innovation surveys are a key source of information to assess behavioural additionality effects. OECD member countries increasingly rely on the behavioural additionality concept (and not only on input and/or output additionality) to assess the efficiency of their programmes of support to business R&D (OECD, 2006).

24. Although it has been argued that for some programmes involving co-operation projects between enterprises and technology centres, SPRI disburses the grants once the approved project has been executed (Olazarán and Otero, 2007).

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BASQUE COUNTRY, SPAIN

The Basque Country region in Spain is world renowned for a successful industrial transformation, the urban regeneration of Bilbao, cultural distinctiveness, unique governance arrangements and high wealth levels. Over the last 30 years, the region has implemented its science, technology and innovation (STI) policy driven by a need to boost industrial competitiveness. The role of total factor productivity and innovation in driving growth was significant in the 1990s and declined in the early part of this decade, but appears to be on the rise again thanks in part to significant increases in public and private investment in innovation. The Basque Country has begun a transition from a model of incremental innovation in manufacturing to a model increasingly based on science and other forms of knowledge. Through a diagnostic of the innovation system and the policy mix, the review offers some policy and governance recommendations to achieve the region's desired transition in light of global trends in the innovation process and innovation policy.

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